Drinking Water Acceptable Solution for Rural Agricultural Water Supplies

January 2022

This document is a working draft of a proposed Acceptable Solution and is based on the requirements set out in the *Water Services Act 2021*.

Contents

1. Drinking water Acceptable Solution under the Water Services Act 2021

Acceptable Solutions offer ways for small suppliers to ensure they are providing safe drinking water in a practical and cost-effective way. Section 50 of the Water Services Act 2021 (the Act) provides that Taumata Arowai may, by notice in the Gazette, issue a drinking water Acceptable Solution for use in establishing compliance with legislative requirements in the Act.

A drinking water Acceptable Solution must be published in accordance with Part 3 of the Legislation Act 2019 (namely the drinking water Acceptable Solution is publicly available free of charge on an internet site maintained by Taumata Arowai).

A person who complies with a drinking water Acceptable Solution must, for the purposes of this Act, be treated as having complied with the legislative requirements, to which the drinking water Acceptable Solution relates (other than the duties under sections 21 and 22).[1] This means that if you follow the requirements laid out in this Acceptable Solution you do not have to comply with the Drinking Water Quality Assurance Rules that relate to your supply. However, a water supplier has the choice of complying with an Acceptable Solution or complying with the Drinking Water Quality Assurance Rules.

As required by section 53 of the Act, Taumata Arowai undertook public consultation before making the drinking water Acceptable Solution for Rural Agricultural Water Supplies.

The commencement date of the drinking water Acceptable Solution for rural agricultural water supplies is (**to be determined**); being the date of the Gazette notice.

For more information in relation to drinking water Acceptable Solutions, contact info@taumataarowai.govt.nz.

[1] Section 21 is the duty to supply safe drinking water. Section 22 is the duty to comply with drinking water standards.

2. Purpose

This drinking water Acceptable Solution provides owners and operators of rural agricultural water supplies with an approved solution for achieving compliance with parts of the Act, Drinking Water Standards and Drinking Water Quality Assurance Rules prepared by Taumata Arowai. The drinking water Acceptable Solution does not provide recommendations but specified requirements and obligations that drinking water suppliers must follow.

If the drinking water Acceptable Solution is not implemented in full, compliance with the requirements of the *Water Services Act 2021* specified in this drinking water Acceptable Solution will not be achieved.

3. Definitions

Term	Definition
Building Code	Schedule 1 of the Building Regulations 1992.
Determinand	A constituent or property of water that may affect taste, odour, colour, clarity or safety.
Drinking water supplier	The person who supplies drinking water through a drinking water supply.
Drinking water supply	A single connected system of infrastructure and processes used to abstract, store, treat, transmit or transport drinking water.
Headworks	The infrastructure located near to the extraction point for source water. For groundwater, the headworks will be the bore, the bore head and the pump infrastructure required to extract the water. For a surface water offtake, the headworks will be the inlet pipes and pumps required to extract the water.
Maximum Acceptable Value (MAV)	The maximum value of a determinand that is permitted in drinking water. The full range of MAVs for a range of determinands are set out in the *New Zealand Drinking Water Standards 202X*. <note the New Zealand Drinking Water Standards 202X are currently being consulted on>
Operations and Maintenance Manual	A hardcopy or electronic document that outlines how to operate and maintain the drinking water supply under this drinking water Acceptable Solution, to ensure safe water is provided.

End point treatment	Treatment systems that are installed at the end point of a supply, including at a household or building supplied by the supply
Roof water	Rainwater obtained from the roof of the building that the water is then supplied to.
Rural agricultural water supplies	A water supply where water is supplied through a network system to farms primarily to support farm activities (e.g. stock water) but up to 35 percent some of the water is used at households for domestic purposes.
Standards	New Zealand Drinking Water Standards 202X. <note the New Zealand Drinking Water Standards 202X are currently being consulted on>
Taumata Arowai	The New Zealand Water Services Regulator, established under the Taumata Arowai–the Water Services Regulator Act 2020.
Treatment system	A treatment system that complies with this drinking water Acceptable Solution.
UV	Ultraviolet light.
UVI	Ultraviolet light intensity

4. Applicable drinking water supplies

This drinking water Acceptable Solution defines what is required for end point treatment systems installed at buildings supplied by rural agricultural water supplies. It includes source water testing and specifications for treatment systems. It describes the design, configuration, installation, operation, maintenance, testing, monitoring, record keeping, emergency management and auditing that is required.

