A practical guide to

Auditing water safety plans

World Health Organization

IWA the international water association

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International Water Association (IWA)

The International Water Association (IWA), a global network of water professionals, is a non-governmental organization (NGO) in Official Relations with WHO. WHO's network of NGOs in Official Relations contributes to promote the policies, strategies and programmes derived from the decisions of the Organization's governing bodies. IWA's role as an NGO in Official Relations with WHO focuses on supporting countries to implement intersectoral policies and interventions for protecting health from immediate and longer term environmental threats. A long history of cooperation exits, built on previous joint activities between WHO and IWA's predecessors, the International Water Supply Association and the International Water Quality Association. A key area of cooperation is drinking-water safety.

IWA's Bonn Charter for Safe Drinking Water promotes the application of water safety plans (WSPs) as expressed in the WHO Guidelines for Drinking-water Quality. (Revisions to the WHO Guidelines will be taken as revisions to the Bonn Charter in as much as the Bonn Charter refers to the Guidelines.) IWA promotes WSPs with WHO through collaboration agreements, and through its membership of water utilities, research institutes, industry, and individual professionals. IWA's work spans the continuum between research and practice, covering all facets of the water cycle. IWA is a registered charity in England (Company registered in England No. 3597005 Registered Charity (England) No. 1076690).

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Abbreviations

AdA	Águas do Algarve, Portugal
DHHP	Department of Hygiene and Health Promotion (Lao People's Democratic Republic)
DHUP	Department of Housing and Urban Planning (Lao People's Democratic Republic)
DoH	Department of Health
DWI	Drinking Water Inspectorate (United Kingdom)
DWSS	Department of Water Supply and Sanitation (Nepal)
GDWQ	*Guidelines for Drinking-water Quality* (WHO)
HACCP	hazard analysis and critical control point
IWA	International Water Association
MoWHS	Ministry of Works and Human Settlement (Bhutan)
NEA	National Environment Agency (Singapore)
NGO	non-governmental organization
OFI	opportunity for improvement
PAC	polyaluminium chloride
QMRA	quantitative microbial risk assessment
QMS	quality management system
RMP	risk management plan
SCADA	supervisory control and data acquisition
SOP	standard operating procedure
UV	ultraviolet
WHO	World Health Organization
WSP	water safety plan
WTP	water treatment plant

1. Introduction

The water safety plan (WSP) approach is widely recognized as the most reliable and effective way to consistently manage drinking-water supplies to safeguard public health. Since the introduction of WSPs in the third edition of the WHO Guidelines for Drinking-water Quality (GDWQ) and the International Water Association (IWA) Bonn Charter for Safe Drinking Water in 2004, a significant number of water suppliers have implemented WSPs and many governments are actively promoting their implementation and/or inclusion in national legislation. According to preliminary results from a recent WHO/IWA global survey on WSPs (or equivalent risk assessment and risk management approaches), approximately 90 countries have implemented WSPs and approximately 40 countries reportedly have policies or regulations in place that promote or require WSPs.

Auditing is a critical element in the sustainable implementation of any WSP as it provides a check that the WSP is complete, adequately implemented and effective, and it supports continuous WSP improvement. In addition, wherever WSPs are required by policy or regulations, auditing is necessary to confirm regulatory compliance. However, the WHO/IWA WSP global survey found that only half of the countries for which WSP policies or regulations apply reported that external WSP auditing was required. Further, fewer than half of the countries that reported external WSP auditing requirements had already established an auditing frequency, suggesting that many auditing schemes are at an early stage of development and implementation. These findings can be explained in part by the challenges of designing and carrying out WSP auditing and the limited guidance available to support this endeavour. As a result, many governments, water suppliers and other stakeholders have called for WSP auditing guidance.

This WSP auditing guidance document contributes to a growing body of practical WSP tools and resources developed by WHO and IWA, in collaboration with a number of other key partners. These include: the *Water safety plan manual: Step-by-step risk management for drinking-water suppliers* (WHO/IWA, 2009); *Think big, start small, scale up: A road map to support country-level implementation of WSPs* (WHO/IWA, 2010); the WSP Quality Assurance Tool (WHO/IWA, 2013); the WSP training package (WHO/IWA, 2012) and the web-based Water Safety Portal (www.wsportal.org). WHO has also published guidance specifically targeting small systems, namely, *Water safety planning for small community water supplies* (WHO, 2012) and the associated *Water safety plan: A field guide to improving drinking-water safety in small communities* (WHO, 2014a). WHO has also published guidance to support water safety planning in the catchment, distribution system and consumer elements of water supply chains, namely, *Protecting groundwater for health: Managing the quality of drinking-water sources* (WHO/IWA, 2006), *Water safety in distribution systems* (WHO, 2014) and *Water safety in buildings* (WHO, 2011a).

1.1 Purpose and scope

This document aims to support the development and implementation of customized WSP auditing schemes by setting out the most important considerations and requirements, including:

- audit objectives
- audit methodology
- audit scope and depth of investigation
- audit timing and frequency
- auditor qualifications
- auditor training and certification
- establishing audit criteria
- evaluating and reporting audit findings.

Case studies, examples and tools from various WSP auditing schemes are included for illustrative purposes and are intended to provide helpful information to guide the development of tailored approaches. Their inclusion does not indicate endorsement by WHO or IWA for any specific approach or tool, and customization to best suit the local context is always encouraged.

As those seeking guidance on developing and implementing WSP auditing schemes will generally already have an understanding of WSPs, it is beyond the scope of this document to provide detailed information on the WSP process. This information can be found in the *Water safety plan manual* (WHO/IWA, 2009) and *Water safety planning for small community water supplies* (WHO, 2012). Additionally, it is not the purpose of this document to provide guidance on considerations for including WSPs in regulations or creating an enabling environment for WSPs more broadly. Such guidance can be found in *Think big, start small, scale up: A road map to support country-level implementation of WSPs* (WHO/IWA, 2010).

1.2 Target audience

This document has been developed as a practical resource for policy-makers, government bodies responsible for drinking-water regulation or surveillance, water suppliers implementing WSPs, and other water sector professionals with an interest in WSP auditing.

Note that throughout this document, 'water supplier' refers to the entity responsible for the provision of drinking-water and therefore the entity implementing the WSP and subject to WSP auditing. It may be a water utility or, in the case of community-managed water supplies, a water users' group. In the case of examples from Victoria, Australia, the term 'water agency' is used, which includes water suppliers and water storage managers.

1.3 Special considerations for small supplies

The guidance in this document applies to all drinking-water supply system types and sizes for which a WSP has been implemented. Auditing WSPs for small supplies can help achieve major benefits to the safety of the supply, often at low costs. However, small supplies commonly face challenges that require special consideration when planning and carrying out WSP audits, including:

- insufficient financial resources for operations, maintenance and improvements;
- untrained or undertrained staff;
- few staff, who often have competing responsibilities;
- geographic remoteness;
- limited access to expert assistance;
- limited equipment, capacities and budgets for water quality testing;
- limited historical data on water quality and availability; and
- regulator with many competing responsibilities, few staff and limited training or technical capacity.

These constraints have important practical implications on the implementation and auditing of WSPs, and considerations and suggestions particular to small supplies are offered throughout this document.

2. A brief overview of WSPs

Water safety plans are a proactive risk assessment and risk management approach encompassing the whole water supply system, from catchment to consumer. The WSP approach, developed to organize and systematize a long history of management practices applied to drinking-water, is considered the most effective means of consistently ensuring the safety of drinking-water supplies (WHO, 2011).

WSPs share many similarities with HACCP and ISO 22000, which are widely used in the food industry. However, HACCP and ISO 22000 are generally more applicable to the batch production processes normal to the food industry than the continuous operation necessary in drinking-water production.

Table 1: WSP modules as described in the *WSP manual* (WHO/IWA, 2009)

Module 1	**Assemble team** Set up a team and decide on a methodology by which a WSP will be developed.
Module 2	**Describe the water supply system** Visit and thoroughly describe the complete water supply system, from catchment to consumer.
Module 3	**Identify the hazards and assess the risks** Identify all the hazards and hazardous events that could affect the safety of a water supply from the catchment, through abstraction, treatment, storage, distribution and point-of-use practices to the point of consumption, and assess the risks associated with each hazardous event.
Module 4	**Determine and validate control measures, re-assess and prioritize risks** Consider if controls or barriers are in place for each hazardous event, check if these controls are effective and re-assess the risks in light of these controls and their effectiveness.
Module 5	**Develop, implement and maintain an improvement plan** Implement an incremental improvement and upgrade plan where necessary.
Module 6	**Define monitoring of control measures** Implement plans for ongoing monitoring of controls or barriers to ensure that they continue to work effectively.
Module 7	**Verify the effectiveness of the WSP** Verify that the WSP as a whole is working effectively to support the consistent delivery of safe and acceptable drinking-water.
Module 8	**Prepare management procedures** Establish and document management procedures, including standard operating procedures (SOPs) and emergency response plans.
Module 9	**Develop supporting programmes** Establish and document supporting programmes such as operator training, consumer education, optimization of processes and research and development.
Module 10	**Plan and carry out periodic WSP review** Regularly review and update the complete WSP.
Module 11	**Revise WSP following an incident** Following any incident or event, consider if it could have been prevented or the impact reduced, determine whether the response was sufficient and effective, and update the WSP to incorporate any identified areas for improvement.

Table 2: Simplified WSP approach as presented in *Water safety planning for small community water supplies* (WHO, 2012)

Task 1	Engage the community and assemble a WSP team
Task 2	Describe the community water supply
Task 3	Identify and assess hazards, hazardous events and existing control measures
Task 4	Develop and implement an incremental improvement programme
Task 5	Monitor control measures and verify the effectiveness of the WSP
Task 6	Document, review and improve all aspects of the implementation

Table 1 provides an overview of the WSP modules as described in the *WSP manual* (WHO/IWA, 2009), which is the primary WSP reference for this document. Table 2 shows the WSP tasks as presented in *Water safety planning for small community water supplies* (WHO, 2012), which outlines a simplified WSP approach to reflect the unique needs and constraints of small supplies. Many water suppliers' WSPs will follow one of these two approaches, while other water suppliers will have risk management systems in place that apply different terminology or structures, for example risk management plans (RMPs) that pre-date the *WSP manual* or cases where drinking-water is legally considered a foodstuff and the HACCP approach has been applied. Regardless of the particular approach followed, the auditing guidance in this document applies to any risk management approach that reflects the WSP principles and core elements shown in Tables 1 and 2.

Properly implemented and maintained WSPs bring many benefits to water suppliers and consumers, and WSP auditing supports the realization of these benefits by ensuring that WSPs are robust and implemented effectively. WSP benefits include:

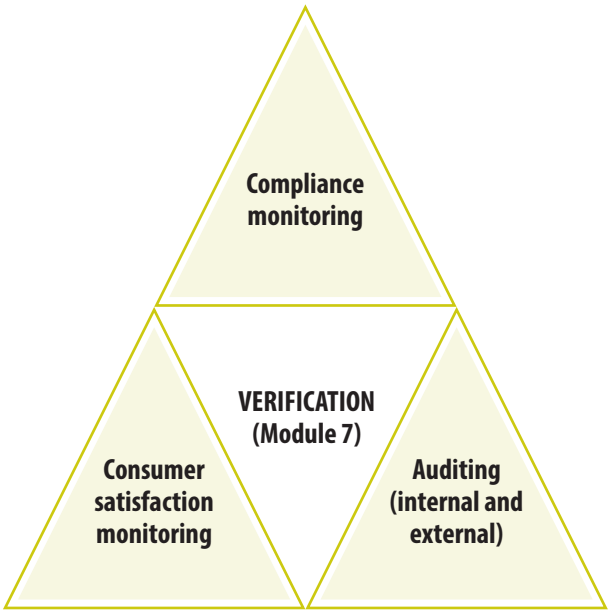
- safe and secure drinking-water supply;
- potential health gains through better understanding and control of hazards and hazardous events and the risks they represent;
- reduced number of incidents and near misses;
- demonstration of due diligence;
- increased consumer confidence in the drinking-water supply;
- cost savings through better ways of working, such as preventive maintenance procedures rather than replacements, resulting in fewer breakdowns;
- better stakeholder communication; and
- a better trained and more focused workforce.

References for further reading and information on WSPs are provided at the end of the document.

3. What is WSP auditing?

Water safety plan auditing can be defined as an independent and systematic check of a WSP to confirm its completeness, adequate implementation and effectiveness. Auditing is a core component of WSP verification (Module 7), as shown in Figure 1 below. Therefore, auditing is an integral part of a WSP.

Figure 1: WSP verification triangle



Source: Adapted from the WHO/IWA WSP training package (2012).

WSP auditing is distinct from WSP review, which is addressed in Modules 10 and 11 of the *WSP manual* (WHO/IWA, 2009). The WSP team should undertake WSP review regularly and following incidents or near misses in order to keep the WSP current and effective. WSP auditing, by comparison, should ideally be carried out by a person or persons not directly involved in the development and implementation of the WSP in order to provide independent verification of the WSP. (The concept of auditor independence is discussed further in Section 7.3.) Although distinct concepts, WSP review and WSP auditing are related in that the results of WSP auditing should always inform the WSP team's ongoing review process, and both activities contribute to the continuous improvement of the WSP.

WSP auditing may form part of drinking-water quality surveillance programmes. Surveillance is defined as the continuous and vigilant public health assessment and review of the safety and acceptability of a drinking-water supply, and the fourth edition of the *Guidelines for Drinking-water Quality* (WHO, 2011) recommends that surveillance programmes include WSP auditing in addition to direct assessment of water quality.

TIP

TERMINOLOGY AND TONE

For clarity and consistency, the term 'audit' is used throughout this document in reference to the WSP verification activity shown in Figure 1. However, 'audit' may imply a level of formality that will not be appropriate in all contexts. For many small systems, and even for some larger ones, the use of alternative terminology that better suits the local situation should be considered. For example, 'independent assessment' may be an appropriate alternative to the term 'auditing'. For community-managed systems, a more informal term such as 'WSP support visit' or 'WSP consultation' may help to set the right tone.

4. The aim and role of WSP auditing

Auditing supports the continuous improvement of WSPs and provides a system of ongoing support and accountability for WSP implementation that is essential to WSP success and sustainability. An audit can have several aims, including supporting WSP implementation and maintenance; the critical assessment of the methodology, technical adequacy and effectiveness of the WSP; and confirmation of compliance with regulatory requirements. It is important that everyone taking part in an audit understands why it is being carried out.

EXAMPLE

REGULATORY AUDITS IN VICTORIA, AUSTRALIA

A RMP (equivalent to a WSP) audit determines whether the water supplier has complied with the obligations imposed by section 7(1) of the Safe Drinking Water Act 2003 during the audit period, i.e. whether the water supplier has prepared, implemented, reviewed and updated its RMP for the supply of drinking-water to the public.

Audit results should directly feed into the further development and implementation of the WSP. Audits will thereby facilitate the strengthening of the WSP throughout its development into maturity. This aim should be a high priority for auditors. Also, in the case of external auditing, trends in audit findings provide valuable insights into the effectiveness of national or sub-national WSP programmes.

Audits, particularly for smaller suppliers, can play an important advisory role. For some small systems, the auditor may need to take on a WSP facilitator or trainer role to guide and support the local WSP team. This differs from the strict auditor role for larger systems, but it is an effective way of advancing WSP implementation, with the audit concentrating on learning and improving the WSP rather than penalizing water suppliers.

EXAMPLE

LEARNING THROUGH SMALL WATER SUPPLY SYSTEM AUDITS IN SCOTLAND

In Scotland, the WSP audit process on small supplies has proven to be highly beneficial. It gives an independent assessment of the WSP, confirms where it has been well developed, and can highlight potential improvements to the system. It gives an excellent opportunity for discussion between those responsible for the WSP and the auditor, and can almost act as a training session for both parties – the WSP 'owners' can learn from the expertise of the auditor, and the auditor can gain further awareness of the many and varied issues with small supplies! If sensitively carried out, an audit can help to boost the confidence of those responsible for the WSP and can raise the profile of the importance of the process. It may also help to promote further development of the WSP, particularly if it has been a slow process!

If audits are not prioritized and carried out regularly, implementation and support for WSPs may lose impetus and focus. The WSP team could become complacent and the WSP could become out of date. The priority given to the development, implementation and review of the WSP by the water supplier could lessen and management may become reactive, responding only to incidents and events rather than following the WSP's proactive approach. The WSP would then lose its legitimacy in the eyes of senior management and stakeholders.

Audits should facilitate implementation and strengthening of water safety plans.

National Environmental Engineering Research Institute Nagpur, India

5. Types of WSP audits

Water safety plan audits can take a number of forms, from a simple, informal, internal audit to a rigorous, external, formal audit required by a regulatory regime. Internal, external, formal and informal audits, and combinations thereof, are described below and summarized in Table 3.

An **internal audit** is one carried out by one or more persons employed or contracted by the water supplier. Whenever possible, although not always easy in practice, such persons should not be directly involved with the WSP implementation but should have a technical background and an understanding of the WSP concept. Training in technical auditing may also be appropriate. This type of audit is usually informal but could be more rigorous in a larger organization, for example an audit initiated and overseen by the board of management.

An **external audit** is one undertaken by one or more persons not directly employed by, or reporting to, the water supplier, such as a regulator, local or national government body, non-government organization (NGO) or auditing firm. An external audit is likely to be initiated by a regulatory or other local statutory requirement or possibly by a water supplier requiring independent auditing of its WSP. External audits are likely to be formal but may also be informal, particularly in the context of small or otherwise resource-constrained supplies, or in the early stages of WSP implementation.

An **informal audit** is one that considers some or all aspects of a WSP's implementation, with a view to giving advice and support as part of the implementation process. Informal audits can be internal or external and are particularly helpful in the early stages of WSP implementation where they can be a useful tool for diagnosing strengths and weaknesses of the WSP.

A **formal audit** is one that usually assesses the whole WSP from a regulatory or management perspective, with a view to forming conclusions and, where necessary, making recommendations and judgments on the development, adequacy, implementation and effectiveness of the WSP. While the structure of formal audits may offer fewer opportunities for the auditor to give advice, as compared with informal audits, they should still be viewed as opportunities for improvement. Formal audits can be internal or external and are best undertaken in the more advanced stages of WSP implementation. Formal audits are most often undertaken because they are required by a regulatory process that may form part of a wider drinking-water quality surveillance programme. In some cases, formal audits may result in the issuance of official notices or requirements for water suppliers to address certain issues.

TIP

EVOLUTION OF AUDIT COMPLEXITY AND FORMALITY

WSP auditing is flexible by nature and the appropriate methodology, scope and depth of the audit will be context specific. Where WSP implementation or regulation is in the early stages, or where water supplier resources are significantly constrained (as is often the case with small supplies), audits will likely be informal, with a focus on the provision of support and advice. Where WSP implementation and regulation are more advanced, WSP audits will likely be more formal and complex. Initial audits may be relatively simple, with a view to becoming progressively more comprehensive and rigorous over time.

EXAMPLE

INFORMAL EXTERNAL AUDITING FOR WSP IMPROVEMENT IN VIET NAM

In 2012, an international WSP expert and auditor was engaged to lead a national WSP audit team. The audit team included two independent national WSP advisers and a representative of the Viet Nam Water Supply and Sewerage Association. The audit team assessed WSPs for four urban water suppliers ranging in size from 90 000 to 860 000 population served. The objectives of the informal external audit were to identify strengths and opportunities to improve the WSPs, to provide key national stakeholders with WSP auditing experience and to inform the development of future WSP training programmes.

The audits were conducted at an early stage of WSP implementation and were framed to ensure that balanced attention was given to WSP strengths and weaknesses in order to provide both encouragement and constructive feedback for improvement. The assessment report recommended specific remedial actions to address each issue noted. Audit feedback was well received by the WSP teams and helped to highlight some fundamental misinterpretations of WSP elements. Some common issues noted during the assessment were:

- confusion of the overall logic of risk assessment phases before and after control measures;
- insufficient attention to hazardous events related to the distribution network and customer practices;
- poor linkages and logic between control measures and operational monitoring plans; and
- confusion between control measure validation and WSP verification.

