Wellington Water

Hygiene Code of Practice

for Safe and Healthy Drinking Water

Our water, our future.

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1 Introduction

1.1 Purpose

To fulfil the requirement of G11 of the Drinking Water Quality Assurance Rules 2022 (DWQAR) prepared by Taumata Arowai in accordance with section 49 of the Water Services Act 2021[1].

This Code of Practice is consistent with the Water New Zealand Hygiene Practices to Prevent Water Supply Contamination 2019.

1.2 Objective

To outline the expected standard of care and good work practices for all personnel working on the drinking water supply network to prevent contamination of drinking water and ensure the delivery of safe and healthy drinking water to customers.

Principle 1 of the six principles of safe drinking water[2], and the overarching principle reflected in the Report of the Havelock North Inquiry states:

A high standard of care must be embraced.

Unsafe drinking water can cause illness, injury, or death on a large-scale. All those involved in supplying drinking water (from operators to politically elected representatives) must therefore embrace a high standard of care akin to that applied in the fields of medicine and aviation where the consequences of a failure are similarly detrimental to public health and safety. Vigilance, diligence, and competence are minimum requirements and complacency has no place.

To maintain safe drinking water supplies, people working on the water supply network must continue to be vigilant and take appropriate steps to minimise ways in which the water supply could become contaminated.

This code of practice does not replace Standard Operating Procedures (SOPs), however SOPs must align with the Code of Practice to ensure the expected standard of care and good work practices are being met.

[1] https://www.taumataarowai.govt.nz/assets/Uploads/Rules-and-standards/Drinking-Water-Quality-Assurance-Rules-2022-Released-25-July-2022.pdf

[2] Report of the Havelock North Drinking Water Inquiry: Stage 2: https://www.dia.govt.nz/diawebsite.nsf/Files/Report-Havelock-North-Water-Inquiry-Stage-2/$file/Report-Havelock-North-Water-Inquiry-Stage-2.pdf

2 Regulatory requirements

Taumata Arowai, the water services regulator for Aotearoa, released Drinking Water Quality Assurance Rules 2022 in July 2022. The rules include the following requirements that are relevant to this code of practice:

Table 1: Relevant DWQAR rules

Rule Number	Requirement
G10	All work (planned or unplanned) on a water supply must be completed by suitably trained or experienced personnel.
G11	Drinking water suppliers must prepare a hygiene code of practice for people working on a water supply which must include: 1. maintenance of personal hygiene at all times; and 2. prohibition of people working on a water system who are experiencing any gastrointestinal illness; and 3. protection of the work site, materials, and tools from contamination; and 4. how all reasonable steps will be taken to minimise the entry of contamination into the water supply during any activity.
D3.7	Before carrying out or commissioning repairs to pipes in a water distribution system, a drinking water supplier must undertake and keep records of a risk assessment to determine the risk of contamination of the network and the procedures required to minimise that risk.
D3.8	All materials used in construction and repairs must be free of visible contamination and remain protected from contamination until installation.
D3.9	All tools contacting the water supply or its parts, particularly cutting surfaces, must be adequately disinfected prior to commencing work and subsequently as necessary when tools contact soil or backfill material.
D3.10	Disinfection of mains (when required) must follow best management practices including but not limited to methods such as tablet, slug, spray chlorination, or equivalent as appropriate.
D3.11	Drinking water suppliers must develop and document standard operating procedures for planned, unplanned and emergency repairs.
D3.12	Drinking water suppliers that have storage facilities within a distribution system must prepare a water storage management plan for the operation of storage facilities which includes the minimum and maximum operating levels, target turnover rates, inspection, and cleaning.
D3.13	All storage facilities must be subject to an annual security and contamination inspection and assessment by the drinking water supplier
D3.14	Drinking water suppliers must prepare and use written disinfection procedures for storage facilities that are consistent with industry best management practices.
D3.15	All new storage facilities, and existing storage facilities that have been drained for maintenance purposes, must be cleaned, and disinfected and tested for E. coli prior to being brought (back) into use.
D3.16	Divers' suits, rafts, remotely operated vehicles (ROVs) and other materials used during inspection, maintenance or other activities within storage facility interiors must be made from materials acceptable for contact with drinking water and suitable for disinfection.
D3.17	All equipment and materials entering storage facilities must be disinfected immediately prior to entry according to industry best management practices.

Rule Number	Requirement
WC.2*	The water carried must only take water from a point in a distribution system prescribed by the drinking water supplier
WC.4*	The operator of any vehicle used to transport water must ensure all tanks, and the equipment used for loading or unloading water, are only used for drinking water
WC.5*	The operator of any vehicle used to transport water must ensure all tanks, and the equipment used for loading and unloading water, are made from material that light cannot pass through, are always kept clean and clear of any possible contaminants, with all openings and connections sealed to protect them from possible contamination. The drinking water must be always protected from contamination during its loading, transit and delivery.
WC.6*	If tanks and the equipment and fittings used for loading and unloading water are not used for the transport of drinking water for a period of 30 or more days, then before next being used to transport drinking water: 1. the tank must be disinfected by filling with drinking water containing at least 5 mg/L FAC for not less than 30 minutes before discharging safely to waste; and 2. equipment and fittings should be washed in water containing 5mg/L FAC.
WC.7*	The water carrier must ensure there is backflow prevention or an adequate air gap in place when discharging drinking water from their tank.

*Note the DWQAR includes other rules for Water Carriers not included in this table.

3 General requirements

3.1 Applicability

This Code of Practice applies to all areas of the drinking water supply design, operations, repairs, commissioning, connections, and maintenance. Backflow prevention, while not specifically included, are other important considerations where a similar high standard of care is expected.