This drinking water Acceptable Solution applies to rural agricultural water supplies where all the following criteria are met:

Drinking water use criteria

- Water is supplied through a network system to a farm (or farms) to support farm activities (e.g. stock water) but some of the water is used at households for domestic purposes.
- Up to 35 percent of the water from the supply may be used for domestic purposes (and therefore goes through a compliant treatment system). At least 65 percent of the water must be used for stock water, wash down, irrigation or other non-domestic uses.
- The water from any household treatment system must be used for domestic purposes only; i.e. drinking, food preparation, washing and oral hygiene for dwellings and farm accommodation or farm buildings.

- All water used within a building fitted with a treatment system must be treated by that system. Water provided for outdoor water use may be untreated but must be marked as non-potable in accordance with the *Building Code* (clauses *G12 Water Supplies* and *F8 Signs*).

Water supply size criteria

- There is no upper or lower limit to the population served by the rural agricultural water supply.
- End point treatment systems, which comply with the requirements for this drinking water Acceptable Solution, are installed for each single dwelling or building (e.g. shearers' quarters) serviced with drinking water or one treatment system which supplies water for up to three buildings.
- Each property that is connected to the rural agricultural water supply that adopts the drinking water Acceptable Solution, can install treatment systems at ten or fewer dwellings or buildings. Properties connected to a rural agricultural water supply that serve more than ten buildings, require a dedicated, centralised treatment system to provide potable water to all those buildings.
- All dwellings and buildings requiring drinking water must be supplied with water from a treatment system. Individual buildings or dwellings cannot opt out.

Treatment system size criteria

- Any treatment system must serve no more than 30 people (within a single dwelling or building).
- Buildings serving more than 30 people require a treatment system specifically designed for the volume of water required.
- The following diagram (Figure 1) demonstrates an example of how this drinking water Acceptable Solution could be applied.

