

North Western District and Western District Water Supply

Water Safety Plan

Organisation and Supply Details:

Community Name	North Western District (NOR013) Western District (WES014)
Supply owner/organisation name:	Waikato District Council
Prepared by:	CH2M Beca Ltd and Waikato District Council staff
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Signed off by Karl Pavlovich - Waters Manager

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1 Revision Details

This plan will be revised and submitted for approval before 1 March 2023.

Assessment of the Performance of the Plan

Assessment of the performance of the Water Safety Plan (WSP) will be undertaken annually. The assessment will consider any events, non-compliances, near misses and unexpected situations that have occurred, progress against the improvement schedule and any changes to any of the supply elements. Any matters requiring attention will be included into the Annual Plan, the Water Supply Activity Management Plan for and if requiring significant capital funding, the Council Long Term Plan.

Reporting of the Plan

A brief report on the performance of the WSP, including information from the assessment of the plan will be provided by the Compliance and Income Team Leader to the Treatment and Services Team Leader in February of each year. The report will cover the items listed in the assessment of the performance of the plan, listed above. The Treatment and Services Team Leader will be responsible for ensuring that any matters requiring attention will be appropriately included into the Annual Plan or the Water Supply Activity Management Plan. If significant capital funding is required the Treatment and Services Team Leader will include the matter into the Council approval process and the Council Long Term Plan.

Links to other Quality Systems

This WSP will be linked to the Annual Plan, the Water Supply Activity Management Plan and the Long Term Plan.

2 Introduction

This Water Safety Plan (WSP) has been prepared for the North Western District Zone - Waikato DC and Western District Zone - Waikato DC (WDZ's) drinking water supplies to identify potential events that present public health risks to the consumers of the drinking water supplies. Waikato District Council (WDC) is committed to the WSP and to the future improvements to the supply identified in this WSP.

This WSP covers two water supplies, the North Western District supply and Western District supply, both of which are supplied with water from the Hamilton City supply. The two supplies are operated and managed by the same organisation and in the same way. Because the supplies are essentially only distribution zones and the risks are very similar, both supplies are covered by this WSP.

The North Western supply was formerly referred to as Te Kowhai Rd, and the Western supply as Stonebridge. The WSP for the abstraction and treatment of water used in both supplies is the responsibility of Hamilton City Council (HCC).

Because both water supplies consist of distribution systems only, WDC will demonstrate compliance against Section 4.4 of the Drinking-Water Standards for New Zealand (DWSNZ).

The supplies are administered at the WDC offices in Galileo Street, Ngaruawahia and managed by the Waters Manager.

The management, maintenance and operation of the North Western District and Western District water supplies is the responsibility of:

- Waters Manager – Karl Pavlovich
- Treatment & Services Team Leader – Mark Curtis
- Treatment Supervisor – David Kennington
- Compliance and Income Team Leader – Jaime Wara
- Water Planning Team Leader – Richard Pullar

3 North Western District Supply Details

Table 1 Summary of North Western District Supply Details

Supply Details	
Supply Name	North Western District – Waikato DC
WINZ Community Code	NOR013
Supply Owner	Waikato District Council
Population Served by Supply	115 (WINZ register March 2016)
Source Details	
Source Name	Waikato River, Hamilton
Source WINZ Code	S00041
Type of Source	River
Depth of Bore	NA
Consent No.	113941
Grid Reference of Source (NZMG)	
Easting : 2713006	Northing : 6374633
Treatment	
Location	Waiora Terrace, Hamilton
Treatment Processes	Clarification; Filtration; Activated Carbon; Chlorination; UV
Average Daily Volume	55 Ml/day
Average Daily Volume to North Western District Zone (6 monthly average)	27 - 36 m ³ /day
Distribution Zone	
Distribution Zone Name	North Western District – Waikato DC
Distribution Zone WINZ Code	NOR013NO
Distribution Zone Population	115 (WINZ register March 2016)

4 Western District Supply Details

Table 2 Summary of Western District Supply Details

Supply Details	
Supply Name	Western District – Waikato DC
WINZ Community Code	WES014
Supply Owner	Waikato District Council
Population Served by Supply	33 (WINZ register March 2016)
Source Details	
Source Name	Waikato River, Hamilton
Source WINZ Code	S00041
Type of Source	River
Depth of Bore	NA
Consent No.	113941
Grid Reference of Source (NZMG)	
Easting : 2713006	Northing : 6374633
Treatment	
Location	Waiora Terrace, Hamilton
Treatment Processes	Clarification; Filtration; Activated Carbon; Chlorination; UV
Average Daily Volume	55 Ml/day
Average Daily Volume to Western District Zone (6 monthly average)	22 - 41 m ³ /day
Distribution Zone	
Distribution Zone Name	Western District – Waikato DC
Distribution Zone WINZ Code	WES014WE
Distribution Zone Population	33 (WINZ register March 2016)

5 Descriptions of North Western District Supply and the Western District Supply

Water is supplied to the North Western District and Western District supplies from the Hamilton City Council (HCC) water treatment plant at Waiora Terrace. A written agreement between HCC and WDC is in place for the supply and acceptance of potable water. This agreement states that HCC will supply a maximum of 5,000m³/day to the District (District includes North Western, Western and Southern Districts). Water is supplied from the HCC reticulation via two separate metered bulk mains, one to the North Western District supply and one to the Western District supply.

The HCC water treatment plant at Waiora Terrace sources water from the Waikato River before treating it prior to distribution. Treatment consists of clarification and filtration followed by chlorine and UV disinfection. Granulated activated carbon is also available for removal of cyanotoxins.

