We're updating this document to reflect the Local Government (Water Services) (Repeals and Amendments) Act, which became law on 26 August 2025.

Drinking Water Safety Planning Guidance

For **Medium** Supplies (supplying 101 – 500 people)

Covers:

- Networked supplies
- Self-supplied buildings

Te Whakatauākī a Taumata Arowai

Ko te wai ahau
Ko ahau te wai
He whakaaturanga tātou nō te wai
Ko te ora te wai ko te ora o te tangata
He taonga te wai me tiaki
Ko wai tātou
Ko wai tātou

I am water, water is me
We are reflections of our water
The health of water is the health of the people
Water is a treasure that must be protected
We are water
Water is us

Contents

Introduction

Kia ora and welcome!

All New Zealanders should have access to safe, reliable drinking water. To help ensure this vision is achieved, owners of drinking water supplies must have a proper appreciation of drinking water-related risks and options to manage, control or eliminate them. This is the essence of drinking water safety planning.

This guidance is aimed at helping owners of supplies with populations of **101 - 500 people**.

It is not for public water suppliers like Councils whose core business is to supply water.

When is a Drinking Water Safety Plan required?

A Drinking Water Safety Plan (DWSP) must be developed for **each drinking water supply** you operate.

What is Te Mana o te Wai and why does it matter?

Te Mana o te Wai refers to the wellbeing of water and the role all New Zealanders have in maintaining the abundance, safety, and care of the water. This is important to all of us because healthy water is essential to any thriving community.

Te Mana o te Wai guides us to practice good stewardship and consider other users, including those in the future, and the needs of our ecosystems as we manage access, storage, and use of our water supplies.

Owners of drinking water supplies must give effect to Te Mana o te Wai to the extent that it relates to their legal duties, including in their DWSP preparation. Taumata Arowai understands that some drinking water suppliers will be unfamiliar with applying Te Mana o te Wai to the management of their supplies. The most important thing to demonstrate in this section of a drinking water safety plan is that you have begun considering what Te Mana o te Wai means to you and that you're committed to enhancing your understanding and application of the concept over time.

Taumata Arowai has developed some guidance on Te Mana o te Wai here. Other helpful resources include the Kāhui Wai Māori report to the Hon Minister David Parker, available here, and the Ministry for the Environment's Youtube video 'Te Mana o te Wai: Introduction and overview', which is available here.

Your legal obligations

There are a range of duties under the Water Services Act 2021 (the Act) that owners of drinking water supplies must comply with. We recommend you visit the Taumata Arowai website for further guidance.

In this context, drinking water supply owners must develop and implement a DWSP for each water supply to comply with s30 and s31 of the Act. You must also comply with s43 in relation to your source water.

The template combines the requirements of s31 and s43.

Please note: Taumata Arowai will not sign off your DWSP but may review it to check it complies with the requirements of the Act..

Your Drinking Water Safety Plan is a living document

The DWSP is a living document that you should review from time to time for it to remain accurate and current.

Your DWSP should reflect:

- The type of water supply system you manage, especially the water source and its end users
- What could go wrong with the water supply system and how you would manage or eliminate these issues, including how you plan to respond to emergencies
- How you monitor the drinking water supply
- Updates as incidents occur or changes happen, including how you will let people know the plan and any updates to the situation.

Before you start

Instructions

1. Ensure you have a copy of the appropriate sections of the Drinking Water Quality Assurance Rules (Rules) on hand so you can cross-check where necessary. It is important to know what Rules apply to your supply, and how compliance with the Rules must be demonstrated.
2. Ensure you have a copy of the National Policy Statement for Freshwater Management 2020 | Ministry for the Environment on hand for guidance.
3. Answer the questions in the template using the guidance in this handbook. Key terms are explained in Appendix 1.
4. If there are other people involved with the supply, it will be helpful to include them in this process.
5. The person in effective control of the water supply signs-off the DWSP to confirm that the water supply details included in the plan are correct and commit to undertaking any identified improvements to the supply.
6. Provide a copy of your DWSP to Taumata Arowai (see details on page 15).
7. Keep your DWSP in a central place that is easily accessible to you (and any others involved in managing the drinking water supply).

Start completing your plan

The Title Page

Fill in basic details of your water supply on the title page:

- **Name of Owner:** the organisation or name(s) of individual(s) who has/have responsibility for the water supply
- **Name of Operator**: if different from the Owner
- **Supply name:** brief description of the water supply e.g. Cooper's Farm Otago, Medium High School, Small Town, Hapori Kāinga
- **Supply location:** please be precise in your description. GPS coordinates are useful
- **Unique supply identifier:** advised when you first registered the water supply
- **Emergency contact name:** who water supply users or Taumata Arowai should contact if an issue is identified with the water supply
- **Emergency mobile phone number**
- **Supply type** as listed in Hinekōrako
- **Population:** state the number of people served by the water supply. If the number of users is variable, state the likely minimum and maximum number of users
- **Drinking Water Quality Assurance Rules:** identify which of the Drinking Water Quality Assurance Rules categories apply to the supply

Question 1: How are you giving effect to Te Mana o te Wai?