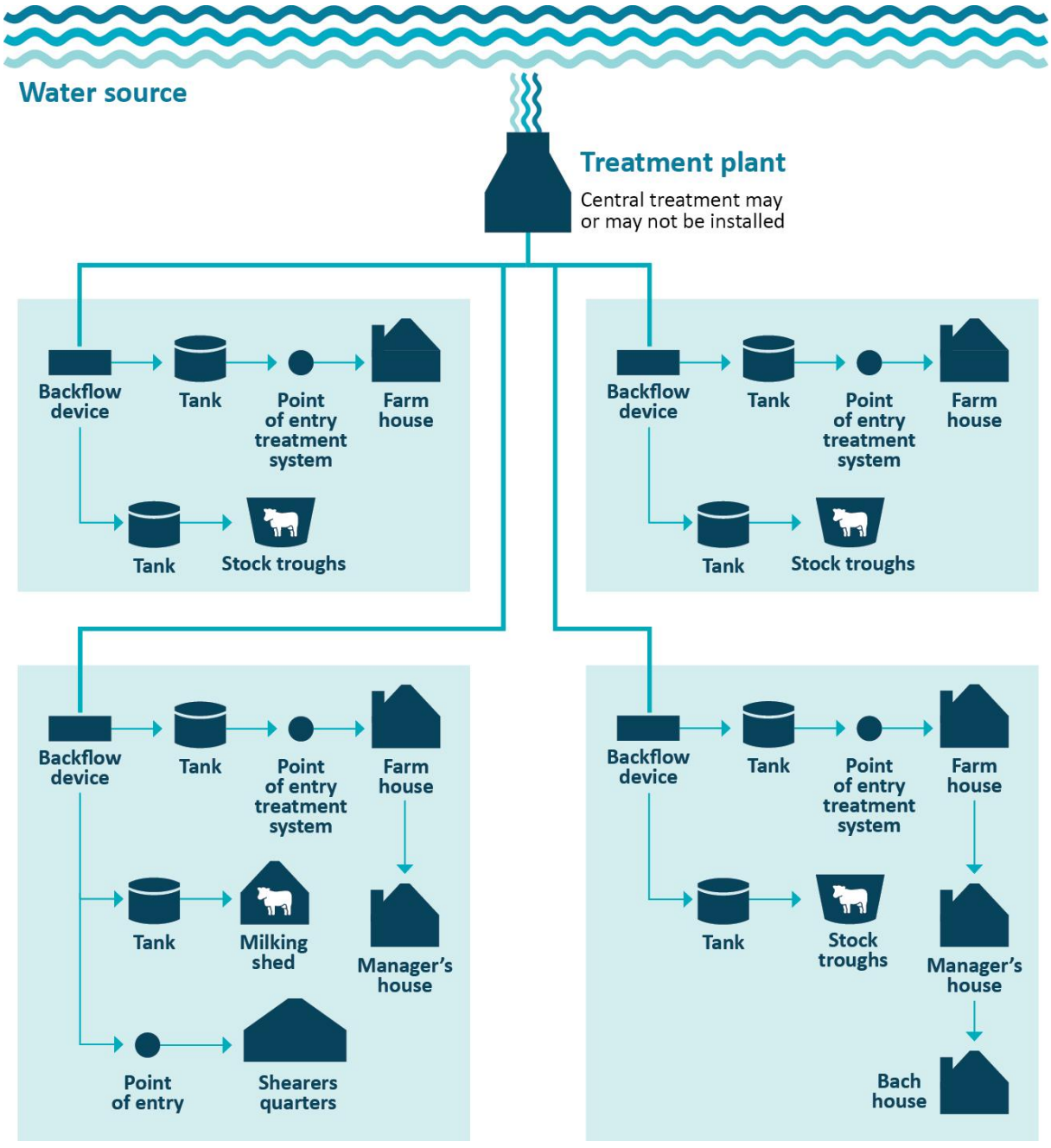

Figure 1. An example of a possible configuration for a rural agricultural supply using the drinking water Acceptable Solution.

5. Rural agricultural water supplies

Rural agricultural water supplies, are supplies where water is provided at a restricted volume (trickle feed) to a point of supply storage tank on a consumers' property. These supplies primarily provide stock water, or irrigation water, in rural areas at an agreed quantity over a period of 24 hours but can also provide water to small rural communities. The water provided by a rural agricultural water supply may or may not be safe to drink. However, if the water is to be consumed by people at households or other buildings provided with water from the supply, it needs to comply with the Standards.

It may not be economical to treat all of the water in a rural agricultural water supply to the level required by the Standards. End point treatment systems which comply with this drinking water Acceptable Solution, provide a way of ensuring that households and other buildings supplied from a rural agricultural water supply receive water that complies with the Standards and is safe to drink.

6. What does this drinking water Acceptable Solution cover?

Rural agricultural water suppliers that comply with the entirety of this drinking water Acceptable Solution will be deemed to comply with the following sections of the Act:

- *Section 24 Duty to take reasonable steps to supply drinking water that complies with aesthetic values issued under the Act*
- *Section 27 Duty to protect against risk of backflow*
- *Section 30 Owner must have a drinking water safety plan*
- *Section 49(3) Duty to comply with any operational rules prepared by Taumata Arowai*

To comply with all their obligations under the Act, rural agricultural water suppliers that adopt this drinking water Acceptable Solution must also:

- register the supply with Taumata Arowai (Sections 23 and 54)
  ensure the drinking water they supply is safe (Section 21(1))
- exercise due diligence to ensure duties under the Act are met (Section 29(1))
- comply with the notification requirements (Sections 35 and 36)
- comply with the record-keeping requirements (Section 37).

The water supplier must notify Taumata Arowai if any determinand detected in a sample exceeds the MAV set out in the Standards (section 22(2)).

7. Design, configuration and installation

The requirements set out below must be met for both the rural agricultural supply, and any treatment systems located at houses or other buildings that receive water from the supply.

7.1. Requirements before the drinking water Acceptable Solution can be adopted

Before use of this drinking water Acceptable Solution can be considered, the water supplier must test the water provided immediately downstream of any central treatment system to determine its suitability for cartridge filtration and UV disinfection. Water must not exceed limits that manufacturers indicate for their equipment. Samples must represent a range of different environmental conditions such as heavy rainfall and dry periods. If the testing indicates that the source water is unsuitable for cartridge filtration and/or UV disinfection, the drinking water Acceptable Solution cannot be used.