We always try to conduct a 'consultative audit' where we provide immediate feedback and advice and flag areas requiring improvement. This is of particular importance in most of our municipalities (not only small municipalities, but medium municipalities as well) where a lack of technical capacity (staff numbers and skills) often exists. Auditors often have a poor reputation, and following this 'consultative audit' approach, the municipal staff relax and are more open and transparent, resulting in improved cooperation and a better quality audit.

Independent external auditor
South Africa

Table 3 provides a summary of types of audits, and the case studies in Appendix A provide practical examples of all audit types from seven countries.

Table 3: Summary of types of audits

Type of audit	Reason for audit	Who undertakes the audit
Internal informal	Mainly to give advice and support, particularly during the early stages of WSP implementation	One or more persons employed by the water supplier (e.g. from operations or quality assurance) or contracted by the water supplier, but not directly involved with WSP implementation
Internal formal	Usually for organizational verification of WSP implementation; it may be initiated by senior management of the water supplier or by the WSP team	One or more persons employed by the water supplier (e.g. from operations or quality assurance) or contracted by the water supplier, but not directly involved with WSP implementation; they may be appointed by senior management within the water supplier
External informal	Mainly to give advice and support, particularly during the early stages of WSP implementation and/or for small supplies where there is insufficient staff or expertise to undertake internal audits and where formal external audits are not appropriate	National, district or local government agencies (e.g. from environment or health), consultants or staff from neighbouring water supplies (peer-to-peer advice)
External formal	Usually to fulfil the legal or surveillance requirements of a regulatory body	Regulatory agency, health authority or other organization as specified by a regulatory requirement

6. Audit timing and frequency

6.1 Initial audit

Early informal audits by a person or persons not directly involved with the WSP team will be useful in testing the WSP team's comprehension of the WSP process. For large organizations, such initial audits are likely to be internal. For smaller organizations, external audits may be necessary to obtain the appropriate expertise. In all cases, it is important that early audits are advisory in nature and biased towards learning, providing encouragement and identifying opportunities for improvement.

Auditors should be aware that in the early stages of WSP development and implementation, there might be requirements for significant culture change within an organization, which needs to be managed sensitively and will not be helped by too many challenging comments. WSP auditing should be introduced in such a way that the WSP team does not perceive the audit or auditing results as criticism, but rather as support for their work, fostering a constructive atmosphere between the auditors and the WSP team. Of course, even at this stage auditors should make it clear if they think the WSP is not going to achieve its aims, but the general role of the auditor in the early stages should be to offer mentoring and support.

The timing of the first informal audit should be based on the WSP team's implementation timetable, with the date fixed early on by the team as a marker for progress. This date should not be changed without good reason. In particular, it should not be changed because it is believed that implementation is behind schedule, as the informal audit may help identify the reasons for the delay and help accelerate implementation. The optimal time for the first informal audit will be situation specific and will depend on the size and complexity of the water supply. Three to nine months (three to six months for small supplies) from the start of WSP development may be an appropriate time for the first informal audit. This should allow sufficient time for WSP teams to develop the WSP and begin implementation, while not allowing so much time to elapse that momentum is lost. For small supplies in particular, early informal audits may be important to check WSP team understanding and offer tips for course correction early in the process.

More formal internal and external audits will benefit the WSP process as it matures, allowing the questioning and investigations to be more complex. Formal audits are generally best considered after the first year, but again this will depend on the size and complexity of the water supply. Regulatory audits may have their own timetable set out in the regulatory requirements. Conducting formal audits too early in the WSP process is unlikely to be helpful for WSP implementation as the audits will merely produce a long list of actions that are incomplete or have yet to be implemented, which may serve to discourage the WSP team. To maximize the benefits of the audit process, the WSP team needs to be given sufficient time to develop and implement the WSP prior to the first formal audit.

6.2 Periodic audits

The optimal frequency for periodic WSP audits should reflect a balance between the benefits to drinking-water safety and the resources and effort required to undertake the audits. As implementation of the WSP continues and matures, some form of audit (internal or external, formal or informal) every six to 12 months may be appropriate. (See the Portugal case study in Appendix A for an example of scheduling different audit types such that some form of audit is undertaken quarterly.) Once the WSP has matured and has been accepted as the way of working by the water supplier, audits can generally be carried out less frequently, for example every one to two years. More frequent audits may be appropriate where audit findings suggest WSP implementation is not being maintained or is not effective in achieving its objectives. As with initial regulatory audits, ongoing regulatory auditing frequency will be determined by regulatory requirements.

For small supplies, the resources available and logistics of auditing large numbers of systems will usually translate into longer intervals between audits once the WSP has matured. An audit every two to five years may be the best that can be achieved, although more frequent auditing is preferable. In scheduling the audits, priority should be given to supplies that have faced problems with WSP implementation or where water quality monitoring results indicate non-compliance with standards or targets.

EXAMPLES

PERIODIC AUDIT FREQUENCIES – PORTUGAL, SOUTH AFRICA AND AUSTRALIA

Águas do Algarve, Portugal: every six months (internal audit, informal)

South Africa: full audits every two years, with less rigorous 'progress inspections' undertaken on the years in between audits (external audit, regulatory requirement)

Victoria, Australia: every two years, according to an administrative decision taken by the regulator (external audit, regulatory requirement)

ROLLING AUDIT SYSTEM – ENGLAND AND WALES

In England and Wales, audit frequency for an individual water supplier is based on drinking-water quality results, which are provided to the regulator monthly, plus the frequency and severity of events affecting drinking-water quality or sufficiency, the number of consumer complaints and the outcome of risk assessments undertaken by the supplier and by the auditing body. This means that different water suppliers will have different audit frequencies. The majority of water suppliers will be subject to at least one site audit on a specific topic each year, and some will be visited several times.

In their advisory role, auditors should encourage owners and operators of small supplies to raise and discuss any concerns with WSP implementation even when no audit is scheduled in the immediate future.

Table 4 provides a summary of audit timing and frequency recommendations.

Table 4: Recommendations for audit timing and frequency

	Reason for audit	
WSP implementation stage	**Small water supplies**	**Large water supplies**
Initial audit during WSP development and early implementation	Ideally after three to six months. Informal internal or with external assistance, mainly advisory but also to check progress.	Ideally after six to nine months. Informal internal, to check progress and advise on implementation.
Periodic audits as WSP implementation continues and matures	Will depend on findings and specific support needs identified in the first audit, as well as resource availability. Advisory role remains important.	Ideally every six to 12 months. Formal internal or informal external, becoming more complex with stricter evaluation criteria but also with an advisory role.
Periodic audits once WSP implementation is mature	Every two to five years, or as per regulatory requirements. Formal or informal external, may be a regulatory requirement. Mainly to check that implementation is being maintained and is effective but also with an advisory element.	Every one to two years, or more frequently, depending on previous audit findings. Regulatory audits will be as per regulatory requirements. Formal internal, to check that WSP implementation is being maintained and is effective, and to identify areas for improvement. Formal external, to check that requirements are being met.

6.3 Notice period for audits

Should the WSP team always know exactly when audits are to be carried out? The logistics involved in carrying out a successful audit suggest that pre-arranged audits will be the norm so that auditors can be sure of meeting key staff, having documentation ready and gaining access to sites they wish to inspect. However, there may be an occasional role for unannounced audits in keeping the WSP team active and alert and to ensure that the WSP team does not become complacent about WSP implementation between audits.

6.4 Initiating the audit

Where WSP auditing is a regulatory requirement, the regulatory authority should initiate the audit process. For other types of audits (whether informal or formal, internal or external), the audit may be initiated by the WSP team or by a government body or NGO providing support to a WSP team. Non-regulatory audits should be planned as part of WSP implementation from the beginning, including what they will cover, when and how they will be carried out, and who will undertake them.

7. The auditor

7.1 Auditor qualifications

Internal audits should be carried out by someone who understands drinking-water quality management issues, relevant standards and targets, and WSP concepts. Internal formal auditors should also have training and experience in technical auditing. Internal audits will normally be undertaken by someone already employed by the water supplier. Ideally, the internal auditor should not be on the WSP team, as WSP team members may have difficulty in objectively assessing WSP implementation. A member of management with an appropriate background, or auditing staff may be the best option. If a member of the WSP team is the only suitable candidate to carry out internal audits, their role should be made clear to all members of the WSP team and should carry the authority to undertake the audit and make conclusions and recommendations.

Small organizations may find it difficult to identify appropriate individuals to carry out an internal audit. In these cases, using external auditors to undertake informal audits may be the best solution. Such auditors could be consultants or representatives of local government, health authorities, larger water suppliers or members of neighbouring communities that have implemented WSPs.

Appointing external auditors requires careful consideration, particularly for formal audits. External auditors should have considerable experience in developing and implementing WSPs. In the case of external formal audits, they should also have training in technical auditing. Experience in auditing other types of risk management systems in the water industry, such as HACCP or ISO 22000, may also be valuable. External auditors should have some experience working for a water supplier or within the water industry more broadly, as this will help ensure that auditors understand how a water supplier is organized and operates and that they are aware of major water quality issues, typical hazardous events, appropriate control measures and monitoring practices. External auditors should also understand relevant water quality standards

EXAMPLES

EXAMPLE INTERNAL AUDITOR REQUIREMENTS FOR ÁGUAS DO ALGARVE, PORTUGAL

Internal auditors must have:
- experience in auditing quality management systems (QMS) or training in HACCP audits;
- experience in WSP implementation; and
- water supply operations, maintenance or laboratory field experience.

REGULATORY AUDITOR REQUIREMENTS IN THE PHILIPPINES

In the Philippines, guidelines on how to assess and approve WSPs have been prepared and will soon be formally issued by the government. WSP evaluations will be undertaken by Department of Health (DoH) staff or DoH-approved agents who have attended at least the basic orientation course on WSPs (or equivalent) and have either:
- a bachelor's degree related to water supply and sanitation (e.g. engineering, public health and environmental disciplines); or
- technical knowledge and three years' experience in managing or operating a water utility.

A series of capacity-building activities is planned to equip the WSP evaluators with skills on how to review and approve WSPs.

and targets, and have an engineering, scientific or operational background.

Regulatory audits will usually be organized by the regulatory body using their own staff or appointing consultants to act on their behalf, as illustrated in the examples from the United Kingdom and Australia. In such cases, the regulator should specify auditor experience and training requirements. Generally, regulatory auditors should meet all the qualifications for external auditors, plus have detailed knowledge of the relevant regulatory requirements, including sanctions for non-compliance where applicable.

In addition to the qualifications described above, successful internal and external auditors will also have certain personal attributes. Not everyone with the appropriate experience and training will necessarily make a good auditor. Desirable personal attributes include:

- authoritative but personable, open approach;
- analytical, flexible, unbiased approach;
- willingness to listen;
- ability to draw conclusions from examinations of extensive data, reports, procedures and site visits and explain these clearly and concisely in written reports;
- ability to suggest realistic and feasible solutions that reflect resource constraints to support step-wise improvement, particularly for small systems; and
- personal and professional integrity/incorruptibility.

Table 5 provides a summary of target qualifications for internal and external WSP auditors.

EXAMPLES

DIFFERENT APPROACHES TO SELECTING AUDITORS FOR REGULATORY AUDITS

Victoria, Australia: in Victoria, the Department of Health & Human Services is responsible for ensuring that water agencies meet the RMP (or WSP) requirements as specified in the Safe Drinking Water Act 2003 and the associated Safe Drinking Water Regulations 2015. The Safe Drinking Water Act requires audits to be conducted by qualified independent consultants who have successfully completed the rigorous auditor certification process described in Section 8.2. The cost of the audit is borne directly by the water supplier being audited. (See Appendix A for more information on WSP auditing in Victoria.)

England and Wales: WSP implementation is also a regulatory requirement in England and Wales, where the responsibility for ensuring water supplier compliance with the regulation falls to the Drinking Water Inspectorate (DWI), a government body providing independent assurance that public water supplies are safe and drinking-water quality is acceptable to consumers. WSP auditing is carried out directly by DWI staff who have a technical background and practical experience and mainly, though not exclusively, come from the water industry. The DWI provides training in technical auditing. The cost of regulatory auditing is now borne by the water industry, although the government bore this in the past. (See Appendix A for more information on DWI and WSP auditing in England and Wales.)

7.2 Audit teams

It can be difficult to identify individual auditors that satisfy all target qualifications described in Section 7.1. In such cases, a small team of experts who collectively possess all the necessary skills and experience can be appointed to undertake the audit. For auditing a large, complex WSP from catchment to consumer, a multidisciplinary team of auditors may be necessary. (The case studies from Nepal, Singapore and South Africa in Appendix A provide examples of team auditing.)

Table 5: Summary of target qualifications and attributes for WSP auditors

Internal auditors	• understand drinking-water and quality management issues, and relevant standards and targets; • understand WSP concepts; • trained and experienced in technical auditing (particularly for formal audits); • preferably not be part of the WSP team; and • have appropriate personal attributes.
External auditors	• understand drinking-water and quality management issues, and relevant standards and targets; • have considerable experience developing and implementing WSPs; • trained and experienced in technical auditing (particularly for formal audits); • have experience working for a water supplier or within the water industry; • have an engineering, scientific or operational background; • for regulatory audits, have detailed knowledge of regulatory requirements; and • have appropriate personal attributes.

EXAMPLE

REGULATORY AUDITS BY A WSP COMMITTEE IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

In the Lao People's Democratic Republic, the recently updated regulation on national drinking-water quality standards issued by the Ministry of Health specifies that WSP auditing is part of the surveillance programme and that the Department of Hygiene and Health Promotion (DHHP) shall form a WSP audit committee to lead WSP audits. While DHHP staff have received training in WSPs and WSP auditing and are, in principle, well placed to provide an independent assessment of WSPs, there are technical aspects involved in WSP auditing for which a background in water supply system design and operation is important. Therefore, it is expected that Department of Housing and Urban Planning (DHUP) staff will form the technical arm of the WSP audit committee, applying their engineering skills and experience to confirm that water supply system schematics are accurate, all relevant hazardous events have been identified, and existing and proposed control measures are appropriate. Under this proposed model, the DHHP would have overall responsibility for leading the audits, including all planning and reporting, and the DHUP would play an important technical support role.

Where WSP auditing forms part of a drinking-water quality surveillance programme, external WSP auditing is likely to be the responsibility of the surveillance authority. In many cases, this will be the health authority, and staff members may lack the technical background or water industry experience required for robust WSP auditing. In such situations, the surveillance authority may elect to engage a qualified third party to carry out the audit on its behalf (as in the example from Victoria, Australia), or it may enlist the support of other experts to form an audit team. In the latter case, the audit team should generally be small and focused. The government body responsible for overseeing or regulating water provision, for example the public works department, may be well positioned to provide technical inputs, as in the example from the Lao People's Democratic Republic.

Where external audits are carried out by audit teams, team members' roles and responsibilities should be clearly established at the outset, particularly leadership and supporting roles.

7.3 Auditor independence

Auditor independence is a key factor for successful WSP auditing in order to avoid audit bias and maximize objectivity. 'Independent' indicates that the auditor should be external to the WSP team wherever possible, i.e. not directly involved in WSP development and implementation. Some countries may elect to adopt additional criteria for auditor independence beyond this base condition. For instance, countries with more developed WSP auditing programmes and a sufficient pool of WSP experts may choose not to have WSP trainers participate in WSP audits. For other countries, however, it will not be practical to insist on this level of auditor independence. WSP trainers may be the leading or only WSP experts available nationally, and they may therefore be the best positioned to audit WSPs. This will often be the case for small systems, and for newer WSP programmes more broadly. In such cases, the WSP training body may play a leading role in WSP auditing. As WSP programmes mature, higher levels of independence may be sought where preferred. For instance, even where WSP expertise lies within a single government agency, it is possible to assign WSP training and WSP auditing responsibilities to different teams or individuals within the agency for greater auditor independence.

> *While there are benefits to strict requirements for auditor independence, high levels of independence should not be prioritized over WSP knowledge and expertise. A thorough understanding of the locally relevant WSP process is essential to effective WSP auditing.*
>
> *Experienced WSP trainer and auditor*

8. Auditor training and certification

8.1 Training

Internal and external WSP auditors should undergo training in both the WSP process and in WSP auditing. Where a particular WSP approach has been adopted nationally or sub-nationally, it is important that auditors receive training in that particular WSP approach. Auditors should also be trained in relevant water quality monitoring requirements and related standards or targets, and regulatory auditors must additionally be trained in all WSP-related regulatory requirements.

A fundamental challenge for those establishing WSP auditing schemes is that WSP auditing courses or training programmes are not yet widely available. The examples in this guidance document are intended to provide useful ideas, but ultimately auditor training programmes need to be appropriate for the local context and will require considerable time and effort to design as there are many factors to be considered and addressed. Some of these factors are highlighted in the example from Bhutan.

Wherever possible, WSP auditor training programmes should include practical field experience with trained auditors. Field sessions are valuable for making concepts more concrete, increasing the depth of understanding and building confidence. Informal, peer-to-peer audits, where staff from one water supplier audit the WSP of another supplier, are also useful in strengthening auditor skills and can be incorporated into training programmes where appropriate.

EXAMPLE

INITIAL STEPS IN DEVELOPING AN AUDITOR TRAINING PROGRAMME IN BHUTAN

In Bhutan, all water suppliers are required to develop and implement WSPs, and the Ministry of Works and Human Settlement (MoWHS) has been assigned the responsibility of carrying out WSP audits (or 'evaluations') for all urban water supplies. As the WSP regulations only recently came into effect, the ministry is in the early stages of developing the WSP auditing scheme, including auditor training.

As an initial step in preparing auditors, ministry staff developed a national WSP auditing tool outlining the specific WSP elements to be assessed. The auditing tool was informally field tested by ministry staff with guidance and support from an international WSP expert and auditor. The auditing tool is expected to support audit consistency, and it will be a central component of auditor training in due course. In the meantime, discussions are ongoing on a number of points that will also influence the auditor training programme, including:

- How should auditors plan and prepare for the audit?
- How long should auditors spend on each site?
- What should be covered in audit initiation and exit meetings?
- How should audit findings be reported and should a reporting template be developed?
- How will knowledge be tested to confirm auditor competency at the end of the training?

The MoWHS is working to resolve these and other questions about the WSP auditing scheme and incorporate the answers into the auditor training programme.

8.2 Certification

An important question in developing a WSP auditor training programme is what system should be put in place to confirm that the training has been effective and that

the auditor is in fact well prepared to lead WSP audits. Confirming auditor competency through a certification process is particularly important for formal audits, such as regulatory audits.

Victoria, Australia, has an advanced system of auditor certification, as described below.

EXAMPLE

CERTIFICATION FOR REGULATORY AUDITORS IN VICTORIA, AUSTRALIA

The state of Victoria in Australia has stringent requirements for auditors who audit the water utilities' RMPs (or WSPs) required by its Safe Drinking Water Act 2003 and associated regulations, including:

- knowledge of the Australian Drinking Water Guidelines framework for drinking-water quality (assessed by examination);
- education and work experience confirmed by:
  - evidence of a relevant degree or diploma in engineering, science or medicine; and
  - evidence of seven years' work experience in two of three areas – water industry, management systems or auditing;
- appropriate personal attributes (examined by standard psychometric testing); and
- skill competency (demonstrated through observational examination by skill examiners).

As there was no pre-existing auditor certification process that dealt directly with the auditing of WSPs, Victoria's Department of Health & Human Services (prior to 2015 called the Department of Health) approached a private company specializing in international training certification services to develop a specific audit certification scheme for auditors of drinking-water quality management systems with assistance from the Water Services Association of Australia and VicWater (the Victorian Water Industry Association).

