
Rangitāiki Plains Public Water Supply – Water Safety Plan

- Report Prepared for:

Whakatāne District Council

- Report Prepared by:

Pattle Delamore Partners Ltd

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Whakatāne District Council

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Executive Summary

Pattle Delamore Partners Ltd (PDP) has been engaged by Whakatāne District Council (WDC) to prepare a Water Safety Plan (WSP) for the Rangitāiki Plains Public Water Supply Scheme (Rangitāiki Plains Scheme). It should be noted that previously the water supply was called Rangitāiki Plains – Edgumbe which is now covered by Otumahi Water Safety Plan.

This WSP was prepared by PDP in collaboration with WDC to identify and manage events that could occur in the Rangitāiki Plains Scheme with potential to cause public health risks to consumers of the scheme.

The following were undertaken in the preparation of this WSP:

- Identifying components and operation of the Rangitāiki Plains Scheme.
- Identifying Contamination and Loss of Supply events that could occur in the scheme that could result in public health risks.
- Preparing Risk Tables to identify potential risks, by identifying existing and additional barriers to contamination and critical points in the scheme. In addition evaluate if the Preventative measures currently in place are able to reduce the risks were also identified.
- Preparing an Improvement Plan by introducing new preventative measures to manage risks that are not sufficiently managed.
- Identifying Critical Control Points (CCPs) in the scheme and limits within which the CCPs are operated to prevent contamination. Control actions to be carried out when CCPs operate outside these limits were also identified.
- Preparing Contingency Plans to mitigate events of acute health risk that may occur despite preventative measures being in place.

This report was prepared in line with the methodology recommended by the Ministry of Health for preparation of Water Safety Plans. Information used in this report was gathered from documents and reports belonging to the Whakatāne District Council, during site visits carried out by PDP to the Braemar Road and Johnson Road water treatment plant and pump station sites, reservoir sites, and during a consultation workshop with WDC staff. Contributors to this report are listed in Section 11.0.

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1.0 Revision and Performance Assessment

Table 1: Revision Details			
Version No.	Revision Details	Reviewed by	Date
V1	Public Health Risk Management Plan - submission to DWA (formerly Edgecumbe Water Supply)	OPUS	01/02/2011
1.00	Prepared by PDP in collaboration with WDC, submitted to WDC for comments	PDP	28/05/2018
1.01	Modified with WDC comments for submission to DWA	WDC/PDP	23/07/2018
1.02	FINAL Version release from PDP to WDC	PDP	5/08/2018
1.03	Updated Improvement Plans and submission to Drinking Water Assessor	Neal Yeates & Michael Van Tilburg - WDC	1/03/2019
1.04	Modifications after reviewing DWA 'Report on adequacy of a Drinking Water Supply's Water Safety Plan (RAN007_RangitaikiPlains_WSPadequacy_140319_v1)	WDC officers: Neal Yeates Michael Van Tilburg	21/06/2019
2.00	Approval from DWA - change to 'Report on adequacy of a Drinking Water Supply's Water Safety Plan (RAN007_RangitāikiPlains_WSPadequacy_240619_v1)	DWA approval added by Michael Van Tilburg	02/07/2019

The Health (Drinking Water) Amendment Act 2007 requires drinking-water suppliers providing drinking-water to over 500 people to develop and implement WSPs.

WSPs are required to be revised and re-submitted to the Drinking Water Assessor (DWA) for approval every 5 years as a minimum. Accordingly, this plan was due for revision and approval by the DWA back in 2016! In recent times, Council has increased in-house resources and will keep strict control of adhering to the regulatory requirements. The WSP is treated as a live document and should be updated as required; it is therefore recommended that WDC revise and resubmit this WSP if there are significant changes to the operations or risks to the Rangitāiki Plains Scheme within the 5-year period.

This water safety plan is in the final stages of preparation, carried out over a lengthy period of time whilst the industry waited for direction and the WSP has

generally been developed prior to the handbook release, with this in mind, this safety plan may have a reduced timeframes imposed by Ministry of Health to comply with new handbook requirements.

A draft plan of this WSP was reviewed by the contributors to the workshop before submitting to the DWA for final approval.

The performance of this WSP is to be assessed annually by reporting on the following items:

- any risk events.
- non-compliances or near misses that have occurred.
- contingency plans that have been used.
- changes made to the scheme operation and components.
- progress made against the Improvement Plan.
- any new risks or improvements that are required to be made and people responsible for carrying them out.

The performance assessment, in the form of a short report, will be submitted by the Manager Three Waters to the Drinking Water Assessor by 31 July each year.

The following staff will be responsible for including any relevant items arising from this report into the Annual Plan, Water Asset Management Plan and Long Term Plans: Manager Three Waters, Team Leader - Three Waters Asset Management and Planning, Manager - Capital Projects, Team Leader - Three Waters Operations.

This WSP is to be linked to the Annual Plan, the Water Asset Management Plan and the Long Term Plan.

This WSP is to be read in conjunction with the 'Catchment Risk Assessment for Rangitāiki Plains Bore Water Supply Scheme, Whakatāne District Council' report (PDP, November 2017).

2.0 Supply Summary

Table 2: Rangitāiki Plains Scheme Summary	
Supply Details	
Supply Name	Rangitāiki Plains Community Water Supply
WINZ Community Code	RAN007
Supply Owner	Whakatane District Council
General Manager Infrastructure	David Bewley
Manager Three Waters	Tomasz Krawczyk
Team Leader – Water Treatment Plant	Neal Yeates
Water Treatment Plant Operators	Ian Bowen Bryan Vautier Tasman Van der Woude
Capital Projects Manager	Jim Finlay
Team Leader - Three Waters Assets Management and Planning	Michael Van Tilburg
Population Served by Supply ¹	2,733 People
Number of Connections ²	1,532 Connections
Source Details	
Braemar Spring	
WINZ Source Code	G00220
Type of Source	Spring
Consent No.	20094
Consent Expiry	05/04/2023
Maximum Consented water take:	9,730 m ³ /d
Map Reference (NZTM2000)	X 1928547.87826 Y 5791108.18036
Johnson Road	
WINZ Source Code	Johnson Road Bore (North) G00221
WINZ Source Code	Johnson Road Bore (South) G00548

¹ 2013 Census – Statistics New Zealand. Information based on Whakatāne District data calculations

² WDC Data, December 2018.

Table 2: Rangitāiki Plains Scheme Summary	
Type of Source	Bores
Consent No.	RM15-0017-WT.01
Consent Expiry	31/12/2031
Maximum Consented water take:	5,200 m ³ /d
Map Reference (NZTM2000)	X 1928884.02595 Y 5786525.97492
Treatment Details	
Braemar Spring	
WINZ TP code	TP00324
Treatment Processes	Chlorination (Gas Chlorine)
Average Daily Demand (July 2018 – February 2019) ³	4,993 m ³ /day
Peak Daily Demand (July 2018 – February 2019) ³	6,690 m ³ /day
Johnson Road Bores	
WINZ TP code	TP00325
Treatment Processes	Chlorination (Gas Chlorine)
Average Daily Demand (July 2018 – February 2019) ³	959 m ³ /day
Peak Daily Demand (July 2018 – February 2019) ³	2,348 m ³ /day
Distribution Details	
WINZ Distribution Zone Code	RAN007PR
Distribution Zone materials	72% Polyvinyl Chloride (PVC), 20% Asbestos Cement (AC) and 6.5% Polyethylene (PE)

³ WDC Records since Otumahi Scheme operational (email 12/2/19)

3.0 Introduction

The Rangitāiki Plains Scheme is owned and operated by WDC and supplies a population of approximately 2,733 people. The water is sourced from a surface water spring at Braemar Road and two bores at Johnson Road and treated for bacteria via chlorination before being circulated to consumers.

Administration of the scheme is carried out at the Council head office located at Commerce Street, Whakatāne. Treatment plant operators are stationed at the main Whakatāne Water Treatment Plant located at Valley Road, Whakatāne and travel to the Rangitāiki Plains Scheme for routine testing and inspections and when required.

Key WDC personnel responsible for the management and operation of the scheme are as follows:

- Chief Executive (CE) – Steph O’Sullivan
- General Manager Planning and Infrastructure (GM) – David Bewley
- Manager Three Waters (MTW) – Tomasz Krawczyk
- Manager Public Affairs (M-PA) – Vacant Position
- Team Leader - Water Treatment Plant (TL-WTP) - Neal Yeates
- Water Treatment Plant Operator (WTP-O) – Ian Bowen / Bryan Vautier / Tasman Van der Woude
- Team Leader - Three Waters Operations (TL-O) – Luke Shipton
- Team Leader - Three Waters Administration (TL-AS) – Helen Toby
- Team Leader - Three Waters Asset Management and Planning (TL-AM) - Michael Van Tilburg
- Asset Engineer - Three Waters (AE) –Joe Xie & Sala Ranasinghe
- Senior Project Planner (SPP) – Nicholas Woodley
- Manager - Capital Projects (PM) – Jim Finlay
- Project Engineer - Three Waters (PE) – Leilani Salanguit

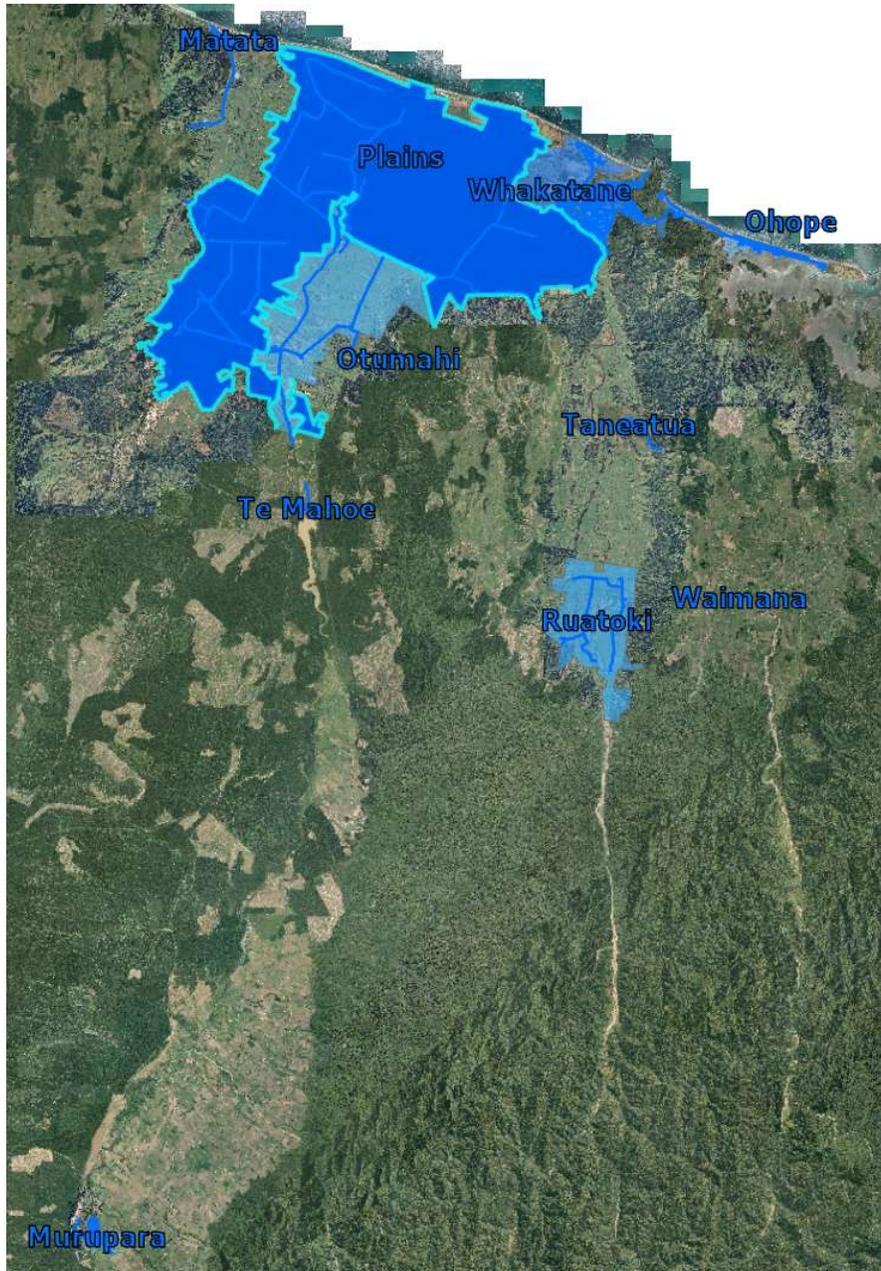


Figure 1: Whakatāne District

4.0 Description of the Rangitāiki Plains Water Supply

4.1 Scheme Details

The original Rangitāiki Plains Water Supply Scheme was established in the 1970s and is owned and operated by WDC. The Scheme underwent significant changes in 2018 as a result of the establishment of the new Otumahi Public Water Supply Scheme (Otumahi Scheme). These changes included:

- Removal of the Tahuna Road bore water supply as a water source to the Rangitāiki Plains distribution zone.
- Change to the scheme's boundary by ceasing to supply Edgecumbe and Te Teko townships with Johnson Road and Braemar Road water sources.

The Rangitāiki Plains Scheme is classified as a Community Water Supply boundary now has 1,532 connections serving an estimated population of 2,733 people. The service connections consist of rural community lifestyle which is a combination of lifestyle homes, farming houses, agricultural and cowshed connections. Over 75% of the water used in the scheme is for agricultural purposes and the remaining is for potable purposes such as drinking-water, and water for food preparation and domestic use.

According to the Rural Agricultural Drinking-water Supply Guideline⁴ the drinking water supplier would not need to treat water not intended for human consumption if a large part of the water is used for agricultural purposes, as is the case with the Rangitāiki Plains Scheme. Upon consultation with all stakeholders and through due processes and investigations, Council will determine the future of the Rangitāiki Plains water supply scheme as either remaining a Community Drinking-water Supply or apply for Rural Agricultural Drinking-water Supply status. Improvement plans have been developed to address Council direction for arsenic treatment.

The Rangitāiki Plains Scheme is a metered supply system with all farm and cowshed connections having meters and backflow preventers installed. Not all properties are connected to the Council's water reticulation network; a number of properties obtain water from private bores and roof water.

The average daily demand between July 2018 - February 2019 for the Braemar and Johnson Road sources were 4,993 m³/day and 959 m³/day respectively. The water take consents for the sources are administered by the Bay of Plenty Regional Council (BOPRC). Maximum consented takes for Braemar and Johnson Road sources are 9,730 m³/day and 5,200 m³/day respectively with consents expiring in 2023 and 2031.

⁴ Rural Agricultural Drinking-water Supply Guideline, Ministry of Health, 2015.

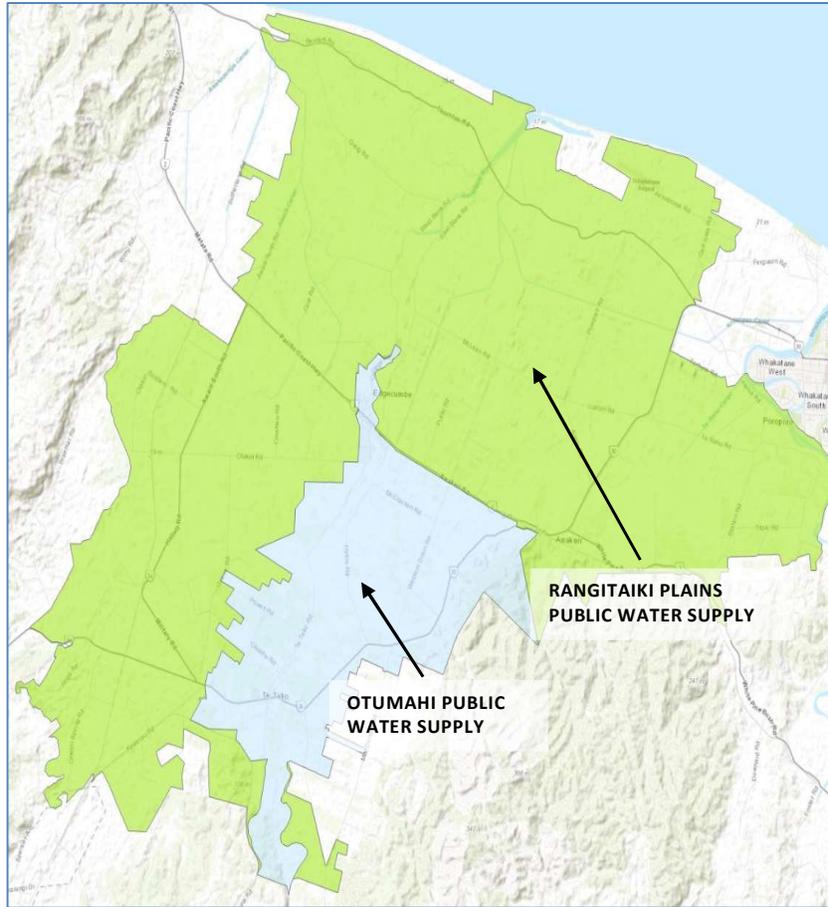


Figure 2: New Boundary of the Rangitāiki Plains Scheme

4.1.1 Water Source and Catchment

The Rangitāiki Plains Scheme has two sources of water: A spring situated along Braemar Road and two bores situated along Johnson Road. Each source and respective catchment have their own characteristics as explained below.

Braemar Road Spring

The Braemar springwater supply site is located at 488 Braemar Road, approximately 7.5 km west of Edgecumbe. Braemar springwater supply consists of a natural spring discharge contained within an above ground chamber situated approximately 40 metres west of the Tarawera River. Braemar Spring is currently chlorinated however has no protozoa treatment.

The Braemar Rd recharge zone is approximately 3 km (Appendix C: Groundwater Capture Zone) and is primary recharged from rainfall seepage.