Testing must include:

Parameter	Limit	Minimum number of samples
Iron	• Must not compromise the effectiveness of UV disinfection. • Must not be at a level that will form a precipitate when oxidised by chlorine.	3
Manganese	• Must not compromise the effectiveness of UV disinfection. • Must not be at a level that will form a precipitate when oxidised by chlorine.	3
Alkalinity	• Must not form a scale that reduces the effectiveness of UV disinfection.	3
UV transmittance	• Must meet the requirements of the UV unit manufacturer.	3
Turbidity	• Must not exceed 20 NTU at any time.	5

7.2. Rural agricultural system requirements

The rural agricultural water supply must meet the following requirements:

- Backflow prevention devices must be installed on all boundary connections to the rural agricultural water supply in accordance with *AS/NZS 3500* and the *Building Code* (*clause G12 Water supplies)*. The minimum requirement is for non-testable double check valves, but devices should be determined depending on the level of risk associated with activities at each property connection. Backflow prevention devices are not required where all upstream water storage tanks incorporate air gaps that comply with the *Building Code clause G12 Water Supplies*.

- The water supplied from the headworks must not exceed a turbidity of 20 NTU at any time.

7.3. End point treatment system requirements

- End point treatment systems must be situated at the water supply point of entry for every serviced building or group of up to three buildings.
- An individual treatment system must serve no more than 30 people (within a single dwelling or building).

Each treatment system must have (as a minimum):

- untreated water storage next to the building upstream of the treatment components to hold a minimum of 96 hours average demand
- secured lids on storage tanks
- two stage cartridge filtration with 20 micron and 5 micron or less, nominal pore sizes.
- a UV disinfection unit that delivers a minimum reduction equivalent dose of 40 mJ/cm^2, with an (UVI sensor
- flow control to ensure flow is within the specification of the UV unit
- lamp status indication
- air release valves to allow air to be removed from the system on start up
- manual isolation valves fitted upstream and downstream of the treatment system to allow for maintenance.

Each treatment system must:

- be designed so that all electrical components are connected to mains power through a standard 3-pin 240 volt plug and can be disconnected from mains power if required
- be sized to ensure flow rates comply with the *Building Code (clause G12 Water supplies)* and are adequate for the correct functioning of fixtures and appliances within the building. Probable instantaneous flow rates for dwellings can be found in *AS/NZS 3500:2018 (Part 1 Water Services, Table 3.2.3)*
- have the UV disinfection unit validated against one of the following:
  - NSF/ANSI 55 for Class A systems
  - UV Disinfection Guidance manual (USEPA)
  - DVGW Technical Standard W294
  - öNORM M5873.
- shutdown flow automatically on low UVI or dose reading (as per the manufacturer's specification).

7.4. End point treatment system configuration

All treatment systems must be configured according to the following:

- Any dwelling or building with a treatment system, must only use water from the rural drinking water supply and is only allowed to augment the supply with roof water from the building that is being supplied with water.
- Rainwater collected from a roof used to augment the supply must enter the untreated water storage before the treatment system, so it is also treated. Minimum requirements are:
  - Rainwater entering the untreated water storage tank must pass through a leaf screen with maximum mesh size of 1.5mm.

- No trees or other vegetation should overhang the roof.
- Every connection to the untreated water storage tank that provides water to the treatment system must include a backflow prevention device (check valve).
- Treatment systems must not be operated:
  - if the UV unit provides a UVI or UV dose reading below the acceptable level determined by the unit manufacturer
  - if there is a power cut
  - during the lamp warm up period until the required UVI level or dose is achieved. This may be achieved using either an automated control valve or by controlled start and stop of a pump.
- The treatment system must generate a local alarm if the UVI level or dose is below that recommended by the manufacturer for effective disinfection.