The result is a water quality management systems auditor certification scheme conforming to an internationally recognized standard for certifying bodies (ISO/IEC 17024:2012) with key competencies based on ISO 19011:2011 (Guidelines for auditing management systems) and Chapters 2 and 3 of the Australian Drinking Water Guidelines.

This competency-based scheme was launched in 2007 and there are now approximately 20 drinking-water auditors certified under the scheme. Certification applies to individuals and there are two grades of auditor: drinking-water quality management systems (DW QMS) auditor and DW QMS lead auditor. Applicants are responsible for the fees and must be re-certified every four years.

9. What to audit

9.1 Establishing audit criteria

For any type of audit (internal or external, formal or informal), a list of audit questions or criteria is a valuable tool for the auditor, although some flexibility should be maintained to allow for topics and questions not covered by the list. A list of audit questions or criteria sets out the expectations for the WSP and therefore establishes the basis for the audit. It supports systematic planning and undertaking of the audit, and it also helps to ensure that audits are thorough and consistent from auditor to auditor, site to site and year to year, which is particularly important in the case of external formal audits. For external audits, the audit criteria can be shared with water suppliers as appropriate in advance of the audit to ensure that expectations are clear, to reinforce WSP team member understanding of key WSP elements, and to support WSP teams in strengthening their WSPs.

Audit criteria should always be customized for the local situation and should follow a logical sequence such as the modules of the *WSP manual* (WHO/IWA, 2009) (see Table 1), the water supplier's own WSP methodology or a national WSP document or template. Where regulatory frameworks require WSPs, such frameworks should be explicit about what is required of WSPs and what should be addressed in a regulatory audit. See the examples below. The Water Safety Plan Quality Assurance Tool (WHO/IWA, 2013), a generalized tool designed to highlight strengths and gaps in WSP development and implementation, is also a useful resource when developing a customized list of audit questions or criteria.

EXAMPLES

SHARING AUDIT CRITERIA WITH WATER SUPPLIERS IN VICTORIA, AUSTRALIA AND BHUTAN

Victoria, Australia: the regulator has developed the *Drinking water regulatory audit Guidance note*, which includes a detailed table of 'auditable elements', or specific criteria for the RMP (or WSP) audits. The guidance note is publicly available, and water agencies are able to use the table of auditable elements to confirm the strength of their WSP and to prepare for the audit.

Bhutan: the regulator developed a WSP audit guidance note, which outlines all questions to be asked and records to be requested during the regulatory audit. The guidance note is shared with water suppliers for their information, planning and preparation. Water suppliers are also encouraged to use the regulatory audit guidance note to support their internal auditing process.

EXAMPLE

DEVELOPING AUDIT CRITERIA IN PORTUGAL

For its internal and external desk and field audits, Águas do Algarve in Portugal uses a list of audit criteria produced by its WSP team compiled from the *WSP manual*, the Water Safety Plan Quality Assurance Tool and site-specific considerations.

Audit criteria should reflect the level of formality of the audit, supplier capacity and resources, and the time elapsed since the WSP was initiated. For instance, an informal WSP audit for a community-managed water supply should not be as rigorous as a formal WSP audit for a utility-managed supply. It is important that audit criteria reflect the particular WSP context, and

even simple audits can greatly contribute to WSP improvement. As WSPs mature, audit criteria should be designed to ensure that the WSP is:

- implemented in practice, according to what is required by the water supplier's WSP documentation;
- conforming to regulatory requirements or other recognized WSP guidelines or standards;
- complete and thorough, with all major WSP elements adequately addressed;
- accurate and up to date;
- a 'living document', reviewed and revised to stay current and relevant;
- understood and supported at appropriate management levels within the water supplier; and
- effective in reducing significant risks and meeting objectives.

9.2 Example audit questions

This section provides a broad set of questions that may serve as indicators of successful WSP development and implementation. The questions are designed to support the development of a customized list of audit questions or criteria that reflects national or sub-national WSP requirements and expectations. The questions are not intended to be comprehensive, as circumstances and priorities will vary considerably and require due consideration.

The example audit questions that follow are based on the WSP elements set out in the *WSP manual* (WHO/IWA, 2009) and outlined in Table 1. For small water suppliers, with few staff and facilities, some questions will not apply and should be omitted or revised as appropriate during customization.

TIP

AVOIDING A 'TICK BOX' APPROACH

Auditors should always seek to understand not only what has (or has not) been done, but also how and why (or why not), and with what outcomes. Each of the following questions should be considered an entry point for discussion, and auditors should take care to avoid taking a yes/no or 'tick box' approach to auditing, which will minimize feedback and limit value for water suppliers and WSP teams. Further guidance on evaluating audit findings is provided in Section 10.

> *When considering risk, auditors must allocate sufficient time to interview staff and visit sites to understand the consequences of any actions. Simply recording that something has been done does not necessarily mean that a risk has been mitigated.*
>
> *Experienced WSP auditor England*

In addition to the questions below, four different examples of audit criteria are provided in Appendix B, including one designed specifically for small water supply systems. Those developing and implementing auditing schemes may find these examples useful for developing a customized set of audit criteria.

WSP documentation

There should be some form of WSP documentation (hardcopy or electronic) that describes the WSP and how it is implemented. While investigating the development and implementation of individual WSP elements as outlined below, the auditor should also consider the clarity, completeness and accuracy of the WSP documentation generally. The following questions should be considered:

- Is the WSP documentation complete, clear and logical?
- Do observed conditions and progress match the WSP documentation?
- Is everyone involved with the WSP aware of its existence and contents?
- Is the documentation easily accessible and is it used in practice by staff in different departments?
- Has the document been kept up to date?
- Is a record-keeping system in place? If so, do records demonstrate WSP implementation in day-to-day operations?
- Is there an indication that the WSP is supported by senior management and has financial support?

WSP team (Module 1)

A qualified, dedicated team should lead the development and implementation of the WSP, with individuals supplying technical expertise and with a team leader who has appropriate authority and organizational and interpersonal skills. The team may be staffed completely by the water supplier or include external stakeholders,

such as representatives of the health or environment sectors. Where a water supplier does not have control over the whole system from catchment to consumer, it should have strong communication and collaboration with the other stakeholders involved to ensure a clear understanding of the entire water supply system and a comprehensive WSP.

The following questions may be relevant when auditing this element of the WSP:

- Is the membership of the WSP team documented?
- Is the documented team membership current and accurate?
- Do all team members fully understand the WSP process?
- Was the WSP team involved in every WSP step?
- Do team members understand their specific WSP responsibilities?
- Does the team have a clear remit and timetable?
- Is the team multidisciplinary, representing all the key areas of the water supply system?
- Does the team include both management and operational staff?
- Where the water supplier is not responsible for the entire water supply system, is there evidence of collaboration with appropriate stakeholders?
- Does the team have the authority to initiate change, improvements and upgrades?
- Is the team leader a member of senior management or, if not, are they having regular briefings with senior management?
- Is the team supported and empowered by senior management?
- Where appropriate, are other stakeholders represented on the team, for example the health or environment sectors?
- Does the team meet regularly on pre-planned dates and after an incident has occurred?
- Are the team meetings, outcomes and decisions documented?
- Do other members of the water supplier staff know about the WSP team and who its members are?
- Does the WSP team regularly report the outcomes of the WSP process to other water supplier staff?

Description of the water supply system (Module 2)

The WSP should describe the water supply system from catchment to the point of consumption. It is vital that such a description is detailed and accurate and that the WSP team undertakes site visits to ensure the accuracy and completeness of the description. The system description should include the catchment, abstraction works, treatment works, service reservoirs, the distribution system and, where consumers are storing or treating water at home, household practices. The system description should also define the intended users and uses of the water supply and list relevant water quality targets and standards.

The following questions may be relevant when auditing this element of the WSP:

- Is there a detailed description of the water supply system?
- Does it cover all steps from catchment to the point of consumption, irrespective of ownership?
- Does the description include incident or emergency supply arrangements, such as water tankers, in addition to normal water supply arrangements?
- Does the description include a layout map of the water supply system and a conceptual flow diagram of all supply steps?
- Did WSP team members conduct site visits to confirm the accuracy and completeness of the description?
- Is the description up to date, comprehensive, accurate and understood by all relevant staff?
- If the description is not comprehensive or accurate, is this recognized and are steps being taken to remedy this?
- Are intended users and uses of the water supply described?
- Are all relevant water quality standards or targets clearly described, including regulatory requirements as well as water supplier targets (for example in cases where supplier targets are more stringent than regulatory standards)?

Identification of hazards and hazardous events (Module 3)

The WSP should identify biological, physical and chemical hazards and hazardous events associated with each step in the water supply system that can result in the water supply becoming contaminated, compromised or interrupted.

The following questions may be relevant when auditing this element of the WSP:

- Do WSP team members understand what is meant by hazards and hazardous events?
- Have hazards and hazardous events been identified for all water supply system components included in the system description?
- Have all major hazards and hazardous events been identified? (See tip box.)
- Have normal and abnormal events been considered?
- Have historical and potential future events affecting drinking-water quality been considered?
- Are hazards and hazardous events well documented?
- Is the list of hazards and hazardous events reviewed regularly and up to date?
- Does the list of hazards and hazardous events appear to be customized/site-specific rather than borrowed from other sites or sources?
- Was a systematic process followed for hazard identification?
- Were field visits undertaken to support the hazard identification process?
- Is current and historical compliance with drinking-water quality standards satisfactory? If not, have the hazards and hazardous events associated with non-compliance been taken into account?
- Did the WSP team actively participate in the identification of hazards and hazardous events or was this WSP step carried out by external consultants only?
- Were relevant external stakeholders consulted, including those managing supply steps outside the water supplier's area of responsibility, for example in the catchments or within households?

A simple bullet list of possible water safety concerns at various steps along the water supply chain is provided in Appendix B. Auditors may find this list useful when assessing whether or not the WSP addresses the most important hazards and hazardous events for a specific water supply system.

TIP

AUDITING HAZARDS AND HAZARDOUS EVENTS

Auditors may find this to be a particularly challenging WSP element to audit as it is difficult to assess if all appropriate hazards and hazardous events have been identified, especially for large systems with complex catchments and multiple treatment steps. A technical background and experience within the water industry are particularly valuable for this part of the audit. In addition, a list of typical hazardous events at different steps in the water supply chain can be a very useful resource for the auditor when carrying out this difficult task.

Assessment of the risks (Module 3)

The WSP should assess the risk associated with each hazardous event using a clearly defined risk assessment methodology that considers the likelihood that the hazardous event will occur and evaluates the severity of the hazard's consequences. The aim should be to distinguish between more and less significant risks.

The following questions may be relevant when auditing this element of the WSP:

- Has the system for estimating level of risk been documented?
- Does the risk assessment methodology consider the likelihood of the hazardous event occurring and the consequences if it does, and have criteria for different levels of likelihood and consequence been defined?
- Is this methodology applied consistently?
- Have all identified hazards and hazardous events been assigned a risk?
- Is the risk assessment well documented?
- Is the risk assessment plausible and substantiated by documented operational, technical and scientific evidence?
- In addition to the risk to public health, has the risk assessment taken into account other factors such as aesthetic effects, continuity and adequacy of supplies and potential problems associated with providing alternative supplies?
- Is the risk assessment reviewed regularly and up to date?

- Was uncertainty given due consideration in the risk assessment, e.g. are there examples of additional information being required and obtained, where possible, to complete the assessment?

Identification and validation of control measures, re-assessment and prioritization of the risks (Module 4)

The WSP should identify existing control measures for all hazards and hazardous events and validate their effectiveness at controlling hazards. The WSP should then re-assess and prioritize risks in light of the effectiveness of existing controls in order to determine where additional controls are needed.

It is worth noting that while the *WSP manual* (WHO/IWA, 2009) describes a dual risk assessment approach – an initial risk assessment without consideration of existing controls followed by risk re-assessment in light of existing controls and their effectiveness – many WSP teams elect to carry out only one risk assessment. In such cases, the single risk assessment should consider existing controls and their effectiveness, but this should not have restricted the scope of hazard identification. Where a single risk assessment approach is preferred and accepted (for example by the regulatory body) such that risk re-assessment is not part of the WSP process, the audit criteria should be adjusted accordingly. Audit criteria should always reflect the locally relevant WSP approach.

The following questions may be relevant when auditing this element of the WSP:

- Have existing control measures been systematically identified and documented for each hazard and hazardous event identified?
- Has each existing control measure been validated to confirm its effectiveness in managing particular hazards and hazardous events?
- Are validation procedures and results adequately documented?
- Are the validation procedures adequate to confirm the effectiveness of control measures in place? (See the following example.)
- Are the staff members responsible for the control measures trained and fully aware of these critical activities?
- Have risks been assessed (or re-assessed) to reflect existing control measures and their effectiveness?
- Have risks found to be significant after consideration of existing controls been prioritized for additional or improved control and addressed in the improvement plan?

EXAMPLE

VALIDATION PROCEDURES IN THE NETHERLANDS VERSUS SRI LANKA

The auditor will often need to apply judgment when deciding whether or not certain criteria have been sufficiently addressed. As an example, 'adequate' validation procedures in the Netherlands will differ from 'adequate' validation procedures in Sri Lanka, for instance. In the Netherlands, some control measures are expected to be validated using quantitative microbial risk assessment (QMRA), a rigorous method involving consideration of dose-response, exposure assessment and risk characterization. In contrast, Sri Lanka (along with a number of other countries in the Asia-Pacific region), has adopted a simplified validation approach whereby each control is qualitatively assessed as 'effective', 'ineffective' or 'somewhat effective', and all available data and observations that form the basis of the qualitative assessment are documented. (However, as WSP experience and understanding grows in Sri Lanka, it is expected that control measure validation will become more rigorous for urban WSPs.) Gauging the appropriate level of rigour in various contexts is challenging, and auditors will develop the required skills through time and experience.

Development, implementation and maintenance of an improvement plan (Module 5)

Where the risk assessment (or re-assessment) has identified significant risks to the safety of a water supply system and demonstrated that existing controls are not sufficient, then an improvement plan should be developed. The improvement plan should reflect available resources, outlining a step-wise approach to managing significant risks where appropriate.

The following questions may be relevant when auditing this element of the WSP:

- Is there a documented improvement plan for each uncontrolled or insufficiently controlled significant risk?
- Are the planned improvements adequate to address identified risks?
- Are the improvements practical, feasible and affordable?
- Has each improvement been assigned to a member of the WSP team or other responsible party?

- Where additional measures outside the responsibility of the water supplier are required, has this been communicated to those whose support is needed?
- Is there a timetable for each improvement and is this realistic?
- If major, long-term improvements are necessary, have possible short-term (interim) measures been identified?
- Are the improvements being implemented as planned?
- Has the improvement plan been acknowledged and endorsed by senior management?
- Is the improvement plan supported by adequate funding?
- Has the WSP been updated to take into account improvements and upgrades already carried out, including revisions to the risk assessment to reflect the addition or improvement of control measures?

EXAMPLE

CONSIDERING COST EFFECTIVENESS IN VIET NAM

The improvement planning process in Viet Nam involves an investigation of the cost effectiveness and risk reduction potential of proposed improvements through the development of an investment plan. Due consideration of these factors helps to ensure practical implementation of the WSP and WSP effectiveness. Therefore, these factors are valuable to explore during the WSP audit.

Operational monitoring of control measures (Module 6)

Operational monitoring involves defining and carrying out the monitoring of control measures to demonstrate that the controls continue to work as expected. A thorough operational monitoring plan generally includes a combination of water quality analysis and visual observations and inspections, and the plan should specify monitoring parameters, critical limits and corrective actions for the various control measures.

The following questions may be relevant when auditing this element of the WSP:

- Is the operational monitoring plan documented and kept up to date?
- Does the operational monitoring plan cover all existing control measures?
- Is it clear who is responsible for carrying out operational monitoring?
- Are the staff members responsible for operational monitoring trained and aware of their responsibilities?
- Does the operational monitoring plan specify monitoring parameters, targets and critical limits, and are these rational?
- Are there documented corrective actions that need to be taken when operational targets and critical limits are not met?
- Are the corrective actions feasible and able to be performed in a timely manner, and are they followed in practice?
- Do monitoring records demonstrate that operational monitoring is carried out in accordance with the plan?
- If some aspects of operational monitoring rely on automatic monitors, are these checked and maintained according to specification?
- Where appropriate, have documented procedures been established to support complex and important operational monitoring procedures?
- Is it clear who is responsible for managing and reviewing the results of operational monitoring?
- Is the review of operational monitoring results done consistently and in a timely manner to inform operational decisions?

Verification of the effectiveness of the WSP (Module 7)

WSP verification should be carried out to provide evidence that the WSP as a whole is working effectively to support the consistent delivery of safe and acceptable water to consumers. Verification includes compliance monitoring, to check that regulatory and other water quality standards or targets are being met, as well as the assessment of consumer satisfaction with the water supplied. Internal and external WSP auditing is also part of verification, as shown in Figure 1.

The following questions may be relevant when auditing this element of the WSP:

- Have internal and external audits been undertaken regularly?
- Is it clear who is responsible for initiating and performing internal and external audits?
- Is it clear who receives the results and reports from these audits?

- Is there evidence that audit follow-up action is consistently taken?
- Is the compliance monitoring plan documented and kept up to date?
- Is it clear who is responsible for compliance monitoring?
- Do records demonstrate that compliance monitoring is carried out in accordance with the plan?
- Is it clear who is responsible for managing and reviewing the results of compliance monitoring?
- Is the review of compliance monitoring results done consistently and in a timely manner?
- Are compliance monitoring data sent to the regulator or other bodies in accordance with agreed communication protocols and timeframes?
- Are actions to be taken when water quality targets are not met documented and are they followed in practice?
- Is there a documented plan to assess consumer satisfaction with the water supplied?
- Is it clear who is responsible for consumer satisfaction monitoring?
- Is it clear who is responsible for managing and reviewing consumer satisfaction monitoring results?
- Do records demonstrate that consumer satisfaction monitoring is carried out in accordance with the plan?
- Have any actions related to the results of verification activities (compliance monitoring, consumer satisfaction monitoring and/or auditing) been undertaken and, if so, are they appropriate?

Management procedures (Module 8)

Management procedures are an integral part of a WSP, including SOPs to be carried out when the system is operating under either normal or incident conditions, as well as response plans for emergency situations. The plans and procedures should be written by experienced staff and should be understood by, and readily available to, all relevant personnel.

The following questions may be relevant when auditing this element of the WSP:

- Are management procedures (SOPs and emergency response plans) documented clearly?
- Do SOPs address all major operational activities? (See Bhutan example.)
- Were management procedures written and compiled by appropriately qualified personnel?
- Are management procedures regularly reviewed and kept up to date, particularly in response to improvements, incidents and near misses?
- Is it clear which versions are the most up to date?
- Are management procedures readily available to everyone in the organization who needs them?
- Is there evidence that management procedures are well understood and followed by operational staff?
- Are the procedures established for incident and emergency situations feasible and able to be performed in a timely manner?

EXAMPLE

AUDITING STANDARD OPERATING PROCEDURES IN BHUTAN

In Bhutan, the external WSP auditor makes a list of major operational activities based on an understanding of the particular water supply system and its operation, as well as experience with other systems. For example, activities listed may include filter backwashing, tank cleaning, pipeline repair, chlorine batching and dosing, or water quality sampling and testing. The auditor then checks to see that clear SOPs have been developed for these major operational activities, and that those SOPs are up to date and accessible to field staff.

Supporting programmes (Module 9)

Supporting programmes are activities that support the development of people's skills and knowledge, commitment to the WSP approach and capacity to manage systems to deliver safe drinking-water. Supporting programmes often address staff training, consumer education or awareness raising, and research and development. They may also cover such activities as calibration of equipment, preventive maintenance or laboratory quality control.

The following questions may be relevant when auditing this element of the WSP:

- Has the water supplier defined and documented appropriate supporting programmes?
- Are supporting programmes reviewed and revised as necessary?
- Are all relevant personnel aware of all these supporting programmes?

