

# ***HarbourTown Water Supply***

## ***Water Safety Plan***

Version 4 – July 2017

Prepared by: Seaview District Council

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Approved by: \_\_\_\_\_  
Drinking Water Assessor

## **1. Consultation and Review**

This WSP was prepared using existing Council documents and records, including the Draft District 4 Waters Activity Management Plan.

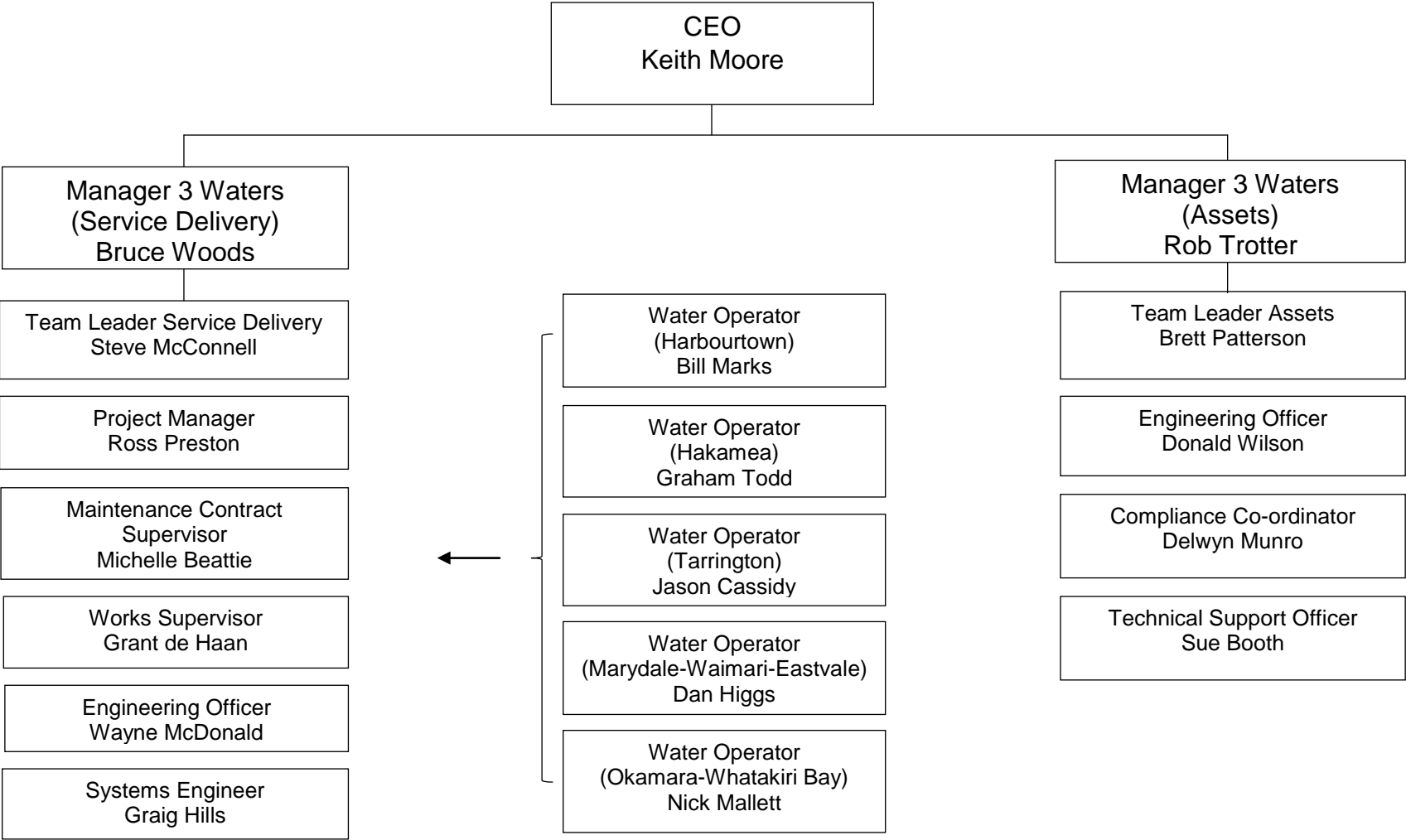
Plan preparation has involved Council's service delivery and asset management staff, along with staff who undertake day to day operation and maintenance of the water supplies.

Following the Salmonella outbreak in March 2017, the Council Infrastructure Committee voted to maintain the chlorination treatment permanently on the supply. This decision was made due to public health risks and therefore it was not considered necessary to consult the Harbourtown community on this decision. A public meeting was held in April 2017 to explain the decision making process.

The WSP was not due for re-approval by the DWA until 2018, however changes have been made to the supply following the Salmonella outbreak and the WSP significantly updated and enhanced, therefore it was considered appropriate to formally re-submit the WSP.

The WSP will be reviewed annually by the service delivery and asset management staff, examining the performance of the WSP, checking to see if anything has changed with the water supply that would necessitate a review of the supply risks and the progress of improvements listed in the schedule will be updated. The review will include examining any adverse incidents / events that have occurred and determining why risk management measures outlined in the WSP did not prevent these events. A record of this review will be maintained by the Asset Manager. The WSP will be formally submitted for review and reassessment to the Drinking Water Assessor every 5 years (from the date of approval).

**SEAVIEW DISTRICT COUNCIL**  
**ORGANISATIONAL CHART (3 WATERS)**



### **3. General Description**

Harbour Town Water Supply provides groundwater to the town and an additional rural residential subdivision (New Harbour) located to the east.

The source water comes from 4 secure bores located over two sites, one to the east of Main street and a second site near the entrance to the New Harbour subdivision. The original site has three bores (1,2 and 3) of similar depth (approximately 50m), these extract into a single suction tank and from there to the treatment plant to be treated by UV before being pumped to the main reservoir. The UV unit is an older style un-validated one (with UVI sensor) but it is not necessary for protozoa compliance because of the secure groundwater status of the bores. Despite the secure status for the bores the UV unit has continued to operate as a carry over from a suspected contamination event 15 years ago. The New Harbour site has one bore (Bore #4) screened at 55m. The bores were given multiple bore status in 2011. Each site has a reservoir.

The control system is linked to the Council's Supervisory Control and Data Acquisition (SCADA) system but only alarms for reservoir level and pump outage.

Harbour Town is currently registered for 7,300 people making it a Medium supply. The town is considered an attractive retirement destination for the surrounding rural catchment and has several retirement homes. Greenwoods school camp on the outskirts is a popular destination for schools from around the wider district.

The supply is owned, managed and operated by Seaview District Council. Some reticulation maintenance is contracted out to approved contractors, such as AssetCare.