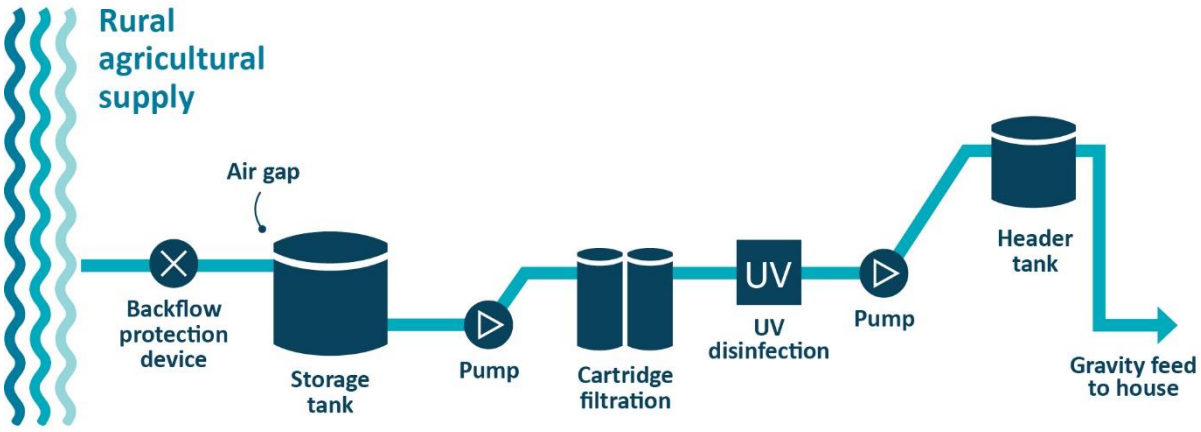

Figure 2. Possible on-site configuration of a treatment setup using a header tank to provide household water pressure.

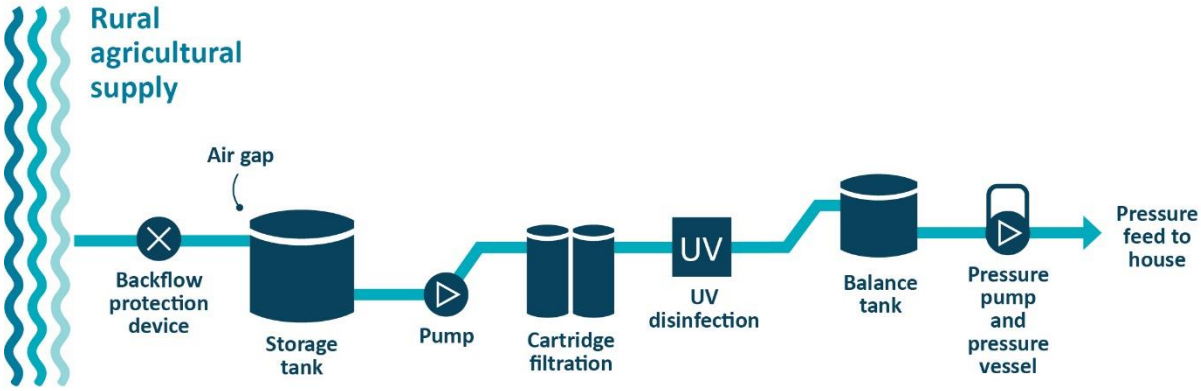

Figure 3. Possible on-site configuration of a treatment system setup using a pump and pressure vessel to provide household water pressure

End point treatment system installation

The treatment system must be installed:

- in accordance with the manufacturer's instructions and by a suitably qualified plumber in accordance with the *Building Code*. All pipework and fixtures must comply with the *Building Code*
- with a sealed untreated water storage tank, with any openings screened with a 1.5mm mesh
- according to the manufacturer's specifications for any continuous monitoring instrumentation.

8. Operation and maintenance

The drinking water supplier is responsible for ensuring that arrangements are in place for the installation, maintenance and testing of all household or building treatment systems installed under this drinking water Acceptable Solution. Household/premises owners can be required by the water supplier to install, maintain and test treatment systems. However, installation must be undertaken by a registered plumber and maintenance and testing must be carried out by a suitably qualified person.

8.1. Operations and maintenance manual

The water supplier must prepare an Operations and Maintenance Manual which covers both the operations and maintenance of the rural agricultural water supply and the end point treatment systems. It must include (but is not limited to):

- a description of the water supply and key components
- process and instrumentation diagrams for all the components in the treatment system, including all valves, pumps and bypasses
- standard operating procedures including restart procedures as outlined in Section 8.2
- incident and emergency response procedures listed in Section 10
- key contacts including operations and maintenance personnel, manufacturers and suppliers, regulators and consumers
- maintenance schedules
- monitoring and activity schedules, procedures and records
- a quick reference troubleshooting section for operators and water suppliers.

8.2. Standard operating procedures

The operation and maintenance manual must contain standard operating procedures for the following (but not limited to):

- restarting the treatment systems
- regular inspections
- routine maintenance
- replacing equipment
- operating individual treatment system units, flow restrictors, pumps and valves
- calibrating of relevant sensors and analysers.