As a drinking water supplier, you can embed Te Mana o te Wai by giving priority to the health and wellbeing of water, the wider environment and the community in the development of your water safety plans and source water risk management plans, and in policies, processes and procedures. Actions or activities that support Te Mana o te Wai will be different in different places. You need to think about what is appropriate for your supply in your region.

Taumata Arowai has developed some guidance on te Mana o te Wai here. Other helpful resources include the Kāhui Wai Māori report to the Hon Minister David Parker, available here, and the Ministry for the Environment's Youtube video 'Te Mana o te Wai: Introduction and overview', which is available here.

Question 2: Who is responsible for your water supply?

Provide details of the key roles and responsibilities of people involved in the operation, and management of your drinking water supply.

Q 2.1 Who owns this plan and approves budget for the water supply?

The owner of the supply is responsible for signing off the DWSP and submitting it. The owner has ultimate responsibility to prepare, and implement the DWSP, and to ensure the supply is operated in accordance with the DWSP. They may be supported by a team or multiple teams (e.g. planning, operations, and review) who will be responsible for gathering information to complete this DWSP, must know about how the water system operates, and have a schedule to review the DWSP and system.

The owner of the DWSP and budget approver (who may be the same or separate people) are responsible for making sure the improvements identified in the DWSP are completed.

Q 2.2 Who helped you prepare this plan?

To help ensure the DWSP is robust you should ideally develop it using a team of people with a range of relevant skills and knowledge; for instance, some of the team should know about water consent requirements, activities around the source and catchment, how the pump and treatment work, and the piping and storage systems, as well as operational requirements.

1. List the team involved in preparing this DWSP. Clearly articulate the role and responsibilities of each member of the team.
2. Describe the skills, knowledge, experience, and qualifications of team members relevant to drinking water and the supply.
3. Provide contact numbers for team members.

Q 2.3 Does your team have the skills, training and experience needed?

You must ensure that your staff, volunteers, or other personnel have the appropriate skills, training/qualifications, and experience to operate the drinking water supply and manage any issues which may arise.

Consider if you have adequate staff with knowledge of the supply to step in if key people operating the supply move on or are unavailable e.g. due to illness.

As a minimum you should consider:

- The skills, training and experience required to operate your supply. Please provide details of relevant qualifications, skills, and experience for all operators.
- Will additional training specific to your supply be required?
- Will suitably qualified staff be available to deal with any issues or incidents which may arise?
- Do you have/need a suitably qualified person such as a water engineer available to assist you?
- Whether you have capacity or a back-up plan if a key person is unavailable e.g. due to illness?

Use the table in the template to record the current team capability, identification of training and resourcing gaps, and the resulting planned training and/or recruitment that you are committing to undertake.

▲ **Question 3:** What makes up your drinking water supply?

Your water supply is more than the pipe into a house, your water supply includes everything from the abstraction of the water at its source all the way to the point of supply to a consumer. That means it can include bore heads or river intakes, reservoirs or tanks, treatment equipment, as well as pipes and pumps.

Please identify the components of your water supply by source, treatment, distribution, and population serviced.

▲ **Question 4:** What does your supply look like?

Q 4.1 How do all the components fit together?

Provide an accurate flow diagram of your drinking water supply, showing its components and sequence of how water moves or is transported through them. An example flow diagram is provided in **Appendix 2**[1].

The drinking water supply system is defined as everything from the abstraction of the water at its source to the point of supply to consumers.

The schematic or flow diagram should:

- include all elements of the water supply, including sources, treatment plants, storage tanks and other infrastructure
- outline all steps and processes, whether or not they are under the control of the supplier
- identify where key monitoring points are located

Q 4.2 What does the supply look like?

Attach photographs of the site(s), including source (where appropriate), treatment plant, storage tanks and other equipment associated with your supply.

Provide clear descriptions for each.

[1] Please note: this diagram is an **example only** and is not representative of an actual supply.

Question 5: How does your water supply work?

Gather as much information as possible on your drinking water supply e.g. consider what is known about:

- The quality of the source water, including variability e.g. seasonal or following heavy rainfall.
- The vulnerabilities of the source water e.g. due to drought or algal blooms.
- The key parts of the drinking water supply, including source, treatment, storage, and distribution.
- Any known issues or challenges with any parts of the drinking water supply.
- Previous incidents or adverse events which had the potential to affect the quantity, safety, or compliance of drinking water supplied from the drinking water supply.
- The actions needed to ensure that you maintain a sufficient supply of safe and compliant drinking water for the duration of an adverse event.

Q 5.1 Do you understand your source water?

To treat drinking water effectively, you must understand what contaminants are likely to be in the water and what treatment will be required to manage those contaminants.

Source water testing is essential for effective drinking water safety planning. This means you will have to arrange for the source water to be tested or, where applicable, obtain sample results from a third party.

The minimum analysis requirements for source water testing are provided in the Drinking Water Quality Assurance Rules. Please attach a copy of your source water test results to your DWSP.