- Is there evidence that supporting programmes are implemented in accordance with the WSP?
- Does the water supplier have a system to identify and address gaps in staff knowledge or skills in its workforce, and is there evidence that this system is effective?

Supporting programmes tend to be the most overlooked element of a WSP, and an audit can help WSP teams identify opportunities to strengthen this area of the WSP. However, it can be a challenging area to audit given that appropriate supporting programmes are not tightly defined in the *WSP manual* (WHO/IWA, 2009). Staff training and consumer education/outreach are often considered priority supporting programmes. Other appropriate supporting programmes will be system specific, and the auditor will need to exercise judgment based on experience. Auditors will need to consider the full WSP when investigating whether appropriate supporting programmes have been defined, as certain ones may be covered elsewhere in the WSP, for example under a SOP on equipment calibration.

Periodic review of the WSP and revision following an incident (Modules 10 and 11)

The WSP team should periodically review the overall WSP to ensure that it is up to date and to reflect the analysis of data collected as part of the monitoring programme, system changes or improvements, new procedures and lessons learned. In addition to planned periodic reviews, the WSP should be reviewed following an incident or near miss and revised as appropriate.

The following questions may be relevant when auditing this element of the WSP:

- Has the WSP team set dates for regularly reviewing the WSP?
- Is there evidence that reviews have been carried out in accordance with the plan and is the frequency of review appropriate?
- Is there a clear procedure for carrying out the reviews?
- Are all appropriate stakeholders involved in the review?
- Is there evidence that changes have been made to the WSP as a result of the review?
- Is there a system for keeping relevant stakeholders informed about incidents and near misses, both within and outside the water supplier?
- Have incidents and near misses led to changes in the WSP?
- Are changes and updates to the WSP communicated within the water supplier?
- Is there evidence that the results of previous internal and external audits were considered by the WSP team during the review process?

9.3 Field visits

Field visits are an important aspect of WSP auditing as documentation alone is unlikely to enable the auditors to confirm the validity, effectiveness and state of on-site implementation of the WSP. Field visits should be planned carefully, with a schedule established. Examples of field activities include:

- Visit the catchment, abstraction works, treatment works and service reservoirs to compare reality with the WSP system description.
- Based on field observations and, to the extent possible, check that all major hazards and hazardous events are identified and addressed in the WSP.
- Check that barriers and controls are in place as described and are operational.
- Check that instrument read-outs agree with written records.
- Check physical progress of improvement plans.
- Check that the chemicals used in the water treatment process are available and match the type, quality and grade described in the WSP documentation.
- Meet field staff to discuss their understanding of the WSP process, their roles within it and how they carry out their day-to-day responsibilities.
- Confirm that appropriate SOPs are available on site and are familiar to field staff.
- Check that operations are carried out in accordance with SOPs, such as chlorine batching and dosing, water quality sampling and testing, filter backwashing or pipeline repair and installation.
- Review records to confirm that operational monitoring is carried out in accordance with the WSP.
- Visit laboratories to check on the analytical facilities, methodologies, recording and reporting procedures.

10. Evaluating audit findings

In addition to detailed audit criteria, auditors should have a clear methodology for evaluating audit findings. Simple responses of yes or no, pass or fail will generally not suffice; explanations should be provided based on the auditor's investigation of what has (or has not) been done and why. The auditor will often find that criteria have been met to varying degrees, with both achievements and improvement opportunities to be considered, discussed and documented. Auditors should always aim for balanced evaluations, with good points of practice

EXAMPLE

AUDIT FORM FROM LAO PEOPLE'S DEMOCRATIC REPUBLIC

In October and November 2011, three WSPs in the Lao People's Democratic Republic were externally, informally audited by a small team of national and international WSP experts in order to strengthen the individual WSPs and provide feedback on the progress of the national WSP programme. Prior to the audit, the audit team developed an audit form based on the structure of the *WSP manual* (WHO/IWA, 2009) (which was adopted by the national government). For each of the 11 WSP modules, a number of criteria were defined as indicators that the module had been successfully addressed, and fields were created to record WSP strengths and weaknesses against the various criteria. The portion of the audit form covering Module 7 is provided below as an example, including auditor notes from one of the sites audited. (The full audit form includes 28 criteria covering all 11 WSP modules, but only one module is shown here for brevity.)

Following the initial round of audits using the audit form below, the audit criteria were revised to place more emphasis on WSP implementation rather than focusing solely on WSP development and documentation, which was a valuable lesson learned. (Refer to Appendix B for the revised audit criteria currently used in the Lao People's Democratic Republic.)

Module 7: Verify the effectiveness of the WSP

Audit criteria	Strengths	Improvement opportunities
Compliance monitoring programme detailed (including review and non-compliance notification procedures)	Great start. The WSP specifies testing parameters and general sampling locations and provides information on regulatory oversight.	Provide more specific monitoring programme details, including frequency and locations for testing of each parameter. The programme should also specify reporting requirements and actions to be undertaken in the event of non-compliance with water quality targets.
Method of assessing consumer satisfaction documented	Well done. The WSP notes the monitoring of consumer satisfaction.	
Internal WSP audit programme defined		No internal auditing programme has been developed. Develop a plan to carry out internal audits of the WSP periodically to ensure that the document addresses all key WSP elements and that it is being implemented as documented.
External WSP audit programme defined	Compliance monitoring records and consumer satisfaction monitoring records are reviewed/audited by external bodies.	No external auditing programme has been developed for the full WSP. Establish an external auditing system to provide independent verification that the WSP addresses all key WSP elements and that it is being implemented as documented.

highlighted as much as non-compliances or learning points to ensure that each audit supports WSP implementation and improvement. Overly critical evaluations may discourage the WSP team or create unnecessary tension between the auditor and the water supplier. Creating audit forms with ample room for comments and explicit prompts for balanced comments can be helpful, as in the Lao People's Democratic Republic example. (The Nepal case study in Appendix A provides a complete example of a similar audit form, and Appendix B contains additional examples of audit forms.)

Scoring systems for assessing the extent to which audit criteria have been met can be useful and are favoured by some auditors. A scoring or grading system can be defined and each audit criterion can be evaluated accordingly, for example: 0 = not yet started; 1 = just started; 2 = some progress; 3 = substantial progress; 4 = fully implemented but not reviewed regularly; and 5 = fully implemented and reviewed regularly. An explanation of how the score was determined and what needs to be done to improve it should also be documented. Such scoring schemes require considerable thought and good definitions (for example, what is the difference between 'some' and 'substantial' progress?), as clear scoring criteria will greatly reduce subjectivity and support consistency between audits. Auditors should take care not to place too much emphasis on the numerical scores assigned, which will always be subjective, although they can help with planning the prioritization of areas for improvement and/or areas requiring attention during future audits.

EXAMPLE

APPROACH TO AUDIT CHECKLISTS IN SOUTH AFRICA

The Department of Water and Sanitation in South Africa does not allow inspectors (auditors) to use a yes/no checklist during WSP audits for municipalities. Rather, a scorecard detailing very specific questions has to be completed for every water supply system assessed.

The four examples of audit criteria provided in Appendix B include evaluation guidance – two using scoring systems and two using qualitative approaches. These examples are intended to support those developing and implementing auditing schemes in defining an appropriate evaluation approach.

Regardless of the evaluation methodology applied, auditors will often need to make determinations of the adequacy of various programmes and activities. This can be challenging, particularly for less experienced auditors. When making such judgments, it is important for auditors to be impartial and open-minded. Auditors may have opinions of how a WSP should be developed and implemented based on personal experience, but they must be able to accept that there are other ways of achieving the goal of safe drinking-water that are equally valid. Auditors should also take care to always consider context. The same level of rigour should not be expected across systems of widely varying sizes and available human and financial resources, and auditors should consider local norms when making determinations of adequacy. The auditor should rely on training, skill, experience and methodology to review the evidence and decide appropriate responses.

TIP

EXTERNAL AUDIT TREND ANALYSIS

For external audits, it is important for the organizations responsible for WSP auditing to look for trends in audit findings, as common WSP weaknesses noted across multiple sites may indicate shortcomings in WSP guidance materials or training programmes. Audits therefore provide a valuable opportunity to assess and strengthen not only individual WSPs, but also national and sub-national WSP programmes more broadly. Using audit findings to strengthen WSP programmes can be particularly important for small systems given the comparatively low audit frequencies typically feasible for these systems. (Refer to the Nepal case study in Appendix A as an example of changes made to national WSP guidance materials based on audit findings.) In addition, comparing audit results across various water supplies will inform prioritization of action, such as follow-up auditing or the provision of support. It is also valuable to explore any correlations between audit findings and water quality test results and other relevant data available at the national or sub-national level.

11. Record keeping and reporting

11.1 Record keeping

The auditor should take clear and thorough notes throughout the audit. Audit forms and templates help to ensure that key information is documented. Notebooks or electronic tablets suitable for site visits in poor weather, or dictation devices, may be useful. Audio recordings of meetings and interviews may be helpful, although they generally require considerable time to transcribe and will contain superfluous information, and poor audio quality is a risk. A camera is useful for visually recording findings or points to discuss from site visits.

Correctly recording dates, people's names and designations, and the names of places visited is important, as is correctly referencing specific documents, procedures and regulations. These basic considerations will be important for the preparation of the audit report and will build the water supplier's confidence in the auditor.

> *I use meeting attendance registers and other sign-in registers for everybody that I meet or interview. This helps with remembering the sequence of events, who I spoke to and what was discussed. Similarly, I try to take photos in a logical sequence (from start of system to end), which is particularly helpful when visiting multiple systems in succession.*
>
> *Independent external auditor*
> *South Africa*

The auditor should also maintain records of data and documentation that informed audit conclusions. Auditor notes and records should be well organized, easily understandable by others, and accessible for review and use in subsequent audits.

11.2 Reporting

All audits should result in a written audit report. The report should reflect the type, scope and purpose of the audit and should document audit activities and findings. While the report format and content will likely differ between an internal informal audit and an external formal audit, all audit reports should generally be:

- **Constructive:** Audits should be a learning exercise for all concerned, and every audit provides an opportunity for the auditor to advise and assist WSP implementation. (This is generally feasible, although more difficult, with regulatory audits, which tend to be more restrictive and prescriptive.) Audit reports should include observations, conclusions and constructive recommendations for actions to progress or strengthen the WSP and meet any regulatory obligations.

EXAMPLE

CONSTRUCTIVE AUDIT FEEDBACK IN SOUTH AFRICA

Examples of audit feedback from the Department of Water and Sanitation in South Africa include:

WSP strengths:
- integrated management of drinking-water quality between various sections (i.e. engineering and environmental health) within the municipality;
- monitoring programmes improved to be risk informed (with the added advantage of being more cost effective);
- treatment optimization stemming from risk assessments; and
- the importance of monitoring results realized, thus the importance of the laboratory in ensuring credibility of results strengthened through the process.

WSP weaknesses:
- WSP found to be a document and not yet a process implemented;
- WSP found to be consultant driven (municipalities not involved in identifying risks); and
- improvement plan not appropriately reflecting resource constraints and therefore not being implemented.

- **Balanced:** Audit reports should clearly highlight achievements and good practice in addition to non-conformities or improvement opportunities. This approach will serve to encourage WSP teams and water suppliers to continue to strengthen the WSP and its implementation.

- **Realistic:** Audit reports should be realistic in recommending improvements, particularly for small supplies. For example, it is not constructive to recommend expensive treatment installations to manage an uncontrolled hazard if the improvement is clearly unaffordable. Available human and financial resources should be taken into account, and auditor recommendations should support realistic, step-wise improvements to water supply systems and WSPs.

- **Fair:** Audit findings, particularly in the case of regulatory audits, can affect investment, liability, individual and organizational reputation, and careers. Regulatory audit outcomes may also result in sanctions that can be legally enforced. Therefore, auditors must always take great care to produce audit reports that are accurate, fair, unbiased and based on observations and evidence collected during the audit.

- **Clear:** Each finding and recommendation should be explained fully and clearly. This will be helpful for the WSP team and water supplier, and it will support subsequent audits, which may be carried out by different auditors who will need to understand previous findings. The report should also include a summary section clearly detailing key recommendations or required actions, including timeframes and guidance or instructions on follow-up communication. For example, where a water supplier is expected to inform the regulatory authority when a requirement has been addressed, this should be specified in the report. Alternatively, the expectation may be that the recommendations are addressed prior to the next audit, and the date of the next audit may be proposed in the report.

- **Audience appropriate:** If an audit report is to be made available publicly, the auditor should consider whether it contains sensitive information such as the names of individuals or details of sites, communications or operational activities that could be a security risk or potentially cause unnecessary embarrassment. Such information should be removed in advance with an explanatory note included in the report. (See the South Africa case study in Appendix A for an example of information omitted from publicly available reports.) A publicly available report will also need to contain background information on the water supplier and the water supply system and, most importantly, an explanation of each finding, conclusion, recommendation and opportunity for improvement. This explanation should allow readers without any technical background to appreciate the significance of each point. Table 6 summarizes typical audit report audiences for various types of audits.

Table 6: Report audience by type of audit

Type of audit	Audit report audience
Internal informal	Internal only
Internal formal	Internal only
External informal	Usually internal only but may also be circulated within the organization conducting the audit
External formal (e.g. regulatory)	Internal and external and may also be made available to the public

TIP

AUDIT REPORTING TEMPLATES

Audit reporting templates can be useful tools to ensure thorough and consistent reporting by auditors. Templates may cover the following:

- water supply system name and location;
- audit dates;
- auditor name, affiliation and contact details;
- primary water supplier contact name, position and contact details;
- brief description of audit type, scope and purpose;
- summary of audit programme, including sites visited, meetings/interviews held (including the exit meeting) and names and positions of all audit participants;
- summary of audit findings, including strengths and improvement opportunities;
- summary of key recommendations or required actions, including timeframes and follow-up communication requirements;
- specific audit findings against audit criteria (perhaps included as an appendix); and
- suggested date for subsequent audit.

The auditor should discuss the overall findings and impressions from the audit with the WSP team and relevant members of the water supplier's management team through an exit meeting at the end of the audit. This will be helpful, even for small systems with few staff, as it will help to sort out any misunderstandings that occurred or any incorrect information that was supplied during the audit. Therefore, an exit meeting should always be carried out, even where the auditor has requested more information to be provided subsequently.

Finally, a water supplier should always be given the opportunity to review and comment on an audit report before it is finalized to clarify any misunderstandings or provide further information. Of course, an auditor is not bound to accept suggested changes to the report if they are not valid. It may be appropriate for a regulatory requirement for WSP audits to include provisions for an appeal system where there are disputes over findings and conclusions.

12. List of considerations for developing an auditing scheme

This section provides a checklist of key considerations for those responsible for developing a WSP auditing programme. The auditing programme may be national or sub-national, as in the case of regulatory audits, or it may apply only to internal audits within a water supply system. The checklist builds on the information provided in the previous sections and presents some additional key points for consideration.

List of key considerations for developing an auditing scheme

- **What is the purpose of the audit?**
  As discussed in Section 4, WSP audits may have a number of objectives, from mentoring and supporting WSP teams to ensuring compliance with regulatory requirements. It is important to bear in mind the particular audit goals in order to design the most appropriate scheme.

- **How will audits be financed?**
  All audits require resources – personnel, time, accommodation, equipment, transport – and all of these must be financed. Larger water suppliers are likely to have to bear all the audit costs. Internal audits may not require direct financing, but consideration will need to be given to how the auditor's day-to-day responsibilities will be covered whilst they are undertaking audits. Funding of audits for small supplies tends to be much more of a challenge as local authorities, government departments and funding agencies have many competing demands on their limited resources and personnel.

- **When should audits be carried out?**
  The timing of the initial audit and frequency of subsequent audits should be established, balancing the benefits of auditing with due consideration of the resources required, as discussed in Section 6.

- **How will sites be prioritized for auditing?**
  When planning external audit schemes for a large number of supplies where human and financial resources are limited, it may be necessary to devise a system of audit site prioritization. This may be particularly relevant for small supplies and will enable all supplies to be audited over an extended time period. Prioritization may involve selecting sites based on the population supplied, water quality results or population health data. In such cases, it may also be useful to conduct short, simplified audits concentrating on WSP elements vital for protecting public health, such as hazard identification and water treatment. Although the aim should always be to carry out comprehensive and regular WSP audits, the realities of resource constraints must be practically considered, and any kind of WSP audit is better than no audit.

- **What skills and experience should auditors have?**
  The audit scheme should set out the skills and experience required of auditors (or audit teams), as discussed in Section 7.

- **How will auditors be trained, certified and appointed?**
  The audit scheme should establish systems for auditor training and certification (as appropriate), as discussed in Section 8. For external audit schemes, another consideration that may be relevant is how auditors should be appointed to avoid any conflicts of interest.

- **What audit criteria will be used?**
  Defining clear audit criteria that reflect the locally relevant WSP approach and, where appropriate, providing qualitative or quantitative evaluation guidance will facilitate the audit process and contribute to audit consistency. Ensuring audit consistency is particularly important in the case of regulatory audits, and regulatory frameworks will generally set out the WSP requirements that will form the basis of any audit criteria. Audit criteria and evaluation guidance are discussed in Sections 9 and 10, respectively.

List of key considerations for developing an auditing scheme (cont.)

- **How will audit results be reported and followed up?**
  Reporting is an important part of all types of auditing. For external audits, the audit scheme should establish how audit results will be externally reported, giving due consideration to any legal, political or reputational implications of the report. In the case of regulatory audits, it will be important to consider how non-compliance will be reported and how corrections or improvements will be followed up. Regulatory frameworks should set out relevant requirements. Reporting is discussed in Section 11.

- **How to continuously improve the auditing scheme and WSP implementation?**
  It is worthwhile to consider how auditing experiences can be documented and shared to support revisions and improvements to the audit process, particularly when an audit scheme is newly developed and implemented. Audit experiences should be evaluated to ensure they are meeting the objectives of the auditing programme, including the strengthening of WSP implementation and national or sub-national WSP programmes, where applicable.

- **Is WSP auditing supported by regulatory requirements?**
  WSP audits may be legally required by legislation, regulations or technical standards, or they may be addressed less formally in guidelines. Audit requirements or guidelines may address the considerations listed here and serve to establish consistent criteria for conducting audits, thereby creating a basis for comparing results nationally or sub-nationally.

13. List of considerations for undertaking an audit

There is no single way to audit. How the audit is undertaken will depend on its aims, the size of the water supplier, the local context, WSP maturity and complexity, and whether or not the regulatory requirement (if applicable) includes a prescribed auditing methodology. The checklist below outlines key considerations for planning and undertaking all types of audits, many of which are addressed in detail in previous sections.

Auditors may find it useful to develop an audit plan as a tool to guide them through major audit activities.

Audit plans help to ensure that the audit process is clear and well organized, and that nothing is overlooked. An example audit plan is provided in Appendix B.

EXAMPLE

AUDIT TIME ALLOCATION AT ÁGUAS DO ALGARVE, PORTUGAL

For its internal and external audits, Águas do Algarve, Portugal, estimates that desk studies make up 50% of the total time, field visits 40% and interviews 10%. (See the Portugal case study in Appendix A.)

List of considerations for undertaking an audit

PRIOR TO THE AUDIT

- **Scheduling the audit**
  Once the audit has been initiated, for example by the regulator or the WSP team, the auditor should schedule the audit. For external audits, typically the senior management or the WSP team leader will be the auditor's point of contact with the water supplier. Internal auditors will usually liaise directly with the WSP team. Audit initiation and scheduling are discussed in Section 6.

- **Allowing sufficient time**
  The auditor should take care to plan sufficient time for the audit so that it is not rushed. While a larger system will generally have more elements to audit, a smaller system WSP team may have mentoring needs that will also take time. The audit scope should take time into account, considering the parts of the water supply system to be covered by the audit and the required travel time between locations. The audit can consider the whole WSP from catchment to the point of consumption, or it can concentrate on one or more specific aspects, depending on the audit objectives, the remit of the water supplier and the time available. (See the case studies in Appendix A for examples of the duration of various audits.)