8.3. Inspection procedures

For the rural agricultural water supply

Inspection procedures should ensure that:

- headworks including bore heads and abstraction infrastructure are secure, watertight, in good condition
- central treatment headworks processes are operating effectively
- calibration of any process monitoring, or control equipment is carried out according to, and at the frequency specified by, the manufacturer
- backflow prevention devices (including air gaps) are in place and operating correctly.

At each household or building

Inspection procedures should also ensure that:

- storage tanks are in good condition including that:
    - the roof is intact and does not allow contaminants to enter the tank
    - the walls and screening are intact to prevent access of vermin or ingress of faecal material
    - overflow pipes and ventilation holes have 1.5mm mesh screening.
- roof water collection systems including leaf screens and first flush diverters are intact and operating correctly
- cartridge filter systems have the correct cartridge types installed and are operating effectively
- UV systems are installed correctly and are operating effectively according to the manufacturers requirements.

8.4. Maintenance, inspection and calibration

At each household or building

The minimum frequency of operation and maintenance visits by the water supplier to houses and buildings with end point treatment systems is:

- three-monthly if alarms from the treatment system are only displayed at the household
- Six-monthly if alarms from the treatment system are notified to the supplier remotely
- Twelve-monthly if the system can:
    - monitor basic water quality parameters (turbidity and total organic carbon)
    - alert the premise owner and water supplier when maintenance is required (in accordance with manufacturer's requirements or when water quality exceeds parameters (e.g. treated water NTU >1))
    - automatically record when filters and UV lamps have been replaced.

Maintenance (including replacement and cleaning) schedules should include:

- replacing cartridge filters at least every six months, unless the manufacturer recommends an alternative period is necessary given the quality of raw water in the system
- replacing mercury-based UV lamps within 12 months, unless the manufacturer guarantees and can demonstrate that performance requirements are maintained over a longer life span
- replacing LED UV lamps at the frequency recommended by the manufacturer to achieve the certified UV dose at the end of lamp life. An alternative UV lamp must be available as a replacement
- replacing (or calibrating) UVI sensors or dose meters every two years, unless the manufacturer recommends an alternative period to maintain validation status

- cleaning the untreated water tank upstream of the treatment system at least every 10 years. (Further cleaning will be required if inspection finds significant build-up of sludge and/or biological growth)
- testing of any testable backflow prevention devices each year.

All activities undertaken according to the maintenance, inspection and calibration schedules are to be recorded in relevant logs and records including the findings or outcomes of these activities. Records and logs are to be retained to demonstrate the activities have been completed.

9. Monitoring and testing

The water supplier must undertake water quality testing and keep records including (but not limited to) the following requirements:

Supply monitoring requirements

Rule Number	Requirement	Limits
RA1	All testing is to be undertaken by a laboratory that is accredited by International Accreditation New Zealand (IANZ) and listed on the Taumata Arowai register of laboratories.	N/A
RA2	All microbiological samples must be provided to a laboratory within 24 hours of collection and must be transported at a temperature of less than 6 degrees Celsius.	N/A
RA3	Water sources must be monitored for the following determinands once when this drinking water Acceptable Solution is adopted and then every 3 years. • Arsenic • Boron • Calcium • Magnesium • Nitrate • Potassium • Bromide • Iron • Manganese • Total organic carbon	Must not exceed MAV
RA4	Analysis of the turbidity, pH and conductivity of the raw water as soon as practicable downstream of the headworks must be undertaken daily or continuously.	N/A

RA5	One sample for *E. coli* is to be taken from the water leaving the headworks of the water supply every 3 months.	N/A
RA6	Testing for any determined that has a level that exceeds 50% of the MAV must be undertaken monthly.	Must not exceed MAV

Household monitoring requirements

Rule Number	Requirement	Limits
RA7	One sample for *E. coli* is to be taken from a household post-treatment every 3 months. Household testing must rotate so that all households in the supply are eventually tested.	Not present

10. Incident and Emergency Management

An incident or emergency is where there is a reasonable likelihood that a supplier's drinking water is unsafe.

The drinking water supplier must be prepared to instigate a controlled response to an incident or emergency by developing appropriate incident and emergency response plans. The plan must outline:

- The most likely incidents or emergencies. While it is not possible to identify all situations, the drinking water supplier must identify any situations that can be reasonably expected. For example, the headworks flooding, a raw water main break, a turbidity surge in the raw water, a positive *E. coli* test in the treated water, or a failure of a component in the UV system.