5.1 North Western District Supply

The North Western District supply was established in 1995 following the decommissioning of the standalone Te Kowhai water supply for economic reasons. Water is supplied to a distribution zone also called North Western District – Waikato DC which is made up of rural and lifestyle properties located around Ruffell Road and Te Kowhai Road. A change to the boundary between WDC and HCC has reduced the distribution zone size with the reticulation on Ruffell Rd and the lower section of Te Kowhai Rd becoming the responsibility of HCC. Figure 1 below shows the extent of the North Western District distribution network including the new location of the bulk meter.

WDC provides a restricted supply relying on the pressure provided by the HCC reticulation system to properties in the North Western District Supply. Each property is required to have an onsite storage tank. There are no storage reservoirs, booster pump stations on-line monitoring or telemetry in the supply.

5.2 The Western District Supply

The Western District supply was installed in 1996 to service semi-rural lifestyle properties of the Stonebridge subdivision adjacent to Wallace Road. The supply is comprised of a distribution zone called Western District – Waikato DC and provides a restricted supply. The lower area of the zone relies on the existing pressure from the HCC distribution system. A reservoir and small booster pump station ensures sufficient pressure is maintained to supply the properties in the higher area of the subdivision. There is no telemetry or on-line monitoring currently in the Western District distribution zone.



Figure 1. Location Plan of North Western District and Western District Supplies

6 Photographs of the North Western District Supply



Figure 2 Properties in the North Western Distribution Zone



Figure 3 Te Kowhai Road

7 Photographs of the Western District Supply



Figure 4 Stonebridge Subdivision



Figure 5 Western District Zone Booster Pump Station



Figure 6 Western District Zone Reservoir

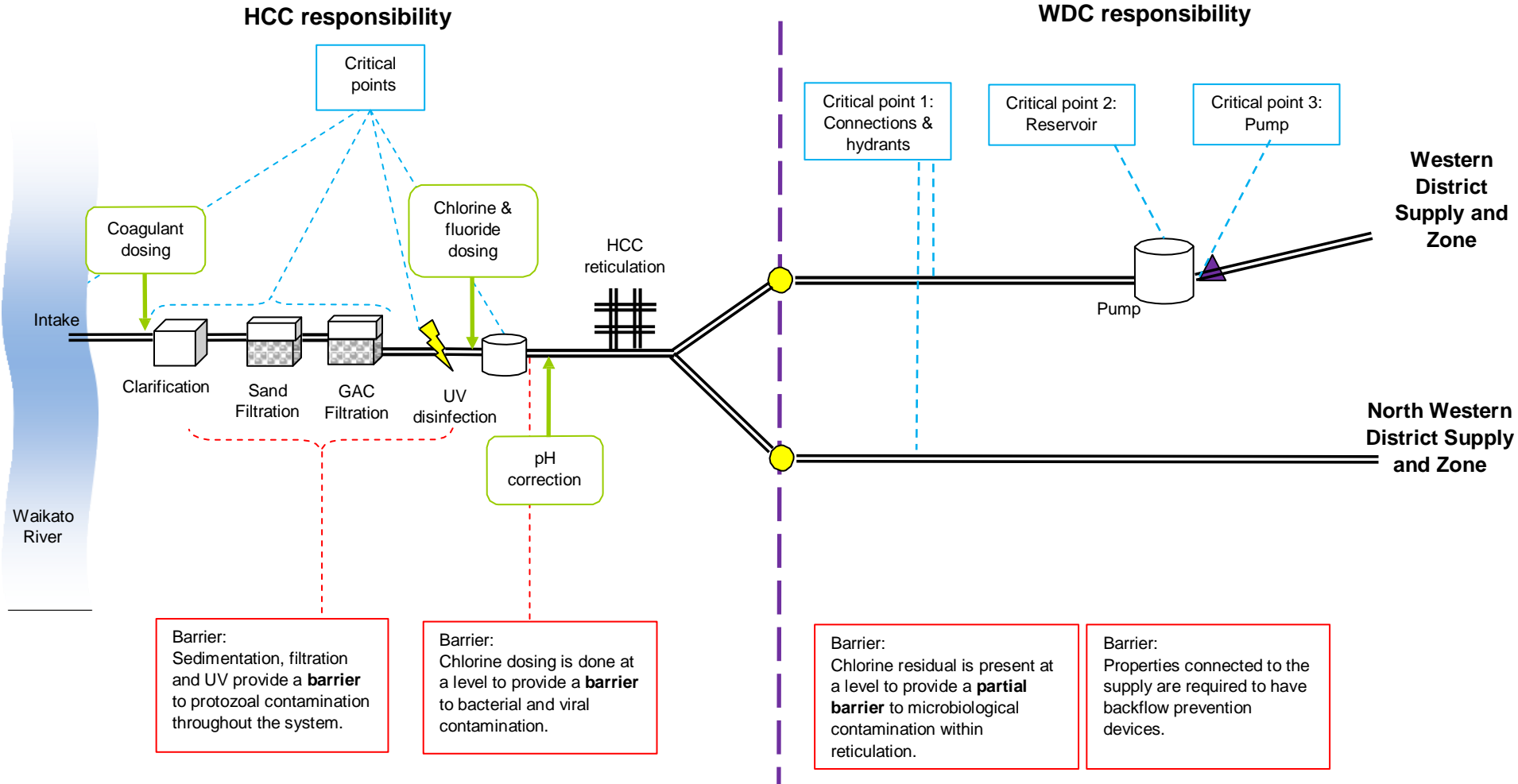


Figure 7 Western District Zone Reservoir Lid



Figure 8 Western District Zone Booster Pump

8 Flow Chart / Schematic of the Supplies



9 Barriers to Contamination

Table 3 Critical Points

Critical points where hazards can be eliminated, minimised or isolated include:

	Critical Point	Description	Responsibility
A.	Intake pumps	<i>Pump failure means eventual loss of supply.</i>	HCC
B.	Coagulant / flash mix	<i>Failure will result in reduced natural organic matter, particle and pathogen removal in the clarification and filtration processes.</i>	HCC
C.	Clarifiers	<i>Failure will result in reduced natural organic matter, particle and pathogen removal.</i>	HCC
D.	Sand filters	<i>Failure will result in reduced natural organic matter, particulate and pathogen removal.</i>	HCC
E.	GAC filters	<i>Failure will result in reduced cyanotoxin and organics removal.</i>	HCC
F.	UV disinfection	<i>Failure will result in reduced protozoa inactivation.</i>	HCC
G.	Chlorine dosing	<i>Failure will result in a lack of bacterial and viral inactivation. Overdosing may exceed chemical MAV.</i>	HCC
H.	HCC reticulation prior to bulk meter	<i>Contamination or failure event in reticulation will impact quality or quantity of water delivered to WDC.</i>	HCC
1.	Distribution system hydrants and connections	<i>Possible access point for contamination due to backflow.</i>	WDC
2.	Booster pumps	<i>Pump failure means loss of system pressure and potential loss of supply to some areas.</i>	WDC

Existing barriers to contamination that are the responsibility of HCC include:

1. Coagulation, Sedimentation Filtration

The treatment plant uses the addition of coagulants to stabilise and flocculate contaminants to enable settling and sand filtration to remove microbiological organisms, organic material and suspended solids. This process step **provides a barrier to pathogen and particulate contamination.**

2. Granular Activated Carbon Filtration

The treatment plant uses the addition of granular activated carbon to remove organic chemicals, including cyanotoxins from the water. This provides a **barrier to contamination**.

3. UV Disinfection

The treatment plant uses UV disinfection to inactivate microbiological organisms that have not been removed by the filtration process. This provides a **barrier to microbiological contamination**.

4. Chlorination

The treatment plant uses chlorination to disinfect the water of non-protozoan microbiological organisms. As there is at least 30 minutes contact time before the chlorinated water is distributed to consumers, this provides a **barrier** to bacterial and viral **contamination**.

Existing barriers to contamination that are the responsibility of WDC include:

5. Prevention of Contamination of Treated Water while it is in the Network Reticulation Systems

Maintaining chlorine residual at a level to protect against microbiological contamination provides a **barrier against recontamination** of the water in the North Western District and Western District distribution zone and storage tank. Systems and SOPs for fixing breaks etc. are in place and screens at the bulk meters provide a partial barrier to contamination of water in WDC reticulation.

6. Installation of Backflow Prevention Devices

Backflow prevention devices and air gaps on restricted supply connections provide a **barrier against recontamination** of the water.

The process control summaries for identified Critical Control Points (Critical Points) are stored in Council's Promapp process management online repository.

10 Benefits of Proposed Improvements

The proposed improvements will provide public health benefits by reducing the risk of adverse health outcomes associated with poor drinking water quality.

Upgrading the access hatch of the Western District Zone reservoir to ensure it is secure against ingress of rainwater, debris (leaf litter etc.), birds and vermin will ensure that re-contamination of the water does not occur.

The installation of telemetry to transmit Western District Zone reservoir water level and pump activity to WDC operators will ensure operational problems with the supply are identified and can be rectified promptly.

11 Methodology

This WSP has been prepared in accordance with the approaches recommended by the Ministry of Health. Supporting documents include the WSP Guides and *A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies*, Ministry of Health (2014).

A qualitative risk assessment approach has been taken following the guidance notes in Appendix 2 of the “Framework” allowing the prioritisation of improvement needs and development of the Improvement Schedule.

Indicative cost estimates have been prepared for the required improvement measures. Implementation timeframes will be discussed and agreed between the Treatment Services Team Leader and the Treatment Supervisor at the start of the financial year. Implementation of the Improvement Schedule is ultimately subject to Council funding approval.

The Treatment and Services Team Leader is responsible for implementation of improvements, subject to community and WDC approvals, funding constraints and availability of resources. The Compliance and Income Team Leader is responsible for ongoing review and updating of the WSP and associated Improvement Schedule.

Contingency Plans have been prepared to provide guidance in event that control measures fail to prevent the occurrence of a risk event that may present acute risk to public health. The Treatment Supervisor is responsible for implementation of the Contingency Plans when monitoring has identified the occurrence of a risk event.

Separate risk tables have been prepared for:

- Supply of Water
- Western District Zone Booster Pump
- Western District Zone Storage Reservoir
- Reticulation (both supplies)
- Other (both supplies)

12 Risk Ranking Procedure

The tables in this section identify the possible public health risks in each part of the supply. Each risk or possible 'event' which might occur has been evaluated based on the likelihood of the event occurring and the consequence (or outcome) if it occurs.

For the purposes of this WSP, categories for likelihood and consequence have been adapted from those in the 2014 MoH Guide, in order to make them more appropriate to this supply. These adapted ratings are given below in Table 4 and Table 5. The overall risk estimate derived from the product of likelihood and consequence is provided in Table 6.

Table 4 Likelihood Scale

Likelihood	Description
Almost certain	Is expected to occur in most circumstances.
Likely	Will probably occur (once in 1 or 2 years).
Possible	Might occur at some time (once in 10 years).
Unlikely	Could occur at some time (once in 50 years).
Rare	Only in exceptional circumstances (once in 100 years).