When assessing the hazards and hazardous events which could impact the safety, compliance, or sufficiency of your supply you should, as a minimum, consider the following:

- The type of source water – e.g. surface (river, lake), ground (spring, aquifer), roof water, mixed.
- If you are using a ground water source, what is the depth of the bore (to the top of screen/s)?
- Are the bore heads in good condition? When were these last inspected?
- What activities are happening in the catchment that could contaminate the source water? e.g. livestock grazing, crop spraying, industrial activities, landfill sites, construction works, forestry?
- Is the source water quality stable or liable to change - e.g. due to heavy rainfall?
- If the source is surface water (dams, ponds, lakes, streams), have you assessed the risk from cyanobacteria?
- Are there other seasonal variations to source water quality or quantity?
- Do samples taken of source water indicate any potential concerns in relation to bacteria or chemicals?
- If you have more than one source, you must assess the risks from each source. Even if a source is rarely used you should understand the impact a change of source is likely to have on your treatment processes and plan for this, especially if infrastructure is not often used.
- Does your intake have any controls which will prevent or reduce a hazard (or hazards) to an acceptable level? Document these carefully.

Q 5.2 Can you provide sufficient drinking water?

To ensure a sufficient supply of safe and compliant water, you will need to know how much water is required and what things (hazardous events) could impact on the sufficiency of your supply. As a minimum, you should consider:

- What is the population served by your supply?
- Is this number fixed or subject to change, e.g. due to visitors, events or tangihanga (funerals)?
- Do you supply any large users such as schools or kura kaupapa, marae, retirement villages or food manufacturers?
- Do you require resource consent(s) or need to comply with local authority bylaws?
- Will your resource consent allow you take enough water to meet demand throughout the year?
- Do you have more than one source associated with the supply?
- Have you planned for external events that may impact on the supply, e.g. extreme weather events, contamination of the source water or rāhui?
- Are you able to treat and/or store the volume of drinking water to meet peak demand?
- How long will you be able to provide a sufficient supply of water if the source (or treatment plant) cannot be used?
- How will you manage your supply to ensure that water is not wasted, e.g. through leakage?
- Do you have a back-up plan, e.g. links to another local drinking water supplier or water carrier?
- Have you undertaken any long-term planning for your supply, e.g. increased demand due to population growth or potential impacts of climate change?
- Does your drinking water supply have any redundancy (e.g. two sources, duty-standby pumps, two or more UVs units in parallel) and how have you built in resilience (e.g. storing key spare parts, multiple storage tanks)?

Q5.3 Are the treatment processes effective?

The following guidance on treatment outcomes will help you to work out whether treatment processes are effective

- Filtration removes particles from water. Although heavy or large particles can be removed by settling, small and very small particles can interfere with other treatment processes. Very fine filters can even remove protozoa (e.g. *Giardia or Cryptosporidium*). Filtration is effective if the filter removes particles as intended. The turbidity (a measure of dirt/particles) of filtered water shows how well the filter is working.
- UV light inactivates protozoa and bacteria (e.g. *E. coli*). UV light is measured as a dose rate, this is based on the intensity of the light and the time any contaminant is exposed. A dose of 40 mJ/cm[2] is effective. The dose is measured by the UV intensity sensor.
- Chlorine kills bacteria. It also leaves a residual that protects water against re-contamination. When measuring chlorine we want to measure Free Available Chlorine (FAC). The FAC level after chlorine is added should be at least 0.5 mg/L. How well chlorine works depends on pH, and the pH of the water must be between 6.5 and 8.

[2] Under the level 2 rules (101-500) a single self-supplied building is exempt from the treatment requirements for chlorination.

Q 5.4 How do you store and distribute your water?

Storage and distribution systems include any pre-treatment storage as well as post-treatment movement and storage of drinking water through pipework, reservoirs, and other distribution infrastructure.

Drinking water storage and distribution must be designed and maintained in a manner which protects drinking water from contamination.

All storage and pipework should minimise water loss through leaks. As a minimum you should consider:

- What steps have been taken to ensure that drinking water in tanks is suitably protected from contamination?
- Do you have documented procedures for inspection, cleaning, and maintenance of storage tanks?
- What steps have been taken to prevent backflow within the treated water and distribution systems? This may include air gaps and/or backflow prevention devices.
- Do you use pumps to transfer treated water? What happens if the pumps cannot operate (e.g. power cut, mechanical failure), can water still reach the point of supply? How are the pumps maintained?
- Does your supply require residual disinfection (normally chlorination)? Residual disinfection is required for supplies with reticulation under section 31(1)(j) of the Act. Have samples confirmed that suitable FAC and pH levels are being maintained throughout the distribution system? How are pumps in the system controlled and maintained? Are there any documented procedures for this?
- How has the infrastructure been constructed, when was it constructed and what materials have been used? Is the infrastructure in place on a permanent or temporary basis?
- How will you ensure that the storage and distribution system are cleaned and disinfected before use (after maintenance or installation of new infrastructure)?
- What steps have you taken to protect the storage and distribution system from physical damage and deliberate tampering?
- What steps have you taken to assess and prevent leakage from the storage and distribution system?

Question 6: What can go wrong?

Most of the time, your drinking water supply will provide clean and ample drinking water. But sometimes the water supply will be compromised, and people can get sick from unsafe water. Sometimes there may not be enough water available (e.g. during a drought). The best way to make sure there is less chance of people becoming sick is to consider what can go wrong and adopt management practices that will prevent it going wrong or manage the impact if it does.