- **Supporting water supplier or WSP team preparation**
  The auditor should provide information to help the water supplier or WSP team prepare for the audit in respect of sites to be visited, staff to be interviewed and documents to be made available for review. For audit inception and exit meetings, the auditor should provide advice on expected meeting participants so that plans can be made accordingly. Providing this information in advance of the site visit demonstrates due consideration of people's time and will help ensure that the audit runs smoothly and efficiently.

- **Reviewing documents in advance**
  Reviewing some documents in advance of the audit may benefit the audit process. For example, the auditor may review water supply system schematics, the WSP document or water quality monitoring records. Questions arising from the advanced paperwork review can be addressed during the audit. This up-front work will limit the amount of time required on site at the water supplier's facilities for the audit and will increase the auditor's knowledge, which can facilitate audit activities and build credibility amongst water supplier staff or WSP team members.

List of considerations for undertaking an audit (cont.)

DURING THE AUDIT

- **Communicating audit aim and methodology**
  At the outset of an audit, the auditor should ensure that everyone involved in the audit understands how the audit will be carried out and what is to be achieved. The auditor should make it clear that the audit is an opportunity for learning and improvement and should be carried out in an open, cooperative and transparent manner. Audit inception meetings provide a good opportunity to communicate these messages and answer any initial questions.

- **Undertake field- and desk-based investigations**
  A successful audit will have field- and desk-based components. The audit will need to assess the water supplier's level of understanding of the WSP process. This will require face-to-face discussions with members of staff about the WSP process, and their roles and responsibilities, as well as spot checks on whether or not operators follow WSP procedures in their day-to-day jobs. Field visits will confirm the accuracy of system descriptions, and the plausibility and adequacy of risk assessments, control measures and operational procedures. Paperwork (methods and procedures, records and results) will also need to be examined. (See page 32 for a practical example from Portugal of the distribution of audit time between desk studies, field visits and staff interviews.)

- **Using clear audit criteria and forms**
  The auditor should use forms with clearly defined audit criteria (and evaluation guidance, where appropriate) to support the audit process and record keeping, as discussed in Sections 9 and 10. In some cases, audit criteria will be established by those responsible for developing the broader audit scheme, and in other cases the auditor will need to develop the criteria. In all cases, the audit criteria should be carefully worded, using local language and the locally relevant WSP approach.

- **Conducting an exit meeting**
  As discussed in Section 11, the auditor should always aim to conduct an exit meeting with the WSP team and water supplier management to discuss major audit findings and impressions. This brings closure to the audit process and provides an important opportunity to sort out any misunderstandings prior to reporting.

FOLLOWING THE AUDIT

- **Reporting and follow up**
  Every audit should result in a written report reflecting the type, scope and purpose of the audit, and documenting audit activities, findings and any follow-up requirements. Guidance for developing the audit report is provided in Section 11, and auditors may find it useful to develop a standard reporting template to ensure that key content is included in all reports. Prior to finalizing the report, the auditor should always give the water supplier an opportunity to review and comment to clarify any misunderstandings or provide additional information.

Appendix A. Case studies

This section contains WSP auditing case studies from various countries, contexts and perspectives. An overview of the audit type and content captured in each case study is summarized below.

Case study	Audit type	Content overview including key features
A.1 Nepal	External, informal	**External informal auditing for a community-managed system:** audit aim, audit team, financing, duration, criteria, example audit form, findings, major activities, reporting (including outline of audit report content), and influence of audit findings on national WSP programme and guidance
A.2 Portugal	Internal and external, informal and formal	**Internal and external, formal and informal auditing from one water supplier's perspective:** audit aims, schedule and scope for various audit types, auditor qualifications, notice and duration, criteria, participants, major activities, reporting and follow up, benefits and challenges
A.3 Victoria, Australia	External, formal (regulatory)	**Description of the regulatory audit process:** audit aims, selection of independent auditors, audit initiation and duration, criteria and evaluation of compliance, major activities, reporting and certification
A.4 New Zealand	External, formal (regulatory)	**Description of the regulatory audit process plus information from one small system audit:** audit aims, field- and desk-based activities, notice and duration, criteria, participants, spirit of the audit, record keeping and reporting
A.5 Singapore	External, formal (regulatory)	**Information from a regulatory audit:** audit aims, government auditing team, audit duration, participants, spirit of the audit, reporting and follow up
A.6 South Africa	External, formal (regulatory)	**Description of the regulatory audit process as part of the Blue Drop (incentive-based) Certification programme:** government auditing team, auditor skills and training, notice and duration, major activities, reporting and results publishing
A.7 England and Wales	External, formal (regulatory)	**Description of the regulatory audit process:** government auditing body and its rights and responsibilities, progression from informal to formal auditing, audit approach and information audited

A.1 Nepal

(External informal auditing)

The Department of Water Supply and Sanitation (DWSS) began leading the development and implementation of WSPs in Nepal in 2010 with support from the WHO/Australian Government Water Quality Partnership. To gain an understanding of the quality and completeness of WSPs that had been implemented, WSPs were assessed (audited) in November 2011 in three communities, including Amarapuri (southern Nepal).

The Amarapuri water supply project was managed by an 11-member water users' committee and it provided service to 8 500 people in 1 331 households. There were 1 050 private tap connections with flow meters. The project supplied about 1 000 m^3 of treated water over a period of six hours per day. The WSP concept was introduced in Amarapuri in August 2010 and an improvement programme had been recently completed.

The WSP audit was supported financially by the Water Quality Partnership and was undertaken by a small audit team comprising an international WSP expert with auditing experience and two national WSP consultants. The audit team developed an audit form with criteria that reflected the national 10-step WSP approach as outlined in the *Nepal WSP Handbook* (which has since been revised with some minor changes in the steps). The audit was informal in nature and was intended to acknowledge WSP team members' efforts and successes as well as improvement opportunities. Therefore, the audit form included fields for recording both strengths and improvement opportunities. (See Amarapuri's completed audit form – Table 7.)

The WSP audit in Amarapuri involved a desktop review of the existing WSP document (completed prior to the site visit) and an on-site evaluation. The on-site portion of the audit was carried out over one full day and involved field visits to intakes, treatment works and storage reservoirs as well as review and discussion of WSP-related activities and records.

The audit found that the WSP team and the water users' committee understood well the WSP concept and that WSP activities had been fully integrated into the overall water supply system operation and management. Effort was given to keeping the WSP current and effective, and the WSP had resulted in many improvements to management of the water supply system, treatment infrastructure, water quality and consumer awareness.

The WSP audit also found several opportunities to improve the WSP, including WSP documentation. A number of important hazards had been identified and managed through the WSP process (for example open defecation in the village upstream of the water intake) but had not been documented in the WSP. The development and implementation of an effective community education programme had also not been documented in the WSP.

The audit process and findings were documented in a written audit report that was shared with the Amarapuri WSP team and water users' group and with DWSS at the national and sub-national levels. The audit report included:

- audit scope and purpose
- audit process (duration, overview of desktop review versus on-site evaluation)
- audit team member names and designations
- photographs and descriptions of all sites visited
- summary of major strengths and improvement opportunities noted
- recommended next steps
- detailed findings against specific criteria (i.e. the completed audit form).

The findings from the WSP audit in Amarapuri and the other two communities audited were considered collectively by DWSS in order to identify common improvement opportunities, and DWSS translated these findings into opportunities to improve national WSP guidance. DWSS subsequently revised the *Nepal WSP Handbook* accordingly in order to strengthen the national WSP programme.

Table 7: Nepal's WSP audit criteria and findings

Nepal WSP Handbook steps	WSP strengths	WSP improvement opportunities
Step 1: Team formation		
A team of five or more members should be formed to develop, implement and maintain the WSP. The team should include a local public health worker, teacher, committee member, operational staff and users.	All team requirements have been met, and the team is highly active and engaged. Team meetings are held monthly and meeting minutes are recorded.	
Collectively, the team should have knowledge and experience of all parts of the water supply system.	All team members demonstrated a thorough knowledge of the complete water supply system.	
The team's collective role and individual team member functions should be defined.	The team's collective functions are defined.	Individual team member functions should be captured in the documentation.
Step 2: System assessment		
All team members should have visited each step in the water supply chain, from source to consumer, and should have a thorough understanding of the complete system.	All team members have visited each step in the water supply chain, generally multiple times, and all understand the complete system.	
The WSP should include water supply system information, layout map and flow chart showing key system components.	Detailed and accurate system information is provided.	The number of system storage reservoirs is not clear from the documentation. The concept of a system flow chart may not be clearly understood. The WSP focal engineer (providing support to the WSP team from the water supply and sanitation division office) should be consulted for guidance and a system flow chart should be developed.
Step 3: Hazard identification and risk analysis		
Hazards should be identified from source to consumer.	Hazards have been identified and documented at all steps in the water supply chain.	The list of hazards should be expanded to include all major hazards, including those hazards that have been considered and managed but are not included in the documentation, for example the possibility of backflow contamination from consumer connections.
The risk level of each hazard identified should be assessed.	A risk level between 1 and 4 has been assigned to each hazard identified. *Note: In the revised handbook, a risk matrix (score 1–9) is being used.*	
Mitigation measures should be identified and prioritized according to risk level.	Mitigation measures have been identified and prioritized.	
Step 4: Control measures		
The team should identify control measures necessary to minimize the risk of contamination.	Required control measures have been documented. (Existing control measures were also identified and considered in the risk assessment.)	
Step 5: Urgent corrective action		
The team should develop a list of urgent and future improvement needs with due consideration of the risk level.	Urgent improvement needs have been documented and needs are being actively addressed.	Long-term needs have been identified and should be documented in the WSP (e.g. expanding laboratory capacity).

Nepal WSP Handbook steps	WSP strengths	WSP improvement opportunities
Step 6: Monitoring plan		
Monitoring should be carried out to ensure that health-based targets are achieved. The team should develop a matrix to monitor key control measures, including monitoring parameters, locations, frequency and responsible parties.	Compliance monitoring (to ensure that water quality targets are being met) is being carried out and recorded. Control measure monitoring has been outlined in the documentation and is being carried out and recorded as described.	
Step 7: Validation		
Evidence should be provided to demonstrate that control measures are capable of achieving performance objectives.	Information has been provided to validate the effectiveness of certain WSP control measures and improvement works.	Validation of additional system components/ control measures should also be documented (e.g. providing raw water versus settled water turbidity results to validate the performance of the settling basin, etc.).
Step 8: Verification of system for effectiveness		
The team should develop a system to record WSP activities and monitoring results and to review records to verify WSP effectiveness.	Records of WSP activities are systematically reviewed and signed off each month by the chair of the users' committee. In addition, activities and results are reviewed and compiled six-monthly (and formally signed off annually) by the focal engineers.	It would be valuable to describe this system in the form of a brief verification plan in the WSP.
Step 9: Assessment of user satisfaction		
Meetings should be held periodically with consumers to discuss WSP activity and gauge satisfaction, and a study should be conducted to assess user perceptions, use of household-level treatment and diarrhoeal illness. *Note: This step is very much in line with the verification concept, addressed above.*	Consumer awareness training is carried out annually on the WSP, the water supply system, water quality, point-of-use treatment, and safe household storage and handling practices. A system has also been developed to encourage safe water practices at the household level by offering prizes to households for cleanliness of tap platforms and water storage areas. A household survey has been undertaken to collect data on user satisfaction, health and point-of-use practices, and the survey is to be repeated regularly (e.g. annually).	It would be valuable to document all consumer education plans and activities in the WSP.
Step 10: Documentation		
WSP activities and results should be documented in a WSP report.	WSP activities and results are documented in the WSP report, which is to be updated annually and shared at the community, district and national levels.	

A.2 Portugal

(Internal and external, formal and informal auditing)

Águas do Algarve (AdA) is a public-private water supplier serving a population of around 410 000 people (up to 1 200 000 people during the peak season) in 16 municipalities in Portugal. AdA has about 160 employees supporting water and wastewater services. In 2007, AdA established the WSP auditing scheme outlined in Table 8 below. All audits are voluntary and seen as a strong tool to keep the WSP working routinely and to improve system performance. Each year, WSP objectives are set with top management to improve performance, and the accomplishment of these objectives is verified through auditing. The first audit was undertaken about six months after the start of WSP implementation, and audits are staggered such that some form of audit is being undertaken every three months.

Table 8: Águas do Algarve WSP auditing scheme summary

Audit type	Auditors	Frequency	Scope
Internal (informal)	WSP team	Every six months	• Follow up from previous audits • Implementation of improvement plans • Reaction/actions relating to significant changes in the organization or occurrence of events • Evaluation of the effectiveness of correction measures • Supporting programmes • Field audits
Internal (formal)	External consultants	Annually	• Effectiveness of actions taken • Effectiveness of decisions • Evaluation of improvement capacity
External (formal)	Independent organization (certification board)	Annually	• Independent verification of the WSP

At AdA, the WSP team leads the internal informal audits, which is a modified approach to internal auditing. Ideally, WSP auditors will not be part of WSP development and implementation for objectivity and to distinguish WSP audit from WSP review. However, AdA's robust WSP auditing scheme ensures ample unbiased feedback through their formal audits (both internal and external). The internal informal audits are a key driver for 'maintaining the pressure' to keep the WSP working well all year round, and not only in the lead up to the formal audits.

External auditors must be officially recognized as qualified to perform ISO 22000 audits and be able to demonstrate their independence from the water supplier. Internal auditors should meet the following criteria:

- experience in auditing (for example QMS or training in HACCP auditing)
- experience in WSP implementation
- field experience in the operations, maintenance or laboratory fields.

All audits are pre-arranged. Since audits are performed every three months, the different areas of the organization are always ready to be audited, although preparation will be given more detailed attention in the two weeks prior to the external audit.

Prior to the audit, the auditor must prepare and submit a general audit plan outlining the scope, infrastructure to be audited and general questions to be answered. (See Appendix B for an example audit plan.) Internal and external audits use a list of audit criteria produced by the WSP team that was compiled from the *WSP manual* (WHO/IWA, 2009), the WSP Quality Assurance Tool (WHO/IWA, 2013) and site-specific considerations. All areas of the organization are audited including operations and maintenance, human resources, laboratories and planning. Legal

compliance with water quality standards is always checked, particularly those associated with hazards identified in the WSP. Also, a strong focus is made on how the control measures are being monitored, verifying data and effectiveness. Consumer complaints are also evaluated, and staff training is checked. Checks on when and how the WSP is reviewed and kept up to date are included and considered critical to maintaining WSP evolution and implementation. For all documents reviewed, original records must be audited rather than summary reports. The credibility of water sample results is tested by examining all the paperwork covering the sampling, analysis and reporting from three or four examples.

An internal WSP team audit involves the following checks on each significant hazardous event:

- risk assessment
- control measures
- monitoring
- presence of hazard
- emergency plan
- improvements.

In the internal audits performed by the WSP team, around 50 people (about 33% of the staff) are involved in the audit. In the audits performed by external auditors (internal and external), usually around 25 people are involved. Table 9 indicates the length of time taken for a typical internal audit performed by the WSP team.

Table 9: Typical internal audit duration

Area	Duration
Operations	2–4 hours for each water treatment plant depending on the size of the plant; 8 hours for distribution
Maintenance	8 hours
Laboratory	4 hours
Planning	2 hours
Construction	2 hours
Planning	2 hours
External relations	2 hours

External audit by a team of two auditors usually takes two days.

Generally, the time allocation of all audits is:

- desk study: 50%
- field visits: 40%
- interviews: 10%.

The auditors give advice to the water supplier on WSP implementation throughout the audit and in the audit report. (The frequency of advice is much greater than during ISO 22000 audits.) Audit reports are developed for all types of audits, and non-conformities are documented. Each non-conformity must have a cause analysis and defined actions. For the external audit, the actions required to overcome the non-conformity must be communicated to the auditor to receive their approval. In the next audit, the auditor verifies the effectiveness of those actions. Strong and weak points are identified.

A total of 24 internal and external audits have been performed since the audit scheme was established. From AdA's perspective, the main benefit of WSP auditing is the opportunity to:

- formally assess the WSP;
- properly review if the plan is in line with the organization's operations and procedures;
- improve and discuss new solutions;
- verify if improvement actions are being updated; and
- use internal audits made by the WSP team as internal 'consultancy'.

AdA also notes the following WSP auditing challenges:

- an external auditor's views are not always in line with the organization's strategy; and
- internal audits carried out by the WSP team may generate internal human resource conflicts.

A.3 Victoria, Australia

(External regulatory/formal auditing)

Audits of RMPs (equivalent to WSPs) are a regulatory requirement under Victoria's Safe Drinking Water Act 2003. The purpose of the audit is to determine if a water agency has prepared, implemented, reviewed and revised an RMP that complies with the legal requirements.

The regulator (Department of Health & Human Services, Victoria) initiates the audit process through a written notice to a water agency to undertake an audit. The water agency then engages an independent regulator-approved auditor to carry out the audit at the water agency's own expense. The regulator determines the time period in which the audits are to be completed. The water agency is encouraged to consider changing auditors after three consecutive audits, and auditors are required to sign a declaration that they have no conflict of interest that would prevent them from carrying out an unbiased audit.

Prior to each audit period, the regulator produces guidance material on the audit process and audit criteria (or 'auditable elements'), and provides briefing sessions for auditors covering the broad audit framework. Auditor training is arranged independently and the audit methodology is up to the auditor.

Audits take two to four days to complete, depending on the size and number of water supplies being audited, and will generally involve between two and 10 water agency staff. Audits consist of reviews of documents, procedures and on-site practices as well as interviews with staff. The regulatory audit requirement is quite prescriptive regarding the documents to be examined:

- the RMP;
- any document or operating manual, procedure or protocol relating to the RMP; and
- any training and competency manual relating to the responsibilities of staff to manage and deal with risks identified in the RMP and emergencies, incidents or events that may adversely affect the quality of raw and treated drinking-water.

The credibility of the documentation is determined by the auditor's training and experience.

The regulator's audit guidance stipulates that in order for an RMP to be assessed as compliant, there must be evidence that each auditable element has been developed, has been effectively implemented, reviewed and amended where required and the RMP is aligned with good risk management practice. However, auditors have been given the freedom to assign a compliant score to an auditable element while also identifying opportunities for improvement, which has helped engender positive feedback from the water suppliers on the audits and audit process. Non-compliant findings are rated as minor, major or critical non-compliance, as outlined in Table 10.

The conclusions and findings of each audit are communicated during a meeting at the end of the audit between the auditor and water agency staff, and formalized in a report and an audit certificate. The report and certificate are provided to the water agency and the regulator. If a water agency is found to comply with regulatory requirements, it receives a letter of congratulations from the regulator. If a water agency is found to be non-compliant, issues of non-compliance are discussed with the regulator and the water agency gives a commitment on how it will address those issues.

The first audits under the Safe Drinking Water Act 2003 were conducted in 2008. Of the 25 water agencies that were audited, 15 were found to have RMPs that complied fully with the legislative requirements of the Act, whereas 10 did not.

Since 2008, audits have been conducted on three further occasions (2009, 2011–12 and 2013–14), and in each of these audit periods 23 water agencies have been assessed as being compliant, with two being found to be non-compliant. The water agencies found to be non-compliant in each of the audit periods were different to those in the previous audit period.

Feedback from auditors suggests that water agencies generally have a good understanding of RMP concepts and terminology, the audits are carried out in an open and cooperative way and information is provided readily.