Table 5 Consequence Scale

Consequences	Description
Insignificant	Insignificant public health impact.
Minor	Minor public health impact or inconvenience to supply users.
Medium	Moderate public health impact and / or short term loss of supply.
Major	Major public health impact and / or loss of supply for a long period. Small number of water-borne illnesses.
Catastrophic	Major public health impact. Significant water-borne illness.

Table 6 Risk Level Allocation Table

	Consequence				
Likelihood	Insignificant	Minor	Medium	Major	Catastrophic
Almost certain	Moderate	Moderate	Very High	Extreme	Extreme
Likely	Low	Moderate	High	Very High	Extreme
Possible	Low	Moderate	Moderate	Very High	Very High
Unlikely	Low	Low	Moderate	High	Very High
Rare	Low	Low	Low	Moderate	High

13 Improvement Schedule

The improvement schedule is derived from the risk tables that follow in Section 17. The improvement schedule outlines improvements that have been recommended for preventing, reducing or eliminating the identified public health risks in the North Western District and Western District drinking water supplies. Possible improvements to the water supply have been identified in the ‘Additional Measures That Could Be Put in Place’ column of the risk tables. The most suitable option to improve the management of each unmanaged risk has then been included in the improvement schedule. Detail, further to that contained in Tables 7 and 8 can be found by following the number in the Reference to Risk Table column. It should be noted that costs are estimates only. Each project is ranked according to the priority to which projects should be completed. Improvement timelines will be enacted as per the improvement schedule adopted by The Waikato District Council Asset Management Plan 2017.

- TSTL – Treatment and Services Team Leader
- TS – Treatment Supervisor
- CITL – Compliance and Income Team Leader
- WPTL – Water Planning Team Leader

Table 7 Capital and Significant Projects

Priority	Risk Level	Water Supply Area	Reference to Risk Table	Proposed Works	Person Responsible	Expected Cost
1	High	Storage reservoir	3.1	Keep vegetation clear of tank. Modify hatch on the WDZ tank to ensure it is secure against ingress of rainwater, debris, vermin etc.	TSTL / CITL	\$2,000

North Western District and Western District Zone Water Safety Plan

Priority	Risk Level	Water Supply Area	Reference to Risk Table	Proposed Works	Person Responsible	Expected Cost
2	Moderate	Booster pump, Storage reservoir	2.1, 2.2, 3.6	Install telemetry and alarms transmitting information about pump activity and reservoir water level back to Waikato DC.	TSTL	\$50,000

Table 8 Operational Improvements and Minor Projects

Priority	Risk Level	Water Supply Area	Reference to Risk Table	Proposed Works	Person Responsible	Expected Cost
1	High	Reticulation	4.4	Review testing regime and reporting of test results for backflow protection devices. Record inspection results on asset management system.	WPTL	Staff time
2	High	Reticulation, Other	4.1, 4.5, 4.6, 5.3	Review process for recording pipe breaks and repairs to ensure all work is captured and recorded into asset management system.	WPTL	Staff time
3	High	Reticulation	4.4	Ensure trickle feed supplies are systematically inspected to ensure air gap at consumer tank. Record inspection results on asset management system.	WPTL	Staff time
4	Moderate	Storage reservoirs	3.1, 3.3, 3.5	Inspect reservoir structures annually inside and out. Reservoir inspection and cleaning to be recorded in asset management system.	TSTL / WPTL	Staff time
5	Moderate	Other	5.5	Undertake a formal review of the standard operating procedures, and operation and maintenance manuals.	TS	Staff time
6	Moderate	Supply of Water, Other	1.4, 5.2	Water supply agreement between WDC and HCC can include event communication protocols.	WPTL	Staff time
7	Moderate	Other	5.4	Develop and implement treatment plants and pump stations asset criticality analysis.	WPTL	Staff time

North Western District and Western District Zone Water Safety Plan

Priority	Risk Level	Water Supply Area	Reference to Risk Table	Proposed Works	Person Responsible	Expected Cost
8	Moderate	Other	5.1	Ensure sampling programme is reviewed by independent person. Ensure sampling collection follows sampling programme.	CITL	Staff time
9	Moderate	Reticulation	4.2, 4.6, 4.9	Monitor and record flushing water quality results.	CITL	Staff time

14 Drinking Water Standards and Grading

Table 9 below shows a summary of the compliance with the DWSNZ to date.

The Hamilton City water treatment and supply has an Aa grade. The North Western District and Western District supplies are currently ungraded (u).

Table 9 Summary of Compliance with DWSNZ.

Standards compliance assessed against.	DWSNZ 2005 (revised 2008).
Secure bore water.	NA
Bacterial compliance criteria used for water leaving the treatment plant.	N / A Responsibility of HCC.
Protozoa log removal requirement required for the supply.	Log 4.
Protozoa treatment process.	Coagulation, clarification, sand filtration and UV. Responsibility of HCC.
Compliance criteria 6A or 6B is used for water in the distribution zones.	Criterion 6A but Section 10 will be used in future.
Bacterial compliance for water leaving the treatment plant has been achieved for the last 4 quarters.	Yes. Responsibility of HCC.
Protozoa compliance for water leaving the treatment plant has been achieved for the last 4 quarters.	Yes. Responsibility of HCC.
Bacteria compliance for water in the North Western District distribution zone has been achieved for the last 4 quarters.	Yes.
Bacteria compliance for water in the Western District distribution zone has been achieved for the last 4 quarters.	Yes.
P2 determinands allocated to supply.	Fluoride. Responsibility of HCC.
Chemical compliance achieved for the last 4 quarters.	Yes. Responsibility of HCC.
Cyanobacteria identified in the supply.	Yes. Responsibility of HCC. Cyanobacteria management protocol in place. Source water monitoring indicates cyanobacteria present but not above the treatment capacity of the WTP.
Cyanobacterial compliance has been achieved for the last 4 quarters.	Yes. Responsibility of HCC.