The Taumata Arowai website has useful guidance prepared by the Ministry of Health that may help.

Q 6.1 What are the risks to your water supply system?

Step A

Identify those things or events that may contaminate or affect the safety or sufficiency of your drinking water, including the quality of the source water, pipes breaking, power cuts, extreme weather events, rāhui, a treatment process failing. Even if these events have not been recorded as causing issues in the past, it is important to identify them as a possibility here.

Some of the major contamination events that have caused illness (and sometimes death) were from events that had not been recorded as happening before. Some are events that may have occurred in the past, and some occur regularly (e.g. a drought can occur during summer most years). Illness is often assumed to be food-related when it may in fact have been caused by drinking water.

Step B

Rank the risks according to their health impact. For example, issues that affect the taste of the water, but are unlikely to cause illness, are a lower risk. However, having bacteria such as *Campylobacter* in water from livestock, are a much higher risk.

This is the current risk i.e., based on:

- the current water supply system as described in Question 2 above, and
- how you manage your water supply.

Q 6.2 How are the risks controlled and monitored?

Step C

Consider whether you have ways to manage each risk, either to eliminate it, or to minimise the impact of the risk. These management measures are called controls. Examples of controls include fencing to keep livestock out, regular inspection and maintenance, or water treatment. Record what is currently being done - planned improvements are in Step E.

Step D

Describe how you know a control is working. This may be by inspecting visually, monitoring the operation of the treatment process, or taking samples of the drinking water regularly to test the quality. It is important to record who is responsible for checking the controls, when they will do it and how they will keep records of their findings - this is done in Question 7. Record what is currently being done - planned improvements are in Step E.

Q 6.3 Can you improve your drinking water?

Step E

Think about what you can do to improve the drinking water system or your management of the system to further protect from the risks you have identified.

Start with documenting any shortcomings and then identify improvements that could be made. For example, if you do not have a regular inspection of the equipment, or the team does not have a member with training on the equipment, an improvement may be starting a weekly check of the equipment or to get the manufacturer to provide a team member with training.

Step F

Prioritise your improvements and give them a time frame you will be able to achieve.

Question 7: How do you manage your water supply?

It is important to have a plan to proactively manage your drinking water supply, and not just react when something goes wrong. You also must record when you do the activities, so you can show the system has been managed well.

Minimum requirements are contained in the Drinking Water Quality Assurance Rules (level 2).

Q 7.1 What inspection and maintenance do you complete and record?

Regular inspection and maintenance are essential to maintaining a well-functioning and safe water supply. Activities may include:

- Check upstream of an intake for contamination after rainfall events, or for algae blooms in summer.
- Check the intake or bore head area, including fenced livestock areas, monthly.
- Check and maintain pumps annually.
- Check tanks, making sure screens and bird and vermin protection (including any lid) is intact and secured (monthly), checking the sludge level inside (every 2 years), checking the structural integrity and roof condition (annually).
- Replace filters and UV lamps as per the manufacturer's advice.
- Follow manufacturer's instructions on routine maintenance of all equipment.

Keeping records of the inspections and maintenance is important to help you detect if equipment is deteriorating faster than expected, or to troubleshoot when something goes wrong with the supply.

Identify if there are any procedures that you need to develop, or equipment purchases required to make sure the inspection and maintenance is carried out effectively.

Q 7.2 How will you know your water supply system is operating as expected? (Monitoring and sampling.)

To check that your system, in particular the treatment plant, is operating as expected and to detect when things start to change, you will need to monitor many parts of it.

This is called operational monitoring. This monitoring can be undertaken by online monitors or manual sampling.

Team members need to know when and what they are monitoring, how monitoring must be done and what the results mean. There are three types of levels:

- Target levels - results confirm that the process is working as expected.
- Action levels - results indicate that a process is drifting and will require action such as more frequent monitoring, process adjustment or escalation to senior team members.
- Critical levels - results indicate that drinking water may be unsafe or non-compliant and a speedy and effective response will be needed to address any public health risks. You are required to notify Taumata Arowai if critical levels beyond Maximum Acceptable Values (MAVs) are reached.

You will have to carefully consider where monitoring thresholds for these levels are set. You will need to ensure team members with monitoring duties fully understand what is required.

When developing your monitoring plan, you must consider the following:

- Are all key points being monitored appropriately, with target, action, and critical levels?
- How frequently will monitoring need to be undertaken?
- Are there documented procedures for operators who undertake monitoring?
- How and when will monitoring equipment be calibrated?

Manual sampling throughout the water supply system can provide valuable information on water quality and provide a check that monitoring equipment is working. You should consider the following:

- What sampling is required in addition to the operational monitoring to understand your water quality or provide additional information?
- What laboratory will be used?
- How will you ensure that samples are taken, stored, and transported correctly? Provide details as an attachment to the DWSP.
- How regularly will samples be taken and what determinands (bacteria and chemicals) will be tested for?

All water samples **must** be analysed by a laboratory accredited by International Accreditation New Zealand (IANZ) for those tests and must be collected according to the requirements provided by the laboratory.