Activities in the catchment: Land use is native bush. There are no consented HAIL sites within the groundwater capture zone. Aerial imagery shows farming activity to the south west of the bore, however, type of farming activity unknown.

Johnson Road Bores

The Johnson Road bore water supply site is located at 58A Johnson Road, Otakiri approximately 8 km south-west of Edgecumbe. The Johnson Road water supply consists of two free-flowing artesian groundwater abstraction bores (referred to as North (2510) and South (2511) Bores). Both bores consist of 300 mm diameter casings installed to depths 274 metres below ground level (bgl) (North Bore) and 235 metres bgl (South Bore). Johnson Road bore water supply is currently chlorinated however has no protozoa treatment.

The bore water supply is highly artesian (approximately 15-20 m above ground head pressure). This suggests the source of groundwater is from deeper, confined zone of ignimbrite and recharge is likely to be derived from elevated ignimbrite. The primary recharge is from deep semi-confined aquifer. Groundwater testing has been carried out and age of the water has been confirmed to be between 91 to 110 years with less than 0.005% young fraction (<1 year).

No agricultural activities were observed in the land in the immediate vicinity of the bores, however, the wider area is characterised by dairy farming and fruit growing. There are 5 consented discharges within the groundwater capture zone which are classed as 'dairy effluent disposal to land'. There are 4 HAIL sites associated with 'persistent pesticide use' from fruit production. Given the depth of bore water abstraction and confining nature of the overlying alluvium deposits and high artesian pressure, it is considered unlikely that the aquifer is at risk of surface contamination.



Figure 3: Johnson Road: Bore Heads and Pump Station/Treatment Plant Site

4.1.2 Treatment

The treatment plants are located on the same site as the pump stations and treatment consists of gas chlorination at both sites.

Bacterial Compliance: Chlorination disinfection treatment available is capable of providing treatment to achieve full bacterial compliance requirements at both sites, according to the Drinking-water Standards New Zealand (DWSNZ 2008).

Protozoa Compliance: No protozoa treatment currently installed at either site (current 0 log credit treatment installed at both sources). The Braemar Spring was assigned a protozoa log credit of 3 by the DWA in July 2018 further to the evaluation of the catchment risk assessment carried out by PDP (2017) and further information provided by WDC relating to research findings detailed in the 'Gastrointestinal Protozoa, Research and Services reports for the New Zealand Ministry of Health' study by Massey University (Appendix E). Therefore the Braemar spring is currently non-compliant for protozoa treatment. Similarly, Johnson road bores were assigned a protozoa log credit of 0 by the DWA provided the bores complied with Bore Water Security Criterion 2 of the DWSNZ 2008, and a log credit of 3 if the criterion was not met. As bore water security criterion 2 has not yet been met, the Johnson Road bores are currently non-compliant for protozoa treatment. As a result, the Rangitāiki Plains Water Supply Scheme does not comply with the protozoa compliance criteria as outlined in the DWSNZ 2008.

At Braemar, gas chlorination is provided via a 920 kg chlorine gas cylinder; a 70 kg chlorine cylinder is used as a backup. At Johnson Road, gas chlorination is provided via a 70 kg cylinder with backup cylinder. A gas cylinder bottle weighs approximately 130kg which contains 70kg of chlorine gas. A cylinder sits on a scale and once this is depleted there is an automatic switch over to a spare cylinder stored on-site.

Chlorine is dosed according to a manually set dose rate; there is no flow proportional or water quality proportional dosing. When the chlorine residual (Free Available Chlorine, FAC) leaving the treatment plant reaches outside operational limits the dose rate is adjusted manually to achieve the required FAC. During events that could change water quality such as during or immediately following storm events/earthquakes, treatment plant operators monitor the FAC levels frequently. WDC is currently looking at the installation of remote FAC monitoring throughout the district's water schemes and the Rangitāiki Plains Scheme may be included in this project.

If turbidity exceeds set limits the pumps stop and no water is delivered to the treatment unit or reservoirs.

Regular maintenance and calibration of all water treatment plant equipment is carried out by WDC staff and recorded in the appropriate log books.

FAC, pH, Turbidity (NTU) are monitored continuously at the water treatment plant and the plant is designed to alarm when these parameters exceed set limits. When certain parameters exceeded certain limits the plant also has the ability to automatically shut down by cutting off power to the pumps. During some instances automatic shut-down of the plant is manually overridden by WDC to provide water to the scheme accompanied by relevant procedures such as boil water notices and appropriate notification to the DWA. WDC is reviewing this process to allow some chlorine disinfection to occur when auto shut-off has been over-ridden.

This is further discussed in Section 9 Process Control Summaries.



Figure 4: Braemar Road: Pump Station/Treatment Plant Site

4.1.3 Storage and Distribution

Treated water from the Braemar treatment plant is pumped to a 4,500 m³ concrete reservoir located on a nearby hill. Treated water from the Johnson road treatment plant is pumped directly to the Rangitāiki Scheme reticulation with the use of booster pumps. The reticulation system is gravity fed from the Braemar reservoir and when pressure in the system drops below a certain level Johnson road pumps additional water into the reticulation to maintain suitable pressures.

The Awakeri concrete reservoir (250 m³) is situated in the East side of the Rangitāiki scheme and is used as a storage/booster reservoir to supply water to the East part of the Rangitāiki Plains Scheme distribution. Service pressure in the distribution zone on the East side of the reticulation is low during summer when there is high demand from agriculture uses.

The Otumahi Scheme distribution system is interconnected to the Rangitāiki Plains distribution system via isolation valve for resilience of these systems. This is a controlled interconnection whereby isolation valves, situated within the Edgumbe township area require manual operation and as added security each valve box has a bolted plate installed.

In the event of low pressures within a system or when emergency supply of water is required, these valves can be opened with the operators following the 'Otumahi – Rangitāiki Plains Emergency Connection Protocol' document.

There have been no issues accessing either of the reservoir sites in the past due to extreme weather.

The reticulation network consists of approximately 190.7 Km of water pipes consisting of 93.8 km of watermains, 96.5 km of rider mains and 460 metres of riser main. 47% of the water pipes were laid in late 1970's and early 1980's and over 70% of the pipe material for this system is Polyvinyl Chloride (PVC).

There is no council reticulated wastewater system within the Rangitāiki Plains rural areas and individual house have on-site septic tanks or similar.

An in-house water balance carried out for the year 2017/18 according to the International Water Association (IWA) guidelines showed that the percentage of real water losses within the previous whole scheme boundary (prior to establishment of Otumahi scheme) was 43% and the Infrastructure Leakage Index (ILI) was 9.32. The water reticulation network is operated at approximately 500 kPa pressure and there are currently no plans to carry out pressure management in the Rangitāiki Plains Scheme.

Although some routine maintenance is carried out, a majority of the day-to-day operational work consists of reactive maintenance. Attention is required to develop appropriate routine maintenance schedules, procedures and protocols to ensure the system is maintained to optimise the lifecycle of the assets.

Backflow prevention devices are installed on all farm and commercial connections triggered by building consents, change of use consents and 'new water connection' applications. It should be noted that no tradewaste consents are issued in the Rangitāiki Plains Scheme as the scheme does not have reticulated wastewater system.

Currently, no routine testing of existing backflow prevention devices are undertaken. Council's reticulation operator has recently obtained a certificate for backflow testing and is ready to undertake in-house testing once a backflow prevention policy has been adopted by the Council.

There are some procedures currently in place for third party contractors/ developers working on WDC reticulation such as the extension of existing reticulation during subdivision developments. However, procedures need to be further developed, documented and strictly enforced in order to minimise risks arising from these works.

4.1.4 Monitoring & Control of Scheme

A combined telemetry and SCADA (Supervisory Control and Data Acquisition) system is used to transmit data from the remote sites of the Rangitāiki Plains Scheme (Rangitāiki Plains pump station/ water treatment site and reservoir site) to the WDC main control room at Valley Road, Whakatāne, where it is monitored and controlled by WDC staff.

Events causing signal failure from equipment such as power outages and malfunctioning of equipment trigger alarms via the SCADA/Telemetry system. Alarms can be seen on the control room monitors and are also delivered to operator mobile phones via text message.

Telemetry shows the pump status, flow rate from the bores and reservoir levels and the following parameters are continuously monitored for treated water quality leaving the treatment plant: Turbidity, pH, FAC, Flow.

Reservoir levels are monitored with the use of level sensors. Pumps operate on a duty standby basis according to pre-set minimum and maximum reservoir levels in order to fill the reservoirs.

Monitoring of water quality in the Rangitāiki Plains reticulation system is carried out through routine manual FACE sampling (FAC and E coli). Sampling is carried out in accordance with the DWSNZ 2008 sampling schedule. A continuous, remote FAC monitoring site within the Rangitāiki Plains has been installed with the use of CHLOROCLAM FC1 3G PACKAGE Chloroclam® -remote water quality monitor for Free Chlorine residual.

Water quality in the reticulation is managed through routine maintenance such as mains flushing, through leak detection and through the use of backflow prevention devices on all connections.

Monitoring and control of the system is further discussed in Section 9.

4.2 Changes to the Scheme

The following significant changes have been carried out to the scheme:

- Establishment of the Otumahi water scheme has altered the Rangitāiki Plains scheme area with the removal of the urban areas of Edgecumbe and Te Teko and the removal Tahuna road bore as a source.
- Installation of backflow prevention devices on remaining connections that currently had no device installed

Mains and connection replacements, as well as installation of backflow prevention devices were carried out in 2010 as part of capital works programmes. The decommissioning of copper and galvanized iron pipes were undertaken and replaced with PVC and MDPE pipes.

5.0 Compliance with Drinking Water Standards

The Rangitāiki Plains Scheme received a MoH Grading of Ee in 2007 which was later upgraded to a Da in 2012. MoH recommends a grading of at least Cc for a drinking water supply of this size. An explanation of the grading given can be found in Table 3.

Table 3: MoH Grading for Water Supply Schemes	
Source and Treatment Grading: Assessment based on source and treatment factors:	
A1:	Completely satisfactory, negligible level of risk, demonstrably high quality.
A:	Completely satisfactory, extremely low level of risk.
B:	Satisfactory, very low level of risk when the water leaves the treatment plant.
C:	Marginally satisfactory, low level of microbiological risk when the water leaves the treatment plant, but may not be satisfactory chemically.
D:	Unsatisfactory level of risk.
E:	Unacceptable level of risk.
Distribution Zone Grading: Assessment based on reticulation condition, management, and actual water quality:	
a1:	Completely satisfactory, negligible level of risk, demonstrably high quality; meets Aesthetic Guidelines and has ISO 9001:2000 accreditation.
a:	Completely satisfactory, extremely low level of risk.
b:	Satisfactory, very low level of risk.
c:	Marginally satisfactory, moderate level of risk.
d:	Unsatisfactory level of risk.
e:	Unacceptable level of risk.

Bacterial, protozoal, chemical, radiological and cyanotoxin compliance requirements and compliance achieved for the year 2016/17 can be found in this section. Results presented in Table 4 reflect sections of the scheme that is currently relevant to the Rangitāiki Plains scheme (i.e.- excludes parts of the treatment and distribution system which now belong to the Otumahi Scheme such as the Edgecumbe and Te Teko urban areas).

Table 4: Rangitāiki Plains Compliance Criteria (DWSNZ 2008)						
Compliance Type/ Location	Section of DWSNZ 2008	Monitoring Parameter	Sampling Frequency	Samples per year	Compliance Criteria	Compliance 2017/18
Bacterial Compliance						
Braemar Road Treatment Plant	Compliance Criterion 1 (Section 4.3.1)	E Coli	Twice a week ¹	Required: 102 Taken: 107	<1 E coli per 100 mL sample according to table A1.4	Compliant
Johnson Road Treatment Plant	Compliance Criterion 2A (Section 4.3.2.1)	FACE	Continuous	FACE: < 0.2 mg/l for >2% of 1 day (28 mins)		Non-Compliant
		Turbidity	Continuous	Turbidity not >1.0 NTU for >= 5% of monitoring period (72 minutes). Turbidity not >2.0 NTU for >= 3 continuous minutes.		
Rangitāiki Plains Rural Distribution Zone	Compliance Criterion 6A (Section 4.4.1, 4.4.3, 4.4.4)	E Coli	13 samples per quarter ²	Required: 52 Taken: 63	<1 E coli per 100 mL sample	Compliant
Protozoal Compliance						
Braemar Road Treatment Plant	No Protozoa treatment installed.					Non-Compliant
Johnson Road Treatment Plant	No Protozoa treatment installed.					Non-Compliant
P2D Compliance						
Braemar Road and Johnson Road Treatment Plants	No priority 2 Determinands assigned to these two treatment plants.					
Rangitāiki Plains Rural Distribution Zone	P2D assigned -> Arsenic Number of samples -> 12 samples required, 30 samples were taken Transgressions -> 3 samples >50% MAV 22 samples greater than 0.01 MAV					Non-Compliant
Radiological Compliance						
Johnson Road Treatment Plant	Section 9.4	Alpha and beta emitting radionuclides and radon-222	Once every 10 years	Last undertaken October 2016		Compliant
Cyanotoxin Compliance						
Not applicable to spring and bore water.						
Notes:						
1. Table 4.2a for E coli monitoring only and population band of 501 – 10,000 with 5 maximum days between samples and 6 minimum days of the week used.						
2. Table 4.3a and 4.3b for the population band of 501 – 5,000 with 11 maximum days between samples and 5 minimum days of the week used. Sampling sites and sampling frequencies are as per Sections 4.4.3 and 4.4.4.1 of the DWSNZ respectively.						

6.0 Critical Points and Barriers to Contamination

By considering both the existing Barriers to Contamination and Critical Points of the scheme it is possible to highlight areas in the scheme that require improvements.

Barriers to Contamination that are present in the Rangitāiki Plains Scheme that eliminate, minimize or isolate contamination were identified and is presented in Table 5. A multi-barrier approach would provide the most robust system ensuring processes are in place to reduce contamination at each stage of the scheme.

As defined by the water safety plan guides, barriers should be present to achieve the following:

- To stop contamination of raw water;
- To remove particles from water;
- To kill germs; and
- To prevent recontamination of treated water.

Critical Points are areas in the scheme where there is potential for contamination or loss of supply of water. These were identified and presented in Table 6.

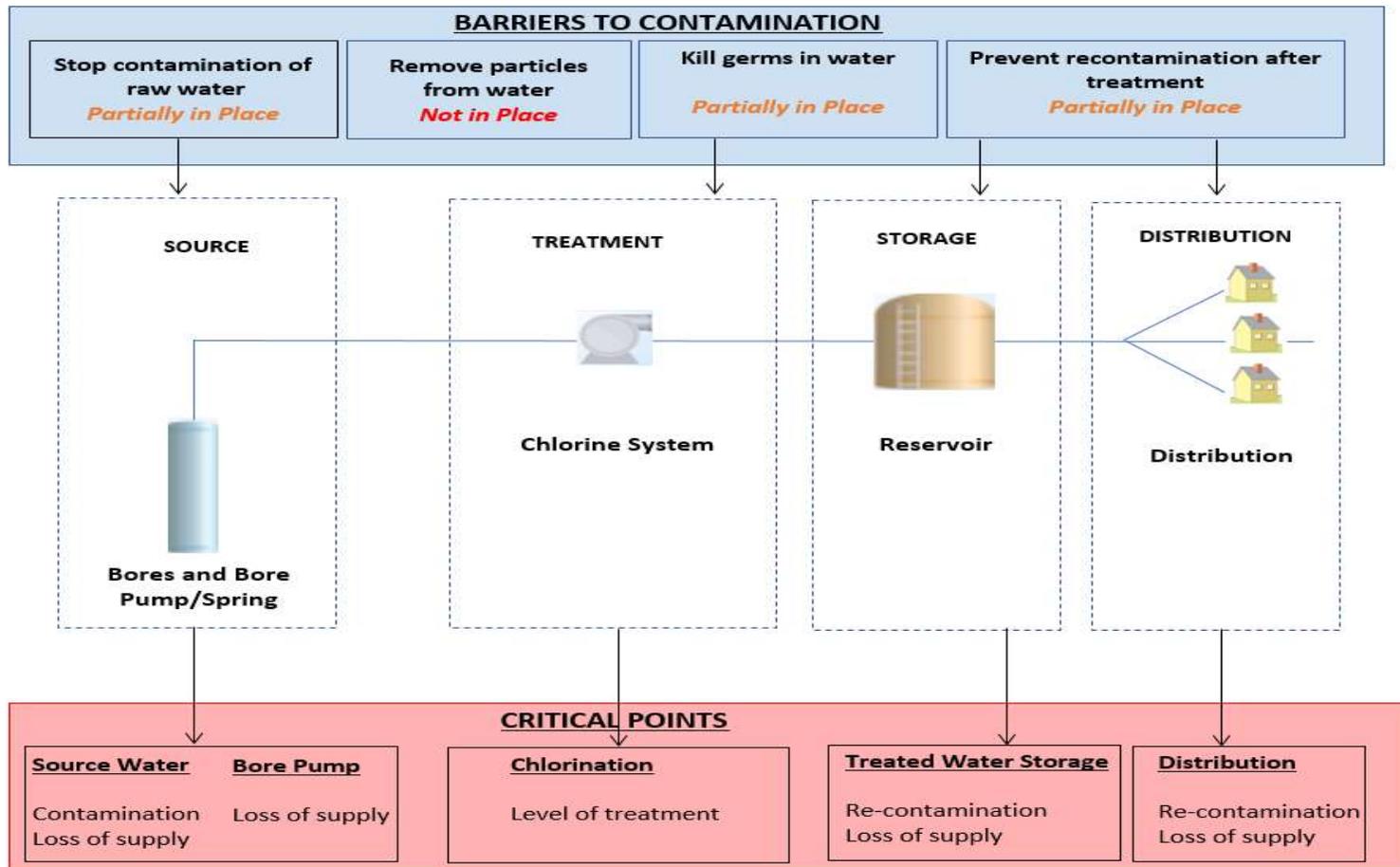


Figure 5: Barriers to Contamination and Critical Points of Rangitāiki Plains Scheme (Braemar Spring/Johnson Road bore Sources)

Table 5: Barriers to Contamination	
Barriers to:	Actions/Supply elements contributing to the barrier
Stop contamination of raw water (At Source) <i>Partially In Place</i>	<ul style="list-style-type: none"> • Security of groundwater source: <i>Partially in place.</i> Braemar spring has the potential to be heavily influenced by changes in catchment. Johnson Road bore water is less influenced by catchment activity due to depth of bores. • Abstraction point positioned and constructed to avoid contamination: <i>Partially in place.</i> 5 metre stock fence not erected at Johnson road site. • Source protected from contamination: <i>Partially in place.</i> Catchment risk assessment carried out to identify activities in the catchment; ongoing monitoring of activities required.
Remove particles from the water (Treatment) <i>Not In Place</i>	<ul style="list-style-type: none"> • Coagulation/Flocculation/Clarification: <i>Possible Requirement, Not in place.</i> Possible requirement to achieve log credit of 3 at Braemar spring. • Dissolved air filtration: <i>Possible Requirement, Not in place.</i> Possible requirement to achieve log credit 3 at Braemar spring. • Filtration: <i>Possible Requirement, Not in place.</i> Possible requirement to achieve log credit of 3 at Braemar spring.
Kill germs in water (Treatment) <i>Partially In Place</i>	<ul style="list-style-type: none"> • Disinfection (Chlorine): <i>Partially In Place.</i> Chlorine disinfection present in both treatment plants in line with bacterial removal, however, no protozoal treatment present (UV/Filtration) to achieve a protozoal removal of log credit 3 and higher at Braemar spring site.
Prevent recontamination after treatment (Storage & Distribution) <i>Partially In Place</i>	<ul style="list-style-type: none"> • Measures to stop contamination of storage tanks: <i>Partially in place.</i> Some measures in place. • Maintenance of a disinfecting residual: <i>In place.</i> Continuous FAC monitoring at treatment plant. FAC leaving treatment plant maintained within target limits. FACE manually sampled at different points of distribution. • Actions taken to avoid contamination during distribution: <i>Partially in place.</i> Some routine asset maintenance and asset replacements in place; these require further development along with current policies and procedures. • Backflow prevention: <i>In place.</i> BFP Policy being developed.