15 Consultation

Risks to the supply, preventative measures that are in place or could be put in place, critical points and the barriers to contamination were identified in consultation with WDC staff. The WSP was then modified to take account of required updates.

Subsequent to this consultation telephone discussions and email contact with the Compliance and Income Team Leader provided information necessary for the preparation of this WSP. The WSP was then reviewed by all divisions of the water team and signed off by the Waters Manager.

The information provided during this consultation has been used to compile the risk tables.

16 Contingency Plan

North Western District and Western District Water Supply Contingency Plan	
Type of Event	Required Contingency Action
<p>Severe microbiological contamination of source water such that treatment is ineffective and water provided by HCC is of poor quality.</p> <p>Indicators: A contamination event may be observed by or reported to HCC or WDC staff. May also be indicated by reported illness among consumers, positive E. coli monitoring results or taste, odour etc. concerns from consumers.</p>	<p>Liaise with HCC treatment plant operators.</p> <p>Issue “Boil Water’ notice.</p> <p>Advise Drinking Water Assessor (DWA).</p> <p>Consider provision of emergency treatment or alternative water supply (e.g. tankers).</p> <p>Disinfect contaminated reservoirs and flush mains.</p> <p>Keep customers informed and advise once regular service is restored.</p>
<p>Chemical contamination of source water such that water provided by HCC is of poor chemical quality.</p> <p>Indicators: A contamination event may be observed by or reported to HCC or WDC staff. May also be indicated by reported water quality concerns from consumers (taste, odour, and colour) or illness among consumers.</p>	<p>Liaise with HCC treatment plant operators.</p> <p>Advise Drinking Water Assessor (DWA).</p> <p>Assess situation and advise customers regarding use / treatment / disposal of contaminated water.</p> <p>Arrange emergency water supply (tankers) if necessary.</p> <p>Flush contaminated reservoirs and mains.</p> <p>Keep customers informed and advise once regular service is restored.</p>

North Western District and Western District Water Supply Contingency Plan	
Type of Event	Required Contingency Action
<p>Cyanobacterial / Cyanotoxin contamination of source water such that GAC filtration is ineffective.</p>	<p>Liaise with HCC treatment plant operators. Advise Drinking Water Assessor (DWA). If cyanotoxins in water leaving the treatment plant exceed 50% of the MAV prepare to supply drinking water from tankers to the community. If cyanotoxins in water leaving the treatment plant exceed the MAV supply drinking water from tankers to the community. Keep customers informed and advise once regular service is restored.</p>
<p>Insufficient water available for abstraction such that HCC is unable to supply the full demand of WDZ. Indicators: Observed or reported low river levels.</p>	<p>Liaise with HCC treatment plant operators. Advise customers to conserve water. Implement demand management strategies as required. Arrange emergency water supply (tankers) if necessary. Keep customers informed and advise once regular service is restored.</p>
<p>E. coli transgression in water in WDC distribution zone. Indicators: E. coli transgression reported following routine monitoring.</p>	<p>Follow transgression response procedure in DWSNZ. Advise Drinking Water Assessor (DWA). Use an enumeration test method. Increase sampling in distribution system. Investigate cause, inspect plant and source. Take remedial action. Continue to sample for E. coli until 3 consecutive samples are free of E. coli. If E. coli is found in repeat samples consult with DWA, intensify remedial action, increase disinfection, consider 'Boil Water' notice, and consider alternative supply.</p>

North Western District and Western District Water Supply Contingency Plan	
Type of Event	Required Contingency Action
<p>E. coli transgression in HCC distribution zone prior to bulk meters.</p> <p>Indicators: Low FAC reported from routine monitoring.</p>	<p>Liaise with HCC operators.</p> <p>Increase sampling in WDC distribution system.</p> <p>Take remedial action if required.</p> <p>Continue to sample for E. coli until 3 consecutive samples are free of E. coli in both HCC and WDC systems.</p> <p>If E. coli is found repeat samples, consult with DWA, intensify remedial action, increase disinfection, consider 'Boil Water' notice, consider alternative water supply.</p>
<p>Inadequate chlorination in reticulation.</p> <p>Indicators: Low FAC reported from routine monitoring.</p>	<p>Advise DWA and issue boil water notice if appropriate, i.e. if cannot reinstate adequate chlorination.</p> <p>Make arrangements for provision of emergency treatment or alternative water supply.</p> <p>Keep customers informed and advise once regular service is restored.</p>

17 Risk Tables

- TSTL – Treatment and Services Team Leader
- TS – Treatment Supervisor
- CITL – Compliance and Income Team Leader
- WPTL – Water Planning Team Leader

Table 10. Risk Table: Supply of Water

1. Supply of Water									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Loss of Supply	1.1	Severe drought conditions limit the rate at which HCC can abstract raw water from the Waikato River.	Very High (Possible x Major)	Drought conditions in region. Reduced volume of water supplied from HCC bulk delivery points Reports from public about loss of supply pressure.	The majority of existing properties have onsite storage and new properties are required by by-law to have onsite storage. A quantity supply agreement exists between HCC and WDC. HCC has a contingency in place to allow abstraction from the river at reduced water levels.	Yes.	Moderate (Unlikely x Medium)	None.	

