

DRAFT

ACCEPTABLE SOLUTION FOR RURAL AGRICULTURAL DRINKING WATER SUPPLIES

This document is a working draft of a proposed acceptable solution and is based on the requirements set out in the *Water Services Bill* as it is currently written. Changes may be made to this document if changes are made to the *Water Services Bill* before it is enacted.

December 2020

CONTENTS

1	Introduction.....	2
2	Rural Agricultural water supplies	2
3	Purpose	3
4	Definitions.....	3
5	Where does this Acceptable Solution apply?.....	4
6	What does this Acceptable Solution cover?.....	6
7	Source Water Risk Management	7
8	Design, Configuration and Installation	8
8.1	Design.....	8
8.2	Configuration	9
8.3	Installation	9
8.4	Rural Agricultural System requirements	10
9	Operation and Maintenance	10
9.1	Operations and Maintenance Manual.....	10
9.2	Standard Operating Procedures.....	10
9.3	Maintenance, Inspection and Calibration Schedules	11
10	Monitoring and Testing	12
11	Incident and Emergency Management	13
12	Training and Awareness	14
13	Auditing.....	14
13.1	Audit Purpose.....	14
13.2	Internal audit	15
13.3	External audit	15
13.4	Audit checklist.....	15

1 INTRODUCTION

Acceptable solutions are prescribed requirements which a water supplier can adopt to demonstrate compliance against some of the legislative requirements set out in the *Water Services Act 202X* (the Act), including the duty to comply with specified operational compliance rules. Acceptable solutions have been prepared by Taumata Arowai in accordance with Section 49 of the Act and relate to specific types of drinking water supply. A water supplier can only use an acceptable solution designed for the type of supply they own or operate.

To achieve compliance with the acceptable solution, a water supplier must demonstrate that all the requirements set out in the acceptable solution documentation have been met.

Demonstrating compliance with an acceptable solution does not exempt a water supplier from complying with all of the duties set out in the Act. For example, the water supplier must still comply with the *New Zealand Drinking Water Standards 202X* (the Standards) and prepare a drinking water safety plan. However, each acceptable solution specifies the duties in the Act that a water supplier is deemed to comply with if the acceptable solution is adopted.

Acceptable solutions enable a drinking water supplier to comply in a way that is proportionate to the scale, complexity and risk profile of different types of supply.

Suppliers do not have to use Acceptable Solutions and can choose to comply with the *Drinking Water Supply Operational Compliance Rules* (the Rules) prepared by Taumata Arowai for their type of supply if they choose to.

This acceptable solution defines what is required point of entry treatment systems installed at buildings supplied by agricultural drinking water supplies. It describes the design, configuration, installation, operation, maintenance, testing, monitoring, emergency management and auditing that is required.

2 RURAL AGRICULTURAL WATER SUPPLIES

Rural agricultural water supplies are supplies where water is provided at a low 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. The water provided by 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 economic to treat all of the water in a rural agricultural water supply to the level required by the Standards, but point of entry treatment systems which comply with this acceptable solution provide a way of ensuring that people drinking water supplied from a rural agricultural water supply receive water that complies with the standards and is safe to drink.

3 PURPOSE

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

If the acceptable solution is not implemented in full, compliance with the Act will not be achieved.

4 DEFINITIONS

Drinking water supply – a single connected system of infrastructure and processes used to abstract, store, treat, transmit or transport drinking water.

Drinking water supplier – the person who supplies drinking water by operating a drinking water supply.

Determinand – A constituent or property of the water that can adversely affect the water's taste, odour, colour, clarity or safety.

Treatment system – [A treatment system that] complies with this acceptable solution.

UV – Ultraviolet light disinfection.

Headworks – the infrastructure located at the extraction point for the source. 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.

Roof water – rain water obtained from the roof of the building that the water is then supplied to.

Taumata Arowai – the New Zealand Water Services Regulator, incorporated under the *Water Services Regulator Act 2020*.

Operations and Maintenance Manual – a hardcopy or electronic document that outlines how to operate and maintain the drinking water supply under this acceptable solution to ensure safe water is provided.

Maximum Acceptable Value (MAV) - the maximum value of a determinand that is permitted in drinking water, which indicates water is not considered safe to drink. The full range of parameters are set out in the *New Zealand Drinking Water Standards 202X*.