Table 10: Summary of compliance grades and auditor actions

Compliance grade	Features	Auditor actions	Indicative Department of Health response
Compliant result			
Compliant	Sufficient evidence to confirm that the business has undertaken, prepared and/or implemented actions in accordance with legislation, and their risk management plan.	Complete compliance certificate for water business. Submit certificate to the department within 14 days.	No specific action.
Compliant with opportunities for improvement.	As above but the auditor's report has identified OFIs.	Complete compliant certificate for water business. Submit certificate to department within 14 days.	Department of Health notes the identified improvement opportunities and observations and requests that the water business advise what actions it intends to take in this regard.
Non-compliant result			
Most significant finding is a critical non-compliance.	Non-compliance where a serious or imminent risk to public health is identified.	Complete non-compliant certificate for water business with details. Submit certificate to the department within five days.	Department of Health to meet with water business within seven days of receiving the audit certificate to discuss and agree on an action plan to address non-compliances.
Most significant finding is a major non-compliance.	Non-compliance where there is a high potential for a risk situation, likely to compromise public health if the non-compliance is not rectified.	Complete non-compliant certificate for water business, with details. Submit certificate to the department within five days.	Department of Health aims to contact and where possible meet with water business within 14 days of receiving the audit certificate to discuss and agree on an action plan to address non-compliances.
Most significant finding is a minor non-compliance.	Non-compliance where there is a low potential for a risk situation, and the potential impact of the non-compliance is not likely to be a serious or imminent risk to public health, or to compromise public health (i.e. it would not warrant a 'critical' or 'major' non-compliance outcome).	Complete non-compliant certificate for water business, with details. Submit certificate to the department within five days.	Department of Health aims to contact water business within 14 days of receiving the audit certificate to discuss and agree on an action plan to address non-compliances.

Note: This table uses the term 'water business', which is synonymous with 'water agency'; OFI stands for opportunities for improvement.

Source: Department of Health & Human Services, Victoria (formerly Department of Health, Victoria), *Drinking water regulatory audit Guidance note*, edition 4, May 2013.

For more information on the RMP audit process in Victoria, refer to the most up-to-date *Drinking water regulatory audit Guidance note* from Victoria's Department of Health & Human Services website (www.health.vic.gov.au/water/drinkingwater/audit.htm).

A.4 New Zealand

(External regulatory/formal auditing)

Community and Public Health (CPH) is a division of the Canterbury District Health Board providing regional public health services. CPH includes a drinking-water auditing body contracted by New Zealand's Ministry of Health and is accredited as an AS/NZS ISO/IEC 17020:2013 (incorporating ISO/IEC 17020:2012) inspection body by International Accreditation New Zealand. CPH has 30 years' experience in the public health sector, including 10 years' experience in the drinking-water regulatory field. The division has significant experience in the preparation approval and auditing (or 'assessment', which is the terminology in New Zealand) of WSPs in New Zealand and the Pacific Islands, with 150–200 audits undertaken.

CPH uses a specified auditing method included within nationally controlled procedures, which has been in use since 2008 and consists of a checklist and standard reporting template. The checklist involves assessing the critical control points of the water supply system and any critical improvements that the water supplier had indicated would be carried out. The audit aims to assess evidence and make observations that controls and associated monitoring are effectively in place and that there is evidence that improvements have been completed or are under way. The audit also reviews any events that have occurred since the last audit and checks how well the WSP dealt with them. There is also a check on any changes to the water supply to see if they present any additional risks and if the WSP has been updated accordingly.

The audit consists of a desk review of documents, interviewing staff on site and direct observation of plant processes and environs. The documentation examined can include water quality data, WSP methodology, external reports commissioned by the supplier, operating instructions, emergency procedures, standard operating records, incident reports and follow-up actions, supporting programmes such as catchment assessment, asset management software and database records, and on-line supervisory control and data acquisition (SCADA) results.

The drinking-water auditor (or 'assessor') adopts an open questions approach, providing feedback and commentary throughout the audit and any findings are reiterated in the audit report. (Note that auditors are not to provide operational solutions or advice. The auditor may identify gaps or issues but should not prescribe how they should be fixed.) Recommendations are areas where the auditor has identified that improvement could be made but do not amount to non-conformance with the WSP. Handwritten notes are recorded at the time of the audit on the checklist. This is scanned and retained electronically by CPH. A meeting is normally held at the end of the audit and the audit findings are discussed.

This case study describes a standardized WSP audit conducted by CPH as part of contracted services to the Ministry of Health. The audited water supply is owned by a local authority and run by a contractor. It provides ultraviolet (UV) treated surface water to a population of about 450 people. The water is sourced from two shallow river gravel wells, there is no filtration and the performance of two UV treatment units has not been validated. The water supply has never achieved protozoa compliance due to a lack of appropriate treatment and it is occasionally non-compliant for *Escherichia coli*, usually after heavy rainfall.

The WSP was originally approved in 2010. It was developed by a consultancy company, which wrote the WSP after spending some time with the supplier and participating in site visits with the operator. The supplier reviewed the WSP before submitting it to CPH for 'approval', which is a desk exercise. The first WSP audit was carried out within a year of the start of WSP implementation; this case study describes the second audit.

The audit was pre-arranged six weeks in advance. Prior to the audit, the auditor reviewed public health files to check for any relevant events or incidents and reviewed the WSP and previous audit result. The water supplier assembled documentation requested by the auditor (a consultant's report on reservoir condition and an asset management assessment) and organized having appropriate staff on site for the audit. The audit took nine hours (preparation time, three hours; on site and travel, four hours; and reporting, two hours). Audit participants were the CPH auditor, a trainee auditor, two representatives of the local authority (the water supplier) and two contracted operators of the supply.

The audit found that concepts and terms such as hazard and risk, risk assessment and prioritizing risk were well understood by the water supplier, and that less well understood were terms like validation, verification and control measures (the last better understood as 'multi-barrier'). The audit also found the WSP to be easy to understand and thorough in identifying risks and priorities according to public health significance. However, a weakness noted was that the water supplier, responsible for a number of water supplies, did not provide a method for prioritizing improvements across all supplies, nor did it provide a clear indication of how funds were going to be made available for all the necessary improvements.

The meeting normally held at the end of the audit to discuss audit findings was not held, as some staff were absent on this occasion. Therefore a provisional report was sent to the water supplier for comment before a final report was sent. The audit concluded that reasonable progress was being made towards implementation of the WSP but the supplier was not well positioned to be fully compliant with their WSP by the five-year statutory lead-in period allowed for smaller suppliers.

The auditor reported that the audit was friendly, cooperative, open and transparent. Those taking part had met during the previous audit. All the information requested by the auditor was provided by the water supplier, some subsequent to the audit but the majority at the time of audit. The overall impression was that the audit was useful, helping staff who were not involved in the original drafting of the WSP to understand more about the process and helping staff to focus on the aspects of the supply system that needed more attention to protect public health.

A.5 Singapore

(External formal/regulatory audit)

In Singapore, the National Environment Agency (NEA) has mandated the requirement for preparation of drinking-water safety plans by piped drinking-water suppliers under its Environmental Public Health (Quality of Piped Drinking Water) Regulations 2008. The water suppliers are required to prepare the WSP in accordance with NEA's Code of Practice on Piped Drinking Water Sampling and Safety Plans, which takes reference from WHO's *Guidelines for Drinking-water Quality* (WHO, 1997). The water suppliers are also required to submit their WSP to the NEA's Director-General of Public Health for approval, and after seeking the approval, carry out subsequent reviews of the WSP on an annual basis.

In May 2013, a team of officers from the Drinking Water Unit (DWU) of NEA undertook a regulatory audit of particular aspects of the WSP implemented by a water supplier at one of its water treatment plants. This WSP had been audited eight times, and thus this was a regular audit, conducted at a frequency of once every six months. The area of the WSP to be audited was selected on a random basis during the audit, as a full audit of all aspects of the WSP was carried out earlier during the approval of the WSP.

The aim of the audit was to verify the treatment process outlined within the WSP, discuss the potential water quality issues, and audit various documents and records relating to calibration of equipment and on-site testing carried out by the water supplier to verify that the WSP was current and effectively implemented. The audit methodology was as specified by the regulator, which was based on DWU's internal procedure and a checklist.

The audit was pre-arranged by the regulator, owing to the security clearance that was required before the audit, and undertaken by a team of three DWU officers with scientific or engineering backgrounds and trained in auditing. Four key staff and other relevant staff from the water supplier were involved in the audit, including the plant manager. The audit included review of the approved WSP documentation and records endorsed by the water supplier's management, which took about three hours to carry out. The auditors were supplied with everything they requested at the time of the audit or it was supplied subsequently, and the regulator described the relationship between the auditors and water supplier as cooperative and helpful. The audit was described as open and transparent.

The audit concluded that there was no breach of the requirements prescribed under the 2008 regulations and that the water supplier had a good understanding of the WSP concept and terminology. In addition, the following points were noted:

- No changes to the water treatment process had been made since the last audit.
- There were no raw water quality issues relating to algal blooms and chironomid larvae.
- No customer complaints regarding the quality of water produced were received by the water treatment plant (WTP).
- No upgrades had been carried out since the last audit, although the water supplier briefly mentioned that sand filter refurbishment would commence towards the end of the year.
- The general sanitation and hygiene conditions of the areas inspected within the WTP were satisfactory.
- Water samples from the clear water tank and pumping main had been tested for various water quality parameters (turbidity, fluoride and free chlorine) and values were in accordance with the WTP's internal limits and NEA's regulatory standards.
- The daily water treatment logs were inspected and the results were well within the WTP's internal limits and NEA's regulatory standards. Based on the records, it was noted that lime was not added during the jar test as efficient coagulation could be achieved with the addition of alum and polymer.

- The maintenance and calibration records for both the on-line and off-line equipment and monitoring systems were also reviewed and no unsatisfactory results were noted.

A formal audit report was produced following the audit and was sent to the water supplier and was stored electronically on the regulator's computer system. The water supplier acknowledged the audit report and, where appropriate, provided feedback on the audit findings and process. Plans for follow up on actions required by the water supplier have been established.

A.6 South Africa

(External formal/regulatory auditing)

Following a major waterborne disease outbreak in 2005 and the reoccurrence of major drinking-water quality failures in five towns in 2007, it was concluded that endpoint monitoring alone would be inadequate to manage all risks associated with the supply of safe drinking-water. The country consequently adopted the WHO WSP concept as the basis for its Drinking Water Quality Framework, which was released in 2007. The regulation of drinking-water quality was further intensified with the introduction of the Blue Drop Certification programme. This was the first incentive-based regulation programme of its kind, with the primary objective of promoting risk-based management of potable water.

In 2010, WSPs accounted for 5% of the Blue Drop score, and at present WSPs account for 35%. As water quality compliance, process control and asset management contain a strong element of water safety planning, WSPs influence about 70% of the Blue Drop programme.

The Department of Water and Sanitation (the sector regulator) commenced with audits as part of its Blue Drop Certification programme in 2008. To date, the department has conducted three annual Blue Drop audits on 152 water services authorities (municipalities). Over this period, at least 742 WSPs were assessed.

The Blue Drop audits are conducted by a panel of inspectors (or audit team) who are trained on all aspects of the regulatory requirements (WSPs, process control, water quality compliance, management accountability and asset management). The inspectors (auditors) include departmental officials from various relevant educational backgrounds such as engineering and science. Even though an annual training programme ensures uniform application of regulatory judgment, the department periodically augments its skills base with private specialists to enhance capability. The credibility of the process can be tarnished if the audit team is not sufficiently skilled since some of the municipal and water board officials are highly experienced in their field.

All municipalities are consulted on the requirements of the annual audit up to six months in advance of the commencement of the audit cycle, and the audit schedule is published up to two months prior to commencing. This approach is followed to allow sufficient time for audit preparation.

The audit is carried out in three phases:

1. An on-site detailed assessment of both documents and implemented processes (two days), which includes:
   - interviewing staff
   - assessing monitoring records
   - assessing the WSP
   - assessing evidence of WSP implementation, e.g. water treatment processes, laboratory work.

2. An off-site assessment of monitoring, compliance and content of WSPs (about one month).
   The auditors collect data and information to determine credibility of the water safety planning process. Section 81 of the Water Services Act compels municipalities to furnish the Department of Water and Sanitation with information required for (regulatory) performance monitoring processes. A scorecard detailing very specific questions has to be completed for every water supply system audited to confirm the WSP is being implemented and the water supplier is not just presenting information in a document. Information related to water safety planning, risk assessment, risk-based monitoring, drinking-water quality data credibility and incident management has to be

furnished. As of 2014, the weighting of the WSP requirement for Blue Drop Certification (35% of the total) is as follows:

- WSP process (10%): skills diversity of WSP team, indication that the WSP is a process rather than simply a document, and applicability of WSP to the specific water supply system;
- risk assessment (35%): adequate coverage of catchment, treatment and reticulation, risk prioritization methodology, adequacy of identified control measures and treatment efficacy (as per water quality assessment);
- risk-based monitoring (30%): adequacy of operational and compliance monitoring;
- drinking-water quality data credibility (15%): laboratory accreditation and proficiency; and
- incident management (10%): incident management protocol and incident management register and report.

3. Confirmation sessions following official audit feedback where the water supplier can present evidence should there be any points of dispute. Interaction between the audit team and water supplier (and water board) is encouraged to ensure the improvement of the WSP in general.

Blue Drop audit results are published in a Blue Drop report, which is a public document. However, the public report does not reveal any specific risk details of the water supply system, but rather comments on any process shortcomings. The reason for this is to avoid an unfavourable situation when confidential information is published through a regulatory report. Specifics are discussed and reported during the confirmation sessions.

The release of this report forms the pinnacle of the incentive-based regulation programme since it either provides public recognition for those doing well or discomfort for those under-performing. Reporting serves to apply pressure to improve drinking-water quality management in a constructive manner.

The whole audit process (from phase 1 to report publication) takes about five to six months.

A.7 England and Wales

(External formal/regulatory auditing)

The public water industry in England and Wales comprises 27 water companies (or water suppliers) operating 1 249 works, 4 430 service reservoirs and over 347 500 km of mains providing about 14 490 million litres of water to 57 million customers every day. The Chief Inspector of Drinking Water for England and Wales regulates the quality of water supplied by these water companies and also carries out checks to ensure that local authorities are meeting their responsibilities for the regulation of small private water supplies. The powers of the Chief Inspector (and inspectors) are set out in the Water Industry Act 1991 and amended by the Water Act 2003. Inspectors are collectively known as the Drinking Water Inspectorate (DWI), a government organization that came into being in 1990. The inspectorate has various powers to obtain information as part of any investigation, including the right of entry, and is able to take enforcement action by putting in place legally binding agreements for remedial action such as notices and orders or by initiating prosecution proceedings in the courts. Until recently DWI was funded directly by the government, now it recovers its operating costs related to regulatory activities from public water suppliers.

Drinking-water quality standards are set out in separate regulations covering public and private water supplies and must be met at the point where consumers draw off water for use. These regulations include a requirement for public water suppliers (and local authorities in respect of small private water supplies) to have the WSP approach in place covering all their water supply systems. The legal requirement for the WSP approach takes the form of a duty to comprehensively risk assess a water supply and to keep this risk assessment under review. When public water suppliers do not comply with these requirements, DWI can follow up with several levels of enforcement.

DWI encouraged the water industry to adopt the WSP approach from 2006 onwards. Initially they carried out site-based informal audits to check on progress and offer advice. In 2008, the WSP approach became a regulatory requirement, and after three years, DWI conducted a formal external audit on WSP implementation. This consisted of public water suppliers providing DWI with the outputs of the WSP approach such as the suppliers' water safety planning methodology, extracts of health risk assessments, risk assessment outcomes and conclusions, and actions for implementing further risk mitigation. DWI did not specify a standard approach or requirement for the documentation of the approach, allowing suppliers to develop their own methodology in accordance with WHO *Guidelines for Drinking-water Quality* (2011).

This initial formal external audit focused on risk management outputs and outcomes, with particular reference to ensuring that water companies had included these in their business plans. The results of the audit generally showed good progress in the development of the approach. There was no clear pattern of a common weakness but validation of controls was seen as having the biggest scope for improvement in terms of collecting data to inform risk assessments.

Since this time, WSP auditing has become a rolling process informed particularly by water quality or sufficiency events, consumer complaints, compliance results and risk assessment conclusions. In addition, DWI's approach to technical audit is fully risk-based whereby a wide range of technical and other information about the water companies is brought together and analysed to identify where a site visit is likely to add the greatest benefit in terms of reducing risk to water quality through advice, recommendations or enforcement. In 2014, DWI carried out 468 technical audits, of which 31 were deemed unsatisfactory.

Table 11: Audits completed by the Drinking Water Inspectorate in 2014

Audit topic	Audit numbers for companies supplying consumers in England and Wales
Water treatment works	25
Treated water storage points	15
Bulk transfer agreements	8
Sampling rounds	10
Consumer complaints	36
Issuing of statutory notices	108
Reviews of improvement schemes	129
Changes of solution to improvement schemes	7
Completion of improvement schemes	68
Receipts of risk assessments	62

Appendix B. Toolbox

This section provides examples of various audit tools. These examples are presented to offer ideas as starting points for the development of customized tools best suited to specific local contexts.

Tool	Content overview
B.1 List of threats to water safety	**Examples of possible threats to water safety at four points along the water supply chain:** catchment/source, treatment works, distribution/storage and user premises.
B.2 Audit criteria and evaluation guidance	**i Victoria example:** audit criteria and qualitative evaluation guidance **ii South Africa example:** audit criteria and scoring guidance **iii Bhutan and Lao People's Democratic Republic examples:** audit criteria and scoring guidance **iv Water safety plan assessment form for small water supplies:** audit (or assessment) questions for small water supplies
B.3 Audit plan	**Portugal example**

B.1 List of threats to water safety

Below is a list of possible water safety threats at various points along the water supply chain. Auditors may find it useful to take this list to the field to support the challenging task of determining whether the WSP reflects due consideration of the most relevant hazards and hazardous events.

The list is not comprehensive and not all concerns listed below will apply in all situations. It is also important to note that the examples below are not fully developed hazardous events. In the WSP, hazardous events should always clearly describe the impact on water quality and the cause.

For auditors of small water supplies, sanitary inspection forms can be used instead of, or in addition to, this list when considering whether or not the WSP addresses the most significant hazards and hazardous events.

Possible threats to water safety

Catchment/source	
Surface water	
• Discharge of sewage • Discharge of industrial effluents • Agriculture (e.g. fertilizer, manure, pesticides, herbicides) • Algal blooms • Solid waste/refuse disposal sites • Runoff from roads near intake • Major spills (accidental and deliberate)	• Animal husbandry • Development/construction activity • Mining activity • Forestry • Landslides • Human activities (e.g. bathing, clothes washing, recreation) • Natural events (e.g. heavy rains, floods, droughts)
Groundwater	
• Naturally occurring chemicals (e.g. arsenic, iron, fluoride) • Seepage of agricultural contaminants (e.g. pesticides, nutrients) • Seepage from on-site sanitation and sewerage systems • Seepage of industrial wastes • Over extraction (e.g. for irrigation) • Declining groundwater tables • Salt water intrusion	• Runoff from surface contaminants to poorly constructed or maintained well • Backflow flow into well (tube well) • Dirty bucket (dug well) • Animal/animal waste access at uncovered well (dug well) • Natural events (e.g. heavy rains, floods, droughts)
Treatment works	
Coagulation, flocculation and sedimentation	
• Alum/polyaluminium chloride (PAC) dosing malfunction • Improper alum/PAC dosing rate • Power failure • Chemical supply exhausted • Incorrect chemical used • Chemicals are of poor quality • Inadequate mixing of chemicals	• Insufficient contact time for floc formation • Improper mixing speed for floc formation • Floc removal (e.g. scrapers) mechanism malfunctions • Flow rate in excess of design limits • Failure of alarms and monitoring equipment • Insufficiently trained operators
Sand filtration	
• Improper media • Flow rate in excess of design limits • Infrequent filter backwashing • Ineffective filter backwashing	• Filter backwashing with raw water • Inadequate filter maintenance • Insufficiently trained operators
Chlorination	
• pH too high for effective chlorination • Turbidity too high for effective chlorination • Insufficient contact time for pathogen kill (e.g. flow short circuiting or flow rate in excess of design limits) • Dosing equipment malfunction • Poor calibration of dosing/testing equipment • Incorrect dose calculation • Chlorine supply exhausted	• Expired chlorine used • Chlorine of poor quality (e.g. not for potable use or outside of specification) • Residual not maintained through network • Disinfection by-products (generally a low risk and attempts to control this should never compromise effective disinfection) • Insufficiently trained operators

Possible threats to water safety

Distribution/storage

Post-treatment storage tanks/reservoirs

- Access by animals/birds (e.g. through unscreened vents)
- Unauthorized access (e.g. vandals)
- Leaching from construction materials
- Runoff from roof
- Entry of contaminated groundwater (for in-ground tanks)
- Contamination during sampling
- Sediment or biofilm build-up and re-suspension or release
- Algal growth (open reservoirs)
- Improper cleaning practices
- Expired chlorine used
- Chlorine of poor quality (e.g. not for potable use or outside of specification)
- Residual not maintained through network
- Disinfection by-products (generally a low risk and attempts to control this should never compromise effective disinfection)
- Insufficiently trained operators

Pipe network

- Unintentional cross connection (e.g. wastewater, stormwater or greywater pipes)
- Illegal or unauthorized connections
- Leaching of chemicals from pipeline materials (e.g. solders and joint compounds)
- Poor pipeline repair/installation practices
- Sediment or biofilm build-up and re-suspension or release
- Contaminants drawn into system due to a combination of:
  - Low pipeline pressure (e.g. intermittent operation)
  - Presence of sub-surface contaminants (e.g. sewers, drains, garbage pits, pit latrines)
  - Breaks or leaks in pipeline
  - Backflow (e.g. from consumers' tanks or hose connections)

User premises

- Water transported and/or stored in open containers
- Water transported and/or stored in unsafe containers (not suitable for potable water)
- Storage tank not regularly cleaned
- Storage tank vulnerable to access by birds/animals (e.g. rooftop tank)
- Poor hygiene practices (e.g. dirty hands and utensils)
- Improper household treatment practices

B.2 Audit criteria and evaluation guidance

This section contains examples of audit criteria and/or evaluation guidance from Australia, South Africa, Bhutan and the Lao People's Democratic Republic. It also contains a general audit (or 'assessment') form designed specifically for small systems.