Table 6: Critical Points	
Critical Point	Description
Groundwater bores: Contamination of source supply	<ul style="list-style-type: none"> Highly variable source water quality in spring. Possible contamination of bore water by surface water ingress due to non-compliance of Johnson Road against borehead security criterion 2 of the DWSNZ.
Groundwater bores: Loss of source supply	<ul style="list-style-type: none"> Failure of pumps leading to loss of supply. Loss of power to site with no backup generator on site; especially vulnerable during heavy storm events.
Treatment	<ul style="list-style-type: none"> Insufficient chlorine dosing resulting in harmful microbiological contaminants remaining in water. Overdosing of chlorine leading to chemical contamination of water. Chlorination – 30 minute contact time to be reviewed. Provides sufficient treatment for complete bacterial removal, however, inadequate protozoal removal at both treatment plant sites. UV and/or Filtration treatment is required for further disinfection and particle removal, to achieve a protozoa log credit treatment of 3 at Braemar Spring. Security Criterion 2 is required to be met to achieve a protozoa log credit treatment of 0 at Johnson Road. Insufficient maintenance of treatment equipment leading to failures and subsequent inadequate treatment. Infrequent calibration and verification of equipment leading to false measurements of water quality.
Treated water storage	<ul style="list-style-type: none"> Possible contamination of treated water storage in the reservoirs if routine inspections and maintenance not undertaken and access by vermin and birds from gaps in the roof and overflow pipe. Loss of structural integrity of reservoir leading to loss of supply.
Distribution system	<ul style="list-style-type: none"> Insufficient routine maintenance such as flushing resulting in build-up of contaminants in the system. Inadequate backflow prevention provided resulting in contamination of water. Limited testing of existing devices is carried out at present.

Table 6: Critical Points	
Critical Point	Description
	<ul style="list-style-type: none"> • Failure of distribution system components such as pipes, valves and hydrants due to lack of routine asset renewals, resulting in contamination of water and loss of supply. • Inadequate maintenance procedures and policies in place to maintain the distribution system (including hygiene/disinfection procedures, procedures for contractors) resulting in contamination of distribution system. • High leakage rates in the distribution system leading to possible contamination of water through back flow. • Possible illegal connections leading to contamination of network.

7.0 Risk Assessment Tables

Based on the Barriers to Contamination and Critical Points identified in Section 6.0 it is possible to identify ‘Risk Events’ that could occur in the Rangitāiki Plains Scheme that has the potential to compromise public health by either contamination of water supply and/or loss of water supply.

These Risk Events are tabulated in the form of Risk Tables and grouped by Source, Treatment, Reservoirs and Distribution, and are found in Appendix A.

The ‘*Current Scenario*’ section of the Risk Tables contain ‘Preventative Measures’ currently in place to prevent the Risk Event from occurring, and assesses the ‘Current Risk’ of the Risk Event occurring.

The ‘*To be Implemented*’ section of the Risk Tables contain Preventative Measures that are to be implemented to reduce the Current Risk, and assesses the ‘Residual Risk’ of the Risk Event occurring once the new measures are implemented. The person/s responsible for the preventative measure/s to be implemented is also identified.

The Current Risk and Residual Risk were assessed according to the qualitative risk assessment methodology consistent with AS/NZS 4360:1999 Risk Management standard. A Likelihood scale (Table 7) and Consequence scale (Table 8) were defined and set by WDC staff according to how they perceived risks and the corresponding Risk Matrix (Table 9) was used to assign the level of Current Risk and Residual Risk as ‘Low’, ‘Medium’, ‘High’ or ‘Extreme’.

Table 7: Likelihood Scale as Defined by WDC	
Almost Certain	Is expected to occur in most circumstances
Likely	Will probably occur (once in 1-2 Years)
Possible	Might occur (once in 5-10 Years)
Unlikely	Might occur (once in 10-20 Years)
Rare	Could occur (once in 50-100 Years)

Table 8: Consequence Scale as Defined by WDC				
	Loss of Supply	Boil Water Notice	Illness	Operation Disruption
Insignificant	Insignificant to none	None	No reported illness	Little disruption
Minor	Less than 1 hour	None. Aesthetic water quality event.	No reported illness	Manageable disruption
Moderate	Less than 4 hours	Up to 3 days. Water quality event that requires flushing.	No reported illness	Significant modification to normal operation
Major	Greater than 4 hours	Prolonged	Probable illness	Abnormal or cease of operation
Catastrophic	For 1 or more days	Prolonged	Severe illness and probable death	Complete failure of system

Table 9: Risk Matrix						
		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Almost Certain	High	High	Extreme	Extreme	Extreme
	Likely	Medium	High	High	Extreme	Extreme
	Possible	Low	Medium	High	Extreme	Extreme
	Unlikely	Low	Low	Medium	High	Extreme
	Rare	Low	Low	Medium	High	High

8.0 Improvement Plan

The Improvement Plan lists improvements to the Rangitāiki Plains Scheme identified during the preparation of this WSP. Each item has been allocated to a person/department that will be responsible for its implementation (Table 10) and the date by which WDC intends to carry it out.

Improvements are listed in order of Priority as follows: High Priority (Table 11), Medium Priority (Table 12) and Low Priority (Table 13).

Items were assigned by WDC based on the timeline achievability, cost of implementation, the ease of implementation and the current risk to the Rangitāiki Plains Scheme if the improvements are not carried out. It should be noted that items in the Improvement Plan relate to both Braemar and Johnson Road treatment plants, associated reservoirs and distribution system unless specifically stated as relating to a specific part of the scheme.

Table 10: Persons Responsible for Improvement Plan Items	
Person Responsible	Code
General Manager Planning and Infrastructure	GM
Manager Three Waters	MTW
Team Leader - Water Treatment Plant	TL-WTP
Water Treatment Plant Operator	WTP-O
Team Leader - Three Waters Operations	TL-O
Team Leader - Three Waters Administration	TL - AS
Team Leader - Three Waters Asset Management and Planning	TL-AM
Asset Engineer - Three Waters	AE
Manager - Capital Projects	PM
Project Engineer	PE
Manager Public Affairs	M-PA
Senior Project Planner	SPP

Table 11: Improvement Plan – High Priority Items

Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
1	S2.1 (PM1) S3.1 T1.3 (PM4)	Managing activities in the catchment	Monitor changes in activities in the catchment and modify catchment risk assessment where required with review of details Annually in July	AE / TL-AM	80 hours	July Annually
2	S3.1 (PM1G)	Managing activities in the catchment	WDC to liaise with pesticide application companies and make them aware of locations of water sources and to be informed of pesticide drops in vicinity of water source.	SPP / TL-AM	80 hours	October 2019
3	S3.1 (PM3G)	Managing activities in the catchment	Pesticide suite testing on raw water was undertaken in September 2013 and again in July 2018, a comparison of results is being undertaken and report to Toi Te Ora shall be prepared.	AE / TL-AM	24 hours	October 2019
4	S1.2 (PM1b) T3.1 (PM1b)	Power failure	For the interim, install a dedicated generator plug-in point	AE/TL-AM	\$10,000	November 2019
5	T7.1 (PM1) R5.1 (PM1)	Lack of chlorine contact time/ short circuiting	Chlorine C.t value must be at least 6 for at least 98% of compliance monitoring period with a minimum retention of 5 minute. Review outputs and investigate if this is achieved.	TL-WTP / WTP-O E	8 hours	November 2019
6	D5.2 (PM1G)	Inadequate operating Procedures	Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater)' document. Modify, where required to clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.	TL-O/TL- WTP/WTP-O	40 hours	December 2019
7	D5.2 (PM2G) D5.3 (PM2G)	Inadequate operating Procedures	Develop and implement a Council SOP (Hygiene code of practice for working on water supply systems). The document to reflect industry best practice and how Council will manage preventing cross contamination in the unlikely event that staff alternate on wastewater and water reticulation work. The Hygiene Code of Practice to include start up employment arrangements, sickness statement and medical clearance requirements.	TL-WTP/TL- O/TL-AS / RC	40 hours	December 2019
8	T1.3 (PM2)	Insufficient chemical treatment installed	Arsenic Removal - In the interim, whilst awaiting outcome of investigation, council will develop public consultation programme informing connected customers that this supply may contain exceedances of particulates (i.e. arsenic etc.) and what the likely human health impacts are; and inform them of the various 'point-of-supply' treatment options.	MTW/M-PA / TL- WTP/TL-AM	80 hours + \$2,500	December 2019
9	T4.1 (PM1) T5.1 (PM1)	Inadequate calibration and maintenance of	WDC to review calibration and maintenance procedures of treatment plant equipment and incorporate into Operations and Maintenance manual with appropriate Standard Operating Procedures (SOP)	TL-WTP / WTP-O	8 hours	December 2019

Table 11: Improvement Plan – High Priority Items

Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
		treatment plant equipment				
10	R2.2 (PM2)	Vandalism to reservoir structure	Investigate and install appropriate ladder locking gage/surround at Braemar reservoir.	TL-AM / PM	\$3,000	December 2019
11	S2.2 (PM2) T1.2 (PM3)	Bore construction Insufficient protozoal treatment installed Johnson Road	Johnson Road: Provide DWA with production bore installation details to comply with bore water security criterion 2	AE / TL-AM	24 hours	December 2019
12	D5.1 (PM1G)	Poor planning of scheduled work by WDC staff and their contractors affecting critical customers	Where possible utilise WDC Asset Management System to maintain an up-to-date database of critical users such as dialysis patients/hospitals/businesses. Develop robust process for critical customer rating and updating data to maintain active list.	TL-AM	20 hours	December 2019
13	S2.2 (PM1)	Bore construction	Johnson Road: Council to write to DWA with regards to the 5 metre animal exclusion zone from the centre of the North bore head; currently unable to extend fence as adjoining land not owned by WDC.	AE / TL-AM	10 hours	December 2019
14	R2.2 (PM1a)	Vandalism to reservoir structure	Investigate the option of fencing installation of gate at Awakeri reservoir.	TL-WTP / AE / PE	24 hours	December 2019
15	D6.1 (PM1G)	Third party contractor/developer work on WDC reticulation (not directly engaged by WDC)	WDC to develop policy and procedure whereby Third party contractors/developers are made liable for any damages to the network to increase accountability.	TL-O / AE / TL-AM	40 hours	December 2019
16	D1.1 (PM1G)	Contamination from backflow	Develop and implement a backflow prevention policy to match device to risk level of activity, including testing requirements of the devices. This has political ramifications and will be difficult to implement thus long lead in time.	GM / MTW / M-PA / TL-AM	100 hours	December 2019
17	S2.1 (PM5)	Managing activities in the catchment, Bore head Security	Johnson Rd site: To liaise with land owner adjoining the Johnson Road site to prevent or limit stock grazing activities. To also find out future plans that may change activity within the zone that may affect bore water quality	AE / TL-AM	40 hours	December 2019

Table 11: Improvement Plan – High Priority Items

Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
18	S2.1 (PM6)	Managing activities in the catchment	Johnson Road site: To liaise with consent holders of the 5 consented discharges and 4 HAIL sites to make them aware of the effects of activities around the bore on water quality	SPP / AE / TL-AM	240 hours	June 2020
19	T1.3 (PM1)	Insufficient chemical treatment installed	Arsenic Removal - Undertake full investigation taking into account past studies. Full options report with costings to achieve Arsenic removal to be developed. Council will consult closely with DWA throughout this process.	MTW/TL-WTP/AE/PM/TL-AM	\$50,000	June 2020
20	D5.3 (PM1G)	Inadequate training and registers	Review staff certificates and maintain updated training and health register. Develop a training and competency system for working on reticulated network.	TL-O / TL-AS / TL-WTP	20 hours + \$500	December 2020
21	D4.1 (PM3) S1.9 (PM3)	Pressure fluctuations in the system Resource consent limitation	Once hydraulic models are completed and in-line with annual water balance calculations develop and implement leak detection programme.	AE / PE / TL-O	20 hours + M & R costs depending on works	December 2020
22	S1.2 (PM1a) T3.1 (PM1a)	Power failure	Braemar and Johnson Road Investigate the installation and/or provision of a dedicated generator for these sites to provide minimum flow requirement during power outage.	AE/TL-AM	40 hours + \$100,000 (tentative)	September 2021
23	S2.1 (PM2) S3.1 T1.3 (PM5)	Managing activities in the catchment	Catchment Risk Assessment undertaken September 2017. Programme activities to submit a catchment risk assessment to the DWA before 5 year period, for approval.	AE / TL-AM	240 hours	July 2022
24	T1.3 (PM3)	Insufficient chemical treatment installed	Arsenic Removal - Seek funding and implement chosen option to achieve Arsenic Removal.	MTW/M-PA / TL-WTP /AE/PM/TL-AM	80 hours + Cost to be determined	October 2022
25	S1.9 (PM1)	Resource consent limitations	Apply for new water take consent in accordance with requirements (at least six months prior to expiry). Braemar consent (2023)	SPP / AE / TL-AM	\$100,000	October 2022
26	R2.2 (PM1b)	Vandalism to reservoir structure	If R2.2 (PM1a) is achievable, budget and programme for fencing and gate installation at Awakeri reservoir	TL-AM / PM	\$40,000 (tentative)	December 2022
27	S1.9 (PM2)	Resource consent limitations	Apply for new water take consent in accordance with requirements (at least six months prior to expiry). Johnson Road Consent (2031).	SPP / AE / TL-AM	\$100,000	October 2030

Table 12: Improvement Plan – Medium Priority Items						
Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
1	WSPs	WSP Review	Carry out WDC internal review of the WSP annually and report on improvement plan works that have been undertaken.	MTW / TL-WTP / TL-O / AE / TL-AM	120 hours	May (annually)
2	D4.1 (PM2G)	Pressure fluctuations in the system	Carry out a periodic water balance to identify levels of leakage in system.	AE	8 hours	August (annually)
3	T7.1 (PM2)	Short circuiting or lack of contact tank	New Rangitāiki Plains distribution zone boundary: Review distribution sample points to ensure points of higher risks are covered and develop sampling point schedule (e.g. points furthest away from treatment plant, dead ends and points of low usage, points of high draw off, service reservoirs, old pipework, low pressure areas).	TL-WTP / TL-O / AE / TL-AM	8 hours	June 2019
4	T7.1 (PM3)	Short circuiting or lack of contact tank	New Rangitāiki Plains distribution zone boundary. Apply to MoH to update drinking water registry with new scheme boundary and scheme population and update other details of the treatment and distribution zones as required.	AE / PE	8 hours	June 2019
5	S1.4 (PM1) T2.1 (PM1)	Damage to equipment wiring due to vermin.	Electrical cabinet to be made vermin proof.	TL-WTP / PM	\$2,000	July 2019
6	D5.2 (PM3G)	Inadequate operating Procedures	Review existing operating procedures and develop procedures that clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.	MTW / TL-WTP/WTP-O / RC	40 hours	September 2019
7	D1.1 (PM4G)	Contamination from backflow	Review policy for withdrawing water from hydrants; specify the use of standpipes fitted with approved backflow preventers.	MTW / M-PA / AE / TL-O / TL-AM	4 hours	December 2019
8	D1.1 (PM6G)	Contamination from backflow	Develop and implement a policy to disconnect connections not in use, with special attention to connections provided to vacant lots during subdivisions.	MTW / M-PA / AE / TL-O / TL-AM	8 hours	December 2019
9	D1.1 (PM7G)	Contamination from backflow	Develop and implement a policy for identifying and dealing with illegal connections.	MTW / M-PA / AE / TL-O / TL-AM	4 hours	December 2019
10	D1.1 (PM3G)	Contamination from backflow	Circulate educational material to customers, especially those considered high risk, about risks of backflow prevention and ways of minimising the risk.	AE / M-PA	4 hours	December 2019
11	S1.6 (PM1) S1.7 (PM1)	Natural disasters - Flooding and extreme storm events	Develop a disaster management plan for the water supply which could be included as part of a wider disaster management plan for the district.	MTW / TL-O / TL-WTP	120 hours	December 2019