### **4. History**

The water supply for Harbour Town was built in the early 1950s to replace the multiple private bores that originally served the town. Water meters were installed in 1993 to help manage peak water consumption and operating costs. Water usage prior to 1993 was extremely high. The supply usually has a good compliance history. Several years ago there was a suspected outbreak of salmonella associated with the supply, no definitive source of potential contamination was found and many of the community doubted the link to water at the time and resisted the idea of introducing permanent chlorination to the supply. Improvements to the boreheads allowed the bores to all gain security status.

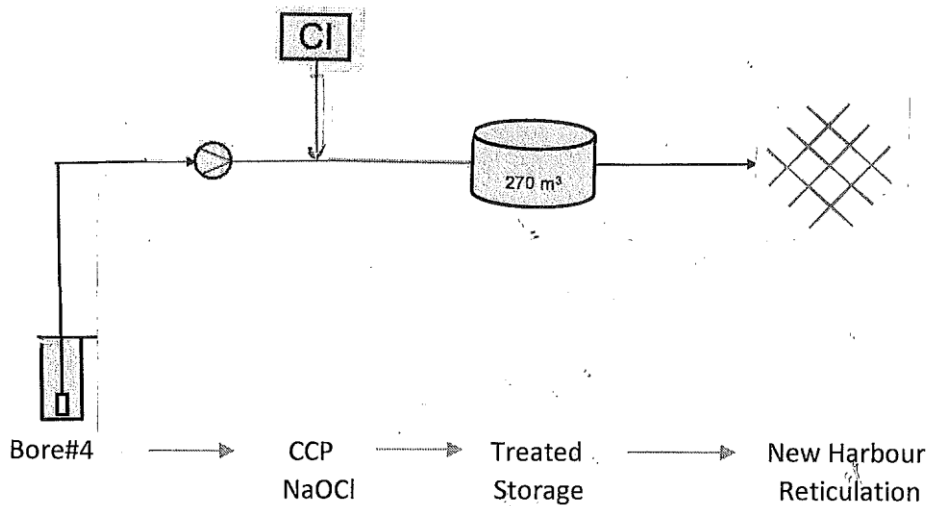
In March 2017, a Salmonella outbreak was caused by contaminated water entering Bore #5, at the New Harbour site. Investigative work that was completed in response to the outbreak determined that there were issues with the integrity of the casing material for Bore #5 which allowed shallow water to mix with the deeper water at the abstraction depth. Bore #5 was removed from the network in March 2017 and fully decommissioned / capped by Smiths Well Drillers in May 2017.

Chlorination via sodium hypochlorite was initially introduced during the outbreak as a temporary measure. The Council Infrastructure Committee voted to maintain the chlorine as a permanent treatment at both treatment plant sites in order to ensure that Council were taking all steps to mitigate the risk of unsafe water and protect public health.