3.2 Roles and Responsibilities

Role	Responsibilities
All staff and subcontractors	Must meet the standard of care expectations for all work on the water supply network.
Supervisors and/or Team Leaders	Periodically audit work practices of their personnel to ensure the expected standard of care is being met. Records must be kept of audit results and be available for review when required. Ensure that they and their staff are medically fit for work daily (see Section 3.9). Any problems or transgressions must be reported to the relevant Team Leaders and Managers immediately. Any confirmed or suspected contamination to the water supply network

	must be escalated to the Head of Risk and Assurance immediately so that appropriate actions can be taken to minimise the risk to delivery of safe and healthy drinking water to customers. Where appropriate, the Emergency Response Team will convene and manage the incident according to emergency response procedures. Ensure that all necessary documentation is completed including those identified in Section 5. Ensure water quality clearance is obtained from the Head of Network Performance, where required. Prompt notification of Network Controller and the Head of Risk and Assurance of any possible or suspected contamination of the network.
Managers	Responsible for annual medical clearance of their staff working on the water supply network.
Head of Network Performance	Review and approval of water quality test results, where required. Escalation of possible or suspected contamination as appropriate/where water quality test results indicate cause for concern.
Network Controller	Approval of connections to the water supply network, following approval of water quality test results by the Head of Network Performance.
Supervising Engineer	Approval of connections to the water supply network, where delegated approval is obtained from the Network Controller (for example via approval shutdown plans or other formal delegation in writing).
Head of Risk and Assurance	Receive notification of possible or suspected contamination and activate emergency management team as appropriate.

3.3 Training and Competency

Water supply workers shall have completed the Level 3 National Certificate in Water Reticulation – Service Person Qualification or be working towards this qualification. As a minimum, the supervisor shall hold this qualification and supervise all disinfection practices.

Good practice:
Records should be kept for all personnel working on the drinking water supply network that clearly document both training achieved and competency for the key activities they undertake, and to identify further training and development needs.

3.4 Risk Assessment

The risk of contamination shall be assessed for all work carried out on the water supply system to determine the appropriate level of work procedures, disinfection, and follow up verification required and shall be assessed on a case-by-case basis as per Section 3.5 below.

The risk assessment results must be recorded prior to carrying out any physical works and be maintained available for audit when required. Information recorded should include the location, risk level assessed, person(s) completing the assessment, and the reasons/justification for the risk assessment result provided.

The risk assessment must be considered live and be updated in response to events during completion of the work and be revised if circumstances change (for example unforeseen suspected contamination etc.).

3.5 Work Procedures Required

Work procedures required and any requirement for bacteriological testing depends upon the level of risk of contamination to the water supply system. Both disinfection and correct procedures and practices are essential. The following table outlines the expected minimum work procedures for typical operational scenarios.

Table 2: Minimum work procedure scenario expectations

Scenario	Contamination suspected?	Hand spray/ submerge bath disinfection?	Flushing? (min. two directions)	Isolate Location, Escalate to Risk & Assurance?	Super Chlorinate?	Microbiological sampling/ testing?	Is water quality clearance required? *****
Depressurised main repair	NO (nominal dia. =>150mm)	YES	YES	NO	NO	YES	NO
	NO (nominal dia. <=100mm)	YES	YES	NO	NO	NO	NO
	Yes*	YES	YES	YES**	YES	YES	YES*
Pressurised main repair		YES	NO	NO	NO	NO	NO
New mains		YES	YES	NO	YES	YES	YES
New service laterals (<32mm dia.)		YES	YES	NO	YES	NO	NO
Reservoirs and storage or contact tanks (emptied)		YES***	NO***	NO	YES	YES	YES
Reservoirs and storage or contact tanks (remaining online)		YES****	NO	NO	NO	NO	NO

*Includes possible foul contamination, for example due to proximity of a damaged or leaking sewer. If pipe has been inadvertently submerged during repair but there is no reason to suspect foul contamination, microbiological sampling is required but mains may be returned to service without clearance provided that the pipe section is thoroughly flushed in both directions and a FAC of greater than 0.5mg/L is achieved.
** Emergency management team to provide incident response oversight. Boil water advisory notice may be required.
*** Specific reservoir/storage tanks recommissioning process to be followed (no flushing per se)
****All materials/divers to be thoroughly disinfected prior to entry
*****Standard practice for all locations and connection regardless of size shall include confirmation of suitable Free Available Chlorine concentration (not less than 0.2 mg/L) prior to return to service.

3.6 Testing Laboratory

Sampling and testing for the services required shall be carried out by Wellington Water's preferred IANZ accredited laboratory.

Any bacteriological transgressions identified as a result of testing are immediately notified to the Head of Network Performance, Head of Water Compliance, Network Controller, and Chief Advisor Drinking Water as soon as possible.

Where appropriate, the Emergency Response Team is convened and manages the incident according to emergency response procedures.

3.7 Water Quality Clearance

Where water quality clearance is required (see Section 3.5), all microbiological test results are sent to the Head of Network Performance and Network Controller for assessment, and approval obtained from the Network Controller before connection work may progress. In the case of new watermains this assessment approval may be delegated by the Network Controller to the supervising engineer overseeing the physical works.

Any perceived bacteriological transgression identified as a result of testing is notified to the Head of Risk and Assurance, and an investigation initiated into the cause of the transgression and extent of the issue.