Table 12: Improvement Plan – Medium Priority Items

Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
12	T4.4 (PM2G)	Inadequate Training	Develop training and competency system.	TL-AS / TL-WTP / WTP-O	80 hours	December 2019
13	R3.1 (PM1)	Insufficient storage capacity	Operators to be trained in following the 'Otumahi – Rangitāiki Plains Emergency Connection Protocol' document	TL-WTP / WTP-O	16 hours	December 2019
14	T4.2 (PM1)	Inadequate plant records and procedures	Ensure all plant records such as manuals, drawings, procedures, Incident response plan, etc. are controlled documents within Council corporate record system and hard copy located at the Water Treatment Plant.	TL-WTP / WTP-O / TL-AS	20 hours + \$500	March 2020
15	R2.1 (PM3)	Reservoir structural integrity	Undertake investigation for integrity of Awakeri reservoir and repair any leaks	AE / PE	\$10,000	March 2020
16	T1.1 (PM1) R4.3 (PM2)	Insufficient bacterial treatment installed Sediment/slime	Investigate best practice for monitoring/ assessing and responding to total coliforms and indicate what costs and benefits this would deliver for this water supply. If feasible and able to adequate resource council to develop protocol and modify Incident Response Plan appropriately.	TL-WTP / WTP-O / AE	40 hours	May 2020
17	D1.1 (PM2) D4.1 (PM5)	Contamination from backflow	Undertake data collection and survey of water supply system to identify all installed backflow prevention devices. Undertake testing of found backflow devices. Renew or install Backflow devices on all connections; priority given to connections identified as high risk. Dual check valve to be installed on residential connections as part of the meter installation programme.	TL-AM / AE / PE	\$900,000	October 2020 (subject to Council Policy)
18	T1.2 (PM1)	Insufficient protozoal treatment installed	Investigate options and costings to upgrade Braemar treatment plant by installing UV/filtration to achieve a log credit of 3 is ideal for protozoa treatment.	MTW/TL-WTP/TL-AM	20 hours + \$5,000	December 2020
19	T1.2 (PM2)	Insufficient protozoal treatment installed	Based on options investigation budget and undertake the upgrade Braemar treatment plant	MTW/TL-WTP/PM/TL-AM	\$150,000 (to be confirmed)	December 2022 (subject to Council approval)
20	T1.4 (PM1)	Other - Insufficient pH treatment	Investigate options to install pH correction and cost benefit of installation of pH correction. If feasible budget and programme for works to occur	TL-WTP/PM / TL-AM	60 hours	December 2022

Table 13: Improvement Plan – Low Priority Items

Items	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
1	D4.1 (PM4G) D5.1 (PM2G)	Pressure fluctuations in system	Develop and adopt internal procedure for maintaining an up-to-date Asset Management System and GIS system.	AE / TL-AM	40 hours	July 2019
2	D4.1 (PM1)	Pressure fluctuations in system	Identify problem pressure areas by carrying out hydraulic model network analysis coupled with customer complaint records.	AE / PE	120 hours + \$35,000	May 2020
3	T1.4 (PM2G)	Other - Insufficient pH treatment	Plumb solvency - Inform wider community and consumers about the use of copper pipes and fittings (including lead jointing) for internal plumbing by circulating information flyer and notification on Council Website	M-PA / AE	40 hours + \$1,000	November 2019
4	T6.1 (PM1)	Over chlorination	Undertake WTP site assessment to determine that all practical measures are in place via Electrical, Mechanical and Physical to avoid overdosing with particular emphasis on possibility of syphoning. Details to be recorded of the assessment and any recommendations	TL-WTP / WTP-O	4 hours	November 2019
5	T6.1 (PM2)	Over chlorination	Develop supply specific flushing plan to be implemented when treatment plant over doses and include in WTP operations manual	TL-WTP / WTP-O / TL-O	4 hours	November 2019
6	R4.3 (PM1)	Sediment/slime accumulation and resuspension	Utilise Asset Management System to schedule and implement a CCTV inspection of reservoirs and vacuum cleaning programmes.	TL-AS / TL-O	4 hours	December 2019
7	R2.1 (PM1)	Loss of structural integrity of reservoirs	Carry out condition assessment of all concrete reservoirs in 2019 and formulate a condition assessment programme thereafter.	AE / PE	\$2,000	December 2019
8	D5.1 (PM3G)	Poor planning of scheduled work by WDC staff and their contractors	Maintain a systematic workflow procedure with control checks for the update of capital works arising from projects, subdivision work and daily replacements and renewals so that all paperwork is sent to the asset engineer for recording on Asset Management System and GIS.	AE / TL-AM	20 hours	December 2019
9	S2.2 (PM4)	Bore-head Security	Carry out CCTV inspection of bore casing to ascertain condition, as required.	TL-AM	\$5,000	February 2020
10	D2.2 (PM2)	Inability to isolate/shut down system	Undertake a programme of marking valve boxes for ease of location and to indicate whether they are open or closed.	AE / TL-O	40 hours	March 2020

Table 13: Improvement Plan – Low Priority Items						
Items	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
11	D2.1 (PM1G), (PM2G) D2.2 (PM3) S1.3 (PM1) S1.4 (PM2) S2.2 (PM3), S2.2 (PM5G) R2.1 (PM2) R4.1 (PM1) T2.1(PM2) T4.1 (PM2G)	Poor circulation in network Bore Pump failure Bore-head Security	Utilise Asset Management System to schedule and/or monitor preventative maintenance. Utilise Asset Management System to schedule the maintenance, verification and calibration of treatment plant equipment.	TL-AS / TL-O	20 hours	March 2020
12	D2.2 (PM1)	Inability to isolate or shut down the system	Carry out a routine maintenance plan for valve exercising with priority given to critical valves i.e.-those supplying a large or critical customer base, valves on rising and falling mains and those used for bore and reservoir isolation.	TL-AS / TL-O	12 hours	March 2020
13	T4.3 (PM2G)	Water Operator Authorisation assessment	Water Operator Authorisation. Authorisation assessments by DWA were undertaken with WDC operators in September 2018. The next assessments will be carried out in 2021.	TL-WTP / WTP-O	8 hours	August 2021
14	D3.1 (PM2G)	Asset failure due to age, condition and material	Update water asset management plan as required and republish every 3 years.	TL-AM / AE	\$4,000 Per system	June 2021
15	T4.4 (PM1)	Inadequate training of staff	All treatment plant operators to complete appropriate qualification for water treatment plant. WDC to keep records of training and produce when requested.	MTW / TL-WTP	\$3,000	December 2021
16	D3.1 (PM1G)	Pipe, valve and hydrant failure due to age, condition and material of pipe	Develop and budget asset renewals programme based on condition sampling and assessments, analysis of asset age, material, frequency of breakages and increase in maintenance costs. Asset renewals to prioritize critical assets such as rising mains/falling mains, pipes supplying a critical consumers or large consumer base, critical valves and hydrants.	AE / TL-AM	160 hours	July 2022
17	S2.1 (PM7) S3.1 (PM4G)	Managing activities in the catchment	Team Leader - Three Waters Asset Management and Planning to provide input into next version district plan (WDC) and regional plan (BOPRC) concerning protection of catchment; input into activities such as sediment control from earthworks and riparian strip management.	SPP / TL-AM	240 hours	December 2026

9.0 Process Control Summaries

Several parameters within the water supply scheme known as ‘Control Parameters’ are routinely monitored by the operators to ensure the system is operating within the prescribed ‘Target Range’. When any of these Control Parameters exceed the Target Range and reach ‘Action Limits’ or ‘Critical Limits’, the operator/s are required to undertake ‘Corrective Actions’ to restore the system back to the prescribed Target Range.

Effective process control occurs when operators are aware of the Target Range, the Corrective Actions required to be taken and who is responsible for carrying them out. It is therefore recommended ‘Process Control Summaries’ are used as a guide by WDC treatment plant operators in day to day operations.

Table 14: Process Control Definitions	
Critical Control Points (CCP)	Points and processes in the Rangitāiki Plains Scheme that can be controlled to prevent contamination of water.
Control Parameters (CP)	Parameters that can be measured and monitored in order to determine if a process is performing as required.
Target Range	Desired range within which each CP is required to operate in the normal day-to-day operation of the system.
Action Limits and Critical Limits	When CPs reach these limits Corrective Actions are required to be carried out by persons responsible to bring CPs back within the Target Range.
Corrective Actions	Actions to be carried out when CPs reach Action Limits and Critical Limits.
Process Control Summaries (PCS)	Target Range, Action Limits and Critical Limits for CPs and a list of corrective actions to be taken when CPs reach Action Limits and Critical Limits, along with person/s responsible for carrying them out.

Figure 6 shows the Critical Control Points (CCPs) of the Rangitāiki Plains Scheme and the Control Parameters that are to be monitored and measured at each CCP.

Process Control Summaries have been prepared for the Treatment CCPs of the Rangitāiki Plains Scheme. Process control summaries have not been prepared for the Source, Storage and Distribution CCPs further to guidance from the DWA.

A description of the Treatment CCP can be found in Section 9.1 (Gas Chlorination) and the Process Control Summaries for the Treatment CCP can be found in Appendix B.

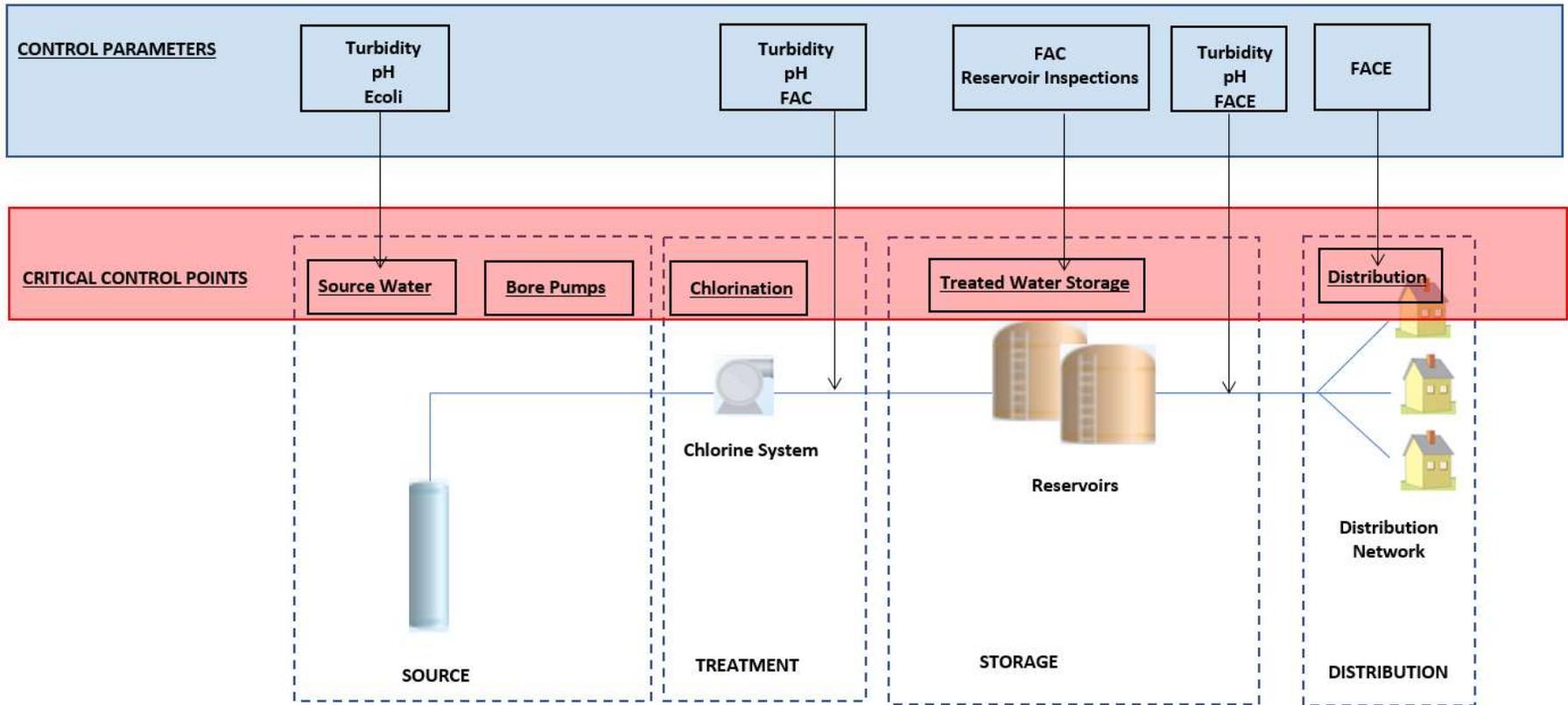


Figure 6: Critical Control Points and Corresponding Control Parameters for the Rangitāiki Plains Scheme for Sources (Braemar Spring/Johnson Road bores), Treatment, Storage and Distribution

9.1 Critical Control Point for Braemar Spring: Chlorination (Primary Disinfection Treatment)

Process Objectives:

- Provide a primary disinfection CCP to inactivate bacterial, viral and some protozoan pathogens.
- Provide residual disinfection quality control pit to help inactivate pathogens entering downstream of the dosing point.

Process Location:

- Chlorine dosing system located downstream of raw water intake.

Parameters and day-to-day monitoring:

- Turbidity (NTU units) – Continuous monitoring through turbidity meter connected to SCADA and Telemetry.
- pH (pH units) – Continuous monitoring through pH meter connected to SCADA and Telemetry.
- Free Available Chlorine (FAC, mg/L) – Continuous monitoring

Parameter Monitoring Points:

- All three parameters (Turbidity, pH and FAC) are monitored immediately downstream of the chlorine injection point.
- Manual weekly sampling of E.coli in water leaving the treatment plant.

Process Records:

- Manual: WTP Log book and manual sampling sheets. In-house information system to record manual sampling results. Results regularly uploaded to Drinking Water Online to be assessed by the DWA for compliance purposes.
- Online: Telemetry and SCADA system to record and display data.

Process Controller:

- WDC water treatment plant operator on duty.

Supporting Programmes:

- Weekly checks of continuous monitoring equipment and calibration of monitoring instruments.
- Training and competency assessment by DWA of operators in equipment operation and monitoring.
- IANZ accredited laboratory verification checks for E coli weekly with transgression reporting to Operator and DWA as per DWSNZ 2008.

9.2 Critical Control Point for Johnson Road Bores: Chlorination (Primary Disinfection Treatment)

Process Objectives:

- Provide a primary disinfection CCP to inactivate bacterial, viral and some protozoan pathogens.
- Provide residual disinfection quality control pit to help inactivate pathogens entering downstream of the dosing point.

Process Location:

- Chlorine dosing system located post-bore.

Parameters and day-to-day monitoring:

- Turbidity (NTU units) – Continuous monitoring through turbidity meter connected to SCADA and Telemetry.
- pH (pH units) – Continuous monitoring through pH meter connected to SCADA and Telemetry.
- Free Available Chlorine (FAC, mg/L) – Continuous monitoring

Parameter Monitoring Points:

- All three parameters (Turbidity, pH and FAC) are monitored immediately downstream of the chlorine injection point.
- Manual weekly sampling of E.coli in water leaving the treatment plant.

Process Records:

- Manual: WTP Log book and manual sampling sheets. In-house information system to record manual sampling results. Results regularly uploaded to Drinking Water Online to be assessed by the DWA for compliance purposes.
- Online: Telemetry and SCADA system to record and display data.

Process Controller:

- WDC water treatment plant operator on duty.

Supporting Programmes:

- Weekly checks of continuous monitoring equipment and calibration of monitoring instruments.
- Regular calibration and verification of field instruments.
- Training and competency assessment by DWA of operators in equipment operation and monitoring.

- IANZ accredited laboratory verification checks for E coli weekly with transgression reporting to Operator and DWA as per DWSNZ 2008.

10.0 Contingency Plans

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

If an event occurs despite preventive and corrective actions being in place, WDC is to consult with the Medical Officer of Health to assess the seriousness of the event.