## 5. Flow Chart / Schematic

Figure 1: Schematic of New Harbour and Harbour Town

### New Harbour



### HarbourTown

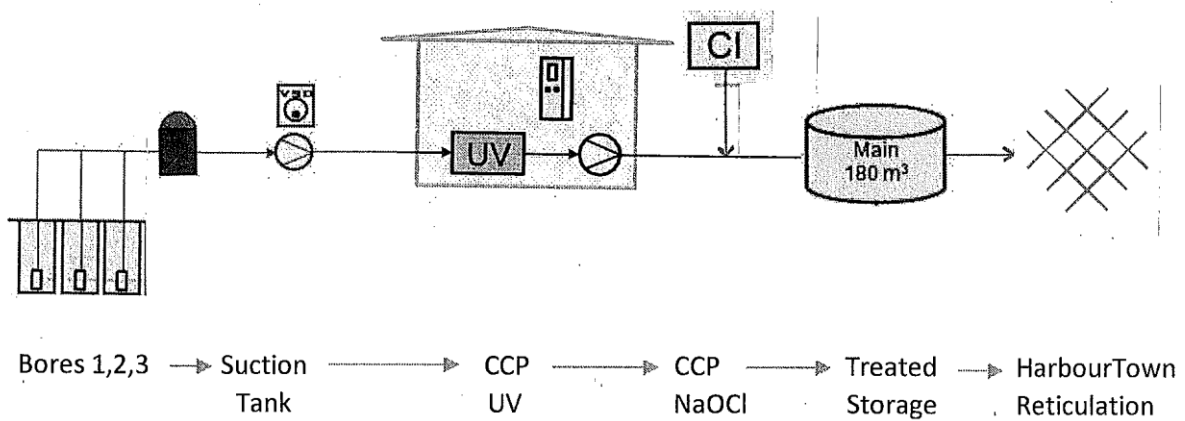
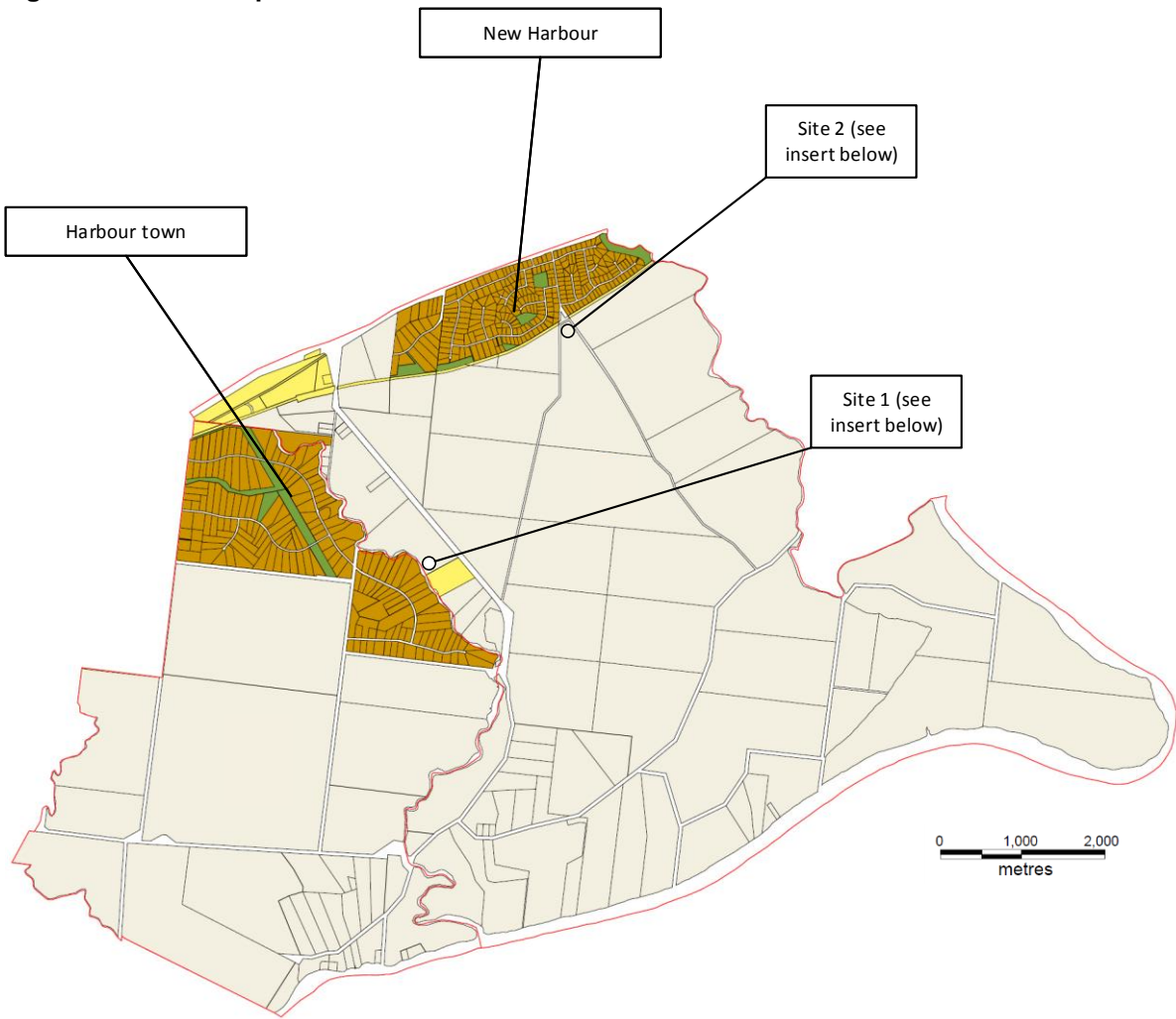
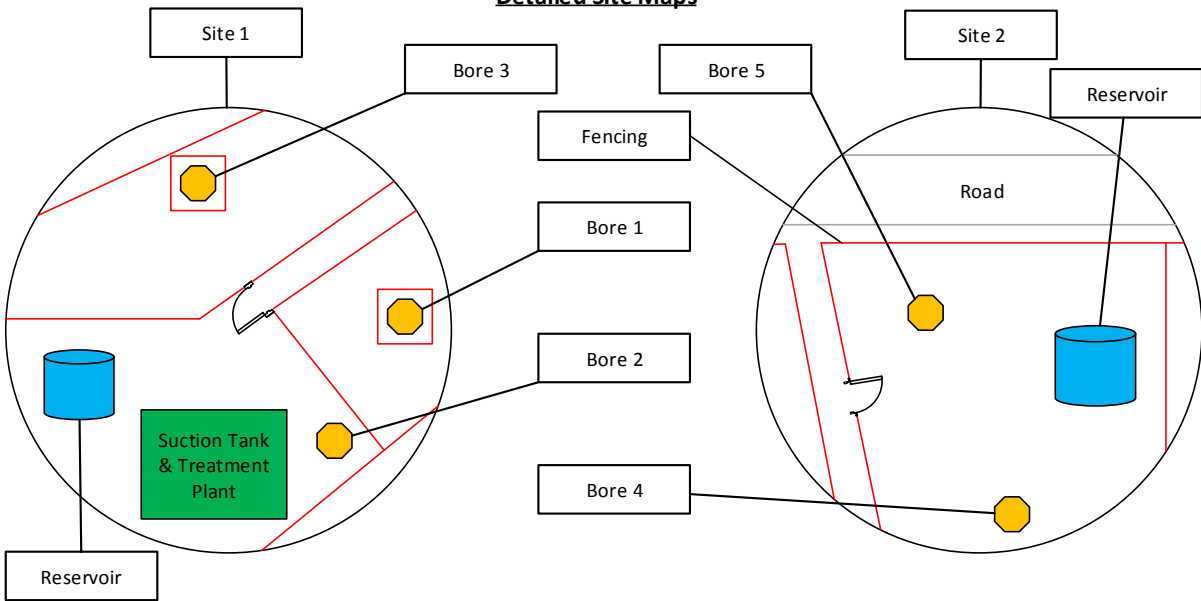


Figure 2 shows the location of source extraction points and distribution zones.  
**Figure 2: Source Map**



**Detailed Site Maps**



## 6. Critical Points / CCPs for Hazard Management

**Critical points** where hazards can be eliminated, minimised or isolated are tabulated below.

Critical Point	Comments
Catchment	Secure groundwater. Source protection zones in place under the regional council plan.
Bore	Failure of the bore pump would prevent abstraction of water for supply but two sites provides good backup.
Treatment	UV provides additional barrier for bores 1,2 and 3 (but is unvalidated) <b>(CCP1)</b> Disinfection by sodium hypochlorite provides a barrier for bacteria and viruses at both treatment plants <b>(CCP2)</b>
Reservoir	The reservoirs are a potential point where water could become contaminated.
Booster pump	Failure of the booster pump would compromise ability to maintain supply.

## 7. Barriers to Contamination

**Barriers to contamination** include:

### 1) Protection of the quality of the raw water source

Water is abstracted from a depth of around 50m for all four bores. Source water residence time testing of bore 4 in 2010 showed that the aquifer source met the DWSNZ bore water security criterion 1. Being of similar depth to the original 3 bores and having a continuous aquitard across the area of the two extraction points, multiple bore status was given by the DWA following a report by D.Odgy Consultants. The bores are protected by rules in the Regional Council's plan that control changes of land-use and discharges within the community water supply protection zones.

### 2) Removal of chemical and microbiological determinands by physical means

No filtration step is required for the secure sources, adequate filtration is provided by the soils that the water passes through in reaching the secure aquifer.

### 3) Inactivation of pathogenic micro-organisms by disinfection processes

Treatment by UV provides an additional barrier to the Harbour Town bores but really is not needed because the 4 bores are all considered to be secure. The UV remained in place following confirmation of security status for the bores because the community wanted it retained, it is acknowledged in this plan as an additional barrier. Chlorination via sodium hypochlorite was introduced in 2017 and provides an effective barrier against bacteria and viruses.

### 4) Prevention of contamination of water while it is in the reticulation network

The following measures contribute to provision of an effective **barrier against contamination** of water following treatment:

#### **Maintenance and Training**

- All maintenance is undertaken by trained and experienced personnel.
- Staff are aware of importance of hygiene and disinfection procedures for working on the water reticulation.