3.8 Vehicles, tools, equipment, and work practices

Good practice:

1. Disinfection is used as a key procedure to prevent contamination of the water supply during maintenance but not as a substitute for good procedures and work practices.
2. A high standard of cleanliness is maintained in the interiors of all vehicles used for water reticulation works. Vehicles must be equipped with sanitary wipes or antibacterial liquid for hand sanitation when working on site, for regular use by personnel.
3. A high standard of cleanliness is maintained in the interior of all stores.
4. Water supply and wastewater equipment is stored separately.
5. All materials are stored and handled to minimise contact with foreign materials. Fittings are boxed, capped, or sealed with plastic wrapping, including when carried in vehicles. All pipe ends are capped.
6. All tools used in the construction or maintenance of the main and fitting that come into contact with the water supply or its parts, particularly cutting surfaces, have been thoroughly cleaned, disinfected, and sprayed or rinsed with a 1% chlorine solution with a pH of between 7 and 8 prior to use, and subsequently as necessary when tools contact soil or backfill material. Larger items of plant and equipment including excavators are steam cleaned before use on potable water works. Disinfected tools are not to be placed directly on the ground prior to use.
7. All materials used in the construction or maintenance of the main and fittings that come into contact with the treated water are either provided sealed by the manufacturer under hygienic conditions and are not uncovered until immediately before use or are thoroughly disinfected and sprayed or rinsed in a minimum 1% chlorine solution prior to use. Disinfected items are not placed directly on the ground prior to installation.

8. A bactericidal lubricant complying with AS/NZS4020 is used on all rings and gaskets being exposed to the reticulated water.

9. Good trade practices are always applied in water main laying, maintenance, and repair procedures.
10. Work practices minimise the potential for pipe fragments to enter the water supply during physical works (for example when cutting into existing pipelines during shutdowns).
11. Bottled water supplied to customers has sealed caps and is stored as per the supplier's instructions, out of direct sunlight, and is not used beyond the expiry date.

3.9 Personal Hygiene and Illness

Good practice:

1. All people employed on the water supply network maintain a high standard of personal hygiene.
2. Training and assessment processes include requiring personnel to declare whether they have ever suffered from any infection that may pose a risk to human health and that may be transmitted through water supplies. These infections include (but are not limited to) the enteric fevers typhoid and paratyphoid, hepatitis A and E, dysentery, and verocytotoxin producing *E. coli* (VTEC). Personnel declare whether they have a history of enteric fever, persistent diarrhoea, vomiting, jaundice or prolonged, unexplained fever.
3. Personnel who declare such illness or history of illness are prohibited from working on the water supply network and are referred for further specialist medical advice and clearance. If in doubt, personnel adopt a precautionary approach and seek specialist advise and clearance.
4. Workers employed on the maintenance, repair, or construction of the water supply network have current inoculations and obtain medical clearance to attest that they are not carriers of any waterborne disease:
    a. Prior to employment on the water supply system, and then as required in the Regional Specification for Water Services Section 4[3].
    b. Following any gastrointestinal illness (vomiting, diarrhoea etc.)
    c. Following overseas travel to countries with endemic waterborne disease.
5. It is each individual's responsibility to report any vomiting, diarrhoea, or fever greater than 48 hours, jaundice, or any other illness that may have a bearing on their suitability to work on restricted operations to their line manager immediately. All such personnel are suspended from carrying out work on the drinking water supply network until cleared to do so.

6. Personnel who have been off sick are assessed to verify that they are fit to continue their operational duties.

7. Line managers who receive any such reports seek advice from a medical professional. Clearance to return to work on the drinking water supply is contingent on the approval of the medical professional. Until clearance is obtained workers may be placed on work not directly involving the water supply system. All such actions are appropriately documented.

8. Water supply workers with running/septic skin infections or wounds do not work on the water supply network unless the infection or wound is effectively dressed, and their work is in a location unlikely to be immersed.

[3] https://www.wellingtonwater.co.nz/assets/Reports-and-Publications/Regional-Specification-R.Spec.pdf?file- size=4.5+MB&file-type=pdf

9. Procedures are in place to ensure that all personnel working on the drinking water supply (including sub-contractors and approved contractors for new water supply connections) comply with these requirements.

4 Cleaning and disinfection methods

4.1 New mains and associated fittings

Designers, constructors, and operators of water networks should be alert to all the possible opportunities for contamination to enter treated water supplies and take all reasonable precautions to minimise the risk. They should equally avoid circumstances where water in the mains can deteriorate through stagnation or long contact with particular materials, for example cement mortar pipe linings. The design and specification of the network can itself significantly reduce most of these risks.

Good Practice:

1. As far as practicable, new mains are designed to ensure adequate turnover. In particular, crossovers, “push-pull” mains or other intermittently used pipes are avoided where possible, or at least are provided with appropriate washout facilities.
2. Networks are designed to include all the features required for their subsequent commissioning (including sampling).
3. An assessment of the ground conditions in which the new main is to be laid is carried out in order to identify any risks to water quality either during the laying or from permeation through the main following commissioning. For example, use of metal or barrier pipes in brown-field sites where there is a risk of hydrocarbon contamination.
4. Chambers for hydrants and air valves are sited in readily accessible locations, away from risk of spillage or surface water and constructed as self-draining.
5. Laying new mains and services are carried out by appropriately trained personnel following good hygiene practices.
6. Pipes and fittings are transported and carefully stored on site, off the ground, to avoid entry of dirt or vermin. All pipes are supplied with close-fitting end caps where feasible, and these remain in place until the pipe is laid. All pipes and fittings (and in particular plastic types) are kept clear of fuel oils, and any materials so contaminated are discarded.
7. All fittings and pipe ends are free of any visible contamination and sprayed with a 1% chlorine solution as they are laid.
8. Care is taken to prevent water, subsoil or other material entering a pipeline under construction. It is not assumed that such material will be flushed out on commissioning. Additional cleaning measures (e.g.: swabbing) and inspection techniques (e.g.: CCTV) are considered prior to commissioning on larger diameter mains.
9. Swabs may be useful for clearing a new main of any dirt or debris that has entered, and the use of a chlorinated swab may be appropriate if any form of contamination is suspected. However, a chlorinated swab is only an intermediate measure and is not a substitute for disinfection.
10. After installation and before use, water mains are flushed until visibly clear. They are disinfected by charging with water containing sufficient free chlorine to ensure that a concentration of between 20mg/L and 30mg/L has been maintained throughout the entire pipe length over 24 hrs. The time is important to ensure adequate dispersion and contact of the chlorine with the water and the entire internal surface of the main and fittings. Samples taken at the end of 24 hrs. show concentrations above 10 mg/L. The main is then flushed and left charged for a minimum of 12 hours and is then sampled at appropriate points including the downstream end for turbidity, free available chlorine concentration and microbiological contaminants. The number and location of samples required is sufficient to ensure the suitability for supply of the entire length of main.

11. Alternative methodologies that achieve greater than 7, 200mg/L.min may be considered at the discretion of the Network Controller and must be approved in writing before undertaking. disinfection.
12. Chlorinated water is discharged appropriately, including dechlorination where necessary (for example when discharging to surface water).
13. Samples from new mains are as a minimum be checked for residual chlorine, taste and odour, coliform bacteria, E. Coli, and appearance / turbidity. Consideration is given to including other parameters as appropriate.
14. Documentary evidence is provided of satisfactory water quality results before the main is connected to the live network.
15. If the main is not brought into service within 14 days of a satisfactory sample having been taken, the main is flushed with mains water and re-sampled. If contamination is suspected, the main is re-chlorinated and sampling carried out as above.
16. All new service connections are disinfected and flushed with mains water before use. Service lateral pipes require disinfection, although water quality samples will not normally be required. If the disinfected service pipe is not commissioned and brought into supply within 14 days of completing disinfection, the disinfection process is repeated prior to commissioning.

Refer to Regional Specification for Water Services Section 6.12 for further information - https://www.wellingtonwater.co.nz/assets/Reports-and-Publications/Regional-Specification-R.Spec.pdf.

4.2 Mains repairs and associated fittings

A burst or damaged main and the process of its repair are potential opportunities for contamination to enter the distribution system. A risk assessment should be carried out immediately prior to all repair activity; this should be dynamic and respond to any new developments during the repair process. Precautions are necessary to prevent contamination and minimise the risk to public health when responding to these circumstances and during subsequent repair work.

The risk assessment and justification for the risk assessed must be recorded. All actions taken during a high-risk situation (where contamination is suspected or confirmed) must be recorded.

The risk of contamination is greatest when the main is depressurised, whether from the burst or damage itself, or during subsequent isolation for repair when contaminated water or other material can enter the main directly or from backflow through service pipe connections.

Good Practice

1. An on-site assessment is performed in each case to establish whether there is a risk of contamination and if so its nature and severity. The risk assessment takes account of the possibility that the surrounding soil may be contaminated with chemical or biological materials (for example, petrol or sewage).
2. Where the main is leaking, but still under pressure, for example from a crack around the circumference of the main, a simple repair can be effected with a collar. The excavation is drained below pipe level (at least 150mm below the invert of the pipe), and the water remains under a positive, but if necessary reduced, pressure while the repair is made.
3. Where possible, the excavation is made and pumped so that the water is min. 150mm below pipe level prior to the main being depressurised. For more serious bursts (where there is risk of flooding to properties, danger to the public or significant loss of downstream pressure) the main is isolated as soon as possible at the nearest downstream valve first. Under these circumstances it is likely that a cut-out repair or pipe length replacement will be necessary.

4. Where the main must be replaced or cut out for repair, the excavation extends to a sump well to at least 150mm below the invert of the pipe. The water level is kept below the bottom of the pipe throughout the repair process, when necessary, by suitable pumping.
5. Fittings and pipes are inspected prior to installation to ensure they are clean and free of defects. Replacement pipes and pieces of pipes together with all fittings and cut ends are spray disinfected with a 1% chlorine solution ensuring that all surfaces are covered.
6. After completing any repair on a depressurised main, including installations of new sections or components, the main is flushed at the nearest downstream hydrant to remove any debris. and excess chlorine. Where practicable, flushing achieves three volume changes. Due consideration is given to the potential for contamination of watercourses, and sufficient neutralising agent (e.g.: sodium thiosulphate) is added to de-chlorinate the water where necessary.
7. Measurement of the downstream chlorine residual is carried out in order to determine whether sufficient flushing of the repaired section has been completed and the residual has returned to background concentration.
8. Where depressurisation occurs during the repair, the precautions necessary prior to return-to-service are documented. Where the repair requires a cut-out, but the risk assessment indicates no reason to suspect contamination and the appearance and smell of the water is satisfactory, a sample is taken for chlorine residual, taste and odour properties, physicochemical and bacteriological analysis from the nearest available downstream hydrant or property. The main is returned to service pending the results. In the event of a failing sample, the main is re-sampled and additional samples taken in the adjacent distribution system. Further actions proportionate to the circumstances are considered to protect public health including disinfection or the issuing of protective advice as necessary.
9. If it is known or suspected that groundwater or other material has entered the pipe, on completion of the repair the main is flushed (and where necessary swabbed), disinfected and sampled. Dependent on the nature and extent of the contamination, the main may be returned to service prior to receipt of analytical results. Where the risk assessment suggests significant contamination may have occurred (e.g., from sewerage) the main remains out of service until results are known, or if it is critical to restore the supply immediately after repair precautionary advice (such as Boil Water Advice or Do Not Drink Advice) is issued.
10. Where the on-site risk assessment has determined the necessity for disinfection of the isolated section of main this is carried out with a 130mg/L – 150mg/L solution of free available chlorine for 60 minutes (or equivalent method) and is not less than 120mg/L at the end of this period. Levels are checked during this period to ensure that the concentration of chlorine is maintained throughout the process.
11. During this time all service connections are closed. If this is not possible, steps are taken to protect any customers who may be affected. After disinfection the main is flushed as above.
12. Repairs requiring more than 3 pipe lengths or more than approximately 20 metres long are disinfected as new mains.
13. Refer to Section 3.5 for a summary of the operational requirements for various types of mains repair and circumstances.