5 WHERE DOES THIS ACCEPTABLE SOLUTION APPLY?

This 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); i.e. 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.
- 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 (Schedule 1 of the Building Regulations 1992).

Water supply size criteria

- The *population served* by the entire drinking water supply must be less than 2,000 people.
- There are compliant treatment systems 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 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 are considered to be secondary supplies and are likely to require a dedicated, centralised treatment system for those buildings.

- *All* dwellings and buildings requiring drinking water must install a treatment system; i.e. 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 are likely to require a treatment system specifically designed for the volume of water required.

The following diagram (Figure 1) demonstrates the scenarios where this acceptable solution does and does not apply.

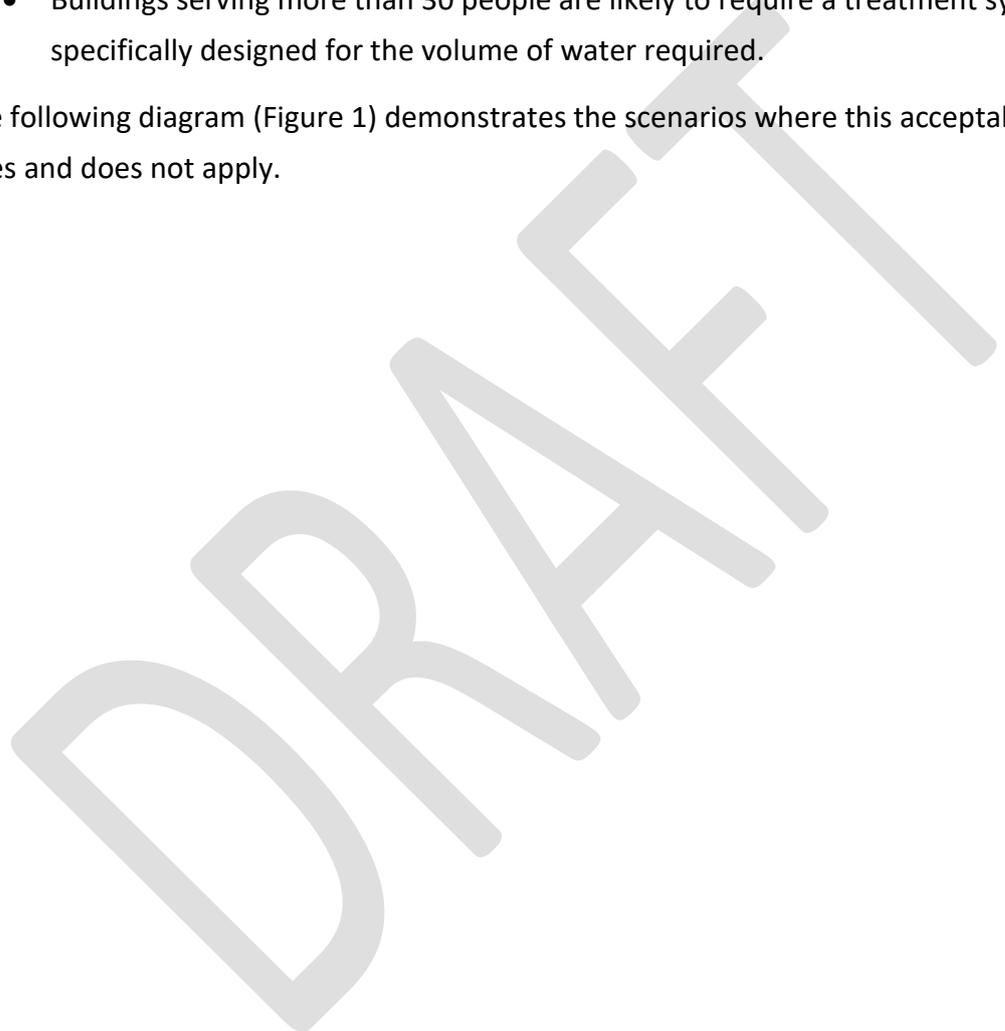
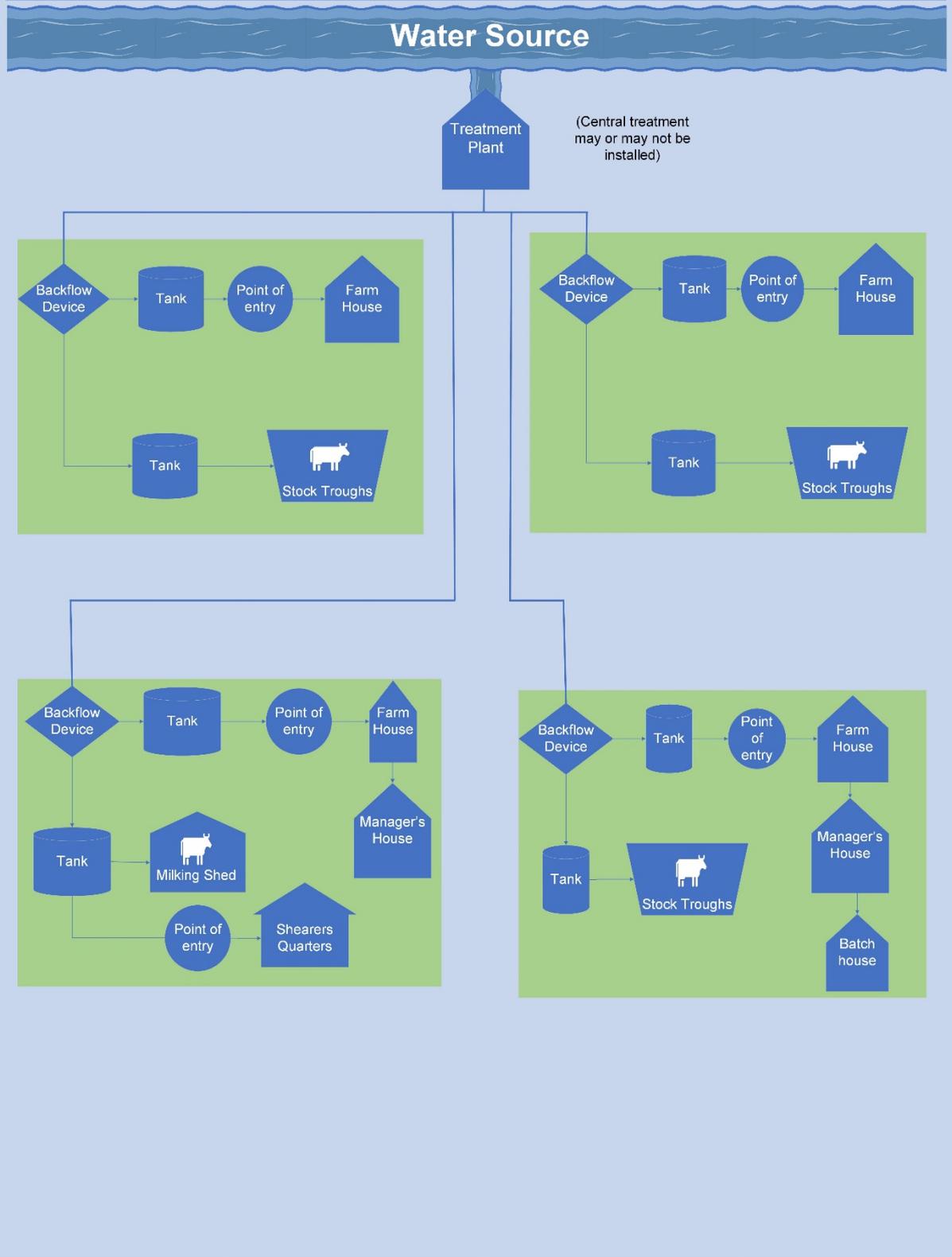


Figure 1. An example of a possible configuration of a rural agricultural supply using the acceptable solution

Examples of Rural Agricultural Supplies



6 WHAT DOES THIS ACCEPTABLE SOLUTION COVER?

This acceptable solution covers most of the obligations on drinking water suppliers under the Act. Rural agricultural drinking water suppliers who comply with the entirety of this acceptable solution will be deemed to comply with the following sections of the Act:

- *Section 22 Duty to comply with any drinking water standards issued under 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 28 Duty to ensure endpoint treatment.*
- *Section 34 Obligations regarding unplanned supply of drinking water when the usual drinking water supply has failed or is unsafe to drink.*

To comply with all of their obligations under the Act, rural agricultural drinking water suppliers adopting this acceptable solution must also:

- Register the supply with Taumata Arowai (Sections 23 and 53).
- Comply with the overarching duties to:
 - 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).
- Comply with the obligations regarding drinking water safety plans (Section 30).