***Reticulation***

- Service plans are maintained by Council and copies held by the maintenance contractor. Plans are readily available to third parties working in proximity to water services. A water main location service is available.
- Provisions are established to recover full cost of repairs to water services should damage occur.
- A minimum chlorine residual of 0.2mg/L is maintained in the distribution network

***Reservoir***

- Reservoirs are covered and secured to prevent unauthorised access, ingress of rainwater or contaminants, and to exclude birds and vermin.
- Reservoirs are visually inspected (external) to confirm integrity against contaminant entry and identify any obvious damage or deterioration.
- Reservoir inspection and maintenance programme, condition assessment, and cleaning as applicable to site and materials construction.

***Backflow Prevention***

- Building consent applications are assessed with respect to backflow risks.
- All domestic connections are fitted with a non-testable backflow prevention device.
- A backflow protection policy for all connection types is now in place. This includes a risk based requirement for backflow protection measures to be installed and maintained on customer connections.
- Fire hydrants prohibit to be used for any other purpose unless specifically permitted.

**8. Photographs**



**Photo 1: Bore 2 chamber**



**Photo 2: Bore 2 headworks**

## CCP 1: Ultraviolet Disinfection (HarbourTown Plant only)

### Process objectives:

1. Provide a disinfection Critical Control Point to inactivate bacterial, viral and protozoan pathogens.

<b>Operational day-to-day monitoring of control process:</b>	
What	<ul style="list-style-type: none"> <li>• Maintain UV intensity at 123 W/m<sup>2</sup> (to give dose of 40 mj/cm<sup>2</sup> at flow no greater than 150m<sup>3</sup>/hr)</li> <li>• Turbidity &lt;1 NTU</li> </ul>
When	<ul style="list-style-type: none"> <li>• Daily</li> </ul>
Where	<ul style="list-style-type: none"> <li>• From the UV intensity display on UV unit</li> </ul>
How	<ul style="list-style-type: none"> <li>• Continuous UV sensor</li> <li>• Continuous NTU meter</li> </ul>
Who	<ul style="list-style-type: none"> <li>• Operator</li> </ul>
Records	<ul style="list-style-type: none"> <li>• SCADA historian and log book</li> </ul>

<b>Process performance criteria at the operational monitoring point:</b>	<b>Correction if performance criteria are not met:</b>
<b>Target:</b> <ul style="list-style-type: none"> <li>• UV intensity 130 W/m<sup>2</sup></li> <li>• NTU: &lt;1.0</li> </ul>	<ul style="list-style-type: none"> <li>• Operator to check pre filtration operating normally and adjust flow or correct/replace filters. Perform reactor sensor and lamp checks during routine checking procedures. Check UVT and or raw water quality.</li> </ul>
<b>Action Limits:</b> <ul style="list-style-type: none"> <li>• UV intensity 125 W/m<sup>2</sup></li> <li>• NTU: &gt;1.0 (&gt;15min)</li> </ul>	<ul style="list-style-type: none"> <li>• Duty Operator to respond by adjusting/maintaining reactor so that target dose achieved. Adjust/maintain pre filtration barrier to achieve target NTU. Reduce flow.</li> <li>• Duty Operator to notify Duty Supervisor.</li> </ul>
<b>Critical Limits</b> <ul style="list-style-type: none"> <li>• UV dose: 123W/m<sup>2</sup></li> <li>• NTU &gt; 2.0 (&gt;3m)</li> </ul>	<ul style="list-style-type: none"> <li>• Duty Operator to shut down affected reactor and switch to standby. Service lamp pre filter.</li> <li>• Duty Operator to notify Duty Supervisor.</li> <li>• Supervisor initiate transgression incident response if water has entered reservoir/distribution.</li> </ul>

### Supporting programs:

1. Monthly monitoring instrument checking and calibration by Operator as necessary.
2. Monthly Operator check of currency of reagents and discarding of outdated reagents.
3. Training and competency assessment of Operator in UV reactor performance and turbidity monitoring of drinking water.
4. Lab verification checks for *E. coli* and total coliforms with transgression reporting to Operator and Public health Unit.
5. Raw water chemistry sampling programme (colour, iron, manganese, hardness).

## CCP 2: Disinfection by Chlorination (both plants)

### Process objectives:

1. Provide a **disinfection Critical Control Point** to inactivate bacterial, viral and most protozoan pathogens that may have entered upstream of dosing point.
2. Provide a **residual disinfection Quality Control Point** to help inactivate pathogens entering downstream of the dosing point.

<b>Operational day-to-day monitoring of control process:</b>	
What	<ul style="list-style-type: none"> <li>Free available chlorine (FAC) concentration of 1 mg/L</li> </ul>
When	<ul style="list-style-type: none"> <li>Daily</li> </ul>
Where	<ul style="list-style-type: none"> <li>At sample point post reservoir (both sites)</li> </ul>
How	<ul style="list-style-type: none"> <li>HACH portable Cl meter</li> </ul>
Who	<ul style="list-style-type: none"> <li>Operator</li> </ul>
Records	<ul style="list-style-type: none"> <li>Plant logbook</li> </ul>

<b>Process performance criteria at the operational monitoring point:</b>	<b>Correction if performance criteria are not met:</b>
<b>Target Range:</b> <ul style="list-style-type: none"> <li>FAC: 1 to 1.2 mg/L</li> </ul>	<ul style="list-style-type: none"> <li>Operator to adjust dosing system to achieve target range if identified as outside of target range during routine checking procedures or if system indicates outside of target range.</li> </ul>
<b>Action Limits:</b> <ul style="list-style-type: none"> <li>FAC:               <ul style="list-style-type: none"> <li>&lt; 0.5 mg/L</li> <li>&gt; 2 mg/L</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Duty Operator to respond by adjusting dosing to within targets.</li> <li>Duty Operator to notify Duty Supervisor.</li> </ul>
<b>Critical Limits</b> <ul style="list-style-type: none"> <li>FAC:               <ul style="list-style-type: none"> <li>&lt; 0.2 mg/L</li> <li>&gt; 5 mg/L</li> </ul> </li> <li>pH:               <ul style="list-style-type: none"> <li>&gt; 9.0 (&gt; 15 m)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Duty Operator to isolate the supply and run off storage until rectified and until back within critical limits.</li> <li>Duty Operator to notify Duty Supervisor.</li> <li>Duty Supervisor to trigger Chlorine Exceedance Protocol and notify Executive and DHB if inadequately disinfected water needs to be supplied or has been supplied.</li> </ul>

### Supporting programs:

6. Daily checking of portable chlorine meter (with secondary standards) and calibration by Operator as necessary.
7. Monthly Operator check of currency of reagents and discarding of outdated reagents.
8. Training and competency assessment of Operator in free chlorination of drinking water.
9. Only utilise potable water grade chlorine stock solution from approved supplier.
10. Lab verification checks for *E. coli* and total coliforms (monthly at TP, 13-16 per quarter in zone) with transgression reporting to Operator and DHB if results are outside DWSNZ.