Refer to Regional Specification for Water Services Section 6.12 for further information - https://www.wellingtonwater.co.nz/assets/Reports-and-Publications/Regional-Specification-R.Spec.pdf.

4.3 Mains rehabilitation and lining

Due its intrusive nature, the process of mains rehabilitation represents a potential opportunity for contamination to enter the system and therefore specific precautions are needed during such work to minimise these risks. However, this planned activity also usually requires the disruption of supplies to consumers, which in itself has potential public health implications. This work should therefore be carried out in such a manner as to minimise the period during which consumers are without water, whilst at the same time minimising risk to water quality during the process. Personnel carrying out this work should therefore continue to be vigilant and recognise all possible ways in which contamination could enter water supplies.

Good Practice

1. All fittings and pipe cut ends are spray disinfected with a 1% chlorine solution so that all surfaces are coated. The pipe is capped until connected.
2. All pipes and fittings are stored, transported, installed, and connected in ways which minimise the risk of contamination (e.g.: from groundwater or other materials) from entering them.
3. In cases where the newly installed or lined pipe may have become contaminated, notification procedures are followed and the need for further disinfection and/or precautionary boil advice notices is assessed by the Emergency Management Team. An individual risk assessment is carried out on each such occasion to determine whether measures are required to protect public health and what these should be.
4. Procedures are followed to deal with instances of contamination when they occur to ensure that at no time are customers' water supplies at risk. Typically, these procedures include isolation of properties from the contamination, communication with customers, communication with the Taumata Arowai, methods of removing the contamination, methods for the disinfection of all apparatus and an appropriate sampling regime.
5. Contractors have appropriate procedures and method statements for the specific rehabilitation technique employed.

Spray Lining

6. Lining work is carried out with approved materials which are applied in accordance with the manufacturer's instructions for use and are only applied by accredited contractors in accordance with specified conditions of approval.
7. Spray lined mains are disinfected by either one of the following methods:
   a) disinfection by "fill and stand" – a free chlorine concentration of 130 – 150mg/L for a minimum of 60 minutes is used. A reduction in chlorine concentration below 120 mg/L using this method over the contact period may indicate a dirty or otherwise contaminated pipe: or
   b) spray disinfection – a specially designed chlorine spray-lining unit designed to completely wet the entire internal surface of a relined main with 1,000 mg/l is used. The main should be left for a minimum of one hour before flushing.
   c) The main may be returned to service following recharging and checks on residual chlorine concentration.
   d) A sample is taken following the return to service of each section of main.

Coiled Polyethylene Pipes or Liners

8. Where coiled polyethylene pipes or liners are to be installed within an existing main, either close or loose fitting within the existing pipe or by insertion through pipe-bursting or created by directional drilling, one of the following disinfection procedures is followed:

a) pre-disinfected with free chlorine levels of 20mg/L – 30 mg/L for 24 hours (or equivalent), flushed and then recharged with mains water for a further 12 hours before sampling at appropriate points and written approval is obtained before being brought into service. A significant reduction in chlorine concentration using this method over the contact period may indicate a dirty or otherwise contaminated pipe; or
b) disinfection with a 130 - 150mg/L free available chlorine solution for 60 minutes followed by flushing and sampling prior to being returned to service. A significant reduction in chlorine concentration using this method over the contact period may indicate a dirty or otherwise contaminated pipe; or
c) use of factory sealed and pre-disinfected pipes (supplied with a manufacturers expiry date) with the seal remaining intact until the pipe is ready to be installed; or
d) treated as a new main installation and disinfected accordingly.

9. The risk of contamination during the installation of pre-disinfected coiled pipe (e.g.: loss of sealed lycap through “pulling” main) is assessed. Where the pipe is suspected to have become contaminated during installation, further cleaning and disinfection methods is completed.
10. Factory-sealed coiled pipe is installed within 6 months of the disinfection/sterilisation date. Where the 6-month period has been exceeded, the pipe is re-chlorinated.
11. Where a pre-chlorinated coiled pipe has been cut or there is any doubt about the disinfection status of the pipe, or it is suspected that contamination has occurred, the coil is re-chlorinated.

4.4 Reservoirs and tanks

Treated water storage reservoirs and tanks balance variation in demand and provide storage. These strategic points in the network may be appropriate locations for secondary chlorination, or other chemical adjustment to the water.

These structures are usually the last storage unit for treated drinking water before it is distributed to consumers and are at additional risk as they are not pressurised and are a potential point for water quality deterioration, e.g., ingress, water age, malicious damage etc.

Appropriate design and operation of such structures are important factors for ensuring water quality is maintained.