Table 15: Contingency Plans		
Event	Actions	Responsibility
Microbiological and/or Chemical contamination of source as a result of, but not limited, to the following: <ul style="list-style-type: none"> • High rainfall events • Change of activity in the catchment • Accidental spills 	Plant to shut down by shutting off pumps when parameters exceed set limits (FAC, pH, Turbidity)	Operations
	Water to be diverted or sent to waste when parameters exceed set limits (FAC, pH, Turbidity)	Operations
	Isolate source – through turning the pump off.	Operations
	Carry out manual dosing – refer to ‘Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)’ section WATER SUPPLY RESPONSE PROCEDURE <i>Note: this includes all aspects of water reticulation responses including items such as flushing, main breaks, boil water notices etc.</i>	Operations
	Undertake Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861) – ‘Communication in the Event of a Boil Water Notice’ and when directed by MTW or DWA notify customers using M-PA department. <ul style="list-style-type: none"> • High risk customers to be notified as a priority. 	Public Affairs/ Operations
	Carry out increased monitoring according to DWSNZ 2008.	Operations
	Notify the DWA of event.	Operations
	Carry out following depending on nature of event: <ul style="list-style-type: none"> • Investigate changes to activities in the catchment. • If accidental spill contain the spill. 	Operations
Carry out flushing of reservoirs and distribution system that may be affected via supply specific flushing plan	Operations	
Following in water leaving treatment plant: E coli, low FAC, High Turbidity, but not limited to, the following: <ul style="list-style-type: none"> • Malfunctioning equipment/sensors 	Plant to shut down by shutting off pumps when parameters exceed set limits (FAC, pH, Turbidity)	Automatic/ Operations
	Water to be diverted or sent to waste when parameters exceed set limits (FAC, pH, Turbidity)	Automatic/ Operations
	Inspect and calibrate/verify/carry out maintenance on treatment plant equipment	Operations

Table 15: Contingency Plans		
Event	Actions	Responsibility
	Recalculate dose rates for chlorine.	Operations
	Notify DWA of the event.	Operations
	Carry out increased monitoring according to DWSNZ 2008.	Operations
Following in distribution system: E coli, low FAC, High Turbidity as a result of, but not limited to, the following: <ul style="list-style-type: none"> • Backflow into system • Insufficient FAC residual in water leaving treatment plant • Leaks in system • Inadequate maintenance of distribution system leading to slime build up, leaching and poor circulation. 	Carry out appropriate actions when treatment parameters deviate from target limits (FAC, pH, Turbidity)	Operations
	Isolate parts of the system including reservoirs. Isolate sections of the distribution network and reservoirs through manual valve isolation.	Operations
	Carry out manual dosing of the network, where required.	Operations
	Undertake Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861) – ‘Communication in the Event of a Boil Water Notice’ and when directed by MTW or DWA notify customers using M-PA department. <ul style="list-style-type: none"> • High risk customers to be notified as a priority. 	Public Affairs/ Operations
	Carry out increased monitoring according to DWSNZ 2008.	Operations
	Notify the DWA of event.	Operations
	Where appropriate, carry out flushing of reservoirs and distribution system that may be affected.	Operations
	Undertake the following depending on nature of event: <ul style="list-style-type: none"> • Identify and fix leaks in the system and instruct customers to carry out the same on private property reticulation. 	Operations
Loss of Supply of Source Water: <ul style="list-style-type: none"> • Prolonged loss of supply due to leaks, insufficient storage, loss of reservoir structural integrity, unplanned maintenance, pump breakdown • Seasonal loss of supply 	Procedure for sourcing water from emergency supply: alternative groundwater/surface water supply or providing tankered water.	Operations
	Undertake Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861) – ‘Communication in the Event of a Boil Water Notice’ and when directed by MTW or DWA notify customers using M-PA department. <ul style="list-style-type: none"> • High risk customers to be notified as a priority. 	Public Affairs/ Operations
	Notify the DWA for loss of supply over 8 hours.	Operations
	Monitor reservoir levels.	Operations
	Demand management plan for seasonal loss of supply (including water conservation notice).	Operations
	Provide extra temporary storage if possible.	Operations
	Loss of Supply and Contamination of water due to natural disasters and high rainfall events	Undertake contingency plan as per civil defence emergency appropriate to the scenario.
Procedure for sourcing water from emergency supply: alternative groundwater/surface water supply or providing tankered water.		Operations

Table 15: Contingency Plans

Event	Actions	Responsibility
	Increased monitoring according to DWSNZ 2008.	Operations
	Notify DWA of the event.	Operations
	Carry out inspections of the components of the intake/pumps, treatment plant, reservoirs and distribution system for structural integrity.	Operations

11.0 Methodology and Consultation

This WSP has been prepared consistent with the approaches recommended by the Ministry of Health.

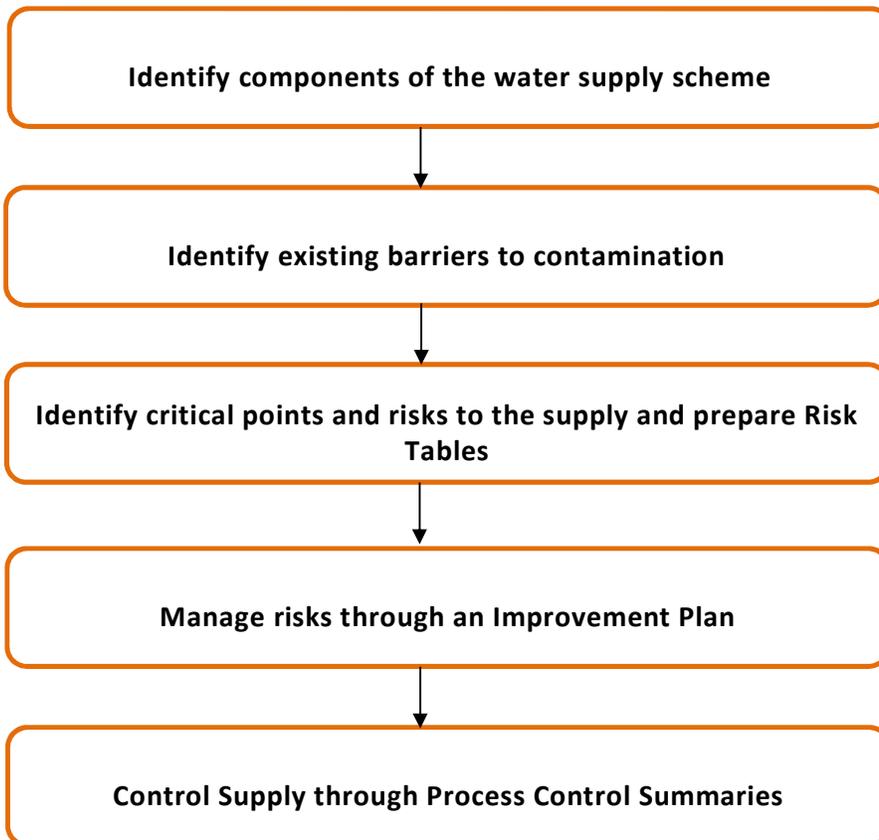


Figure 7: Methodology

The following supporting documents published by the MoH have been used in the preparation of this report:

- The series of “Water Safety Plan Guides for Drinking Water Supplies (2014)”.
- The document “A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies (2014)”.
- New Zealand Drinking-water Safety Plan Framework (2018)

Information used in this report has been gathered as follows:

- Documents and reports:

- Water Asset Management Plans (WDC).
 - Asset condition assessments for reservoirs and pipes (WDC).
 - Various Council Policies and Procedures (WDC).
 - Maintenance checklists and schedules (WDC).
 - Council Annual Plan and Long Term Plan (WDC).
 - Drinking Water Assessor Compliance Reports and PHRMP verification reports (DWA, MoH).
 - Reservoir cleaning and structural assessments (WDC).
 - Catchment Risk Assessment for Rangitāiki Plains Water Supply Report (November 2017, PDP).
- Site Visits carried out by PDP to the following locations: Johnson Road and Braemar Road treatment plant and pump station sites (20/07/2017), Braemar reservoir and Awakeri reservoir (10/10/2017).
 - Consultation workshop carried out by PDP with participation of WDC, 9th October 2017.

The consultation workshop was facilitated by Sala Ranasinghe (Senior Environmental Engineer) from PDP with the participation of key WDC personnel.

The following key WDC personnel participated in the workshop and contributed to the information provided in this report:

Gareth Phillips – Manager Three Waters Operations (position held up till May 2018); Neal Yeates – Team Leader Water Treatment Plant; Luke Shipton – Team Leader Operations; Leilani Salanguit – Project Engineer; Inka Krawczyk – Project Engineer; Michael Van Tilburg – Team Leader Three Waters Assets Management and Planning; Joe Xie – Asset Engineer Three Waters Assets Management and Planning.

The aim of the workshop was to identify risks to the Rangitāiki Plains Scheme as experienced by the operators of the scheme based on historical events and their knowledge of the scheme, and putting in place improvement measures to manage risks that are not currently managed.

The qualitative risk assessment was carried out using the AS/NZS 4360:1999 Risk Management Standard approach. A Likelihood scale and Consequence scale was defined and set by WDC staff according to how they perceived risks, and the corresponding risk matrix was used to assign risks to events.

The Improvement Plan was ranked by WDC in order of priority, taking into account current risks to the Rangitāiki Plains Scheme if not implemented along with the cost of implementation.

Appendix A: Rangitāiki Plains Scheme Risk Tables

Table 16: Source – Catchment and Bores								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
S1: EVENT: LOSS OF BORE WATER SUPPLY								
S1.1	Insufficient source water due to seasonal variations/drought (low levels in the river or water tables).	<ul style="list-style-type: none"> Reduced or no flows. Drop in system pressure. Customer complaints about low pressure. 	<ul style="list-style-type: none"> Seasonal variations in bore and spring sources not experienced at the two sites. PM1: Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable. 	Yes	Low (Rare x Minor)	Risk Managed	N/A	N/A
S1.2	Power failure	<ul style="list-style-type: none"> Power failure alarms. Reduced or no flows. 	<ul style="list-style-type: none"> No generator available on either pump station site. PM1: Generator hired from local contractor and taken to site when required. PM2: Sufficient storage available in reservoirs, 4,500 m³ in Braemar reservoir and 320 m³ in Awakeri and Aerodrome reservoirs. 	Partially	Moderate (Possible x Minor)	PM1a: Braemar and Johnson Road Investigate the installation and/or provision of a dedicated generator for these sites to provide minimum flow requirement during power outage. PM1b: For the interim, install a dedicated generator plug-in point	Low (Unlikely x Minor)	PM1a: TL-O / AE / PE PM1b TL-O / AE / PE
S1.3	Pump failure	<ul style="list-style-type: none"> Pump failure alarms. Reduced or no flows. 	Risk Managed PM1: Sufficient storage available in reservoirs, 4,500 m ³ in Braemar reservoir and 320 m ³ in Awakeri and Aerodrome reservoirs. PM2: Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable. PM3: Regular pump maintenance carried out.	Yes	Low (Possible x Insignificant)	PM1: Utilise Asset Management System to schedule and monitor preventative maintenance of distribution network and pumps.	Low (Unlikely x Insignificant)	PM1: TL-AS
S1.4	Damage to bore headworks and pumping equipment/wiring due to vandalism and/or vermin and animals.	<ul style="list-style-type: none"> Visual damage to intake/pump equipment/electrical cables. Reduced or no flows from bore. No signal or no readings received from equipment and/or equipment failure. 	<ul style="list-style-type: none"> No history of vandalism at the two sites. PM1: Perimeter security gate with locks at Johnson Road which is at road frontage. Braemar Road has locked gates and cannot drive in (but walk-in access possible); spring intake completely covered and cannot be accessed. PM2: Braemar spring intake covered by concrete slab. Both Braemar and Johnson Road treatment plant equipment including chlorination equipment, flow meters, pumps, etc. are contained within locked concrete housing. PM3: Site visited weekly for sampling and inspection. 	Partially	Medium (Unlikely x Moderate)	PM1: Electrical cabinet to be made vermin proof. PM2: Vermin/rodent poison stations placed on site and added to schedule monitoring and maintenance via Asset Management System	Low (Unlikely x Minor)	PM1: TL-WTP PM2: TL-AS / TL-O

Table 16: Source – Catchment and Bores								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
			PM4: Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable.					
S1.5	Restricted access to bore site due to absence of right of access.	<ul style="list-style-type: none"> Restricted access to site during normal operating conditions. 	<ul style="list-style-type: none"> Watertake sites are situated on WDC owned land/easements and WDC has no legal restrictions to access the site. 	Yes	Low Unlikely x Minor	Risk Managed	N/A	N/A
S1.6	Natural disasters – Flooding and extreme storm events.	<ul style="list-style-type: none"> Restricted access to site. Inability to operate and maintain equipment. 	<ul style="list-style-type: none"> BOPRC provided information to confirm that the Braemar and Johnson Road sites will not be affected by a 1% AEP flood event at the bore site. No historical flooding has been observed on the Braemar Road and Johnson Road sites. 	Partially	Medium (Possible x Minor)	PM1: Develop a disaster management plan for the water supply which could be included as part of a wider disaster management plan for the district.	Low (Possible x Insignificant)	PM1: MTW / TL-O / TL-WTP
S1.7	Natural disasters – slips and earthquakes.	<ul style="list-style-type: none"> Restricted access to site. Inability to operate and maintain equipment. 	<ul style="list-style-type: none"> No flooding experienced on the roads leadings to either of the sites at Braemar Rd and Johnson Rd. 	Partially	Medium (Possible x Minor)	PM1: Develop a disaster management plan for the water supply which could be included as part of a wider disaster management plan for the district.	Low Possible x Insignificant)	PM1: MTW / TL-O / TL-WTP
S1.8	Clogged bore screen/s	<ul style="list-style-type: none"> Reduced or no flows. Johnson road screen before valve has clogged up once in past with pumice 	<ul style="list-style-type: none"> No historical issues at Braemar site. Sufficient reservoir storage available if maintenance required. Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable. Review bore production after earthquake events 	Yes	Low Possible x Insignificant)	Risk Managed	N/A	N/A
S1.9	Resource consent limitations	<ul style="list-style-type: none"> Loss of right to abstract water. Increase in take compared to extraction limit granted. 	<ul style="list-style-type: none"> Number of consents throughout the country expiring in 2026 therefore some risk in delay in having consent issued. Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable. Leakage rates in this scheme (percentage of real water losses in the system was 43% and the Infrastructure Leakage Index (ILI) was 9.32). <p>PM1 / PM2: WDC has consent management System currently in place, alerting conditions of consent and when consents are nearing expiration (the consents database-management tool is called CS-VUE).</p>	Yes	Medium (Possible x Minor)	<p>PM1: Apply for new water take consent in accordance with requirements (at least six months prior to expiry). Braemar consent (2023)</p> <p>PM2: Apply for new water take consent in accordance with requirements (at least six months prior to expiry). Johnson Road Consent (2031).</p> <p>PM3: Once hydraulic models are completed and in-line with annual water balance calculations develop and implement leak detection programme.</p>	Low Possible x Insignificant)	<p>PM1: SPP/AE/TL-AM</p> <p>PM2: SPP/AE/TL-AM</p> <p>PM3: AE / PE / TL-O</p>

Table 16: Source – Catchment and Bores

No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
S2.1	<p>Discharge/leachate/runoff from the following activities in the catchment:</p> <p>Agriculture: Manure from grazing livestock, Manure fertiliser, silage leachate, dairy shed washwater, effluent spray irrigation, effluent ponds.</p> <p>Forestry: Sewage from sludge application.</p> <p>Industry: Wastewater discharges from industrial processes, biological washwater.</p> <p>Human activities: Wastewater discharge from human activities to land or water i.e. on-site disposal and septic tank.</p> <p>Feral animals: faecal matter.</p> <p>Contaminated sites and landfill sites</p> <p>Other: Stormwater runoff, construction sites, abandoned/unused bores</p>	<p>Water not compliant with DWSNZ 2008:</p> <ul style="list-style-type: none"> E coli transgressions Concentrations of health significant determinands, agrichemicals and other contaminants more than 50% of their MAV in the source water. Unsatisfactory practices being used in farming and forestry activities, especially related to fertiliser application and sediment control. 	<ul style="list-style-type: none"> Recharge zone Braemar Rd: Primary recharge from rainfall seepage (3 km groundwater capture zone). Recharge zone Johnson Rd: Primary recharge from deep semi confined aquifer. Groundwater testing has been carried out and age of the water has been confirmed to be between 91 to 110 years with less than 0.005% young fraction (<1 year). Activities Johnson Rd: There are 5 consented discharges within the groundwater capture zone which are classed as ‘dairy effluent disposal to land’. There are 4 HAIL sites associated with ‘persistent pesticide use’ from fruit production. Given the depth of bore water abstraction and confining nature of the overlying alluvium deposits and high artesian pressure, it is considered unlikely that the aquifer is at risk of surface contamination. <p>PM1: Catchment risk assessment has been carried out in 2008 and most recently in 2017. Through the assessment WDC has developed an understanding of the extent of the recharge zone and nature of activities in it.</p> <p>PM3: Business as usual - BOPRC informs WDC of new discharge consents and WDC to provide comments on these consents.</p> <p>PM4: WDC to send BOPRC submissions opposing new applications for septic tanks within 500 metre groundwater capture zone.</p>	Partially	Extreme Likely x Major	<p>PM1: Monitor changes in activities in the catchment and modify catchment risk assessment annually.</p> <p>PM2: Submit a catchment risk assessment to the DWA every 5 years for approval.</p> <ul style="list-style-type: none"> WDC to monitor activities within 250 metres of the water source: <p>PM5: Johnson Rd site: To liaise with land owner adjoining the Johnson Road site to prevent or limit stock grazing activities. To also find out future plans that may change activity within the zone that may affect bore water quality.</p> <p>PM6: Johnson Road site: To liaise with consent holders of the 5 consented discharges and 4 HAIL sites to make them aware of the effects of activities around the bore on water quality.</p> <p>PM7: Team Leader - Three Waters Asset Management and Planning to provide input into next version district plan (WDC) and regional plan (BOPRC) with regards to protection of catchment; input into activities such as sediment control from earthworks and riparian strip management.</p>	Medium (Rare x Moderate)	<p>PM1: AE/TL-AM</p> <p>PM2: AE/TL-AM</p> <p>PM5: AE/TL-AM</p> <p>PM6: SPP / AE/TL-AM</p> <p>PM7: SPP/TL-AM</p>
S2.2	<p>Contamination of bore/well from surface ingress due to:</p> <ul style="list-style-type: none"> Inappropriate bore/well head design, not complying with the standards set by DWSNZ 2008 and the DWA. Bore headworks and pipework damaged. 	<ul style="list-style-type: none"> Inspection of bore/well head shows non-compliance with DWSNZ 2008. E coli transgressions. Inappropriate casing material selected, or old casing. 	<ul style="list-style-type: none"> Site inspection of the bore head identified some non-compliant features against the DWSNZ 2008 and DWA requirements. No damage to bore headworks or pipework could be assessed visually. Johnson Rd: Installation of testable backflow preventer on bore headworks. 100 mm air gap on the inlet main at the reservoir confirmed by TL-WTP (December 2017). 	Partially	Extreme (Likely x Major)	<p>Refurbish boreheads to comply with DWSNZ 2008 and DWA requirements as follows:</p> <p>PM1: Johnson Road: Council to write to DWA with regards to the 5 metre animal exclusion zone from the centre of the North bore head; currently unable to extend fence as adjoining land not owned by WDC.</p> <p>PM2: Johnson Road: Provide DWA with production bore installation details to</p>	Medium (Rare x Moderate)	<p>PM1: AE / TL-AM</p> <p>PM2: AE / TL-AM</p>