B.2.i Victoria, Australia

In Victoria, Australia, the various audit criteria are assigned one of the following codes indicating the degree of compliance with each audit criterion.

A: Compliance
Indicates conformance of the RMP and/or drinking-water quality management system elements with one or more of the auditable elements, legislative requirements or risk management activities.

OFI: Opportunity for improvement
This comment may relate to a conforming or non-conforming clause of the RMP or drinking-water quality management system that does not contravene a legislative requirement. It is not itself a non-conformance. It may include opportunities for improvement, comments that may be relevant to the next audit or against best practice considerations, or incidental or isolated discrepancies.

Mi: Minor non-conformance
A minor non-conformance is defined as a non-compliance with one or more of the auditable elements, legislative requirements or risk management activities where the potential impact of the non-conformance is not likely to be a serious or imminent risk to public health.

Ma: Major non-conformance
A major non-conformance is defined as a non-compliance with one or more of the auditable elements, legislative requirements or risk management activities where there is a high potential for a risk situation and that risk situation is likely to compromise public health if the non-conformance is not rectified.

C: Critical non-conformance
A critical non-conformance is defined as a non-compliance with one or more of the auditable elements, legislative requirements or risk management activities where a serious or imminent risk to public health is indicated.

Source: Department of Health & Human Services, Victoria (formerly Department of Health, Victoria), *Drinking water regulatory audit Guidance note*, edition 4, May 2013.

B.2.ii South Africa

This example details the audit criteria and scoring guidance used to evaluate WSPs during the 2012 assessment cycle of municipalities in South Africa. (Some entries have been slightly modified or abbreviated for clarity.)

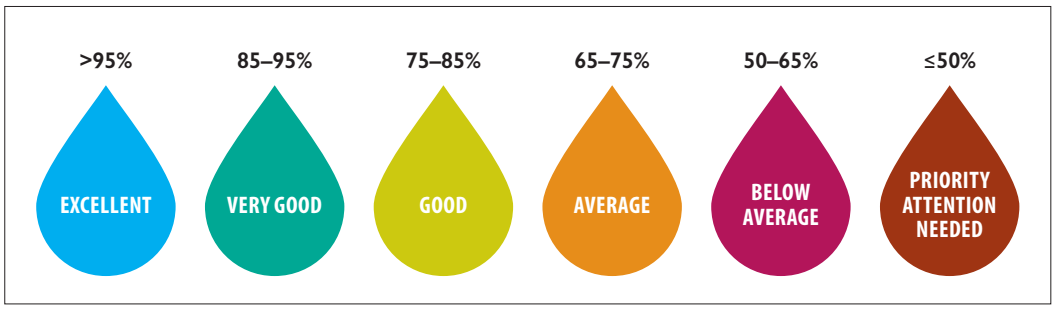
Process	Questions/criteria	Scoring guidelines
Water safety planning process	a) The water safety planning process is steered by a group of people including the technical, financial and management staff of the municipality. b) There should be clear indication that the water services conducted a water safety planning process and not only drafted a document. c) There should be clear reference to the specific water supply system and not only global management measurements put in place.	Fully complying with requirement = 1 Complying only with b) and c) = 0.7 Complying only with a) and c) = 0.6 Complying only with a) and b) = 0.5 Complying with only one of the sub-requirements = 0.3
Risk assessment	a) The risk assessment must cover both treatment and reticulation. b) The water service must provide information on findings of the risk assessment (and detail risk prioritization method followed) for the specific water supply system including water resource quality. Format not important but it should be proven not to be a desktop study. c) The water safety planning process must include (adequate) control measures for each significant hazard or hazardous event identified. d) A water quality risk assessment conducted for at least 80% of South African drinking-water standards list of parameters. This is to verify whether treatment technology is adequate to treat the raw water to comply with national standards.	Fully complying with requirement = 1 Fully complying with process but not covering one risk element identified = 0.9 Fully complying with process but not covering two or more risk elements identified = 0.8 Lacking control measures for which there is no plan in place = 0.7 WSP does not cover one of the following elements: catchment, treatment works or reticulation risks = 0.6 Partially complying with process in two elements and then not covering two or more risk elements identified = 0.5 Further deduct points for risk prioritization not indicated = -0.2 Full standard analyses not included as part of the risk assessment = -0.2 For any other major shortcoming identified = -0.2

B.2.iii Bhutan and Lao People's Democratic Republic

Below is the audit guidance note used in the Lao People's Democratic Republic and Bhutan for internal and external/regulatory audits. The guidance note contains audit criteria and detailed scoring guidance. The audit criteria reflect the major elements of the nationally adopted WSP approach and have been designed to gauge the quality of WSP development and the degree of implementation. Note that due to local preferences and convention, the audit guidance note uses 'assess' and 'assessor' rather than 'audit' and 'auditor'.

Audit criteria are scored from 0 to 4, with 4 indicating full compliance or achievement and 0 indicating little or no compliance. (The scoring scale used in Lao People's Democratic Republic and Bhutan is in fact 1–5 rather than 0–4. However, due to an observed tendency for auditors to instinctively assign a score of 0 for complete non-compliance with a question or criterion, the scale has been changed from 0–4 for this document.) In most cases, scenarios that warrant a score of 0, 2 and 4 have been provided, with room for auditors to assign scores of 1 or 3 using their own discretion for situations that fall in between the pre-defined reference scenarios. Scores are totalled at the end of each section, and each section is assigned a qualitative rating as shown in Figure 2. Ultimately, all section scores are summed and an overall audit score and associated qualitative rating are assigned for the WSP. For the sake of brevity, the scoring boxes at the end of each WSP section have been omitted from this document such that only the scoring summary table at the end of the form is provided here.

Figure 2: Qualitative ratings



The qualitative ratings above indicate the following:

- **Excellent:** highest achievement. WSP is thorough, up to date and fully implemented. Water quality risks are well managed.
- **Very good:** WSP is generally complete, up to date and well implemented. Some opportunities exist to strengthen the WSP, its implementation and/or record keeping.
- **Good:** major WSP elements have been generally addressed and good progress has been made to implement the WSP. Several opportunities exist to strengthen the WSP, its implementation and/or record keeping.
- **Average:** major WSP elements have been generally addressed and some progress has been made to implement the WSP. Focused efforts by the WSP team are needed to strengthen the WSP, its implementation and/or record keeping to lift WSP quality above average.
- **Below average:** the WSP is not sufficiently complete, up to date and/or implemented. Attention is needed to improve water quality risk management.
- **Priority attention needed:** there are a number of critical gaps in the WSP and/or its implementation indicating insufficient water quality risk management. Priority attention is needed to ensure water safety.

Water supplier information	
Information requested below should be provided for the water supply system(s) covered by the WSP being assessed.	
Water supplier name	
Town(s) served	
Number of people served	
Primary supplier contact during assessment	
Month/year WSP implementation began (when WSP began to influence the actions of the supplier, e.g. introduction of changes to management procedures or monitoring practices, implementation of control measures to manage risks)	

External assessor information	
Date	
Assessor name(s)	
Assessor organization(s)	

1. WSP team Objective: assemble an appropriate team of professionals with knowledge and experience in all aspects of the water supply system and sufficient decision-making authority to develop and implement the WSP.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
1.1	**Is there a documented WSP team and is the team list current?**	Ask WSP team to make a list of current WSP team members (ideally without referring to the WSP). Compare this list with the WSP team list documented in the WSP. **Score 4** only for a perfectly up-to-date list; **score 2** for one member out of date (new member not added or resigned member not deleted); **score 0** for two or more team members out of date or no documented WSP team list. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
1.2	**Are appropriate organizations represented on the team?**	Appropriate persons often include representatives of the health or environment sectors in addition to water supplier staff. Based on knowledge of optimum team composition (drawing on experience elsewhere in the country), assessor should **score 4** for a fully complete team; **score 2** for a team with one key organization missing; score 0 for a team with two or more key organizations missing. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
1.3	**Does the team include people with the authority to carry out WSP recommendations as well as technical staff?**	The WSP team should include those with authority in matters related to budget and operations, for example. A balanced WSP team should also include technical staff to capture inputs and ensure awareness and buy-in. **Score 4** for a well-balanced team with technical and management-level staff; **score 2** for a team with one key position/discipline missing (e.g. either no technical staff or no managers); **score 0** for a team with two or more key positions/ disciplines missing. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
1.4	**Is there evidence that regular team meetings held and recorded?**	Is the WSP team able to furnish evidence, e.g. meeting minutes, that WSP team meetings are held at the frequency indicated in the WSP? Assessor should review these records for the audit period (or for a period of at least one year). **Score 4** only if target frequency is documented in the WSP and there is evidence that meetings are held at this frequency; **score 2** if there is partial evidence that meetings are held at least six-monthly (or at the target frequency in WSP); **score 0** if there is no evidence of regular WSP team meetings. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		

2. System description Objective: thoroughly describe the water supply system to demonstrate complete system understanding and inform the risk assessment.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
2.1	**Are intended users/ uses of the water supply defined?**	The WSP should indicate how the water supply is to be used (e.g. drinking directly, drinking only after household treatment, not for drinking) and by whom. **Score 4** if both intended users and uses of the water supply are clearly defined in the WSP; **score 2** if either intended users or uses are missing; **score 0** if both are missing. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations, e.g. definitions included but unclear or incomplete.)		
2.2	**Are drinking-water quality standards or targets described?**	Does the WSP include the nationally relevant water quality standards or targets that the water supply must meet? A general reference to WHO guidelines is not sufficient. **Score 4** if standards/targets are fully defined in the WSP (or a relevant national document is thoroughly/accurately referenced); **score 2** if this requirement is partially addressed in the WSP; **score 0** if there is no reference to standards in the WSP. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations, e.g. standards included but out of date.)		
2.3	**Are clear, accurate and up-to-date maps and/or schematics of the complete water system included?**	Follow the flow of water from catchment to consumer on the schematics/maps to confirm clarity and consistency. Field verify the information provided and note any errors or inconsistencies. Also, discuss the schematic details with staff and ask them if there have been any changes. **Score 4** if maps/schematics are detailed, clear, complete, accurate and fully up to date; **score 2** if included but not fully clear, complete, accurate or up to date; **score 0** if not included. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
2.4	**Are all major steps in the water supply chain described?**	Accurate information on the catchment, treatment and storage facilities, distribution system and household-level practices should be provided. **Score 4** if all steps are thoroughly and accurately described (including household practices where household storage and/or treatment are required, e.g. because of tap stand use or intermittent supply to homes); **score 2** if one major step is missing; **score 0** if two or more major steps are missing. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations, e.g. steps are included but inadequately or inaccurately described.)		

3. Hazard identification and risk assessment Objective: identify hazards/hazardous events and assess related risk to water safety to determine if improvements are needed.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
3.1	**Has the risk assessment approach been clearly described?**	The WSP should clearly describe the method and basis for the risk assessment, including key terminology and definitions (e.g. how likelihood and severity are defined). **Score 4** if the risk assessment methodology is clearly and thoroughly defined in the WSP; **score 2** if partially defined (e.g. if key definitions are missing or incomplete); **score 0** if not defined. (**Scores 1 and 3** can be assigned at assessor's discretion for in between situations.)		
3.2	**Have all significant hazards been identified at all major steps?**	Based on discussions with the WSP team and field visits, determine if all important hazards/hazardous events have been documented. **Score 4** if all major hazards have been identified and documented for each step in the water supply chain; **subtract one point** for each significant hazard that in the assessor's estimation should have been considered/documented and was not (down to a minimum score of 0).		
3.3	**Have existing control measures been identified and validated?**	Ensure that the risk assessment considers controls that are already in place and whether or not those existing controls are capable of mitigating the risk. ('Validation' is the process of confirming the effectiveness of existing controls and is an important step in determining if additional controls are needed.) **Score 4** if existing controls are documented and validated for all hazardous events; **score 2** if existing controls have been documented but not validated; **score 0** if existing controls have not been documented. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
3.4	**Have risks been logically and systematically assessed for all hazards identified?**	Confirm that the risk assessment indicates a clear understanding of the risk assessment methodology and that the risk scoring is clear, consistently applied and logical. **Score 4** if the complete risk assessment is clear, consistent and logical; **score 0** if the risk assessment is significantly unclear, inconsistent or illogical and/or suggests that the WSP team does not have a clear understanding of the risk assessment process. (**Scores 1, 2 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
3.5	**Is it clear which hazards require additional control or improvement?**	Confirm that the risk assessment clearly indicates which hazards require additional control (or improvements). Any additional controls needed should be clearly separated from the existing controls documented. **Score 4** if there are no challenges in determining which hazards require additional control; **score 2** if it is somewhat unclear which hazards need more control (e.g. existing and proposed controls are mixed together); **score 0** if it cannot be determined from the risk assessment which hazards require additional control. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		

4. Improvement plan Objective: plan improvements based on system needs and priorities identified through the risk assessment process.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
4.1	**Has an improvement plan been developed that is clearly linked to the risk assessment process?**	There should be a clear and direct link between the risk assessment and the improvement plan. All improvements identified in the plan should follow directly from the risk assessment process. **Score 4** only if the following two conditions are met: a) an improvement has been proposed for each significant risk requiring additional control, and b) each improvement in the plan is clearly and directly linked to the risk assessment; **score 2** if the link between the risk assessment process and the improvement plan exists but is not fully clear and direct; **score 0** if there is no clear link between the risk assessment and the improvement plan, or if there is no improvement plan. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
4.2	**Does the improvement plan describe the action, responsible party, cost, funding source and due date?**	The improvement plan should be specific to facilitate action. **Score one point for each of the following categories** of information included in the improvement plan (provided that meaningful information has been provided for each category): • action to be taken; • responsible party; • cost and/or funding source; and • target due/completion date. (If no improvement plan, score 0.)		
4.3	**Is the improvement plan being carried out as documented and kept up to date?**	Look for evidence that improvements are being made as per the defined schedule. The improvement plan is of little use if it is not being implemented. Talk through the full improvement plan with the WSP team to gauge the degree of implementation. Also look for evidence that the plan is revisited and revised by the WSP team, e.g. that completed works are marked as complete or that new schedules have been defined for lapsed deadlines. **Score 4** only where all works are being implemented as described in the schedule and where completed work are marked as complete or removed from the improvement schedule; **score 2** where works are generally being implemented as described but where there are a couple of lapsed deadlines or where completed works have not been marked; **score 0** where the improvement plan is generally out of date and not being followed, or there is no improvement plan. **Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		

5. Operational monitoring Objective: describe monitoring to be carried out by the supplier (visual inspections and water quality testing) to ensure that key water supply system components and control measures continue to work effectively.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
5.1	**Has an operational monitoring plan been documented, addressing routine water quality monitoring and visual inspections by the supplier?**	This addresses operational monitoring by the supplier to confirm control measure effectiveness, and it is distinct from compliance monitoring by health officials to confirm that health-based standards or targets are being met (which is covered in the next section – 6. Verification). Ideally, the operational monitoring plan should cover visual inspections, e.g. checking fences, storage tanks, spring boxes, etc., as well water quality testing by the supplier. Where possible, the supplier should monitor water quality at appropriate locations to inform operational decisions, e.g. monitoring raw, settled or filtered water. This is especially critical where treatment chemicals are being used, such as alum or chlorine. If an operational monitoring plan has not been documented to cover water quality testing and/or visual inspections by the supplier, **score 0**. Where a documented plan exists, **score one point for each of the following elements**: • parameters (e.g. turbidity, pH, chlorine) and/or control measures/ components to be monitored (e.g. fences) • monitoring locations and frequency • responsible party • target conditions and/or critical limits and corrective actions if critical limits are breached.		
5.2	**Is the supplier carrying out operational monitoring as per the documented plan?**	Review monitoring records, e.g. water quality logbooks and site inspection checklists for the audit period (or for a period of at least one year) to confirm that operational monitoring is being conducted by the supplier as per the plan. **Score 4** only where complete records clearly indicate full compliance with the monitoring plan; score 2 where available records indicate general compliance with the schedule but where there are gaps in records; **score 0** where no records exist to confirm compliance with the monitoring plan or where there is no plan for operational monitoring by the supplier. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		

6. Verification Objective: confirm that drinking-water quality standards are being met, consumers are satisfied and the WSP is complete and effective.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
6.1	**Has a compliance monitoring plan been documented?**	The compliance monitoring plan is generally developed as a collaboration between health officials and the water supplier. Compliance monitoring is distinct from operational monitoring by the supplier (covered in the previous section – 5. Operational monitoring). It covers the water quality monitoring required to determine compliance with health-based water quality standards or targets. If a compliance monitoring plan has not been documented, **score 0**. Where a documented plan exists, **score one point for each of the following elements**: • parameters monitored (e.g. *E. coli*) and relevant standard or target for each parameter • monitoring locations • monitoring frequency • responsible party.		
6.2	**Is compliance monitoring being carried out as planned?**	Review water quality records for the audit period (or for a period of at least one year) to confirm that compliance monitoring is being conducted as planned. No monitoring (or no records) may indicate insufficient communication between water supplier staff and health sector members of the WSP team. **Score 4** only where complete records clearly indicate full compliance with the monitoring plan; score 2 where available records indicate general compliance with the schedule but where there are gaps in records; **score 0** where no records exist to confirm compliance with the monitoring plan or where there is no plan for compliance monitoring. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
6.3	**Are water quality standards or targets being met?**	Do compliance monitoring records indicate that water quality targets are being achieved? If not, the WSP is not achieving one of its primary objectives. The assessor should review available water quality records for the audit period (at least one year) and calculate compliance rates for key water quality indicators, e.g. faecal coliforms. **Score 4** where records indicate >95% compliance with standards; **score 3** for 85–95% compliance; **score 2** for 75–85%; **score 1** for 65–75%; **score 0** for ≤65%. (If no water quality records are available, **score 0**.) Where there is documented evidence of corrective action by the supplier during non-complying events, the assessor should **add one point** to the breakdown above (with a maximum score of 4). For instance, 70% compliance with regular, documented corrective action by the supplier during non-complying events would score 1 + 1 = 2.		