1. Supply of Water									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Loss of Supply	1.2	Power outage affecting HCC treatment plant pumps or booster pumps.	Very High (Possible x Major)	Reduced / no flow through bulk delivery points. Power outage at treatment plant. Reports from public about loss of supply pressure.	HCC treatment plant is recognised as a priority site for restoration of power and also has generators on site which allow 60MLD to be produced during prolonged power outage.	Yes.	Moderate (Unlikely x Medium)	None.	
Loss of Supply	1.3	Failure in bulk main prior to delivery point to either North Western or Western distribution zones.	Very High (Possible x Major)	Reduced / no flow through bulk delivery points. Reports from public about pipe failure or loss of supply pressure.	The majority of existing properties have onsite storage and new properties are required by by-law to have onsite storage. HCC reticulation has 'a' grading.	Yes.	Moderate (Possible x Medium)	None.	

1. Supply of Water									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Poor Water Quality	1.4	Failure at treatment plant resulting in water of low quality passing through into reticulation.	Very High (Possible x Major)	Low FAC or <i>E. coli</i> detected in WDZ reticulation. HCC notifying WDC about major failure at treatment plant. Complaints from consumers.	Treatment plant uses automated dosing / treatment control systems, continuous monitoring and alarms that are monitored by operators 24 hours a day. Written agreement that HCC provides potable water.	Partially.	Moderate (Rare x Major)	Water supply agreement between WDC and HCC can include event communication protocols.	WPTL
Poor Water Quality	1.5	Contamination introduced through pipe breakage or inadequate hygiene procedures in bulk main prior to WDZ delivery point.	High (Likely x Medium)	Low FAC or <i>E. coli</i> detected in the WDZ reticulation or the HCC reticulation prior to the WDZ. Complaints from consumers.	Chlorination is done at a level to provide protection in the reticulation. All breaks repaired by HCC staff. HCC staff undertaking repairs have National Certificate in Water Reticulation (Level 3), or are under supervision of staff that have.	Yes.	Moderate (Possible x Minor)	None.	

1. Supply of Water									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Poor Water Quality	1.6	Contamination introduced through backflow into bulk main prior to WDZ delivery point.	Very High (Possible x Major)	Low FAC or <i>E. coli</i> detected in the WDZ reticulation or the HCC reticulation prior to the WDZ. Complaints from consumers.	HCC requires high risk industries to install backflow prevention devices which it tests / inspects annually. Chlorine residual maintained in reticulation. Written agreement that HCC provides potable water.	Yes.	Moderate (Unlikely x Medium)	None.	
Loss of Supply	1.7	Future development in WDZ pushing demand beyond the capabilities of the HCC treatment plant.	Very High (Likely x Major)	Development or subdivision WDZ.	Future quantity requirements and options for providing adequate quantities are part of the water supply planning process. Current demand projections show 5,000 cubic metres per day is adequate for the Western and Southern Water Supplies for the next 10 years.	Yes.	Moderate (Rare x Major)	None.	

Table 11. Risk Table: Booster Pump

2. Western District Distribution Zone Booster Pump									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Loss of Supply	2.1	Extended pump failure due to power outage.	High (Likely x Medium)	Complaints from consumers about loss of pressure / supply. No pump activity. Reduction in storage reservoir water level.	Existing properties have onsite storage (of greater than 24 hours supply) and new properties are required by by-law to have onsite storage.	Partially.	Moderate (Likely x Minor)	Install telemetry transmitting information about pump activity, reservoir water level and alarms back to WDC operators.	TSTL
Loss of Supply	2.2	Pump failure due to mechanical failure.	Moderate (Possible x Medium)	Complaints from consumers about loss of pressure / supply. No pump activity. Reduction in storage reservoir water level.	Existing properties have onsite storage (of greater than 24 hours supply) and new properties required to have onsite storage. Replacement pump held in storage.	Partially	Moderate (Possible x Minor)	Install telemetry transmitting information about pump activity, reservoir water level and alarms back to WDC operators.	TSTL

2. Western District Distribution Zone Booster Pump									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Loss of Supply	2.3	Pump failure due to vandalism.	Very High (Possible x Major)	Complaints from consumers about loss of pressure / supply. No pump activity. Reduction in storage reservoir water level. Obvious signs of damage to pump house or pumps.	Pump is located in a locked shed.	Yes.	Moderate (Unlikely x Medium)	None.	
Microbiological Contamination	2.4	Microbiological contamination due to vandalism of pumps.	Very High (Possible x Major)	Low FAC or <i>E. coli</i> detected in reticulation. Complaints from consumers.	Pump is located in a locked shed.	Yes.	Moderate (Unlikely x Medium)	None.	

2. Western District Distribution Zone Booster Pump									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological Contamination	2.5	Microbiological contamination due to inadequate hygiene practices during pump maintenance.	Very High (Possible x Major)	Low FAC or <i>E. coli</i> detected in reticulation. Complaints from consumers.	Contractors used to undertake pump maintenance are suitably qualified. WDC staff undertaking repairs have National Certificate in Water Reticulation (Level 3), or are supervised by staff that have. WDC have protocol for maintenance, repair work, and replacement of reticulation components.	Yes.	Moderate (Unlikely x Medium)	None.	

Table 12. Risk Table: Western District Distribution Zone Storage Reservoir

3. Western District Distribution Zone Storage Reservoir									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological contamination	3.1	Leakage through reservoir roofing or walls.	High (Likely x Medium)	E. coli in water leaving reservoir. Decreased FAC in water leaving reservoir.	Residual chlorine in water.	Partially.	High (Likely x Medium)	Inspect reservoir structures annually inside and out. Secure hatches and possible entry points for against ingress rainwater, etc. Keep vegetation clear of tank. Clean reservoirs as required (identified by annual checks). Reservoir inspection and cleaning to be recorded in asset management system.	TSTL / WPTL
Microbiological contamination	3.2	Vandalism to reservoir.	Very high (Possible x Major)	E. coli in water leaving reservoir. Decreased FAC in water leaving reservoir.	Residual chlorine in water. Reservoir partially hidden by stand of trees on private property in exclusive subdivision.	Yes.	Low (Unlikely x Minor)	None.	