## Risk Assessment Worksheet – Catchment and Intake

<i>List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)</i>			<i>Is this under control? How will you know when an event occurs?</i>		<i>If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.</i>			<i>What could be done to improve?</i>
Ref	Risk Event	Potential Cause of Risk Event	Measures in Place to Control and/or Identify Risk Event	Controlled? Yes / No / Partial	Likelihood of Risk Event	Consequences of Risk Event	Risk Level, Urgent Attention Required?	Additional Measures to Control Risk Event
C1	Microbiological contamination of source water	Contaminant entry via recharge zone or other aquifer access point	Secure groundwater. Non-secure bore #5 removed from network.	Yes	Unlikely	Minor	Low	Education of other well owners / property owners to ensure that there is good awareness of being located within the source catchment. Work with regional council on catchment protection zones.
		Contaminant entry via well head	Bore heads are secure and are visually checked six monthly (note need to reconfirm GW Crit 2 urgently for DWSNZ compliance)	Partial	Unlikely	Major	Moderate	Reconfirm bore-water security criteria 2 by reassessment of Wellheads 1,2,3,4
C2	Chemical contamination of source water	Contaminant entry via recharge zone or other aquifer access point.	Security gives some protection. Annual full suite chemical monitoring at sources.	No	Likely	Minor	Moderate	Implement requirements of Priority 2 determinand identification guide to prioritise chemicals and test in accordance with that programme
C3	Insufficient water available	Damage to well head – natural hazards, eg flooding or vandalism	Location of well head/pump means this is unlikely to sustain damage due from natural hazards or vandalism	Yes				
C4	Insufficient water	Bore pump failure or power	Provision for portable	No	Likely	Minor	Moderate	Install SCADA alarms to signal power

<i>List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)</i>			<i>Is this under control? How will you know when an event occurs?</i>		<i>If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.</i>			<i>What could be done to improve?</i>
Ref	Risk Event	Potential Cause of Risk Event	Measures in Place to Control and/or Identify Risk Event	Controlled? Yes / No / Partial	Likelihood of Risk Event	Consequences of Risk Event	Risk Level, Urgent Attention Required?	Additional Measures to Control Risk Event
	available	supply interruption.	generator					supply interruption or pump fault  Review the need to hold a spare bore pump
C5	Insufficient water available (New Harbour)	New Harbour site -one bore only after decommissioning of Bore #5	New Harbour connections can be supplied from Harbortown if required	No	Possible	Minor	Moderate	Investigate options for new bore at New Harbour site

## Risk Assessment Worksheet – Treatment

<i>List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)</i>			<i>Is this under control? How will you know when an event occurs?</i>		<i>If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.</i>			
Ref	Risk Event	Potential Cause of Risk Event	Measures in Place to Control and/or Identify Risk Event	Controlled? Yes / No / Partial	Likelihood of Risk Event	Consequences of Risk Event	Risk Level, Urgent Attention Required?	Additional Measures to Control Risk Event
T1	Failure to remove chemical contaminants from raw water	No treatment	No known chemical contaminants in source water (i.e. no P2 determinands).	No	Possible	Minor	Moderate	Cannot implement treatment based control measures to deal with all potential contaminants.  Monitor source water annually to identify potential contaminants.
T2	Failure to remove/treat bacterial contaminants in raw water	Loss of security	Currently secure ground water  Portable chlorine dosing system available to respond to contamination events.	Yes	Likely	Minor	Moderate	
T3	Failure to remove/treat bacterial contaminants in raw water	UV not operating properly	Routine inspections, renewal of lamps as required. Checking of UV intensity regularly and operated as per original operations manual	Yes	Possible	Minor	Moderate	Consider replacing turbidity meter
T4	Inadequate protozoa removal/inactivation	Loss of security  UV not operating properly	Currently secure ground water UV not required for compliance but operated as per original operations manual.	Yes	Unlikely	Minor	Low	
T5	Failure to remove/treat	Chlorine supply runs out	Reputable supplier Regular ordering before	Yes	Unlikely	Major	High	Consider installing online continuous FAC monitoring with alarm and linked



	bacteria/viruses in raw water		supply runs out Operator checks level daily					to SCADA
T6	Failure to remove/treat bacteria/viruses in raw water	Chlorine dose pump fails	Regular maintenance programme Daily operator checks Spare dose pump available at Council works depot	Yes	Unlikley	Major	High	Consider having spare dose pump onsite  Review SOPs
T7	Failure to remove/treat bacteria/viruses in raw water	Chlorine dosing line fault	Regular maintenance programme Daily operator checks of FAC at plant	Yes	Unlikley	Major	High	Review SOPs
T8	Supply is overdosed with chlorine	Chlorine dosing fault	Dose rate is set Daily operator checks of FAC at plant	Yes	Unlikely	Minor	Low	Review SOPs
T9	Water is not treated	Power failure	Supply will shut-down (cannot gravity feed) Generator plug in point available at both treatment plants Portable generators at Council works depot	Yes	Possible	Minor	Moderate	Review SOPs
T10	Failure to remove/treat bacteria/viruses in raw water	Chlorine contact time	>30 minute contact time in reservoirs Possible short circuiting as single unbaffled inlet/outlet	Yes	Unlikley	Major	Moderate	Investigate possible short-circuiting in reservoirs

## Risk Assessment Worksheet – Storage and Distribution

<i>List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)</i>			<i>Is this under control? How will you know when an event occurs?</i>		<i>If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.</i>			
Ref	Risk Event	Potential Cause of Risk Event	Measures in Place to Control and/or Identify Risk Event	Controlled ? Yes / No / Partial	Likelihood of Risk Event	Consequences of Risk Event	Risk Level, Urgent Attention Required?	Additional Measures to Control Risk Event
S1	Introduction of contaminants into the distribution system	Backflow from customer connections	<p>Non-return valves on all connections.</p> <p>FAC residual of 0.2mg/L minimum maintained in reticulation</p> <p>Documented rules governing new connections requiring non-return valves. Draft backflow prevention policy under development</p>	Yes				Full implementation of backflow prevention policy
S2	Introduction of contaminants into the distribution system	<p>Operation and maintenance activities</p> <p>Pipe materials, age and condition, plumbosolvency</p>	<p>Operators follow hygiene practices to minimise risk.</p> <p>Council provide guidance to consumers relating to plumbosolvency.</p>	Partial	Possible	Minor	Moderate	<p>Document existing hygienic repair practices (SOP) and implement new procedures if necessary.</p> <p>SOP for portable disinfection unit</p>
S3	Failure to maintain adequate FAC residual	Inadequate dosing	<p>Refer Risks T5-T8</p> <p>FAC residual checked by sampling contractor during E.coli compliance sampling</p>	Yes	Possible	Minor	Moderate	Review processes for notification from sampling contractor to Service Delivery Team if FAC low
S4	Introduction of micro contaminants into the distribution system	Contamination at reservoir	Reservoir is visually checked six monthly (informal)	Partial	Possible	Minor	Moderate	More frequent documented inspections SOP for checking and cleaning reservoirs