7 SOURCE WATER RISK MANAGEMENT

The drinking water supplier *must prepare and implement* a source water risk management plan which:

- Identifies any hazards that relate to the source water, including emerging or potential hazards.
- Assesses any risks that are associated with those hazards.
- Identifies how those risks will be managed, controlled, monitored or eliminated, including additional monitoring of any determinands identified as a high risk.
- Has regard to any values identified by local authorities under the *National Policy Statement for Freshwater Management* that relate to a freshwater body that the drinking water supplier uses as a source for drinking water supply.
- Has regard to any relevant information provided by local authorities such as district and regional councils, including information about:

- Land-use activities, potential sources of contamination, and other water users that could directly or indirectly affect the quality or quantity of the source water.
- Source water quality monitoring by the relevant regional council.
- Known risks or hazards that could affect the source.

The drinking water supplier must implement the mitigation measures identified in the source water risk management plan.

8 DESIGN, CONFIGURATION AND INSTALLATION

Treatment systems *must be situated at the water supply point of entry* for every serviced building.

An individual treatment system *must serve no more than 30 people* (within a single dwelling or building) and no more than 3 buildings.

This section specifies the requirements for the design, configuration and installation which all treatment systems must meet to comply with this acceptable solution.

8.1 DESIGN

Each treatment system must have (as a minimum):

- Untreated water storage next to the building upstream of the treatment components to hold 96 hours average demand.
- Cartridge filtration with 5 micron or less, nominal pore size spun or wound depth, filtration cartridges. Pleated paper cartridges are not permitted.
- A UV disinfection unit that delivers a minimum reduction equivalent dose of 40 mJ/cm², with an ultraviolet light intensity (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 sized to match peak instantaneous demand of treated water in accordance with *AS/NZS 3500*.
- Have the UV disinfection unit validated against:

- *NSF/ANSI 55 for Class A systems; or*
- *UV Disinfection Guidance manual (USEPA); or*
- *DVGW Technical Standard W294; or*
- *öNORM M5873.*
- Shutdown flow automatically on low UVI reading (as per the manufacturer's specification).

8.2 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. The roof water must be fed through the treatment system.
- Treatment systems must not be operated:
 - If the UV unit provides a UVI 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 is measured (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 is below that recommended by the manufacturer for effective disinfection.
- Rainwater collected from a roof may be used to augment the supply but must enter the untreated water storage before the treatment system, so it is also treated.

Minimum requirements are:

- Rain water 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.

8.3 INSTALLATION

The treatment system must be installed:

- In accordance with the manufacturer's instructions and by a registered plumber and electrician 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 penetrations sealed with a mesh with 1.5mm maximum openings.
- According to the manufacturer's specifications for all online instrumentation

8.4 RURAL AGRICULTURAL SYSTEM REQUIREMENTS

Backflow prevention devices must be installed on all connections to the rural agricultural water supply in accordance with *AS/NZS 3500* and the *Building Code*. 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.

9 OPERATION AND MAINTENANCE

The operation and maintenance of the treatment system under this acceptable solution is the responsibility of the drinking water supplier.

9.1 OPERATIONS AND MAINTENANCE MANUAL

The water supplier must prepare an Operations and Maintenance Manual for the drinking water supply that includes requirements for each treatment systems. This must include (but is not limited to):

- A description of the drinking 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 as outlined in Section 9.2.
- Schedules and records of activity as outlined in Section 9.3.
- Key contacts including operations and maintenance personnel, manufacturers and suppliers, regulators and consumers.
- Troubleshooting section for quick reference for operators and water suppliers.

9.2 STANDARD OPERATING PROCEDURES

The Operation and Maintenance Manual must contain *Standard Operating Procedures* for the following (but is not limited to):

- Regular inspections
- Maintenance

- Equipment replacement
- Operation of the individual treatment system units, flow restrictors, pumps and valves
- Calibration of relevant sensors and analysers.