3. Western District Distribution Zone Storage Reservoir

Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological contamination	3.3	Sediment / slime accumulation within reservoirs.	Moderate (Possible x Medium)	Suspended matter in water exiting reservoir. Consumer complaints. Decreased FAC in water leaving reservoir.	Residual chlorine in water.	Partially.	Moderate (Possible x Medium)	Inspect reservoir structures annually inside and out. Clean reservoirs as required (identified by annual checks). Reservoir inspection and cleaning to be recorded in asset management system.	TSTL / WPTL

3. Western District Distribution Zone Storage Reservoir

Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological Contamination	3.4	Contamination through unsanitary maintenance or sampling procedures.	Very High (Possible x Major)	Illness in community. E. coli present in reticulation system. Decreased FAC in water leaving reservoir.	Chlorination is done at a level to provide protection in the reticulation. All breaks repaired by WDC staff. All WDC staff undertaking repairs have National Certificate in Water Reticulation (Level 3), or are supervised by staff that have. Dedicated sampling sites and taps used for sampling. WDC have protocol for maintenance, repair work, and replacement of reticulation components.	Yes.	Moderate (Possible x Medium)	None.	

3. Western District Distribution Zone Storage Reservoir

Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Loss of Water	3.5	Deterioration of reservoir structure.	Very High (Possible x Major)	Failure of reservoir to fill. Obvious signs of spillage or deterioration of reservoir structure.	None.	No.	High (Likely x Medium)	Inspect reservoir structures annually inside and out. Reservoir inspection and cleaning to be recorded in asset management system.	TSTL / WPTL
Loss of water / Overflow	3.6	Failure of pump control.	Moderate (Unlikely x Medium)	Booster pump running for prolonged period.	None.	No.	Moderate (Unlikely x Medium)	Install telemetry transmitting information about pump activity and reservoir water level back to Waikato DC.	TSTL
Failure to Fill	3.7	Excessive demand.	Moderate (Possible x Medium)	Low water level in storage reservoir.	The Western District distribution zone is restricted trickle feed with consumers having on site storage. Consumers are metered and invoiced for the water consumed. Future quantity requirements and options for providing adequate quantities are part of the water supply planning process.	Yes.	Moderate (Unlikely x Medium)	None.	

3. Western District Distribution Zone Storage Reservoir

Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Stagnant Water	3.8	Inadequate circulation within the reservoir.	Low (Unlikely x Minor)	Complaints of taste, odour or 'stale' water. Water of lower quality exits the reservoir during peak usage when the reservoirs' storage is depleted.	Reservoir is set up so that turnover is high. Drawdown is to 60% to encourage turnover.	Yes.	Low (Unlikely x Minor)	None.	

Table 13. Risk Table: Distribution Zone Reticulation

4. Reticulation (Both Supplies)									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Loss of Supply	4.1	Pipe failure.	Moderate (Possible x Medium)	Complaints from consumers about loss of supply or pressure. Change in flow or pressure in reticulation.	Reticulation in the WDZ is only approximately 20 years old.	Partially.	High (Likely x Medium)	Review process for recording pipe breaks, repairs and flushing to ensure all work is captured and recorded into asset management system.	WPTL
Insufficient Chlorine Residual	4.2	Chlorine dosed at HCC treatment plant is insufficient to ensure sufficient residual is maintained to the furthest extents of the WDZ reticulation.	Very high (Likely x Major)	Low FAC detected in monitoring results in dead ends or at sampling points at the extents of reticulation. Illness in consumers. Low FAC due to stagnant pipe ends.	Sufficient chlorine residual in the water as North Western District and Western District distribution zones are not extensive.	Partially.	Moderate (Unlikely x Medium)	Test results from the flushing programme to be recorded in WaterOutlook.	CITL

4. Reticulation (Both Supplies)									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological Contamination	4.3	Inadequate controls on maintenance and construction work.	Very High (Possible x Major)	Illness in community. Complaints from consumers about taste or odour. E. coli present in reticulation system. Inadequate FAC in reticulation.	Chlorination is done at a level to provide protection in the reticulation. All breaks repaired by WDC staff. All WDC staff undertaking repairs have National Certificate in Water Reticulation (Level 3), or under the supervision of staff that have. WDC requires all work on reticulation to meet the specifications determined by the Hamilton City Council Standard Technical Specifications (Vol. 3). WDC have protocol for maintenance, repair work, and replacement of reticulation components.	Yes.	Moderate (Unlikely x Medium)	None.	