<i>List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)</i>			<i>Is this under control? How will you know when an event occurs?</i>		<i>If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.</i>			
<b>Ref</b>	<b>Risk Event</b>	<b>Potential Cause of Risk Event</b>	<b>Measures in Place to Control and/or Identify Risk Event</b>	<b>Controlled ? Yes / No / Partial</b>	<b>Likelihood of Risk Event</b>	<b>Consequences of Risk Event</b>	<b>Risk Level, Urgent Attention Required?</b>	<b>Additional Measures to Control Risk Event</b>
S5	Insufficient water	Reservoir or water main failure	Reservoir is visually checked six monthly	No	Likely	Negligible	Moderate	Review and update condition assessments regularly. Install SCADA monitoring for reservoir level.

## Risk Assessment Worksheet – Other

<i>List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)</i>			<i>Is this under control? How will you know when an event occurs?</i>		<i>If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.</i>			
Ref	Risk Event	Potential Cause of Risk Event	Measures in Place to Control and/or Identify Risk Event	Controlled? Yes / No / Partial	Likelihood of Risk Event	Consequences of Risk Event	Risk Level, Urgent Attention Required?	Additional Measures to Control Risk Event
O1	Incorrect water quality data used for supply management (failure to identify adverse water quality)	Inappropriate/inadequate/ incorrect sampling, analysis and reporting	Council engage contractor to carry out sampling and analysis according to a sampling manual.  Contractor's staff are required to undertake training for taking and handling water samples	No	Possible	Minor	Moderate	Review annual sampling programme in consultation with DWA. (July/August)
O2	System does not perform as intended	Incorrect operation, inadequate maintenance  Inadequate skills or training	Operations staff are experienced and have a sound knowledge of systems.  Some drawings, manuals and reference material are kept on site and/or in operations vehicles.  Basic visual inspections are programmed fortnightly and detailed inspection 6 monthly  Key plant records (volumes, flows, pump hours, etc) are made in site log book during programmed and other site visits.  Asset Management System (AMS) used for programming and monitoring regular maintenance and inspection/ monitoring tasks.	No	Possible	Minor	Moderate	Prepare Operation and Maintenance Manuals including routine operation procedures, preventative maintenance task, inspections, monitoring, record keeping, and instrument calibration.  Review maintenance contract requirements with operations contractor.

<i>List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)</i>			<i>Is this under control? How will you know when an event occurs?</i>		<i>If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.</i>			
<b>Ref</b>	<b>Risk Event</b>	<b>Potential Cause of Risk Event</b>	<b>Measures in Place to Control and/or Identify Risk Event</b>	<b>Controlled? Yes / No / Partial</b>	<b>Likelihood of Risk Event</b>	<b>Consequences of Risk Event</b>	<b>Risk Level, Urgent Attention Required?</b>	<b>Additional Measures to Control Risk Event</b>
O3	System damaged or contaminated by construction/ maintenance work	Inadequate controls on construction and maintenance work	All maintenance is undertaken by trained/authorised Council staff or contractors.  Construction work is appropriately supervised.  As-constructed records are maintained and made available to all parties working on or in vicinity of system.  Inspect third party work to ensure no damage to water services.	No	Possible	Minor	Moderate	Keep service plan records up to date.
O4	Failure to sustainably manage supply	Costs exceed ability of community to pay	Costs are tracked and rates reviewed regularly.	Partial	Possible	Minor	Moderate	Review options for connection to another supply. Consult with community.

## 9. Improvement Planning

The following Improvement Schedule has been derived from the Risk Tables presented above and is prioritised according to the assessed level of public health risk associated with hazards that are not adequately controlled at present. The proposed improvements will provide public health benefits by reducing the risk of adverse health outcomes associated with poor drinking water quality.

No high to extreme risks have been identified with this small water supply delivering untreated, unchlorinated secure groundwater. Some potential issues around reliability could be addressed through provision of redundancy (duty/standby booster pumps), monitoring (SCADA) or emergency power supply.

The Improvement Schedule is presented in two sections:

### ***Part I: Major Projects and Capital Works***

These projects will generally provide the greatest benefits in terms of addressing public health risks but typically require high levels of funding that may not be realistic for the communities involved. SDC operate a targeted rating system such that costs associated with this water supply are borne by those ratepayers with connections to the supply. This is currently out for public consultation to have to this changed to a “one rate” rating system.

Implementation of these improvements will be subject to consultation through the Long-Term Council Community Plan (revised every three years). It may be necessary to review and revise how the WSP and Improvement Schedule will work towards achieving compliance and the communities agreed position.

### ***Part II: Management and Operational Improvements***

These improvements will generally not provide the same degree of risk reduction as the proposed capital works upgrades but collectively they contribute to providing and maintaining effective barriers to contamination and can often be undertaken within existing operational budgets. These works are prioritised on the basis of the risk level identified and budget/resource availability.

### ***Prioritisation***

The priority for implementation is initially based on the identified risk level as follows:

Extreme risk	=	Priority 1
Very High risk	=	Priority 2
High risk	=	Priority 3
Moderate risk	=	Priority 4
Low risk	=	Priority 5

Priorities have then been modified (generally elevated) where improvement items are related or need to be sequenced together.

### ***Responsibility***

Those responsible for implementation of specific improvement items have been identified below:

AMWS	=	Asset Manager – Water Services
TLWS	=	Team Leader – Water Services
WWEWS	=	Water and Wastewater Engineer – Water Services
OMC	=	Operation and Maintenance Contractor

The OMC is responsible for some improvements because of the Operation and Maintenance Contract is a Network Outcomes Contract.

***Cost Estimates***

Cost estimates presented in this Improvement Schedule are intended to provide an indication of the typical cost associated with the item. In some instances there is no direct cost other than Council staff time.

***Timeframes***

The proposed timeframe for implementation reflects the assessed priority, anticipated funding arrangements and availability of resources. Some lower priority, low cost improvements may be completed at an earlier date where staff resources are available.