Q 7.3 How do you know your monitoring equipment is effective? (Calibration and checks.)

To know if your system is protecting public health (the health of all those who drink it), you will need to confirm the results of operational monitoring and observations with some retrospective monitoring. This will generally not prevent an incident occurring but may identify that a problem that was not detected by operational monitoring. You should consider the following:

- How do you know you can rely on your operational monitoring results?
- How and when will monitoring equipment be calibrated to make sure it is providing accurate results?
- What sampling do you do to check your monitoring instruments?

Q 7.4 What written procedures and manuals are in place to guide and record operations and maintenance?

Procedures describing how activities (operational and maintenance) are to be carried out support the ongoing operation of a safe drinking water supply. They help make sure team members consistently complete activities and provide instruction to new or temporary team members brought in to manage the system.

Think about:

- What documented procedures are available to support the team to operate the supply effectively?
- How are the procedures documented?
- Who does the checking, how frequently and how do they record the result?
- Where is this recorded, who has access to the information and who is responsible for signing off on the information?

Question 8: How will you respond when an incident occurs?

Q 8.1 What would be an emergency for your water system?

How have you planned for factors which could impact on your supply and require an immediate response?

These may include:

- power cuts/loss of electricity supply
- damage to or problems with reticulation infrastructure
- loss of key staff members
- natural disaster
- outbreak of illness in the community (indicator of potential waterborne contaminant)
- incident affecting a registered drinking water supply you intend to use

Q 8.2 How will you respond to an incident?

Drinking water suppliers must act immediately to ensure that public health is protected if their drinking water does not comply with the Drinking Water Standards, is likely to be unsafe, or when they become aware that a notifiable risk or hazard exists. You must have identified key personnel and their responsibilities and the procedures that will be followed if this occurs.

You are also required to take other steps including notifying Taumata Arowai, investigating the cause and implementing measures to ensure that the problem does not recur.

As a minimum you should consider:

- Do the appropriate people understand the notification requirements under the Act?
- Are they able to access Hinekōrako, the self-service portal on the Taumata Arowai website if a notification is required?
- What will you do if water is unsafe or unavailable?
- Do you have a suitable alternative supply on standby?
- How will you advise affected consumers if there is an issue?
- Have you prepared messaging in advance?
- What other key stakeholders need to be advised?

Q 8.3 Incident response procedures

Drinking water suppliers must act immediately to ensure that public health is protected if their drinking water does not comply with the Drinking Water Standards, is likely to be unsafe or when they become aware that a notifiable risk or hazard exists. In order to know how to act it is important to have procedures or flow charts for actions to be followed for some of the more common incidents like boil water notices for a positive *E. coli* result.

Notifying Taumata Arowai:

- If there is an imminent risk of serious illness or death arising from your drinking water supply, or you need to discuss an urgent matter, contact Taumata Arowai by calling **04 889 8350**. This number is available 24 hours a day, 7 days a week.
- Once you have a user account in Hinekōrako – the self-service portal for drinking water suppliers - you can use the notification function in Hinekōrako.
- The Act requires that you notify Taumata Arowai under certain circumstances, most commonly:
  - where any sample exceeds the relevant MAV
  - if the supply of water is interrupted for more than 8 hours
- You should also investigate the cause and implement measures to ensure that the problem does not recur. These changes should be captured in an update of your DWSP, to ensure it remains current.

Question 9: When will you review your plan?

This plan should be reviewed on a regular basis and as a result of any changes or incidents which may affect your understanding of the risk associated with your supply.

This could include:

- changes in key staff
- changes in processes or equipment
- changes to the source
- significant changes in the population supplied
- an incident or event
- sample results which indicate a change in the source water or non-compliance
- the minimum frequency of review – we suggest annually
- any triggers which will lead to a review of your DWSP

If the owner of a drinking water supply replaces or makes a material change to a drinking water system, they must lodge a copy of the amended or replacement DWSP with Taumata Arowai as soon as is reasonably practicable.

Next steps

Please return your completed DWSP to Taumata Arowai, by either:

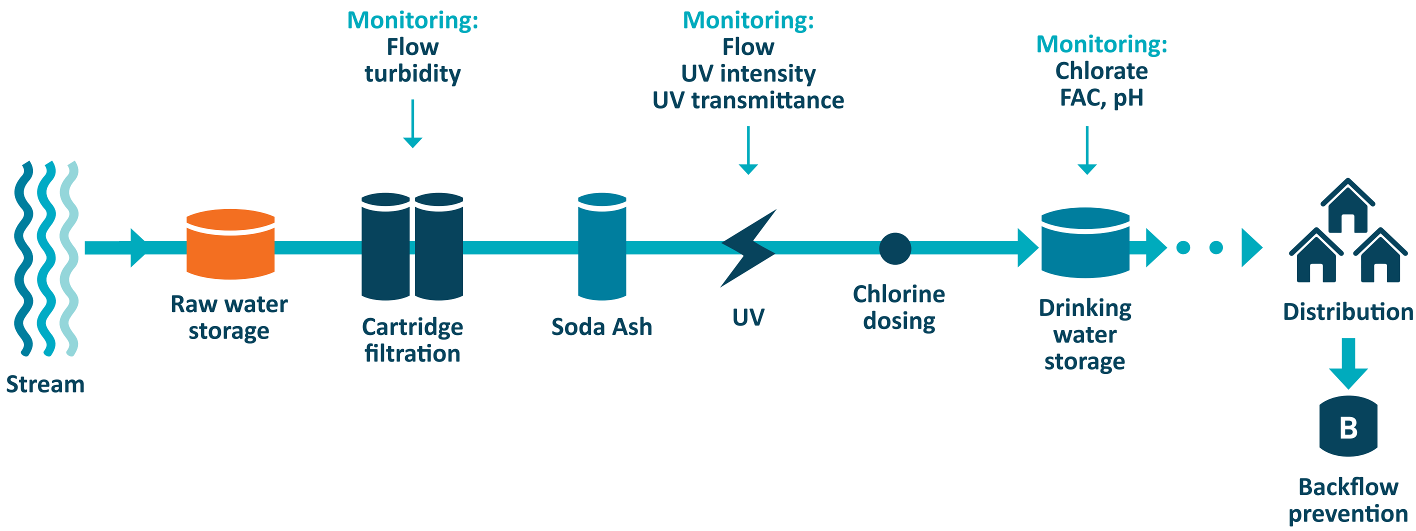
- Online: via Hinekōrako on the Taumata Arowai website
- Email us at info@taumataarowai.govt.nz
- Post: Level 2, 10 Brandon Street, PO Box 628, Wellington 6140, New Zealand

Appendix 1: Key terms explained

Term	Definition
Controls	• A measure or step which is designed to reduce the likelihood or severity of harm. • Also known as 'preventative measures', 'mitigation measures' and 'barriers to contamination'.
Corrective actions	• Remedial action taken to correct a problem (e.g. the breach of a critical limit) and measures taken to prevent recurrence.
Critical control limits	• A monitoring threshold which if breached indicate that drinking water is likely to be unsafe.
Drinking Water Quality Assurance Rules	• The Drinking Water Quality Assurance Rules 2022 are compliance rules made by Taumata Arowai under s 49 of the Water Services Act 2021 and can be found on the Taumata Arowai website.
Drinking Water Standards	• The Water Services (Drinking Water Standards for New Zealand) Regulations 2022. The Drinking Water Standards are regulations made under s 47 of the Water Services Act 2021 and can be found on the New Zealand Legislation website.
Hazard	• An object, substance (including biological, chemical, physical, or radiological agents) or a set of circumstances that has the potential to make a drinking water supply unsafe or insufficient to meet the drinking water needs of consumers.
Hazardous event	• An incident or situation that can lead to the presence of a hazard in the drinking water supply or prevent sufficient supply of drinking water. • The point at which control of the hazard is lost.
Hinekōrako	• A self-service portal for water suppliers and laboratories, and our Regulatory and Intelligence system. Hinekōrako personifies the lunar rainbow. This name was gifted to Taumata Arowai by Te Atiawa.
Rāhui	• Form of restriction place on resources or specific areas to prohibit use of that resource or area for a particular period of time.
Risk	• The likelihood that the hazards will cause harm combined with the severity of the consequences if the hazard does occur.
Rohe	• Boundary/tribal boundary, district, region, territory, area, border (of land).
Source water	• The water body from which water is abstracted for use in a drinking water supply (e.g. river, stream, lake or aquifer) and rainwater.
Takiwā	• District.
Tangihanga	• Funeral.
Te Mana o te Wai	• A universal concept for all Aotearoa New Zealanders. It refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and wellbeing of the wider community environment.

Appendix 2: Example flow diagram

Please note: This is just an example of how you could draw your own water source.



Appendix 3: Example of some potential hazards and sources of hazards to a water supply

	Components of the drinking water supply system	Hazard	Potential sources of hazard/hazardous event
SOURCE	Lake, river (surface water)	Bacteria Protozoa Viruses	• Animal or human waste entering the source water from farm run-off, wastewater treatment plant discharges, or septic tanks.
		Chemicals	• Chemicals used on farms within the catchment, discharges from industry within the catchment, run-off from roads, vehicles entering water (road accidents), chemicals from natural sources (e.g. deposition of volcanic ash).
		Cyanotoxins	• Benthic or planktonic cyanobacteria producing toxins (seasonal).
	Bore, spring (ground water)	Bacteria	• Animal or human waste entering the aquifer from farm run-off, wastewater treatment plant discharges, or septic tanks.
		Protozoa	• Animal or human waste entering the aquifer from farm run-off, wastewater treatment plant discharges, or septic tanks (typically only in very shallow aquifers, or through defective bore heads).
		Viruses	• Animal or human waste entering the source water from farm run-off, wastewater treatment plant discharges, or septic tanks.
		Chemicals	• Chemicals used on farms within the catchment, discharges from industry within the catchment, run-off from roads, vehicles entering water (road accidents), naturally occurring chemicals from soil and rock.
		Radiological determinands	• Chemical isotopes from soil and rock that are radioactive (alpha and beta emitters including radon) (typically naturally occurring).
	Roof	Bacteria Protozoa	• Animal or bird waste entering rainwater system.
		Viruses	• Typically, only an issue when people have direct access to the roof.
		Chemicals	• Chemical found in roofing materials, discharge from nearby chimneys.
TREATMENT	Treatment	Chemicals	• Failure of the water treatment equipment. • Impurities in treatment chemicals or unloading of the wrong chemical.
DISTRIBUTION	Storage (tanks/ reservoirs)	Bacteria	• Animals or birds able to enter the reservoir, or from human access to reservoirs (e.g. swimmers, divers).
		Protozoa	• Animals or birds able to enter the reservoir.
		Viruses	• Human access to reservoirs (e.g. swimmers, divers).
		Chemicals	• Materials used in the construction of reservoirs, deliberate tampering.
	Reticulation systems	Bacteria	• Biofilms building up inside the water pipes and entering the supply system when repairs are undertaken or via backflow.
		Viruses	• Viruses entering system through leaks when repairs are undertaken or via backflow.
		Chemicals	• Chemicals entering system through leaks when repairs are undertaken or via backflow. Leaching from pipe materials, joints and fixtures (e.g. lead).