Good Practice

1 Routine inspection and maintenance strategies identify risks and necessary control measures to ensure that water quality does not deteriorate as it passes through these assets.
2 The inspection and maintenance approach/strategy aligns with the water storage management plan(s).
3 External and internal inspection of structures is carried out at a frequency determined by individual risk assessment. Internal inspection is carried out at a frequency not greater than every 10 years.
4 Treated water storage tanks are restricted areas, and all personnel involved in their inspection, cleaning and maintenance are appropriately trained and competent for this work.
5 Weekly (or more frequent) monitoring of service reservoirs or tanks, when in supply, for bacteriological indicators and chlorine residual is carried out.

6 Structures are designed:
i. to prevent contamination through external ingress,
ii. and managed to ensure that there is adequate turnover,
iii. to allow access for cleaning,
iv. to achieve a balance of hydraulic flow between any compartments,

7 Facilities are available to allow isolation of the structure from service to allow continuation of supply e.g., bypass facilities, multiple compartments.

8 Overflow arrangements are secured, designed, and maintained to prevent introduction of contaminants and vermin (for example flap valves need to be maintained to prevent sticking in the open position, mesh on overflow pipework etc.).

9 All materials used for construction, maintenance, and repair (including membranes, sealants and associated apparatus which are likely to come into contact with treated potable water) meet the relevant standards for use in potable water storage structures.

10 Access hatches comply with Wellington Water specifications and are:
i. kept to a minimum,
ii. designed with concealed hinges,
iii. designed to include devices to prevent contaminant ingress,
iv. fitted with a watertight seal between the lid and supporting frame,
v. self-venting,
vi. installed with intruder alarms installed where necessary,
vii. regularly inspected.

11 Any mesh used for vents are designed and maintained to prevent access of insects and small mammals. Vent screens are constructed of corrosion resistant materials.

12 Any redundant access hatches are securely and permanently sealed.

13 Where secondary (booster) chlorination is necessary to maintain chlorine residual in the distribution system, dosing facilities are flow proportional.

14 Disinfection by-product risk is assessed.

15 Services including telemetry cables and sample pipes that may be a route for contamination are, as a minimum, be sealed with an appropriate elastomeric sealant to a depth that will prevent inadvertent raking out.

16 Installing glanded entry plates inside reservoirs and tanks is considered for all small-bore entries such as cables and small-bore pipes (e.g.: sample lines).

17 Where structures are emptied to supply to enable inspection, care is taken to prevent the mobilisation of any sediment entering the distribution system.

18 Prior to return to supply, arrangements are made to ensure adequate disinfection and satisfactory water quality monitoring results are obtained.

19 On-site valves are clearly marked with details recorded in site manuals and asset records.

20 Structures are designed and operated to minimise the detrimental effects of water ageing, including consideration of the following factors:
i. Inlet and outlet pipes are located to minimise the creation of “dead spots”, as far as is practicable;
ii. Common inlet/outlet pipes (“push/pull” systems) are avoided as far as is practicable.
iii. The operation of multiple-celled tanks is optimised to prevent deterioration in one or more such tanks from hydraulic imbalances.
iv. Turbulent inflow improves mixing and prevents stratification.

21 Internal inspections identify aspects which may impact on water quality, including a survey of internal surfaces and joints, a leakage drop test and roof integrity test. Remedial work is carried out prior to return to supply where practicable.

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22 Structures are cleaned, disinfected and satisfactory sample results obtained prior to return to supply. Disinfection procedures ensure that a minimum chlorine contact C.t of 7,200mg/L.min is achieved.

23 Sampling routinely includes analysis for bacteriological, physical, and aesthetic parameters. Other parameters are considered where additional contamination risks may have occurred during refurbishment and/or cleaning activities.

24 Where a structure is being filled or left standing during the return to service period, it is configured such that flow out to the distribution system is prevented.

25 Sampling facilities are installed to enable compliance with the water quality monitoring requirements and minimise health and safety risk for personnel.

26 Particular consideration is given to achieving representative samples from multi-compartment structures and those with more than one outlet main.

27 Workers entering the reservoir for maintenance activities take appropriate precautions to minimise the risk of contamination entering the reservoir, including for example using suitable PPE/footwear coverings, overalls, disinfection baths etc.

Refer to Regional Specification for Water Services Section 6.12 - https://www.wellingtonwater.co.nz/assets/Reports-and-Publications/Regional-Specification-R.Spec.pdf.

4.5 Temporary mains and services

As part of a planned work activity, for example where water mains are being renovated or in an emergency situation, there may be a need to install a temporary supply. The use of temporary mains presents additional risks to the integrity of the water supply. Therefore, generally, the use of temporary mains should be only for short periods and where there is no other satisfactory means of supply. Safeguards should be in place to ensure that risks from the use of temporary mains are adequately controlled.

Good practice

1 The installation, testing and connection of a temporary main is carried out appropriately trained and competent personal for carrying out such work.

2 All temporary connections of reticulated water to mains under construction and/or maintenance incorporate testable double check backflow prevention devices as a minimum.

3 The size of the overland supply pipe is appropriate for the number of customers to be supplied, and modelling techniques may be used for this purpose.

4 If the temporary main is laid as part of a pre-planned activity, it is disinfected, sampled and satisfactory results obtained before being commissioned. Alternatively, pre-chlorinated lengths of polyethylene pipe may be used to maintain supplies providing they have been sampled and approved for use and have sealed ends during transportation.

5 If electrofusion joints are used then the main is treated as if the coil has not been disinfected and further disinfection carried out, and samples taken to demonstrate it is suitable to put into use.