**Table 10.1: Harbour Town Water Supply Improvement Schedule - Part I**

Harbour Town Water Supply Improvement Schedule								
Upgrade ID	Priority	Risk Level	Water Supply Area	Reference to Risk Table	Details of Proposed Works	Person Responsible	Expected Cost	Intended date of Completion
IMP2	4	Moderate	Source	C5	Investigate new bore for New Harbour	AMWS	\$40,000	July 2018
IMP3	4	Moderate	Source	C1	Re-confirm DWSNZ security Criteria 2 for all boreheads 1, 2, 3 and 4	AMWS	\$20,000	August 2017
IMP4	4	Moderate	Source	C1	Re-confirm compliance with DWSNZ security Criteria 1 by re-aging bores 1,2,3 and 4	AMWS	\$8000	August 2017
IMP5	3	Hlgh	Plant	T5	Install online chlorine monitoring system linked to SCADA with alarms	TLWS	\$30,000	July 2019
IMP6	4	Moderate	Source	C2	Implement requirements of Priority 2 determinand identification guide to prioritise chemicals and test in accordance with that programme	AMWS	Staff time & \$5000	Dec 2018

**Table 10.2: Harbour Town Water Supply Improvement Schedule - Part II**

Harbour Town Water Supply Improvement Schedule - Part II: Minor Projects and Operational Improvements								
Upgrade ID	Priority	Risk Level	Water Supply Area	Reference to Risk Table	Details of Proposed Works	Person Responsible	Expected Cost	Intended date of Completion
IMP7	5	Low	Source	C1	Education of other well owners / property owners to ensure that there is good awareness of being located within the source catchment. Work with regional council on catchment protection zones.	AMWS	Staff time	Ongoing
IMP8	3	Moderate - High	Storage and Plant	S2, T6-T9	Document existing hygienic repair practices and implement new procedures if necessary. Review SOPs for treatment.  SOP for disinfection unit  SOP for checking and cleaning reservoirs	WWEWS	Staff time	July 2017
IMP9	4	Moderate	Plant	T10	Investigate possible short-circuiting in reservoirs	TLWS	Staff time	July 2018
IMP10	4	Moderate	Other	O2	Introduce better recording systems - Prepare Operation and Maintenance Manuals including routine operation procedures, preventative maintenance task, inspections, monitoring, record keeping, and instrument calibration.	WWEWS	Staff time	July 2017



## Harbour Town Water Supply Improvement Schedule - Part II: Minor Projects and Operational Improvements

Upgrade ID	Priority	Risk Level	Water Supply Area	Reference to Risk Table	Details of Proposed Works	Person Responsible	Expected Cost	Intended date of Completion
IMP11	4	Moderate	Storage	S5	Review processes for notification from sampling contractor to Service Delivery Team (to cover if FAC is low)	TLWS	Staff time	July 2017

## 2.1 Standard preventative actions

For the majority of the Council water supply schemes, the following risks are controlled. Where these risk are not controlled for a specific scheme, they have been included in the individual scheme risk tables.

Risk	Potential Cause of Risk event	Measures in place to Control and/or Identify Risk Event
Insufficient water available	Damage to well head from natural hazard, e.g. flooding.	Location of well head/pump means this is unlikely to sustain damage due to natural hazards.
	Drought, low river levels affecting surface water supplies	<ul style="list-style-type: none"> <li>No know history of the sources failing to provide the required quantity of water under adverse flow conditions.</li> <li>Some schemes also having monitored storage at headwork's, and consumers having onsite storage.</li> <li>Water use restrictions used where required</li> </ul>
	Damage to well head or intake structures from vandalism.	Well head/pumps are secured against unauthorised access and intake structures are located in remote locations.
	Power supply interruption preventing bore pump and/or treatment operating	<ul style="list-style-type: none"> <li>Reservoir levels monitored where scheme have reservoirs.</li> <li>Some schemes are gravity feed, therefore not requiring power supply</li> <li>Provisions for portable generator or alternative power supply on site</li> </ul>
Inadequate disinfection (Failure to remove chemical/bacterial/protozoa contaminant)	Treatment system inadequate, e.g. rain event causing increased level of turbidity in source water	<ul style="list-style-type: none"> <li>Some sources have secure status</li> <li>Where Chlorine is used, FAC testing carried out at treatment and in distribution points</li> <li>UV treatment monitored (UV dose only)</li> </ul>
	Incorrect Operation and Maintenance	<ul style="list-style-type: none"> <li>E.coli Monitoring</li> <li>Staff training</li> <li>Regular site visits and checks</li> <li>SCADA monitoring and alarms</li> </ul>
	Spill of hazardous substance / chemical and transgression in the Distribution zone	<ul style="list-style-type: none"> <li>Staff training</li> <li>Regular site visits and checks</li> <li>Backflow prevention devices installed for high risk properties</li> </ul>
Inability to access sites for operation/maintenance/emergency works	Flood, slip, bridge washout, snow fall or other hazard preventing vehicle access	<ul style="list-style-type: none"> <li>Access road are in good condition, and not generally vulnerable to natural hazards</li> <li>Operations staff are equipped with suitable vehicles</li> </ul>
	Inadequate easement / access agreements	Some land owned by Council, otherwise easements are in place.

## 2.2 Contingency Actions Events

<b>Event 1: Microbiological Contamination of water leaving treatment plant (or source for secure supplies)</b>
Indicators: Contamination may be observed by or reported to Council staff. May be indicated by reported illness among consumers, or could be picked up by E.coli compliance monitoring.
Corrective Measures: <ul style="list-style-type: none"><li>• Advise Drinking Water Assessor (DWA)</li><li>• Inspect headwork's and recharge zone (if applicable) to identify source of contamination and rectify if possible</li><li>• Commence daily E.coli testing of source, treatment plant and distribution zone</li></ul> If unable to fix problem (achieve three consecutive E.coli free days) continue with contingencies below
Contingency Actions: <ul style="list-style-type: none"><li>• Consider Issuing boil water notice.</li><li>• Consider installing emergency treatment system/use of portable chlorinator.</li><li>• Disinfect any contaminated reservoirs, refer to SOP - Reservoir Disinfection</li><li>• If any repairs are required, refer to SOP – Disinfection and Hygiene and Water Reticulation</li></ul>
<b>Event 2: Chemical Contamination of water leaving treatment plant (or source for secure supplies)</b>
Indicators: Contamination may be observed by or reported to Council staff. May be indicated by reported water quality concerns from consumers (taste, odour, colour) or illness among consumers.
Corrective Measures: <ul style="list-style-type: none"><li>• Advise Drinking Water Assessor (DWA)</li><li>• Take water samples and arrange urgent testing</li><li>• Inspect headwork's and recharge zone (if applicable) to identify source of contamination and rectify if possible</li></ul> If unable to fix problem and transgression continue with contingencies below
Contingency Actions: <ul style="list-style-type: none"><li>• Assess situation and advise customers regarding use/treatment/flushing of contaminated water.</li><li>• Arrange emergency water supply if necessary. Refer to SOP for further detail.</li><li>• Flush contaminated reservoirs and mains and disinfect as per SOPs.</li></ul>
<b>Event 3: Insufficient water available for abstraction and treatment</b>
Indicators: Low level faults from abstraction pump (SCADA alarm).
Corrective Measures: <ul style="list-style-type: none"><li>• Respond to alarm, assess situation and rectify if possible</li></ul> If insufficient water available for abstraction continue with contingencies below
Contingency Actions: <ul style="list-style-type: none"><li>• Assess situation and advise customers regarding conservative measure for water use. Refer to SOP for further details.</li><li>• Arrange emergency water supply if necessary. Refer to SOP for further detail.</li></ul>