Appendix 4: Controls – Bores and Springs (groundwater)[3]

A small diameter hole sunk/drilled into the ground tapping into a layer of water and usually, with the aid of an underground pump, pushing the water to the surface.

The intake (bore) is an important part of your system. Usually, providing a good intake is only a little more expensive than a poor one, yet a good intake will fix many of the problems caused by turbidity and other contaminants.

Bore heads should be sealed at the surface to prevent surface water and contaminants entering. The bore should be cased so that shallow groundwater does not mix with the deeper water. Ensure that your bore is well away from any septic tank soakage areas, offal or rubbish dumps, and animals are excluded from within **5 metres** of the bore head.

Springs should have a wall or berm around the abstraction area to prevent surface run off mixing with the spring water, and the area should be fenced to keep stock out.

[3] Information in Appendices 4 – 11 is provided courtesy of the Ministry of Health and modified where appropriate by Taumata Arowai.

Appendix 5: Controls – Lakes, Rivers and Streams (surface water)

Locate your stream or lake intake upstream of any waste discharges, drawing sufficiently below drought level to prevent sucking air into the system. Intakes normally incorporate a screen to remove larger items such as leaves, sand or stones and aquatic animals.

If the source water becomes dirty after rain, consider introducing a system that shuts off the intake until the water is clear.

Appendix 6: Controls – Rainwater (roof water)

Rainwater may not be suitable for drinking if the property collecting rainwater is near a busy highway, near factories discharging contaminants to the air and while pesticides are being sprayed nearby.

Avoid collecting water from the section of roof that collects fall-out from a flue from a slow combustion heater or oil burner.

Avoid using lead flashings and lead-headed nails on roofs harvesting rainwater. If the roof does have lead flashings, you may be able to isolate the lead by painting it.

Asphaltic and bitumen-based roofing have been known to impart taste and colour to rainwater. Unpainted treated timber shingles may leach chemicals, e.g. copper, chromium, and arsenic.

The metals lead, chromium and cadmium are toxic, and a roof painted with paint containing these metals should not be used as a source of drinking water. Lead and chromium are more likely to be found in primers and rust control coatings.

While modern roof paints are generally labelled for their suitability for painting a roof for water supply, you should still talk to a technical representative from a paint manufacturer before painting.

Guttering should be installed so water does not pond and stagnate; this can allow micro-organisms to grow.

Apart from carrying out maintenance (see later section), the quality of the water running off the roof can be improved significantly by:

- adding leaf guards/mesh to the guttering and/or installing a debris diverter
- installing a first-flush diverter – most need manual cleaning so require regular maintenance
- installing the inlet pipe so the water enters the bottom of the tank through a U-bend without disturbing the sediment
- attaching the draw-off pipe to a float so the water is extracted from near the water surface
- installing a vacuum device that uses the overflow to automatically de-sludge the tank
- operating small tanks run in series rather than installing one large tank; as the water passes to successive tanks, the microbiological quality improves significantly

Appendix 7: Controls – Water Treatment – Filtration

Filtration is a process where water is passed through a treatment device that screens or removes certain types and sizes of particles. Filters may be coarse and remove large particles, or fine, such as ultrafilters, capable of removing most substances.

Cartridge filtration is a water filter housing installed directly into the water. Replaceable cartridges are installed with a tight seal so that all water must pass through the filter. The Drinking Water Quality Assurance Rules require that cartridges rated as 5 micron nominal are used.

Activated carbon is a form of charcoal which is activated by steam treatment at high temperatures, making the material extremely porous and reactive. Granulated activated carbon comes in small lumps or granules. The sizes vary but are usually about 3 to 5 mm in diameter. Powdered activated carbon is a very fine powder that is normally impregnated on to a cartridge.

Either plain or activated carbon cartridge type filters can remove protozoan cysts if the nominal particle retention size of the filter is 1 micron or less. Note: Activated carbon filters should not be exposed directly to water containing biological contaminants; carbon granules can act as a growth medium for bacteria. If you think your water could be contaminated then activated carbon may not be the best filter for you.