6. Verification (cont.) Objective: confirm that drinking-water quality standards are being met, consumers are satisfied and the WSP is complete and effective.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
6.4	**Does the supplier have a documented and implemented system for regularly monitoring and recording consumer satisfaction?**	The WSP should define a system for regularly monitoring consumer satisfaction, e.g. customer surveys or complaints logs, and the supplier should be able to furnish evidence that the system is implemented in practice. **Score 4** if the supplier has clearly defined and documented a system of monitoring consumer satisfaction and can furnish thorough evidence that the system is implemented; **score 2** where the supplier has developed and regularly implements a system of consumer satisfaction monitoring but where there are some gaps in documentation and record; **score 0** where no documentation or records of consumer satisfaction monitoring exist, or no system has been defined. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
6.5	**Has a plan for internal WSP auditing been defined and is it being implemented?**	The WSP should define the frequency of internal audits and the WSP team should be able to furnish evidence that internal audits are being conducted at the frequency indicated in the WSP. (The auditor should make this guidance note available to WSP teams to use for internal auditing.) **Score 4** only if target internal audit frequency is documented in the WSP and there is evidence that internal auditing is carried out at this frequency; **score 2** if there is partial evidence that an internal audit has been conducted during the audit period; **score 0** if there is no evidence of internal auditing. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		

7. Management procedures Objective: define procedures to be followed during routine operations and emergency situations.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
7.1	**Have clear SOPs been defined for major operational activities?**	Based on the experience and site knowledge acquired during the assessment, the assessor should be able to make a general list of key operational activities for which SOPs should be developed (e.g. filter backwashing, coagulant dosing, chorine dosing, storage tank cleaning, pipeline repair and replacement, equipment calibration, etc.). The assessor should make this list with WSP team members and review evidence that these SOPs have been developed. **Score 4** if the supplier has developed clear and detailed SOPs for the majority of the key operational activities listed by the assessor; **score 2** where the supplier has developed SOPs for many of the activities on the list and/or where the level of detail is not sufficient to guide field staff; **score 0** where few or no detailed SOPs exist. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
7.2	**Are SOPs up to date and accessible to field staff?**	The assessor should review a sample of the supplier's SOPs in detail with the WSP team to gauge whether or not they are generally accurate and up to date. In addition, the assessor should determine whether or not the SOPs are easily accessible to field staff for their use and reference. (SOPs that exist only at the head office are of little use to field staff.) **Score 4** if all sample SOPs reviewed are up to date and easily accessible to relevant field staff; **score 2** if there are minor issues with SOP updating/accuracy or accessibility; **score 0** if SOPs are significantly out of date, inaccurate or inaccessible or if documented SOPs do not exist. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
7.3	**Does the WSP include a current emergency response plan?**	The WSP should include a documented emergency response plan describing water quality emergencies that would trigger implementation of the plan, as well as communication protocols and up-to-date contact information. If an emergency response plan has not been documented, **score 0**. Where a documented plan exists, **score one point for each of the following elements**: • a list of water quality incidents or emergencies that would trigger plan activation; • current names, positions and contact details of persons within the water supplier to be notified (no point given for outdated contact information); • current names, positions and contact details of health officials to be notified (no point given for outdated contact information); and • plan for disseminating emergency messages to consumers.		

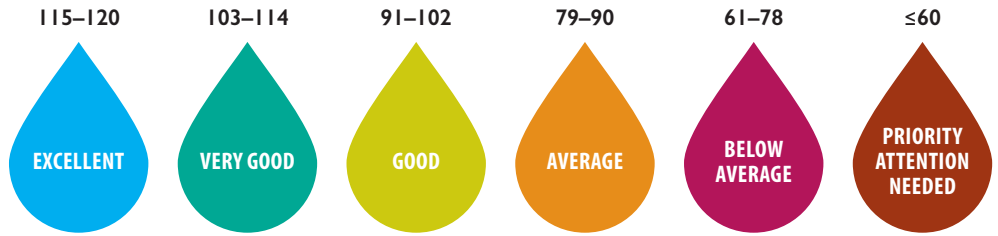
8. Supporting programmes Objective: identify programmes that indirectly support water safety.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
8.1	**Have appropriate supporting programmes been clearly defined?**	Based on the experience and site knowledge acquired during the assessment, the assessor should be able to make a general list of supporting programmes that should be included in the WSP, generally including operator training and consumer education as a minimum. **Score 4** if the supplier has clearly defined all relevant supporting programmes, including implementation details; **score 2** where the supplier has vaguely defined all relevant supporting programmes or has clearly defined only some of the key supporting programmes; **score 0** where few or no supporting programmes are defined. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
8.2	**Are supporting programmes being implemented as planned?**	The supplier should be able to furnish evidence that supporting programmes are being implemented as described in the WSP. Review relevant records to confirm. **Score 4** where records indicate that supporting programmes are being carried out as planned; **score 2** where available records indicate the supporting programmes are being carried out to some extent but where there are gaps in records or some departures from implementation plan in WSP; **score 0** where no records exist to confirm implementation of supporting programmes. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		

9. Review and revision Objective: ensure that the WSP remains up to date and effective through regular review and revision.				
Question		**Tips for assessor and scoring guidance**	**Score (0–4)**	**Comment/justification**
9.1	**Is a schedule for regular review and revision of the WSP defined?**	Regular review and revision of the WSP by the WSP team is essential to ensuring that the WSP remains relevant and guides day-to-day operations. WSP review following an emergency or incident is also important. **Score 4** if the WSP includes a clearly defined schedule of regular WSP review and revision; **score 0** where a regular review schedule is not defined in the WSP. (**Scores 1, 2 and 3** can be assigned at assessor's discretion for 'in between' situations.)		
9.2	**Is the WSP being reviewed and revised as planned?**	The WSP team should be able to furnish evidence that the WSP is being reviewed and revised as per the review schedule defined in the WSP, e.g. minutes from review meetings and or old/updated WSP versions. **Score 4** only if the target frequency is documented in the WSP and there is evidence that it is being reviewed at this frequency; **score 2** if there is partial evidence that WSP is being reviewed at least annually (or at the target frequency in the WSP); **score 0** if there is no evidence of regular WSP review. (**Scores 1 and 3** can be assigned at assessor's discretion for 'in between' situations.)		

Audit/assessment summary sheet				
Assessment area/WSP element	**Tips for assessor and scoring guidance**		**Score from previous assessment** (n/a for initial assessment)	**Current qualitative assessment** (excellent, good, below average, etc.)
	Points received	**Points possible**		
1. WSP team		16		
2. System description		16		
3. Hazard ID and risk assessment		20		
4. Improvement plan		12		
5. Operational monitoring		8		
6. Verification		20		
7. Management procedures		12		
8. Supporting programmes		8		
9. Review and revision		8		
Grand total score		**120**		

Grand total score (— / 120): _____

Circle grand total score below:



B.2.iv Water safety plan assessment form for small water supplies

The purpose of this form is to guide the assessment or audit of a WSP for a small water supply system, whether it is managed by a community, the local government or an institution (school or health care facility), for example. The form was developed for use by surveillance authorities or others providing ongoing monitoring of, or support for, WSP implementation.

There are a number of considerations the assessor should bear in mind:

Setting the right tone: It is important to approach the WSP assessment as a learning opportunity for the WSP team and for you, the assessor. Making clear the spirit of the assessment and helping the WSP team to feel comfortable should be one of your highest priorities. The WSP team should understand that you are there to provide guidance and support, not to 'police' their WSP activities. The ultimate goal of the assessment is to improve management of the water supply and thereby drinking-water safety.

Scheduling the assessment: You will need to visit the scheme to carry out the assessment, and you should plan a meeting with the WSP team in advance of your visit. When scheduling your visit, be sure to allow plenty of time for a walk through the scheme to see, for instance, the spring box, the well, the reservoir and a few tap stands. This field visit will be necessary to answer a number of the questions on this form. You may want to take your camera or smartphone along with you to take a few pictures as well.

Using the assessment table:

- **Column A – discussion questions**
  These are the questions for you to ask the WSP team directly to initiate a conversation about various WSP activities. There are no 'yes/no' questions in column A, but rather more open questions that are intended to encourage discussion.
- **Column B – what to look for**
  These questions are for your consideration as you explore WSP strengths and improvement opportunities. Wherever possible, you should look for evidence related to the various questions or activities to be sure you fully understand the situation. You may elect not to ask the WSP team directly all of the questions in column B, but rather use them as an internal guide for conducting the assessment. Where a WSP is at an early stage of development, for example, it may be best not to emphasize WSP shortcomings by reading all questions aloud, so as not to discourage the WSP team.
- **Column C – assessor observations**
  For each question, you should record the strengths and successes of the WSP, as well as key shortcomings and opportunities for improvement. It is important to provide balanced feedback that reflects the local context and the feasibility of improvements.
- **Column D – agreed follow-up actions for improvement**
  For each question, you and the WSP team should review the improvement opportunities noted, as well as the WSP team's response to the question, 'Do you face challenges with this task?' You should then lead a discussion on appropriate follow-up actions and record recommendations.

Reporting assessment findings: It is important that you provide the WSP team with a written summary of the assessment findings, indicating the assessment date, general impressions, key discoveries and agreements for follow up. It may be appropriate for you to enter the summary into a meeting minutes register so that the record is readily available for the WSP team.

General information	
Name of village and scheme and/or unique ID number	
District and province	
Number of people using the water supply	
Type of water supply	Check all boxes that apply: ❑ Point source. Please specify (e.g. spring, well):_____ ❑ Piped water supply. Please specify source (e.g. river, spring, well):_____ ❑ Motorized pumping ❑ With disinfection. Please specify (e.g. chlorination, UV light):_____ ❑ With other treatment. Please specify (e.g. sedimentation, filtration):_____ ❑ With central water storage reservoir(s) ❑ Tap stands: Number of public tap stands:_____ Number of private tap stands:_____
Type of water supply management	❑ Community managed (e.g. by water user group) ❑ Managed by local government/municipality ❑ No management entity ❑ Other. Please specify:
Year WSP implementation began	
Date of WSP assessment	
Assessor name and affiliation	
Primary contact for the water system (name, role or title and mobile number)	

WSP assessment summary (to be completed at the end of the assessment)	
Overall WSP level (tick the most appropriate box) ❑ L1: WSP well understood, complete and fully implemented ❑ L2: WSP on track with minor improvements needed ❑ L3: WSP in need of significant improvement and further support	**Justification for overall WSP level** (summarize key points and impressions)
WSP level assigned during the previous assessment (if applicable) ❑ Not applicable (this is the first assessment) ❑ System previously assessed. Please specify L1, L2 or L3	

A Discussion questions (to ask WSP team members)	B What to look for? (criteria to be considered by the assessor when reviewing the WSP and its implementation)	C Assessor notes		D Agreed follow-up actions for improvement (what should be done, by when and by whom)
		Strengths	Improvement opportunities	
Task 1: Engage the community and assemble the WSP team				
Who is on your WSP team?	• Is team membership documented? • Is the team list current? • Are all individuals/stakeholders with responsibility for the water supply represented on the WSP team? • Are relevant supporting organizations involved (e.g. health and/or water offices)?			
When does the WSP team meet?	• Does the team meet regularly? How often? • Are team meetings and outcomes documented? • Is there evidence that the WSP is a 'living' process and the WSP team continuously addresses water safety issues? • Was the team involved in every step in developing the WSP?			
Do you face challenges with this task? If so, what kind of assistance or support is needed?				
Task 2: Describe the water supply				
How are different water sources in the community being used?	• Are all water sources used by the community documented in the WSP and registered with the local authorities? • Is it clear from the WSP which sources are used for drinking and food preparation versus other purposes? • Is it clear from the WSP which sources provide water all year round and which provide water only seasonally?			
Can you show me a map of your water system?	• Is the map clear and does it reflect current system conditions? • Are all major water supply steps included in the map? • Is the map up to date?			

A Discussion questions (to ask WSP team members)	B What to look for? (criteria to be considered by the assessor when reviewing the WSP and its implementation)	C Assessor notes		D Agreed follow-up actions for improvement (what should be done, by when and by whom)
		Strengths	Improvement opportunities	
What information do you have about your water supply system?	• Has the WSP team conducted a site visit from source to tap? When? • Has the WSP team described all steps of the water supply system? • Which activities in the catchment area did the WSP team see that may adversely impact source water quality? Are they noted in the WSP? • Are household-level water treatment and storage practices understood and documented (where applicable)? • Has the WSP team collected information and materials related to the water supply (e.g. technical handbooks, manuals, documented procedures, water quality information)?			
Do you face challenges with this task? If so, what kind of assistance or support is needed?				
Task 3: Identify and assess hazards, hazardous events, risks and existing control measures				
How have you identified events that threaten your water supply?	• Does the WSP team understand that the purpose of this step is to identify what could go wrong and adversely impact drinking-water safety? • Are hazardous events documented for all parts of the water supply system? • Did the team consider what has gone wrong in the past and what could possibly go wrong in the future? (Ask the team to give an example of a prior hazardous event, such as a flood or damaged pipeline, and ask what could have been done to prevent it or to minimize the impact. Is this reflected in the WSP?) • Have the most relevant hazardous events been considered, including those resulting from poor sanitation practices (open defecation, inappropriate faecal sludge disposal/management)?			

A Discussion questions (to ask WSP team members)	B What to look for? (criteria to be considered by the assessor when reviewing the WSP and its implementation)	C Assessor notes		D Agreed follow-up actions for improvement (what should be done, by when and by whom)
		Strengths	Improvement opportunities	
How have you decided which of these events are the most important?	• Have the hazardous events been ranked/ prioritized through a risk assessment? • Were existing control measures identified and considered in the risk assessment? • Is the risk assessment complete, appropriate, logical and sensible (or are there any misconceptions possibly leading to flawed prioritization)? • Has the risk assessment considered the type of hazards associated with the identified hazardous events (i.e. microbial, chemical or physical)? • Is it clear which hazardous events are most important and require more attention by the WSP team?			
Do you face challenges with this task? If so, what kind of assistance or support is needed?				
Task 4: Develop and implement an incremental improvement plan				
What system improvements are needed?	• Have improvements been identified for all significant risks, including those requiring support and/or funding from outside the community? • Has an improvement plan been documented? • Does the plan clearly describe what should be done, who should do it, how much it will cost and when it should be done? • Does the plan support step-wise improvements over time that reflect available resources? • Does the plan also consider non-infrastructure improvements (e.g. improved monitoring, maintenance or caretaker training)? • Are improvements being carried out as planned?			
Do you face challenges with this task? If so, what kind of assistance or support is needed?				

A Discussion questions (to ask WSP team members)	B What to look for? (criteria to be considered by the assessor when reviewing the WSP and its implementation)	C Assessor notes		D Agreed follow-up actions for improvement (what should be done, by when and by whom)
		Strengths	Improvement opportunities	
Task 5: Monitor control measures and verify the effectiveness of the WSP				
How and when does the caretaker check all the parts of your water system?	• Does a caretaker regularly inspect the water system infrastructure (e.g. fences, well covers) and/or activities close to the water source that may adversely impact drinking-water quality? • Does a caretaker regularly monitor water quality (e.g. turbidity, chlorine residual)? (Here we are exploring monitoring by the caretaker. Water quality monitoring by support agencies is addressed in the next question.) • Is there a monitoring and/or inspection plan documented and is it being carried out as planned? • Does the plan address what will be done if something is wrong and needs correction? (Pick an example of something that is monitored and ask, 'If the target condition or limit is not met, what would you do?') • Are all important control measures included in the monitoring and inspection plan?			
How often is your water quality being tested by others?	• Is the water quality regularly tested by the health office (or another external support agency)? • Are the results of this external testing made available to the WSP team? • Do the results indicate compliance with water quality standards? • Is the schedule for external water quality testing documented and is it being carried out as planned? • Are appropriate parameters being tested given the identified site risks?			
Do you face challenges with this task? If so, what kind of assistance or support is needed?				

A Discussion questions (to ask WSP team members)	B What to look for? (criteria to be considered by the assessor when reviewing the WSP and its implementation)	C Assessor notes		D Agreed follow-up actions for improvement (what should be done, by when and by whom)
		Strengths	Improvement opportunities	
Task 6: Document, review and improve all aspects of WSP implementation				
What instructions are available for the caretaker to follow?	• Are there clear written or pictorial instructions to guide important operations or maintenance tasks (e.g. reservoir cleaning, pipe repair, chlorination)? • Are instructions easily available to the caretaker? • Does the caretaker understand these instructions and apply them in practice?			
What will you do in case of a water quality incident or emergency?	• Has the WSP team considered what to do in the case of a water quality incident or emergency? • Has a response plan been documented (e.g. including health office contact information or a plan for issuing a boil water advisory to community members)?			
When was your WSP last updated?	• Is the WSP regularly reviewed and revised? • Is the WSP up to date?			
Do you face challenges with this task? If so, what kind of assistance or support is needed?				
Other relevant information				
Is there any other relevant information you would like to communicate (e.g. general challenges and developments, supporting activities such as awareness raising campaigns, etc.)?				

B.3 Audit plan

Below is an example of an audit plan developed in preparation for an audit of a water supply system in Portugal. This audit plan template is used for internal and external formal audits.

Audit plan template

Number:_____ **Date:**_____ **Page** ____ of ____

Audit objectives and scope

Objectives
- To verify the effective implementation of the water safety plan and compliance with established criteria
- To identify improvement opportunities.

Scope
- Structure, operation and management of the Águas do Algarve drinking-water municipal system, including all the activities performed to supply drinking-water to the clients.

Criteria
- Water safety plan
- National drinking-water legislation
- Internal policy documents, manuals, operating processes and procedures.

Applicable documents

Check criteria

Audit team

Names of auditors

Date	Time	Site	Functional area/contact persons	Items/processes/requirements
30/3	9:30	WTP A	Top management, WSP team	Opening meeting
	11:00		WTP manager, operations, laboratory, maintenance, WSP team	**Water treatment:** control measures and their monitoring; treatment of non-conformities; traceability
	13:00	Lunch		
	14:00	WTP B and distribution system A	Top management, WSP team	Top management commitment to the WSP; communication
	14:30		WSP team and operations manager	Production of safe water: planning activities; evaluation of WSP and operations and maintenance (O&M) linkages; follow up of previous audits.
	15:00		WTP manager, operations, laboratory, maintenance, WSP team	**Water treatment:** control measures and their monitoring; treatment of non-conformities; traceability
	15:30		Water distribution manager, operations, laboratory, maintenance, WSP team	**Water distribution:** control measures and their monitoring; treatment of non-conformities; traceability
	17:00	Headquarters	Human resources	Human resources management; training and knowledge assessment of the WSP team and other members of the organization
	17:30	Headquarters	Emergency response manager	Emergency plan; WSP revision after an incident
	18:00	Headquarters	Audit team	Summing up of the first day

Date	Time	Site	Functional area/contact persons	Items/processes/requirements
31/3	9:00	WTP C	WTP manager, operations, laboratory, maintenance, WSP team	**Water treatment:** control measures and their monitoring; treatment of non-conformities; traceability
	11:00	WTP D and distribution system B	WTP manager, operations, laboratory, maintenance, WSP team	**Water treatment:** control measures and their monitoring; treatment of non-conformities; traceability
	12:00		Water distribution manager, operations, laboratory, maintenance, WSP team	**Water distribution:** control measures and their monitoring; treatment of non-conformities; traceability
	13:00	Lunch		
	14:00	WTP D	Maintenance manager and WSP team	**Maintenance:** planning; critical equipment performance
	15:00		WSP team	**WSP revision/update:** system assessment (including risk evaluation); improvement plans; WSP team meetings
	16:30		Audit team	Preparation of the audit report
	17:30		WSP team, organization representatives	Presentation of audit conclusions
	18:00		Audit team	Audit summing up

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Further reading

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World Health Organization

the international water association