6 Temporary service connections (<50mm nominal dia.) do not normally require sampling provided appropriate disinfection and flushing has been carried out.

7 All joints and fittings are disinfected with a 1% chlorine solution.

8 Consideration is given to ensuring that the main and services are suitably protected from physical damage. For example, where crossing driveways, footpaths and roads, appropriate measures include the use of sandbags, ramps, and shallow buried sections.

9 The potential for contamination by oil, petrol or solvents is assessed as these may quickly penetrate plastic pipes. If crossing contaminated land suitably protected/barrier pipe is used.

10 Suitable points are installed to enable the temporary main(s) to be flushed (and if necessary sampled) prior to use.

11 Appropriately qualified and experienced staff complete a risk assessment to determine an appropriate sampling regime for the particular installation.

12 The main is connected, flushed and chlorine residuals checked to match normal distribution levels. Further clarity, taste and odour checks are carried out at a downstream flushing point.

13 Samples are taken from downstream points for bacteriological indicator parameters after connection.

14 Chlorinated water is discharged appropriately, including dechlorination where necessary (for example when discharging to surface water).

15 When in use the overland main is regularly inspected to confirm its integrity, and samples should be taken at a frequency determined by the risk assessment.

16 In warm weather, consideration is given to regular flushing to minimise the effects of rises in water temperature.

17 For certain operations, such as mains relining or online replacement, it may be necessary to redeploy bypass mains as the work proceeds. Where this is required, pipe lengths are securely capped on disassembly and fittings cleaned. Upon reassembly, and providing that a period of no more than 14 days has elapsed between the two operations, an assessment of the cleanliness of the pipes is carried out and recorded. Bypass mains assessed as uncontaminated by the move are disinfected with a 130 - 150 mg/l chlorine solution for a period of 60 minutes, flushed and sampled prior to being put into service. Bypass mains that have been out of service for longer than 14 days or where contamination may have occurred are disinfected as for new mains.

18 All temporary work connections of reticulated water to mains under construction and/or maintenance incorporate testable double check backflow prevention devices, including water used for hydrostatic pressure testing, flushing and disinfection.

19 All pipe flushing is carried out to achieve the equivalent of three pipe volumes being discharged from the mains.

4.6 Tankers, static tanks, and bowsers

When normal supply arrangements are disrupted, either as a result of a planned shutdown of the distribution network or following an operational emergency, alternative supplies may be provided to customers, including the use of tankers, static tanks, or bowsers.

Good practice

1 Procedures are in place to ensure the smooth deployment of alternative supplies across the supply area.

2 Consideration is given to having a pre-planned list of appropriate locations to place static tanks and bowsers, taking into account accessibility for consumers, risk of vandalism and contamination, and suitability for filling and re-filling by tanker.

3 Alternative/backup supplies are available when needed – including plans to contact alternative providers if required.

4 All clothing and personal protective equipment is clean and kept suitable for use on the drinking water supply network (e.g., separate from other equipment).

5 Road tankers, tanks and bowsers are approved for either permanent or emergency use.

6 Vehicles, equipment, and fittings used in water supply operations are not used for any other purpose and kept clean internally and externally, and record of previous work are available.

7 Petrochemicals, oils and chemicals, and any fuel-driven equipment is kept separate from pipework and fittings during transport.

8 Pipework and fittings are kept above the vehicle floor and pipes are end capped. Small fittings are kept in their original protective wrappings or in clean polythene bags.

9 Used/soiled equipment is thoroughly cleaned and disinfected before being returned to use.

10 Each vehicle carries hand washing facilities, preferably soap and water, but waterless hand cleaner and paper towels may be used.

11 Tankers and bowsers may be kept in a "ready condition" provided there is a suitable regime of turnover and sampling or periodic disinfection and sampling, and that the appropriate records are maintained.

12 If not stored in a state of readiness, tankers, static tanks, and bowsers should be left drained and stored in area where the risk of external contamination is minimised, and if tanks and the equipment and fittings used for loading and unloading water are not used for the transport of drinking water for a period of 30 or more days, then before next being used to transport drinking water:

- the tank is be disinfected by filling with drinking water containing at least 5 mg/L FAC for not less than 30 minutes before discharging safely to waste; and
- equipment and fittings should be washed in water containing 5mg/L FAC.

13 Tankers, static tanks, and bowsers should be able to be locked to prevent unauthorised access and be marked with a unique number for reference and audit.

14 All tankers, static tanks and bowsers are completely empty before filling.

15 All equipment (hoses, hydrants, and standpipes) used for filling are kept specifically for that purpose, stored appropriately, and cleaned and disinfected before use. The filling point is flushed and where necessary disinfected before use. Acceptable disinfection methods include the use of steam-cleaning equipment (supported by an appropriate method statement) and chlorine solutions. Where re-filling operations take place, they are arranged to ensure an air gap between the delivery hose and the water in the tank to prevent back-syphoning. If this is impractical then a double check valve is fitted in the re-filling device.

16 Appropriate arrangements and methods are in place to ensure suitable disposal of any chlorinated water.

17 Consider is given to nominated/designated filling points that can guarantee a rapid filling rate.

18 The filling point is regularly flushed to minimise any risk of deterioration in water quality.

19 All tanks and bowsers are checked for the expected chlorine residual at the point of use.

20 Access and filling points are locked and secured to prevent contamination.

21 Static tanks and bowsers should be clearly signed with "boil before use" notices. This is due to the risk of contamination from the vessel used by the consumer to carry water to the point of use.