Inspection procedures should cover the following:

At each household or building:

- Storage tanks are intact to prevent access of vermin or ingress of contaminants material.
- Roofs water collection systems (leaf screens, first flush diverters etc) are intact and operating correctly.

For the rural agricultural water supply

- Source water extraction point - for example bore head integrity or offtake 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.

9.3 MAINTENANCE, INSPECTION AND CALIBRATION SCHEDULES

The minimum frequency of **operation and maintenance visits** by the water supplier is:

- Six-monthly if alarms from the treatment system are notified to the supplier remotely.
- Monthly if alarms from the treatment system are only displayed at the household.

Maintenance (including replacement and cleaning) schedules are to include:

- Cartridge filter replacement at least every six months, unless the manufacturer recommends an alternative period is necessary given the quality of raw water in the system.
- Mercury-based UV lamp replacement within 12 months, unless the manufacturer guarantees and can demonstrate a longer life span meets the performance requirements.
- Alternative UV lamp, including LED lamp replacement at a frequency as recommended by the manufacturer to achieve the certified UV dose at the end of lamp life.

- UVI sensor replacement or calibration validated every two years, unless the manufacturer recommends an alternative period is necessary to maintain validation status.
- Untreated water tank upstream of treatment system cleaning at least every 10 years, however to be cleaned if inspection finds the build-up of sludge and/or biological growth.

Inspection schedules must meet the frequencies below:

Component	Inspection Frequency Minimum
Source Water extraction point	Annual
All storage tanks	Annual
Backflow Prevention Devices	Annual
UV lamps	As per manufacturer's recommendation to maintain validation

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

10 MONITORING AND TESTING

Monitoring at the Rural Agricultural Water Supply headworks must be undertaken by the water supplier and includes (but is not limited to):

- Testing of the source water for arsenic, boron, cadmium, chloride, copper, iron, manganese, nitrate, phosphorus, potassium, selenium, sodium, every three years.
- The turbidity of the raw water just downstream of the headworks daily or continuously.
- Any determinands identified in the source water risk management plan as possible hazards are to be tested every 5 years(unless the risk assessment results in a high risk requiring more frequent testing).

- 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.

Testing of the water quality must be undertaken by the water supplier including:

- Bacterial water quality testing for *Escherichia coli* (*E. coli*)
- One sample is to be taken from the water leaving the headworks of the water supply *each month*, and one from a household post-treatment *each month*. Household testing must rotate so that all households in the supply are tested.
- *E. coli* should be found in any sample

The water supplier must keep records of all monitoring and testing undertaken.

11 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 reasonably expected in a ten year period. 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.
 - Detail 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 identified key messages, including how it should be issued.
 - Increased monitoring if a monitoring or a test result exceeds a MAV set out in the Standards.

- Plans for the use of emergency water sources (ideally more than one) including information about the quality of the alternative sources and how it might be adequately treated; advice to be given to consumers; if the quality is known to be poor; and 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 observation in audit.

12 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 must be trained in the use of the Operations and Maintenance Manual. Personnel must have been trained in the past three years before undertaking any works on the water supply.

Training records must be kept demonstrating the training has occurred.

13 AUDITING

13.1 AUDIT PURPOSE

Internal audits are to be undertaken to check that the drinking water supplier is complying with the requirements of this acceptable solution.

The audits will check that the initial installation and document development meets the requirements (adequacy-style audit), but also that the ongoing operation and maintenance

is carried out according to the documentation that was developed (implementation-style audit).

13.2 INTERNAL AUDIT

All drinking water suppliers using this acceptable solution are to undertake self-audits every 12 months and make the audit results available to Taumata Arowai.

13.3 EXTERNAL AUDIT

Taumata Arowai may undertake an audit of the acceptable solution application or may have a third party undertake the audit on its behalf.

13.4 AUDIT CHECKLIST

Where this acceptable solution is used, the internal audit may confirm:

- The source water risk management plan has been developed and implemented.
- The treatment system has been designed, configured and installed according to the 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 peak instantaneous flows required.
 - 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 compliance with the acceptable solution including but 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.
 - That the UVI alarms are operational (including remote signalling if appropriate).
 - That the visual indication of the UV reactor being operational 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 acceptable solution.
- Responses to instances of non-compliant water, equipment failures or consumer complaints, were appropriate and as per the Incident and Emergency Response Plan in the Operations and Maintenance Manual.