- Establish a response plan for each possible incident or emergency situation identified, including:
  - who has responsibility for responding to the incident or emergency
  - details of every step of the response – from investigating the source or cause of the problem, to taking remedial action to rectify the problem
  - pre-prepared communications such as *boil water* notices and *do not drink water* notices, and other key messages, including how communications should be issued
  - increased monitoring if a monitoring or a test result exceeds a MAV set out in the Standards
  - regarding using alternative water sources to top up a supply:
    - plans for the use of registered tankered drinking water suppliers including contact details
    - plans for the use of bore water or spring water sources
    - information about the quality of the alternative sources and whether additional treatment is required
    - advice to be given to consumers if the quality of the alternative source is known to be poor
    - the contact details of other agencies that may potentially be involved.

- Contact details for relevant personnel and external stakeholders like Taumata Arowai, local authorities and consumers.

- How the drinking water supplier intends to:
  - take immediate action to ensure that public health is protected
  - notify Taumata Arowai that the drinking water is or may be unsafe
  - identify and implement measures required to ensure that the problem does not reoccur
  - train staff in emergency and incident response practices.

One of the aims in drafting the plan, is to not rely on particular personnel for key steps and the release of key communications.

Suppliers must review incident and emergency response plans after every major incident and at least every two years. All boil water notice incidents need to be recorded for review and audit.

11. Training and Awareness

The drinking water supplier is responsible for ensuring that all people who work on the supply and undertake any operations, maintenance or testing, have been trained in the use of the Operations and Maintenance Manual. The competencies associated with the training must be validated for each staff member at least once every three years.

Training records must demonstrate that training and competency validation has been completed.

12.Auditing

Audit purpose

Audits will monitor whether the drinking water supplier is complying with the requirements of this drinking water Acceptable Solution.

These audits will check that the initial installation and document development meets the requirements (adequacy-style audit), and that ongoing operation and maintenance is carried out according to the documentation that was developed (implementation-style audit).

Internal audit

All drinking water suppliers using this drinking water Acceptable Solution are to undertake their own internal audits every 12 months and make the audit results available to Taumata Arowai.

External audit

Taumata Arowai, or a third party on their behalf, may carry out an audit of how a drinking water supplier has applied this drinking water Acceptable Solution.

Audit checklist

Where this drinking water Acceptable Solution is used, the internal audit may confirm:

- The treatment system has been designed, configured and installed according to the drinking water Acceptable Solution requirements – including but not limited to:
  - The quantity of untreated water storage at each household.
  - The treatment system is sized to meet the flow rates required to comply with the *Building Code (clause G12 Water supplies)*.
  - The household treatment system configurations ensure that untreated water cannot enter the dwelling/building.
  - The operation and calibration of headworks online instrumentation meets requirements.
  - Backflow preventers are installed on any non-potable water lines from the untreated water storage tank.
  - Backflow at every point of supply in the network is installed with the minimum requirement being a non-testable double check valve.
  - There are no cross connections or illegal connections.

- The Operations and Maintenance Manual complies with the drinking water Acceptable Solution including but is not limited to:
  - the status and the date of its last update
  - the operations and maintenance requirements of the equipment provided for the network and household treatment systems
  - records to show that operations and maintenance for all treatment systems was carried out in accordance with the Operations and Maintenance Manual
  - evidence that operators have been trained in the Operations and Maintenance Manual and/or by manufacturers, if relevant
  - records of maintenance including cartridge filter replacement, lamp changes, and sleeve and UVI sensor cleaning
  - the use of the flow restrictors
  - whether the UVI or dose alarms are operational (including remote signalling if appropriate).
  - whether the visual indication of the UV reactor operation is working.

- The presence of maintenance and testing records for each treatment system including:
  - inspection records for the storage tank and testing of backflow preventers
  - cartridge filter replacement
  - UV sleeve cleaning
  - UV lamp replacements
  - UVI sensor replacement or calibration.

- Water quality testing has been carried out in accordance with this drinking water Acceptable Solution.

- Responses to instances of non-compliant water, equipment failures or consumer complaints where appropriate and as per the Incident and Emergency Response Plan in the Operations and Maintenance Manual.