22 The water carrier ensures there is backflow prevention or an adequate air gap in place when discharging drinking water from their tank.

23 Records are kept in accordance with DWQAR Requirements.

4.7 Abandoned mains and connections

Mains and connections which are no longer in service represent a significant risk to water quality if they are not fully decommissioned. Mains whose function is changed from carrying treated drinking water to partially-treated or raw water also represent a potential risk to water quality if procedures for their correct identification and labelling on records are not accurately and promptly updated.
An abandoned main is a main that has been permanently decommissioned and is not required for further use. A decommissioned main is a main that has been taken out of service either on a temporary but prolonged basis or pending abandonment.

Good Practice

1. As soon as practicable after a main has been taken out of service for abandonment, all live connections are physically separated from any abandoned pipework remaining in situ (a closed valve is not sufficient). Valves between live and abandoned mains are removed where possible, but as a minimum are fitted with a blanking plate (and thrust block where necessary), buried in the closed position and the surface box removed.
2. Where abandonment of mains creates a potential for poor turnover the need for a scour point is considered at the end of the live main.
3. Valves and hydrants on abandoned mains are removed where possible or buried and the surface boxes removed.
4. Abandoned or decommissioned fire-hydrant markers are removed.
5. Where a main is in service but a hydrant is no longer required, the hydrant (and any branch pipe) is removed as close to the main as practicable or alternatively converted to a scour point.
6. Abandoned service pipes are isolated by closing and removing the ferrule. A closed stop-tap is not a satisfactory long-term solution.
7. The details of all abandoned assets are recorded promptly in records and using GIS.
8. Mains whose function is changed from carrying potable water to non-potable water (i.e.: partially treated, blended or raw water mains) are clearly identified on records and GIS. Any services connected to such mains are identified and transferred to a treated drinking water supply main prior to such change in function.

5 Chlorine Solutions

5.1 Preparation

Chlorine is an effective disinfectant for most bacterial and viral pathogens. The effectiveness of prepared chlorine solutions for use in water hygiene procedures is dependent upon the concentration of the active form of chlorine (e.g.: hypochlorous acid where hypochlorite salts are used) which is influenced by age of product and storage conditions.

Good Practice

1. Appropriate health and safety procedures are employed when using concentrated chlorine-based solutions, powders, and tablets.
2. Chlorine-based solutions and tablets are not to be used after the stated “expiry date”. Procedures are in place to ensure that diluted chlorine solutions (for use for example in spray chlorination techniques) are used within a stated time to ensure their effectiveness. Procedures are in place to ensure effective stock rotation.
3. Chlorine-based solutions are stored in dedicated and clearly marked containers. Storage sites have sufficient bunding to prevent accidental spills affecting a wider area. Containers previously used for the storage of any other products are not to be used.
4. “Ready reckoner” tables or similar are available for operational field staff in the preparation of chlorine-based solution.
5. Newly prepared solutions are made available at least weekly, and the old solution disposed of after de-chlorination neutralising.

5.2 Disposal of solutions and chlorinated water

Good Practice

1. Care is taken when disposing of water containing chlorine, particularly strong solutions used for the disinfection of water mains and fittings. Chlorine is toxic to aquatic flora and fauna. Chlorine may also inactivate the biological process necessary for effective sewage treatment.
2. Chlorine solutions and chlorinated water is not discharged to water courses, without obtaining appropriate consents, meeting permitted conditions, or gaining consent from the regional council, and de-chlorinating appropriately. Care is taken to ensure that surface and land drains do not discharge to water courses.
3. Chlorine solutions and chlorinated water may be discharged to foul drainage systems. A risk assessment should be carried out prior to doing so in order to confirm that the receiving sewage treatment works will not be adversely affected.
4. De-chlorination of water is completed prior to disposal.
5. De-chlorination solutions, powders and tablets are not used after the stated “expiry date”.
6. Discharge to waterways is carefully controlled to prevent erosion and scouring.

6 Documentation and Record Keeping

Good Practice

1. Training, immunization, and competency records for all personnel working on the drinking water supply network are documented and available for inspection on request and are updated on an annual basis.
2. Records of contamination risk assessments for all work activities are clearly documented and available onsite and following completion of work for auditing and assurance purposes.
3. Storage facility inspection, cleaning, and disinfection records that align with the Water Storage Management Plan requirements (see Rule D3.12 in Table 1) are documented for auditing and assurance purposes. Frequency of inspections and maintenance activities is actively monitored and trended, and any overdue work is elevated to senior management level for visibility.
4. Written disinfection procedures are available onsite, and documentation is completed to verify compliance with the disinfection procedures completed.
5. Where water quality clearance is required, documentation is completed and available to verify that water quality clearance has been received, what the results of the tests are, and the personnel signing off that the water quality is acceptable for reinstating service to consumers.
6. Periodic auditing is carried out within each team to verify that work procedures align with the expectations of this Code of Practice. Audit results are communicated to the Regulatory Services team to support annual assurance reporting to Taumata Arowai.
7. External auditing is carried out for additional assurance and continuous improvement purposes.

7 Supporting Information

7.1 Related Documents

Document number	Title
STD_0002	Regional Specification for Water Services

7.2 Regulation, Legislation and Standards

Drinking Water Quality Assurance Rules 2022
Water Services Act 2021
Water New Zealand Hygiene Practices to Prevent Water Supply Contamination 2019
AS/NZS 4020:2018 Testing of products for use in contact with drinking water

7.3 Document owner

Document Owner	Safe Drinking Water Committee
Document Author	Chief Advisor Drinking Water

7.4 Implementation

Implementation date	25 Feb 2025
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