4. Reticulation (Both Supplies)									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological Contamination	4.4	Backflow from consumer connections.	Very High (Possible x Major)	Illness in community. Contaminants present in the reticulation system. Taste or odour complaints from consumers.	Chlorine residual in water. WDC requires double check (testable) backflow devices and air gaps on all rural connections. Backflow is covered in the Water Supply Policy and Bylaw. WDC currently employs a contractor to test 10% of backflow devices each year. Results are recorded on property database.	Partially.	High (Unlikely x Major)	Review testing regime and reporting of test results for backflow devices. Ensure trickle feed supplies are systematically inspected to ensure air gap at consumer tank. Record inspection results on asset management system.	WPTL

4. Reticulation (Both Supplies)									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological Contamination	4.5	Breaks or leaks in pipes.	Very high (Possible x Major)	Illness in community. Contaminants present in the reticulation system. Taste or odour complaints from consumers. Reduced FAC in water.	Chlorine residual in water. Reticulation in the WDZ is only approximately 20 years old.	Partially.	High (Likely x Medium)	Review process for recording pipe breaks and repairs to ensure all work is captured and recorded into asset management system.	WPTL
Microbiological Contamination	4.6	Poor circulation leading to biofilm growth.	Very High (Possible x Major)	Contaminants present in the reticulation system. Taste or odour complaints from consumer. Reduced FAC in water.	Flushing programme in place to flush part of the reticulation every second month on a rotation basis Flushing is undertaken if high turbidity is detected in system or if consumers complain. Residual chlorine in water.	Partially.	High (Possible x Moderate)	Review process for recording pipe breaks and repairs to ensure all work is captured and recorded into asset management system. Test results from the flushing programme to be recorded in WaterOutlook.	WPTL / CITL

4. Reticulation (Both Supplies)

Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Microbiological Contamination	4.7	Inappropriate materials used for reticulation pipes and fittings.	Moderate (Possible x Medium)	Illness in community. Contaminants present in the reticulation system. Taste or odour complaints from consumers. Reduced FAC in water.	Reticulation in the WDZ is only approximately 20 years old. WDC requires all materials used in reticulation to meet the specifications determined by the Hamilton City Standard Technical Specifications (Vol. 3).	Yes.	Moderate (Unlikely x Medium)	None.	
Microbiological Contamination	4.8	Contamination through unsanitary sampling procedures.	Moderate (Possible x Medium)	Illness in community. E. coli present in reticulation system. Inadequate FAC in reticulation.	Residual chlorine in water. Sampling done by trained IANZ accredited Shared Services staff. Sampling undertaken at dedicated sampling sites and sampling taps.	Yes.	Moderate (Unlikely x Medium)	None.	

4. Reticulation (Both Supplies)

Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Inadequate Supply	4.9	Silting up of pipes.	Moderate (Unlikely x Medium)	Reduced flows in reticulation. Complaints from consumer about quality of water.	Reticulation in the WDZ is only approximately 20 years old. Flushing programme in place to flush part of the reticulation every second month on a rotation basis Flushing is undertaken if high turbidity is detected in system or if consumers complain.	Yes.	Low (Rare x Minor)	Test results from the flushing programme to be recorded in WaterOutlook.	CITL

Table 14. Risk Table: Other

5. Other (Both Supplies)									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Sampling Failure	5.1	Inadequate sampling programme, sample collection error or response to transgression.	High (Likely x Medium)	DWSNZ compliance failure due to days of week, days between samples, insufficient samples, information gaps, positive results or sampling error. Gaps in records from weekly testing regime.	Sampling programme prepared checked against Standards. Relevant staff well trained and qualified. Hills Laboratory does E. coli testing and inform WDC promptly if positive result is detected. Results recorded in WaterOutlook (Council's operational and data reporting system for monitoring the quality of water).	Partially.	Moderate (Possible x Minor)	Ensure sampling programme is reviewed by independent person. Ensure sample collection follows sampling programme.	CITL

5. Other (Both Supplies)									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Unidentified Operational Failure of Treatment Plant	5.2	Treatment plant processes are not sufficiently monitored or alarmed.	Very High (Possible x Major)	Process failure not identified before supply is contaminated. Contamination identified in supply. Operational near miss identified	HCC treatment plant is fully telemetered and alarmed.	Partially.	Moderate (Rare x Major)	Water supply agreement between WDC and HCC can include event communication protocols.	WPTL
Failure of Supply Equipment due to Inadequate Maintenance.	5.3	Supply equipment fails due to inadequate asset information and insufficient maintenance.	Moderate (Possible x Medium)	Unexpected plant equipment failure. Not having an asset register and maintenance programme	Planned and routine maintenance undertaken including basic lubrication and greasing of pumps undertaken by operator. Specialist maintenance is contracted out as required.	Partially.	High (Possible x Moderate)	Review process for recording breaks, repairs and maintenance to ensure all work is captured and recorded into asset management system.	WPTL
Failure of Supply due to Unavailability of Spare Parts	5.4	Inadequate spare parts held or spare parts unavailable.	Moderate (Possible x Medium)	Plant is out of operation due to not having spare parts available.	Spare parts are held for some things. Replacement spares parts are usually available overnight.	Yes.	Moderate (Unlikely x Medium)	Develop and implement treatment plants and pump stations asset criticality analysis.	WPTL

5. Other (Both Supplies)									
Event	No.	Cause	Risk Without Preventative Measures	Indicators	Preventative Measures in Place	Controlled	Residual Risk	Additional Measures That Could be put in Place	Resp.
Failure of Supply due to Inadequate Operating Procedures	5.5	Inadequate, out of date or incorrect standard operating procedures.	Moderate (Possible x Medium)	SOPs not used. SOPs not up to date. SOP copies are not the same.	SOPs prepared but not for individual sites.	Partially.	Moderate (Unlikely x Medium)	Undertake a formal review of the standard operating procedures, and operation and maintenance manuals.	TS
Operator Error or Mismanagement	5.6	Inadequate training, professional development and up-skilling of operators.	Very High (Likely x Major)	Poor operation of plant. Plant compliance failure. Loss of supply. Poor score on question about level of supervision in supply grading.	WDC requires reticulation supervisors to have at least level 3 reticulation certificate. Treatment operators train for National Water Treatment Certificate Ongoing training and up skilling provided for operators	Yes.	High (Unlikely x Major)	None.	