Table 16: Source – Catchment and Bores								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
	<ul style="list-style-type: none"> Poor joints, cracks or corrosion, in the bore casing. 					comply with bore water security criterion 2 PM3: Utilising Asset Management System to schedule annual testing of backflow preventer PM4: Carry out CCTV inspection of bore casing to ascertain condition, as required. PM5G: Utilising Asset Management System to schedule CCTV inspection of bore casing and monitor preventative maintenance.		PM3: AE / TL-AM PM4: AE / PE / TL-WTP PM5G: AE / TL-AM
S3.1	Discharge/leachate/runoff from the following activities in the catchment: Agriculture: Pesticides (including stock dip), chemical fertiliser, dairy shed washwater, stock effluent, effluent spray irrigation, effluent ponds, increase in turbidity from soil and silt due to cultivation (tilling). Forestry & Pesticides: poison from feral animal control, 1080, cyanide, brodifacoum, fuel contamination from vehicles and fuel storage. Industry and HAIL sites: Chemical discharges depending on industry; underground fuel storage contamination, cyanide and metal contamination from ore extraction/mining, turbidity from open cast mining and quarrying. Roading: Asphalt, contamination due to fuel/oil leaks and accidental spillages.		<ul style="list-style-type: none"> Possible chemical contamination risk from pesticide spraying in the Johnson Rd groundwater capture zone. Currently no chemical treatment carried out on source water, therefore high risk in the event of chemical contamination. PM3G: Pesticide suite testing on raw water was undertaken in September 2013 and again in July 2018.	No	High (Unlikely x Major)	Also refer to S2.1 Monitor changes in activities in the catchment and modify catchment risk assessment annually. Submit a catchment risk assessment to the DWA every 5 years for approval. PM1G: WDC to liaise with pesticide application companies and make them aware of locations of water sources and to be informed of pesticide drops in vicinity of water source. PM2: WDC to liaise with BOPRC as follows: 1) BOPRC to inform WDC of new discharge consents to the recharge zone at both Braemar Rd and Johnson Rd sites, and WDC to provide comments on these consents. 2) WDC to send BOPRC submissions opposing new applications for septic tanks within groundwater capture zone at each site. PM3G: Pesticide suite testing on raw water was undertaken in September 2013 and again in July 2018, a comparison of results is being undertaken and report to Toi Te Ora will be prepared PM4G: Team Leader - Three Waters Asset Management and Planning to provide input into next version district plan (WDC) and regional plan (BOPRC) with regards to protection of catchment; input into activities such as sediment control from earthworks and riparian strip management.	Medium (Rare x Moderate)	PM1G: SPP/TL-AM PM2: AE/TL-AM PM3G: AE/TL-AM PM4G: SPP/TL-AM

Table 16: Source – Catchment and Bores								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
	Other: Contaminated/ landfill sites, Stormwater runoff, increased turbidity from construction sites, abandoned/unused bores							
S3.2	Mineral deposits in the catchment and recharge zone due to characteristics of the catchment.	<ul style="list-style-type: none"> Reticulated water not compliant with (note heavy metals due to corrosion are excluded) DWSNZ 2008. 	No historic issues with mineral deposits from these sources.	N/A	N/A	N/A	N/A	N/A
S3.3	Contamination of bore/well during construction by cross contamination and by residues from drilling process (e.g. barium)	<ul style="list-style-type: none"> Concentrations of chemical determinands more than 50% of their MAV. 	Johnson road screen before valve has clogged up once in past with pumice and is not considered as attributable to bore/well construction	Yes	Low Possible x Insignificant)	N/A	N/A	

Table 17: Treatment – Chlorination								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
T1: EVENT: INADEQUATE TREATMENT INSTALLED								
T1.1	Insufficient bacterial treatment installed	<ul style="list-style-type: none"> High turbidity and E coli levels 	<ul style="list-style-type: none"> Bacterial treatment complies with current DWSNZ 2008 requirements; Chlorination treatment installed at both treatment plant sites. 	Yes	Low (Rare x Minor)	PM1: Investigate best practice for monitoring/ assessing and responding to total coliforms and indicate what costs and benefits this would deliver for this water supply. If feasible and able to adequate resource council to develop protocol and modify Incident Response Plan appropriately.	Low (Rare x Insignificant)	PM1: TL-WTP / WTP-O / AE N/A

Table 17: Treatment – Chlorination								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
T1.2	Insufficient protozoal treatment installed	<ul style="list-style-type: none"> High turbidity and E coli levels 	<ul style="list-style-type: none"> Protozoa log credit 3 required at Braemar spring and 0 required at Johnson road provided Bore Water Security Criterion 2 is met. Currently no protozoa treatment installed in either site (current log credit is 0). Turbidity monitored continuously at treatment plant; pumps stop when turbidity exceeds set limits. 	Partially	High (Unlikely x Major)	<p>PM1: Investigate options and costings to upgrade Braemar treatment plant by installing UV/filtration to achieve a log credit of 3 is ideal for protozoa treatment.</p> <p>PM2: Based on options investigation budget and undertake the upgrade Braemar treatment plant</p> <p>PM3: Johnson Road: Provide DWA with production bore installation details to comply with bore water security criterion 2.</p>	Low (Unlikely x Minor)	<p>PM1: MTW/TL-WTP/TL-AM</p> <p>PM2: MTW/TL-WTP/PM/TL-AM</p> <p>PM3: AE/TL-AM</p>
T1.3	Insufficient chemical treatment installed	<ul style="list-style-type: none"> Chemicals exceed set MAVs 	<ul style="list-style-type: none"> Arsenic assigned as a priority 2 determinand to the Rangitāiki Rural distribution zone. PM4: Activities in the catchment giving rise to chemical contamination identified by carrying out a catchment risk assessment every 5 years. 	Partially	Extreme (Almost Certain x Major)	<p>PM1: Arsenic Removal - Undertake full investigation taking into account past studies. Full options report with costings to achieve Arsenic removal to be developed. Council will consult closely with DWA throughout this process.</p> <p>PM2: Arsenic Removal - In the interim, whilst awaiting outcome of investigation, council will develop public consultation programme informing connected customers that this supply may contain exceedances of particulates (i.e. arsenic etc.) and what the likely human health impacts are; and inform them of the various ‘point-of-supply’ treatment options.</p> <p>PM3: Arsenic Removal - Seek funding and implement chosen option to achieve Arsenic Removal.</p> <p>PM4: Monitor changes in activities in the catchment and modify catchment risk assessment annually.</p> <p>PM5: Submit a catchment risk assessment to the DWA every 5 years for approval.</p>	Medium (Rare x Moderate)	<p>PM1: MTW/TL-WTP/AE/PM/TL-AM</p> <p>PM2: MTW/M-PA / TL-WTP/TL-AM</p> <p>PM3: MTW/M-PA / TL-WTP /AE/PM/TL-AM</p> <p>PM4: AE/TL-AM</p> <p>PM5: AE/TL-AM</p>
T1.4	Other – Insufficient pH treatment	<ul style="list-style-type: none"> pH below 7 or pH above 8.5 	<ul style="list-style-type: none"> No pH correction installed, water pH approximately 6.1. PM1: pH monitored continuously at treatment plant. PM2: Plumbosolvency notice circulated among customers every 6 months. 	Partially	High (Possible x Moderate)	<p>PM1: Investigate options to install pH correction and cost benefit of installation of pH correction. If feasible budget and programme for works to occur</p> <p>PM2G: Plumb solvency - Inform wider community and consumers about the use of copper pipes and fittings (including</p>	Low (Rare x Insignificant)	<p>PM1: TL-WTP/PM / TL-AM</p> <p>PM2G: M-PA / AE</p>

Table 17: Treatment – Chlorination

No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
						lead jointing) for internal plumbing by circulating information flyer and notification on Council Website		
T2: EVENT: INADEQUATE PROTECTION OF TREATMENT PLANT SITE AND EQUIPMENT								
T2.1	Damage to treatment plant equipment due to vandalism and/or vermin and animals.	<ul style="list-style-type: none"> Visual damage to treatment equipment/electrical cables. No signal or no readings received from equipment and/or equipment failure. 	<ul style="list-style-type: none"> Bore and treatment plant on same site, refer to S1.4. PM1: Treatment plant equipment situated in locked buildings. PM2: Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable. 	Partially	Medium (Unlikely x Moderate)	PM1: Electrical cabinet to be made vermin proof. PM2: Vermin/rodent poison stations placed on site and added to schedule monitoring and maintenance via Asset Management System	Low (Unlikely x Minor)	PM1: TL-WTP PM2: TL-AS / TL-O
T3: EVENT: POWER FAILURE TO TREATMENT PLANT SITE AND EQUIPMENT								
T3.1	Power failure.	<ul style="list-style-type: none"> Power failure alarms, Reduced or no flows. No signal or no readings received from equipment. 	<ul style="list-style-type: none"> Bore and Treatment plant on same site (also refer to S1.2 & S1.3). When treatment plant equipment fails (loss of power) alarms are triggered. PM1: Generator hired from local contractor and taken to site when required. PM2: Sufficient storage available in reservoirs, 4,500 m³ in Braemar reservoir and 320 m³ in Awakeri and Aerodrome reservoirs. 	Partially	Moderate (Possible x Minor)	PM1a: Braemar and Johnson Road Investigate the installation and/or provision of a dedicated generator for these sites to provide minimum flow requirement during power outage. PM1b: For the interim, install a dedicated generator plug-in point	Low (Unlikely x Minor)	PM1a: TL-O / AE / PE PM1b TL-O / AE / PE
T4: EVENT: INADEQUATE CALIBRATION/VERIFICATION, MAINTENANCE, PROCEDURES, SAMPLING, TRAINING								
T4.1	Inadequate calibration, verification and maintenance of treatment plant equipment.		<ul style="list-style-type: none"> pump station / treatment plant monitoring equipment (i.e. pH, turbidity, FAC) are verified weekly pump station / treatment plant monitoring equipment (i.e. pH, turbidity, FAC) are calibrated, along with pipework, once a year zone FAC are calibrated yearly PM1: Routine maintenance of chlorination equipment (Dosing regulator, dosing pump, chlorine injector, booster pump) undertaken in accordance with manufacture specifications. 	Yes	Medium (Unlikely x Moderate)	PM1: WDC to review and update calibration and maintenance procedures of treatment plant equipment and incorporate into Operations and Maintenance manual with appropriate Standard Operating Procedures (SOP) PM2G: Utilise Asset Management System to schedule the maintenance, verification and calibration of treatment plant equipment.	Low (Unlikely x Minor)	PM1: TL-WTP / WTP-O PM2G: TL-AS
T4.2	Inadequate plant records and procedures		<ul style="list-style-type: none"> A set of procedures are documented and plant records are maintained for equipment calibration/verification and site visits. 	Partially	Low (Unlikely x Minor)	PM1: Ensure all plant records such as manuals, drawings, procedures, incident response plan, etc. are controlled	Low (Unlikely x insignificant)	PM1: TL-WTP / WTP-O / TL-AS

Table 17: Treatment – Chlorination								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
			<ul style="list-style-type: none"> Not all procedures are made available at each treatment plant site. 			documents within Council corporate record system and hard copy located at the Water Treatment Plant.		
T4.3	Inadequate/incorrect sampling		<p>PM1: Treatment plant sampling spreadsheet updated periodically for anomalies.</p> <p>PM2: WDC treatment plant operators trained and aware of correct sampling procedures.</p> <p>PM3: MoH approved accredited labs carry out testing of samples.</p> <p>PM4: Transgressions and non –compliances followed up as per DWSNZ 2008 requirements</p>	Partially	Medium (Possible x Minor)	PM2G: Water Operator Authorisation. Authorisation assessments by DWA undertaken with WDC operators in September 2018. The next assessments will be carried out in 2021.	Low (Unlikely x Minor)	PM2G: TL-WTP/ WTP-O
T4.4	Inadequate training of staff		<p>Annual budget set aside for training.</p> <p>PM1: Three treatment plant operators with national diploma certificate and one treatment plant operator on the way to completing the certificate.</p> <p>PM2G: listing of training kept in spreadsheet no evidence of competency system</p>	Partially	Medium (Possible x Minor)	<p>PM1: All treatment plant operators to complete appropriate qualification for water treatment plant. WDC to keep records of training and produce when requested.</p> <p>PM2G: Develop training and competency system</p>	Low (Unlikely x Minor)	<p>PM1: MTW/ TL-WTP</p> <p>PM2G: TL-AS / TL-WTP / WTP-O</p>
CHLORINATION								
T5: EVENT: MICROBIOLOGICAL CONTAMINATION DUE TO INADEQUATE CHLORINATION								
T5.1	Dosing malfunction (Dosing regulator and/or dosing pump, chlorine injector)	<ul style="list-style-type: none"> FACE concentration below 0.2 mg/l. E coli detected in water leaving treatment plant. 	<p>PM1: Continuous FAC monitoring at treatment plant; alarm triggered outside normal operation range, plant shuts down if critical limits reached.</p> <p>PM2: Routine maintenance of dosing regulator, dosing pump, chlorine injector.</p>	Yes	Low (Possible x Insignificant)	PM1: WDC to review calibration and maintenance procedures of treatment plan equipment and incorporate into Operations and Maintenance manual with appropriate Standard Operating Procedures (SOP).	Low (Unlikely x Insignificant)	PM1: TL-WTP / WTP-O
T5.2	Inadequate calibration of equipment (calibration of dosing regulator sensor)	<ul style="list-style-type: none"> FACE concentration below 0.2 mg/l. E coli detected in water leaving treatment plant. 	PM1: Equipment verified weekly and calibrated yearly; manual checks on calibration as per DWSNZ 2008.	Yes	Low (Rare x Insignificant)	Risk managed	N/A	N/A
T5.3	Dosing regulator set point wrong or incorrect due to incorrect calculation	<ul style="list-style-type: none"> FACE concentration below 0.2 mg/l. E coli detected in water leaving treatment plant. 	PM1: Continuous FAC monitoring at treatment plant; alarm triggered outside normal operation range, plant shuts down if critical limits reached.	Yes	Low (Possible x Insignificant)	Risk Managed	N/A	N/A

Table 17: Treatment – Chlorination								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
T5.4	High chlorine demand and poor dose control	<ul style="list-style-type: none"> FACE concentration below 0.2 mg/l. E coli detected in water leaving treatment plant. 	PM1: Continuous FAC monitoring at treatment plant; alarm triggered outside normal operation range, plant shuts down if critical limits reached. PM2: Frequency of testing increased during high water quality change periods e.g. rainfall, earthquakes.	Yes	Low (Possible x Insignificant)	Risk Managed	N/A	N/A
T5.5	Chlorine supply exhausted	<ul style="list-style-type: none"> FACE concentration below 0.2 mg/l. E coli detected in water leaving treatment plant. 	<ul style="list-style-type: none"> A gas cylinder bottle weighs approximately 130kg which contains 70kg of chlorine gas. The cylinder is manually replaced once the weight reaches approximately 80kg. (cylinders placed on a weighing scale and weekly weight recorded on board next to scales) All sites have auto changeover of chlorine bottles when supply exhausted. PM1: Continuous FAC monitoring at treatment plant; alarm triggered outside normal operation range, plant shuts down if critical limits reached.	Yes	Low (Unlikely x Minor)	Risk Managed	N/A	N/A
T5.6	Inadequate chlorine supply from chlorine booster stations	<ul style="list-style-type: none"> FACE concentration below 0.2 mg/l. E coli detected in water leaving treatment plant. 	<ul style="list-style-type: none"> No chlorine booster stations in the reticulation system. PM1: FAC leaving treatment plant maintained at 0.8 mg/L which is sufficient to last through the distribution system. PM2: Manual FACE sampling in distribution system according to DWSNZ 2008.	Yes	Low (Rare x Insignificant)	Risk managed	N/A	N/A
T6: EVENT: CHEMICAL CONTAMINATION DUE TO OVER CHLORINATION								
T6.1	Overchlorination due to dosing malfunction, inadequate calibration, dosing regulator set point wrong	<ul style="list-style-type: none"> FACE concentration is more than 50% of its MAV. 	PM1: Continuous FAC monitoring at treatment plant; alarm triggered outside normal operation range, plant shuts down if critical limits reached.	Yes	Low (Possible x Insignificant)	PM1: Undertake WTP site assessment to determine that all practical measures are in place via Electrical, Mechanical and Physical to avoid overdosing with particular emphasis on possibility of syphoning. Details to be recorded of the assessment and any recommendations PM2: Develop supply specific flushing plan to be implemented when treatment plant over doses and include in WTP operations manual	Low (Unlikely x Insignificant)	PM1: TL-WTP / WTP-O PM2: TL-WTP / WTP-O / TL-O
T7: EVENT: MICROBIOLOGICAL CONTAMINATION DUE TO INSUFFICIENT CHLORINE CONTACT TIME								