<b>Event 4: E.coli transgression in distribution zone / Boil Water Notice situation</b>
<p>Indicators:</p> <p>Contamination may be observed by or reported to Council staff. May be indicated by reported illness among consumers, or could be picked up by E.coli compliance monitoring.</p>
<p>Corrective Measures:</p> <ul style="list-style-type: none"> <li>• Advise Drinking Water Assessor (DWA)</li> <li>• Water operator or Water Services Team leader to immediately check operation of treatment equipment (whether distribution zone or treatment plant failure). Rectify any fault if applicable.</li> <li>• Inspect headwork's and recharge zone and reservoir to identify source of contamination and rectify if possible. Check for possibility of backflow if distribution zone failure.</li> <li>• Distribution zone failure – review work request records to establish if any recent installation or repair work that may have introduced contamination</li> <li>• Commence daily E.coli enumeration testing of source / treatment plant and distribution zone if is less than 10 per 100ml. (refer flowchart in DWSNZ, Figure 4.2, p39 for distribution zone failure, or figure 4.1, pg 33 for treatment plant failure). Consider additional sampling sites to assist with investigation e.g. neighbouring properties. Review water testing results including turbidity to ensure no unexpected changes to raw water quality.</li> <li>• Implement more frequent checks of FAC residual at plant and in reticulation</li> <li>• If unable to fix problem (achieve three consecutive E.coli free days) continue with contingencies below</li> <li>• Refer to communications plan for alerts to the public where necessary: <u><a href="K:/WaterUtilities/Protocols/Communications/IncidentCommsPlanV2017">K:/WaterUtilities/Protocols/Communications/IncidentCommsPlanV2017</a></u> (Section 2.3 below has a brief summary)</li> <li>• For prolonged incidents consider activation of the emergency response protocol (CIMS structure)</li> <li>• Records: The incident should be recorded in the Drinking Water Online database, including actions taken.</li> </ul>
<p>Contingency Actions:</p> <ul style="list-style-type: none"> <li>• Consider Issuing boil water notice. A template Boil Water Notice can be found at the following location: <u><a href="K:/WaterUtilities/Protocols/Forms/BWNTemplatev22017">K:/WaterUtilities/Protocols/Forms/BWNTemplatev22017</a></u></li> <li>• Disinfect any contaminated reservoirs, refer to SOP - Reservoir Disinfection</li> <li>• If any repairs are required, refer to SOP – Disinfection and Hygiene and Water Reticulation</li> </ul>

<b>Event 6: Over Chlorination</b>
<p>Indicators:</p> <p>High FAC reported from treatment plant (from manual daily operator testing)</p>
<p>Corrective Measures:</p> <ul style="list-style-type: none"> <li>• Assess situation and advise customers regarding use/treatment/flushing of water. Refer to SOP for further details.</li> </ul> <p>If risk to potential risk to customers continue with contingencies below</p>
<p>Contingency Actions:</p> <ul style="list-style-type: none"> <li>• Flush system to remove water</li> <li>• Assess situation and advise customers regarding flushing of contaminated water. Refer to SOP for further details.</li> </ul>

<b>Event 7: Under Chlorination</b>
<p>Indicators:            Low FAC reported from treatment plant – currently with daily manual monitoring by operator</p>
<p>Corrective Measures:</p> <ul style="list-style-type: none"> <li>• Correct dosing at plant (refer to CCP2)</li> <li>• Assess situation and advise customers regarding use/treatment/flushing of water. Refer to SOP for further details.</li> <li>• Inspect treatment plant to identify cause of problem</li> <li>• If adequate treatment cannot be achieved continue with contingencies below</li> </ul>
<p>Contingency Actions:</p> <ul style="list-style-type: none"> <li>• If unable to achieve adequate treatment consider issuing boil water notice.</li> <li>• Assess situation and advise customers (refer to Communications Plan, located here: <a href="K:/WaterUtilies/Protocols/Communications/IncidentCommsPlanV2017">K:/WaterUtilies/Protocols/Communications/IncidentCommsPlanV2017</a>)</li> </ul>

## 2.3 Communications Plan

A Communications Plan for serious drinking water incidents has been developed by Seaview District Council based on the EPA drinking water advisory communication toolbox  
ref: [https://www.waternz.org.nz/Attachment?Action=Download&Attachment\\_id=2019](https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=2019))

**The full communication plan can be found here:**

- <K:/WaterUtilities/Protocols/Communications/IncidentCommsPlanV2017>

**The Communication Plan covers:**

- Preparation work
  - Improving coverage of electronic contact with consumers
  - Development of ARC GIS database for potable water schemes – to allow up to date access for water advisories / status of water restrictions / water outages etc
  - Identification of vulnerable consumers and high use connections
  - Factsheets on:
    - FAQs about E.coli and drinking water
    - FAQs about chlorination
- Initiating an advisory – who needs to be involved, preparation and distribution
  - Assembling the team (Water Assets Manager / Public Information Manager/Customer Services Representative)
  - Identifying the geographic boundaries to ensure clear message
  - Notifying internal staff / elected officials / external (including water carriers)
  - Developing and formatting the message
  - Identifying a council spokesperson
  - Implementing the distribution methods (social media, text message, website, door to door)
  - Public notification procedure including a standard template boil water notice: <K:/WaterUtilities/Protocols/Forms/BWNTemplatev22017>
  - Involving the media – including a press release template
- Lifting the advisory
  - Determining when the supply is safe
  - Debriefing requirements
  - Reporting requirements
  - Reviewing WSP