Activated carbon will eventually become full of contaminants and must be replaced to prevent contaminants returning to the water.

Ultrafiltration is a type of membrane filtration (see the Drinking Water Quality Assurance Rules).

Ultrafiltration can remove particles down to the size of approximately 0.1 micron (1/10,000th of a mm). Some ultrafilters can remove all biological contaminants. They can clog quickly and should only be used with relatively clear water or following upstream filters.

Appendix 8: Controls – Water treatment – UV disinfection

Ultraviolet light is used to disinfect water by treating microbiological contaminants, making the organism harmless. A UV device must be used with relatively clean water, allowing the light to penetrate with sufficient intensity throughout the reaction chamber. A dose of **40mJ/cm2** is effective against bacteria and protozoa.

The lamps degrade with time and must be replaced on a six monthly to a yearly basis. UV disinfection devices should have a built-in monitoring system that indicates that the device is operating correctly and warns of lamp deterioration or failure.

UV devices must be installed by a suitably qualified person such as a registered plumber.

Appendix 9: Controls – Water treatment – Chlorination

Chlorine is a common disinfectant used to reduce the risk of harmful micro-organisms in drinking water. Nearly all pathogenic organisms can be destroyed with chlorine when suitable volumes and concentrations are added to drinking water with a sufficient contact time.

Chlorine can be used as both a primary disinfectant in the treatment of a water supply, and as a residual disinfectant in the distribution to protect water from contamination events once it has left the treatment plant. It can also be used as a one-time shock disinfection to the water supply in response to a contamination event or as a part of a maintenance schedule and can be flushed through the system to treat the whole supply.

Chlorine is available in multiple forms for water treatment. It is important to remember that chlorine compounds can be harmful to people when mishandled. Check the concentration and recommended dose of the chlorine compound before adding it to the water supply and follow product manufacturers instructions.

One type of chlorine is liquified chlorine gas, Cl2. Chlorine gas must only be used by an approved handler under the Hazardous Substances and New Organisms Act, due to the risks of storing and handling it.

Sodium hypochlorite (NaOCl) is a liquid which is the common ingredient in bleach. It can also be made from brine solutions. Sodium hypochlorite used to disinfect drinking water must be less than 3 months old due to a reaction which decreases the strength of the free available chlorine and the formation of chlorate ions (ClO3-).

Calcium hypochlorite (Ca(OCl)2) is a solid, provided in powder, granules or tablets. The powder must be mixed with water for dosing. Calcium hypochlorite has the same issue of degradation over time as sodium hypochlorite but has a longer shelf life depending on storage conditions.

Chlorate concentrations can reach health-significant levels in water supplies due to the use of hypochlorite, therefore appropriate preparation, dosing and monitoring methods should be used.

Free available chlorine is the standard method of monitoring chlorine in a water supply. This measure indicates if there is enough chlorine in the water to act as a disinfectant. It can also indicate whether something has changed in the supply which has used up a lot of free available chlorine, and therefore a potential contamination event.

Sources:

Supply of Chlorine Third Edition (Water New Zealand)

Instructions for dosing tanks ESR0940-Household-water-supply (Ministry of Health)

Appendix 10: Controls – Treated water – Pipework and connections

Many of New Zealand's waters are soft and drinking water may be corrosive. As corrosive water can leach out metals from metallic pipes and fittings, you may need to use plastic pipes and valves for drinking water.

The most used plastics are:

- unplasticised polyvinylchloride (UPVC)
- low density polyethylene (LDPE e.g. alkathene)
- medium density polyethylene (MDPE)
- high density polyethylene (HDPE)
- polybutylene.

Select pipes according to cost:

- availability
- resistance to handling, trenching and superimposed loads
- flexibility and ease of laying
- ease of connection
- esistance to frost.

Roofing, guttering, downpipes, and pipework used in conjunction with drinking water should comply with AS/NZS 4020: Testing of Products for Use in Contact with Drinking Water.

While an experienced master plumber or plumbing goods supplier should be able to give useful advice, a low-cost quality system might consist of low-density polyethylene pipes, approximately 20 mm internal diameter for main runs and 15 mm internal diameter for spurs. For long runs or high flow, a 25 mm pipe connecting the source and the buildings being supplied may be desirable.

Pipes should be buried (at least 400 mm deep) from the source to storage tanks.

Appendix 11: Controls – Treated water – Backflow prevention

Backflow prevention devices should be installed between a drinking tap and any place where there is a connection which could allow contaminated water to be drawn into the distribution system.

Examples include connections to chemical containers, cattle troughs etc. An air gap is a very simple backflow prevention device. Air gaps must be checked regularly to ensure they are still working (e.g. an overflow pipe can become blocked meaning the air gap no longer exists).

Commercially purchased WC flushing cisterns have a backflow preventer built in, but any "do-it-yourself" device needs a backflow preventer.

Cattle shed devices used for dosing animal remedies into the animal watering system and hose connections where the hose is used to mix sprays and wash down animal or bird faeces should have preventers fitted.

In many cases, the fitting of such a device to the specifications of AS/NZS 3500.1:2015 Plumbing and Drainage – Part 1: Water Services 3 will meet the requirements of the building code.