Table 17: Treatment – Chlorination								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
T7.1	Short circuiting or lack of contact tank	<ul style="list-style-type: none"> FACE concentration below 0.2 mg/l. E coli detected in water leaving treatment plant. 	<ul style="list-style-type: none"> No contact tank after chlorine injection. PM1: Manual FACE sampling in distribution system according to DWSNZ 2018.	Partially	High (Unlikely x Major)	PM1: Chlorine C.t value must be at least 6 for at least 98% of compliance monitoring period with a minimum retention of 5 minute. Review outputs and investigate how this can be achieved, modify systems appropriately. PM2: New Rangitāiki Plains distribution zone boundary: Review distribution sample points to ensure points of higher risks are covered and develop sampling point schedule (e.g. points furthest away from treatment plant, dead ends and points of low usage, points of high draw off, service reservoirs, old pipework, low pressure areas). PM3: Apply to MoH to update drinking water registry with new scheme boundary and scheme population and update other details of the treatment and distribution zones as required.	Low (Unlikely x Minor)	PM1: TL-WTP / WTP-O E PM2: TL-WTP/TL-O/AE / TL-AM PM3: AE/ PE

Table 18: Reservoirs								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
R1: EVENT: LOSS OF SUPPLY DUE TO INSUFFICIENT STORAGE								
R1.1	Insufficient storage capacity to store treated water for daily demand.	Treated water storage levels unacceptably low. Reservoir telemetry indicates loss in levels. Decreased or no flow, loss of pressure in the system.	<ul style="list-style-type: none"> Sufficient storage available in reservoirs, 4,500 m3 in Braemar reservoir and 320 m3 in Awakeri and Aerodrome reservoirs. Two water sources (bore source and spring source) therefore one source is likely to be 	Yes	Low (Unlikely x Minor)	Risk managed	N/A	N/A

Table 18: Reservoirs								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
			available when the other is unavailable.					
R2: EVENT: LOSS OF SUPPLY DUE TO STRUCTURAL FAILURE								
R2.1	Poor condition of reservoirs leading to leakages, collapse or loss of structural integrity.	Drop in reservoir levels do not match demand. Increased pump starts. Loss of supply. Insufficient pressure/flow for firefighting purposes.	PM1: Reservoir inspections carried out monthly. <ul style="list-style-type: none"> Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable. 	Partially	Medium (Unlikely x Moderate)	PM1: Carry out condition assessment of all concrete reservoirs by 2019 and formulate a condition assessment programme thereafter. PM2: Develop and implement a preventative maintenance programme for reservoirs. PM3: Investigate and fix leaks in the Awakeri reservoir	Low (Rare x Minor)	PM1: AE / PE PM2: TL-AS / TL-O PM3: AE / PE
R2.2	Vandalism to reservoir structure	Loss of supply. Insufficient pressure/flow for firefighting purposes.	<ul style="list-style-type: none"> Awakeri reservoir site not fenced. Road access to reservoirs restricted. Two water sources (bore source and spring source) therefore one source is likely to be available when the other is unavailable. 	Partially	Medium (Possible x Minor)	PM1a: Investigate the option of fencing installation of gate at Awakeri reservoir. PM1b: If R2.2 (PM1a) is achievable, budget and programme for fencing and gate installation at Awakeri reservoir. PM2: Install lock ladder access at Braemar Reservoir.	Low (Unlikely x Minor)	PM1a: TL-WTP / AE / PE PM1b: TL-AM / PM PM2: TL-WTP / AE / PE
R3: EVENT: LOSS OF SUPPLY DUE TO INSUFFICIENT SOURCE WATER								
R3.1	Insufficient storage capacity to store additional treated water due to seasonal variations in source.	Treated water storage levels unacceptably low. Insufficient pressure/flow for firefighting purposes. Reservoir telemetry indicates loss in levels.	Awakeri reservoir is affected by seasonal variations. Controlled interconnection with Otumahi Water scheme to supplement reservoir filling	Partially	High (Likely x Moderate)	PM1: operators to be trained and following the 'Otumahi – Rangitāiki Plains Emergency Connection Protocol' document	Low (Unlikely x minor)	PM1: TL-O / TL - WTP
R4: EVENT: MICROBIAL AND/OR CHEMICAL CONTAMINATION OF STORED WATER								
R4.1	Access by animals/birds.	Visual evidence of animal and bird access i.e. feral animal droppings, birds' nests. Unexplained deterioration/change in water quality. FAC residual less than 0.2 mg/L and cannot be maintained and E coli or coliforms	<ul style="list-style-type: none"> Unable to check there is a mesh on the overflow pipe, was told by WDC staff that the overflow is meshed at the exit from the reservoir. Mesh installed on overflow pipe. FAC residual tested once in 3 months. 	Partially	Extreme (Possible x Major)	PM1: Utilise Asset Management System to schedule and/or monitor preventative maintenance of reservoir site to prevent breeding of vermin/animals	Medium (Unlikely x Moderate)	PM1: TL-AS

Table 18: Reservoirs								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
		detected in 100 mL of water.	<ul style="list-style-type: none"> Reservoir site inspected once a month. 					
R4.2	Vandalism and sabotage	Visual evidence of vandalism to reservoir structure, evidence of unauthorized human access (broken glass, bottles, rubbish). Unexplained deterioration/change in water quality.	<ul style="list-style-type: none"> Awakeri reservoir site not fenced. Road access to reservoirs restricted. 	Partially	Medium (Possible x Minor)	Same as R2.2	Low (Unlikely x Minor)	Same as R2.2
R4.3	Sediment/slime accumulation and resuspension of accumulated sediment.	Visible slime/ sediment and customer complaints. FAC residual concentration less than 0.2 mg/L and E coli or coliforms detected in 100 ml of water. High turbidity levels.	Reservoir inspections carried out in 2008 and 2015. FAC residual maintained, checked weekly. Set procedure for reservoir cleaning to include disinfection of equipment, appropriate isolation from network, minimising sediment stir up, etc.	Partially	Medium (Unlikely x Moderate)	PM1: Utilise Asset Management System to schedule and implement a CCTV inspection of reservoirs and vacuum cleaning programmes PM2: Investigate best practice for monitoring/ assessing and responding to total coliforms and indicate what costs and benefits this would deliver for this water supply. If feasible and able to adequate resource council to develop protocol and modify Incident Response Plan appropriately.	Low (Unlikely x Minor)	PM1: TL-AS PM2: TL-WTP / WTP-O / AE
R5: EVENT: INSUFFICIENT CHLORINE CONTACT TIME								
R5.1	Insufficient turnover (Short-circuiting)	E coli or coliforms detected in 100 mL of water despite adequate FAC residual concentration.	<ul style="list-style-type: none"> No contact tank after chlorine injection. PM1: Manual FACE sampling in distribution system according to DWSNZ 2018.	Partially	High (Possible x Moderate)	PM1: Chlorine C.t value must be at least 6 for at least 98% of compliance monitoring period with a minimum retention of 5 minute. Review outputs and investigate how this can be achieved, modify systems appropriately.	Low (Unlikely x Minor)	PM1: TL-WTP / WTP-O

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
D1: EVENT: MICROBIAL AND CHEMICAL CONTAMINATION DUE TO BACKFLOW INTO DISTRIBUTION NETWORK								

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
D1.1	Backflow from individual properties into the distribution system due to a pressure drop in the reticulated system/elevated pressure in individual premises, where the property has no/malfunctioning backflow prevention device.	<ul style="list-style-type: none"> E coli or coliforms detected in 100 mL water sample. Unexplained fluctuations in chemical and microbiological water quality. Customer complaints of gross contamination of tap water. 	<ul style="list-style-type: none"> Backflow prevention policy is currently being developed by WDC Rangitāiki Plains is a fully metered scheme therefore all residential connections fitted with dual check valves. Testing of existing backflow preventers not currently carried out. All new domestic connections installed with untestable dual check valves; during capital renewals projects and 'new connection' applications. All new commercial and farm connections installed with backflow preventers adhering to NZ Building Code standards; triggered during building/ land use/ tradewaste consents or 'new connection' applications. Specific hydrants assigned for water withdrawal by contractors for ease of policing. Applications are made to the operations depot and water to be withdrawn using standpipes with fitted BFP device and water meter. <p>PM5G: Operations department to discuss with building control department to include backflow prevention devices as part of the building control checklist when carrying out building inspections</p>	Partially	High (Possible x Moderate)	<p>PM1G: Develop and implement a backflow prevention policy to match device to risk level of activity, including testing requirements of the devices. This has political ramifications and will be difficult to implement thus long lead in time.</p> <p>PM2: Undertake data collection and survey of water supply system to identify all installed backflow prevention devices. Undertake testing of found backflow devices. Renew or install Backflow devices on all connections; priority given to connections identified as high risk. Dual check valve to be installed on residential connections as part of the meter installation programme.</p> <p>PM3G: Circulate educational material to customers, especially those considered high risk, about risks of backflow prevention and ways of minimising the risk.</p> <p>PM4G: Review policy for withdrawing water from hydrants; specify the use of standpipes fitted with approved backflow preventers</p> <p>PM6G: Develop and implement a policy to disconnect connections not in use, with special attention to connections provided to vacant lots during subdivisions.</p> <p>PM7G: Develop and implement a policy for identifying and dealing with illegal connections.</p>	Medium (Unlikely x Moderate)	<p>PM1G: MTW / M-PA / AE / TL-O / TL-AM</p> <p>PM2: AE/PM</p> <p>PM3G: AE / M-PA</p> <p>PM4G: MTW / M-PA / AE / TL-O / TL-AM</p> <p>PM6G: MTW / M-PA / AE / TL-O / TL-AM</p> <p>PM7G: MTW / M-PA / AE / TL-O / TL-AM</p>
D2: EVENT: CHEMICAL AND MICROBIOLOGICAL CONTAMINATION DUE TO LACK OF ROUTINE MAINTENANCE								
D2.1	Poor circulation due to lack of hydrant and mains flushing programme.	<ul style="list-style-type: none"> Accumulation of sediments in the system. Parts of the distribution network 	<ul style="list-style-type: none"> The current routine maintenance schedule is being reviewed by WDC. <p>PM1: Flushing of dead ends in the network is currently being carried out in adhoc manner.</p>	Partially	Medium (Possible x Minor)	<p>PM1G: Carry out a routine maintenance plan for flushing of mains and hydrants with priority given to flushing dead ends and areas of poor circulation.</p> <p>PM2G: Utilise Asset Management System to schedule and monitor preventative maintenance.</p>	Low (Rare x Insignificant)	<p>PM1G: TL-AS/TL-O</p> <p>PM2G: TL-AS</p>

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
		containing water with low FAC.						
D2.2	Inability to isolate or shut down the system due to missing or failed valves.	<ul style="list-style-type: none"> Dirty water E Coli present Aesthetic issues Low/not enough FAC 	PM1: Critical valves have been identified through a study carried out by OPUS in 2016.	Partially	Medium (Possible x Minor)	PM1: Carry out a routine maintenance plan for valve exercising with priority given to critical valves i.e. those supplying a large or critical customer base, valves on rising and falling mains and those used for bore and reservoir isolation. PM2: Undertake a programme of marking valve boxes for ease of location and to indicate whether they are open or closed. PM3: Utilise Asset Management System to schedule and monitor preventative maintenance.	Low (Rare x Insignificant)	PM1: AE PM2: AE/TL-O PM3: TL-AS
D3: EVENT: LOSS OF SUPPLY AND CONTAMINATION OF SUPPLY DUE TO LACK OF ROUTINE ASSET REPLACEMENT								
D3.1	Pipe, valve and hydrant failure due to age, condition and material of pipe.	<ul style="list-style-type: none"> Low FAC. 	<ul style="list-style-type: none"> Currently reactive maintenance being carried out. AMP for 2017 is being prepared to identify condition of existing components of the scheme. Pipe sampling has been carried out in certain areas. PM3G: New Asset Management System implement recording maintenance carried out and cost of maintenance per asset has been introduced March 2018	Partially	Medium (Possible x Minor)	PM1G: Develop and budget asset renewals programme based on condition sampling and assessments, analysis of asset age, material, frequency of breakages and increase in maintenance costs. Asset renewals to prioritize critical assets such as rising mains/falling mains, pipes supplying a critical consumers or large consumer base, critical valves and hydrants. PM2G: Update water asset management plan as required and republish every 3 years.	Low (Rare x Insignificant)	PM1: AE / TL-AM PM2: TL-AM/AE
D4: EVENT: CONTAMINATION DUE TO PRESSURE FLUCTUATIONS IN THE SYSTEM								
D4.1	Pressure fluctuations in the system due to: pipe failure, accidental penetration by contractors and leaks in the system, major fire events, Low pressure areas (hills/extremities).		GIS system for WDC reticulation network can be accessed online by public or contractors. PM6G: Procedures for third party contractors/developers that require them to obtain a Permit to Work before any work is carried out as part of resource consent. Only Council approved contractors to work on council reticulation	Partially	High (Possible x Moderate)	PM1: Identify problem pressure areas by carrying out hydraulic model network analysis coupled with customer complaint records. PM2G: Carry out a periodic water balance to identify levels of leakage in system PM3: Once hydraulic models are completed and in-line with annual water balance calculations develop and implement leak detection programme. (also see S1.9 PM2) PM4G: Develop and adopt internal procedure for maintaining an up-to-date Asset Management System and GIS system PM5: Undertake data collection and survey of water supply system to identify all installed	Low (Rare x Insignificant)	PM1: AE / PE PM2G: AE PM3: AE / PE / TL-O PM4G: TL-AM / AE PM5: TL-AM / AE / PE

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
						backflow prevention devices. Undertake testing of found backflow devices. Renew or install Backflow devices on all connections; priority given to connections identified as high risk. Dual check valve to be installed on residential connections as part of the meter installation programme		
D5: EVENT: CONTAMINATION AND LOSS OF SUPPLY DUE TO POOR PLANNING, INADEQUATE PROCEDURES AND INADEQUATE TRAINING								
D5.1	Poor planning of scheduled work carried out by WDC staff and their contractors.		Customer services department notified of work being carried out resulting in service disruption. Work carried out outside peak hours to ensure minimum disruption. Public announcements made on radio/ newspaper for major work. 24 hour letter drop notice given to smaller projects. Critical users (dialysis patients/hospitals) notified as a priority.	Partially	High (Possible x Moderate)	<p>PM1G: Maintain an up-to-date list of critical users such as dialysis patients/hospitals/businesses.</p> <p>PM2G: Maintain an up-to-date Asset Management System and GIS system in order to capture assets arising from projects, subdivision work and daily capital replacements and renewals; current work to be entered into system as a priority with plans for systematic update of any backlog.</p> <p>PM3G: Maintain a systematic workflow procedure with control checks for the update of capital works arising from projects, subdivision work and daily replacements and renewals so that all paperwork is sent to the asset engineer for recording on Asset Management System and GIS.</p>	Low (Rare x Insignificant)	<p>PM1: TL-AM</p> <p>PM3: AE/TL-AM</p>
D5.2	Inadequate operating Procedures.	<ul style="list-style-type: none"> Staff working on wastewater/storm water systems and then on Water reticulation Staff returning to work after waterborne illness 	<p>PM1G: Existing operations procedure 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater)' last updated 2018.</p> <p>PM2G: As part of operators training well aware of Hygiene issues associated within the 3 Waters industry. Some common sense prevails.</p>	Partially	Medium (Possible x Minor)	<p>PM1G: Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater)' document. Modify, where required to clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.</p> <p>PM2G: Develop and implement a Council SOP (Hygiene code of practice for working on water supply systems). The document to reflect industry best practice and how Council will manage preventing cross contamination in the unlikely event that staff alternate on wastewater and water reticulation work. The Hygiene Code of Practice to include start up employment arrangements, sickness statement and medical clearance requirements.</p> <p>PM3G: Review existing operating procedures and develop procedures that clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.</p>	Low (Rare x Insignificant)	<p>PM1G: MTW / TL-WTP / WTP-O</p> <p>PM2G: TL-WTP /WTP-O / TL-AS</p> <p>PM3G: MTW / TL-WTP / WTPO</p>

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne District Water Safety Plans)	Residual Risk	Responsibility
D5.3	Inadequate training of operations staff.		<ul style="list-style-type: none"> Staff provided with relevant training. All staff hold appropriate certificate in water reticulation. Prior to employment within 3 Waters Operation Section, staff are vaccinated against Hepatitis A/B and Tetanus to immunised against these known water borne diseases Tool box meetings carried out weekly. 	Partially	Medium (Possible x Minor)	<p>PM1G: Review staff certificates and maintain updated training and health register. Develop a training and competency system for working on reticulated network.</p> <p>PM2G: Develop and implement a Council SOP (Hygiene code of practice for working on water supply systems). The document to reflect industry best practice and how Council will manage preventing cross contamination in the unlikely event that staff alternate on wastewater and water reticulation work. The Hygiene Code of Practice to include start up employment arrangements, sickness statement and medical clearance requirements.</p>	Low (Rare x Insignificant)	<p>PM1G: TL-O / TL-AS / TL-WTP</p> <p>PM2G: TL-WTP /WTP-O / TL-AS</p>
D6: EVENT: CONTAMINATION AND LOSS OF SUPPLY DUE TO THIRD PARTY CONTRACTORS								
D6.1	Third party contractor/developers work on WDC reticulation (not directly engaged by WDC).		<ul style="list-style-type: none"> Implement procedures for third party contractors/developers that require them to obtain a Permit to Work before any work is carried out. <p>PM2 Contractors to submit disinfection procedures, Health and Safety plans, detailed design of work to be carried out prior to works commencing</p> <ul style="list-style-type: none"> WDC supervises subdivision work at critical stages such as pressure testing, disinfection, connection to the water main and backfilling, in the presence of the Engineer to the developer. Part of resource consent 	Partially	Extreme (Possible x Major)	<p>PM1G: WDC to develop policy and procedure whereby Third party contractors/developers are made liable for any damages to the network to increase accountability.</p>	Medium (Unlikely x Moderate)	<p>PM1G: TL-O/AE/TL-AM</p>

Appendix B: Rangitāiki Plains Scheme Process Control Summaries

Braemar Spring and Johnson Road Bores: Chlorination – Performance Parameters

The alarms for each control parameter are set to ensure appropriate corrective action is taken before the performance parameters reach critical limits. The Target Range, Action limits and Critical limits are set within a percentage of the Maximum Acceptable Values (MAVs) set by DWSNZ 2008 for each performance parameter (FAC, pH, Turbidity). The parameters set for Braemar Spring and Johnson Road Bores can be found in Table 20 and 21 respectively.

Table 20: Braemar Spring Gas Chlorination – DWSNZ 2008 Limits and Process Performance Parameters				
Limits		Performance Parameters		
		FAC (mg/L)	pH (pH units)	Turbidity (NTU)
DWSNZ 2008 Monitoring Parameters		<0.20 mg/L for >2% of 1 day	Guideline: Between 7.0 and 8.0	<1.0 NTU for >5% of 1 day
		>5.00		<2.0 NTU for 3 minutes of 1 day
Target Range	Low Limit	0.80		-
	High Limit	0.90		-
Action Limits	Low Alarm	0.40	5.0	-
	High Alarm	1.90	8.0	0.50
Critical Limits	Low Low Alarm	0.30	4.9	-
	High High Alarm	2.00	8.5	1.00

Plant automatically shuts down when 'Critical Limits' are exceeded.

Table 21: Johnson Road Bores Gas Chlorination – DWSNZ 2008 Limits and Process Performance Parameters

Limits		Performance Parameters		
		FAC (mg/L)	pH (pH units)	Turbidity (NTU)
DWSNZ 2008 Monitoring Parameters		<0.20 mg/L for >2% of 1 day	Guideline: Between 7.0 and 8.0	<1.0 NTU for >5% of 1 day
		>5.00		<2.0 NTU for 3 minutes of 1 day
Target Range	Low Limit	0.80		-
	High Limit	0.90		-
Action Limits	Low Alarm	0.30	5.0	-
	High Alarm	1.90	8.0	0.50
Critical Limits	Low Low Alarm	0.20	4.9	-
	High High Alarm	2.00	8.5	1.00
<i>Plant automatically shuts down when 'Critical Limits' are exceeded.</i>				

Braemar Spring and Johnson Road Bores Gas Chlorination – Triggers and Corrective Actions

Corrective actions to be taken when trigger limits are reached and are as follows for Braemar Spring and Johnson Road Bores:

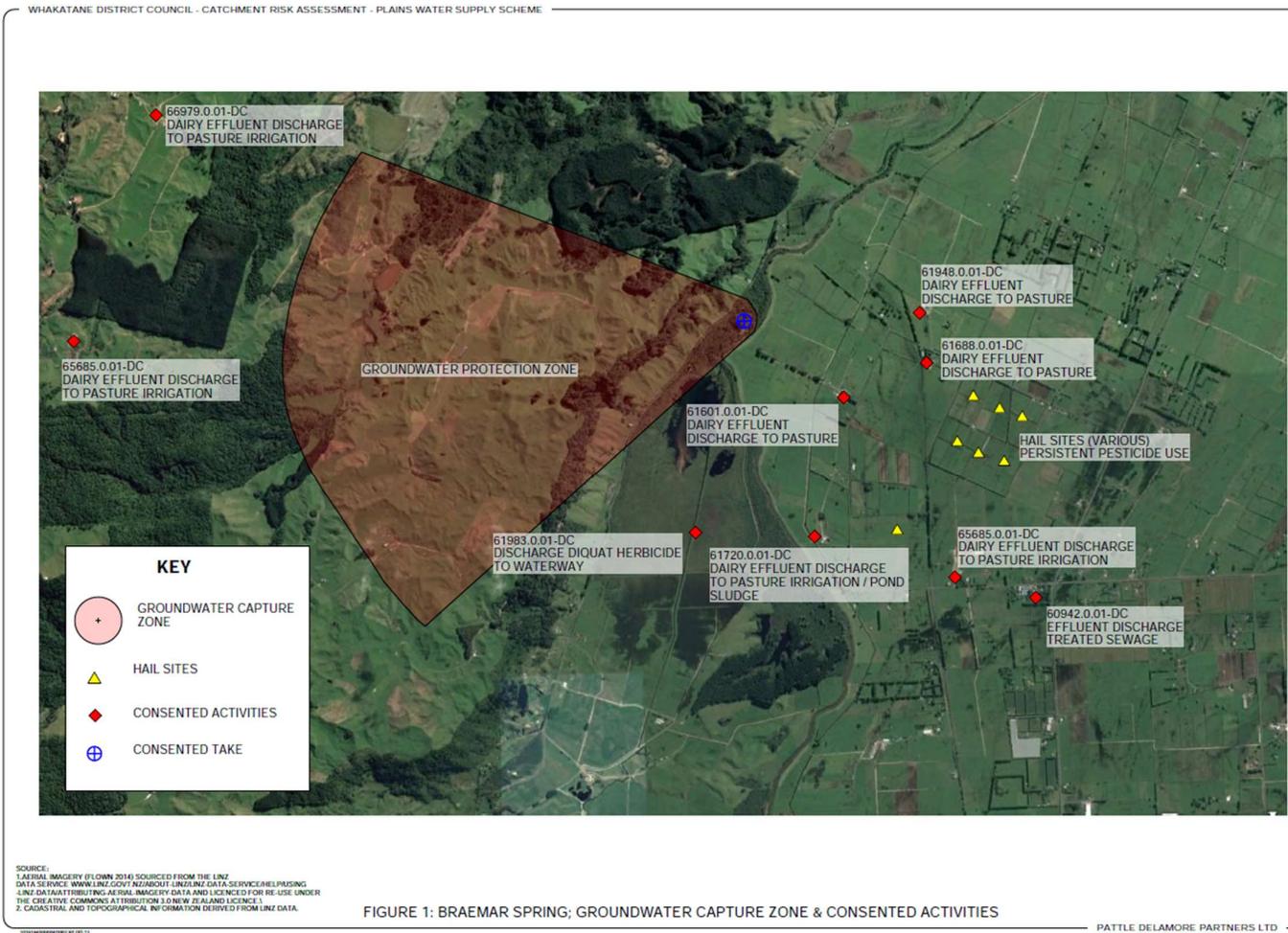
Table 22: Braemar Spring and Johnson Road Bores Gas Chlorination - Triggers and Corrective Actions

Limits	Triggers	Corrective Actions
Target Range	During day to day monitoring or inspection.	<ul style="list-style-type: none"> Adjust chlorine dosing rate manually until target range is achieved.
Action Limits	Alarms	<ul style="list-style-type: none"> Treatment Plant Operator to turn plant off by turning off the pump remotely and travel to site to carry out an inspection. Carry out a site inspection to investigate reason for turbidity and/or pH and/or FAC outside action limits: <ul style="list-style-type: none"> Check Turbidity meter/ Rotometer / pH meter for any mechanical problems e.g. a jammed rotometer. Check if chlorine dosing is correct or if the chlorine supply exhausted. Carry out manual tests to obtain turbidity, FAC and pH readings to verify against turbidity meter/ chlorine analyser/ pH meter readings to check equipment is operating correctly. Sample to be collected manual for additional E coli test. Verify online instruments with calibrate field equipment as per the Water Treatment Plants SOP and/or the manufacturer’s instructions. Carry out a visual check of borehead, treatment plant equipment and surrounding site for signs of vandalism. Check around borehead area and vicinity for any visible signs of contamination. Adjust chlorine dosing rate manually until target range is achieved. Increase monitoring frequency. Once problem is identified and resolved, remote in from laptop disable appropriate alarm and set up the plant to run automatically. Alarms to be reset once plant has settled and returned within normal target range of operation. Log incident in the water treatment plant log book. Record event details, manual test results any re-calibration information in the water treatment plant log book.

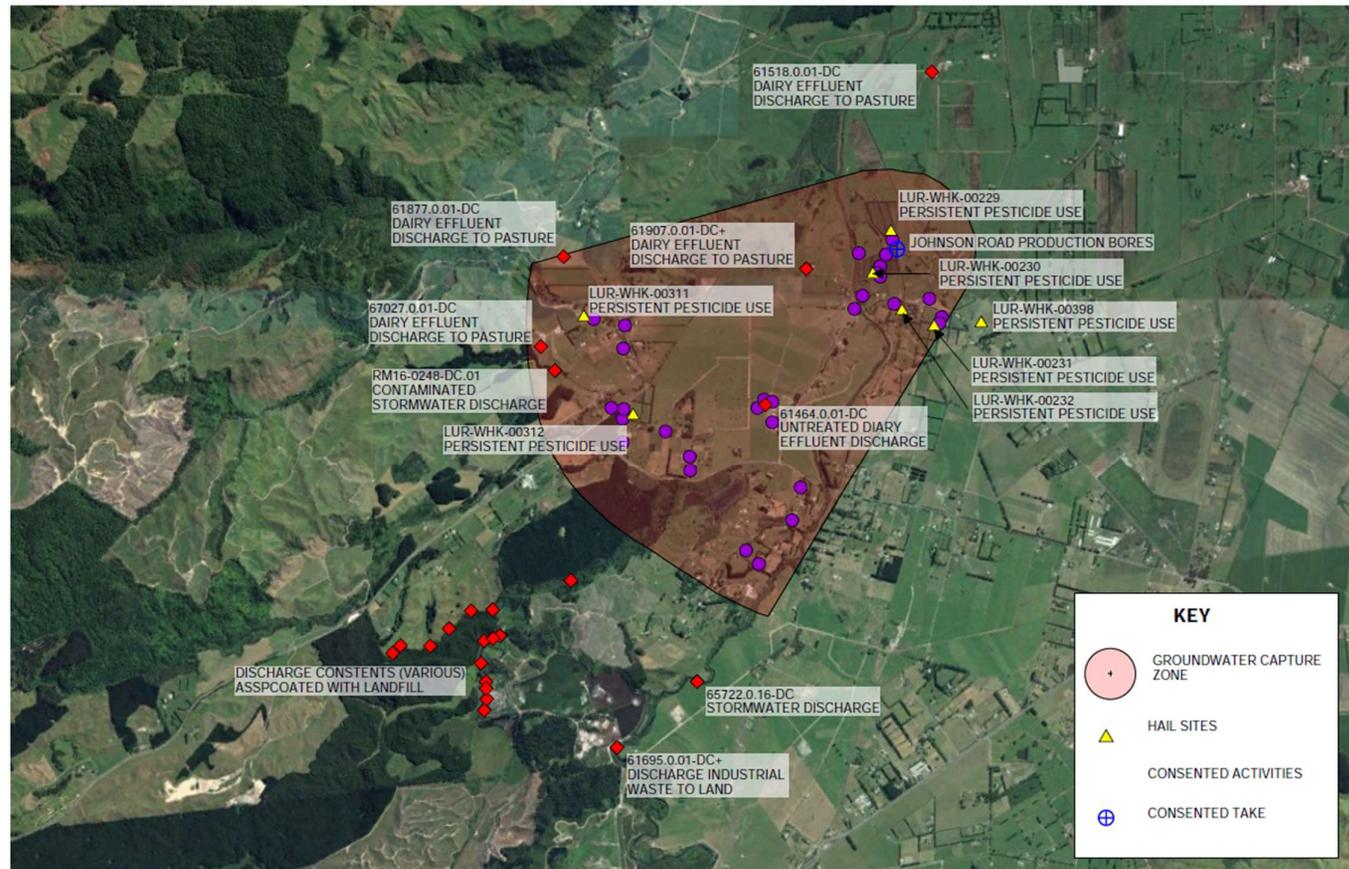
Table 22: Braemar Spring and Johnson Road Bores Gas Chlorination - Triggers and Corrective Actions

Limits	Triggers	Corrective Actions
Critical Limits	Alarms and/or plant shut down.	<p><i>Plant automatically shuts down when critical limits are exceeded for FAC and turbidity</i></p> <ul style="list-style-type: none"> • Water Treatment Plant operator to notify Water Treatment Plant Team Leader and Water Treatment Plant Team Leader to notify Three Waters Manager. • Travel to site, inspect, test and verify as per ‘Action Limits’ above. • Supply of water to the reservoir to be stopped while performance parameters are in the critical limit range and scheme to be supplied with compliant stored water using emergency storage or backup/alternative supply. • Carry out contingency plan as per civil defence emergency appropriate to the scenario. • Carry out transgression sampling according to section 4.3.9 of the DWSNZ 2008. • Increase monitoring frequency. • If there is a requirement for the plant to supply water to the scheme whilst performance parameters are in the critical limit range carry out the following: <ul style="list-style-type: none"> – Obtain approval from TL-WTP, MTW and DWA before supplying water to the scheme that may not satisfy DWSNZ 2008 limits. – Isolate alarms in order to operate the plant. – Confirm conditions of continued operation with the DWA and carry them out (i.e. boil water notice etc.). – Reinstate alarms so that the plant runs automatically once performance parameters are back to Target Range. • WTP-O to complete an incident report for the event, and the TL-WTP to develop a full transgression report.

Appendix C: Braemar Road and Johnson Road Sources - Localised Groundwater Capture Zone



WHAKATANE DISTRICT COUNCIL - CATCHMENT RISK ASSESSMENT - PLAINS WATER SUPPLY SCHEME



SOURCE:
 1. AERIAL IMAGERY (LOWN 2014) SOURCED FROM THE LINZ DATA SERVICE: WWW.LINZ.GOVT.NZ/ABOUT/LINZ/LINZ.DATASERVICE/HELP/ISSUES
 2. LINZ DATA/TERRITORY/INGESTION/IMAGERY/DATA AND LICENCES FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 3.0 NEW ZEALAND LICENCE.
 3. CADASTRAL AND TOPOGRAPHICAL INFORMATION DERIVED FROM LINZ DATA.

FIGURE 3: JOHNSON ROAD BORE; GROUNDWATER CAPTURE ZONE & CONSENTED ACTIVITIES

PATTLE DELAMORE PARTNERS LTD

Appendix D: Protozoal Log Credit Requirement Assignment - Amendment Letter from the DWA



Toi Te Ora Public Health
PO Box 2120
TAURANGA 3140

10 July 2018

Tomasz Krawczyk
General Manager Infrastructure
Tomasz.Krawczyk@whakatane.govt.nz

Dear Tomasz

Braemar Plant (TP00324) and Johnson Road Plant (TP00325): Protozoal log credit requirement assignment – amended for Braemar June 2018.

Whakatane District Council (WDC) has requested the DWA reconsider the log credit assignment based upon the research findings detailed in the *Gastrointestinal Protozoa, Research and Services reports for the New Zealand Ministry of Health* study.

Previously WDC had nominated to use a catchment risk category approach as per section 5.2.1.1 of the Drinking-water Standards for New Zealand 2005 (Revised 2008) (DWSNZ) and provided the Pattle Delamore Partners Catchment Risk Assessment for Plains Water Supply Scheme, Whakatane District Council, Nov 2017 (T01606400R007).

The Survey method and information presented in the catchment risk assessment (CRA) is acceptable for determining the protozoal log credit requirements and to inform the water safety plan. The CRA stipulated a log credit of 4 for the Braemar plant and this was accepted by the DWA.

However, the Ministry of Health research findings indicate that a log credit of 3 is most appropriate for shallow groundwater/spring sources.

Therefore, based on the CRA and the Ministry of Health research findings the log credit requirement assigned to the Braemar Plant is 3.

The CRA identifies a number of recommendations that are expected to be addressed in the pending water safety plan.

The Drinking Water Online database will be updated to reflect that the Braemar Plant requires a minimum 3 log protozoa treatment.

The CRA stipulates a log credit of 0 for the Johnson Road Supply North and South Bores, however it also states that groundwater security criteria 2 is not met. In order to achieve a log credit of less than 3, groundwater security criteria 2 must be satisfied. In this instance the fenced exclusion zone around the North bore is less than 5 m and no evidence that the bores meet the NZS 441 drilling standard, in particular any sealing between the bore casing and the hole.

Phone us on 0800 221 555 • enquiries@toiteora.govt.nz • www.toiteora.govt.nz

Regarding stock exclusion, leniency may be granted if additional mitigation is undertaken that will compensate for the distance being less than the 5m required. In other instances this has usually comprised of an additional physical barrier/wall which may also extend a distance down below the ground.

With regards to the NZS 441 drilling standard, production bore installations details should be provided.

Until these outstanding requirements are addressed the assigned log credit requirement is 3.

The CRA identifies a number of recommendations that are expected to be addressed in the pending water safety plan.

The Drinking Water Online database will be updated to reflect that the Johnson Road Plant requires a minimum 3 log protozoa treatment.

If you do not agree with the log credit assignation an appeal, as per section 1.9 of the DWSNZ, must be lodged with the Technical Manager, Central North Island Drinking Water Assessment Unit, PO Box 11036, Palmerston North 4440, within 2 months of receipt of this letter. The Technical Manager will arrange for a review to be undertaken using the Ministry of Health appeals procedure. Any log credit assignation appeal must be supported by data obtained by monitoring *Cryptosporidium* as per section 5.2.1.2 of the DWSNZ.

If you have any questions about this assessment please contact me 07 577 3788.

Yours sincerely,
Grant King



Drinking Water Assessor

Central North Island Drinking-water Assessment Unit – Toi Te Ora

cc: Leilani.Salanguit@whakatane.govt.nz
Michael.VanTilburg@whakatane.govt.nz
Diana.Kim@whakatane.govt.nz

Appendix E: Improvement Plan – Completed Projects

Table 23: Improvement Plan – Completed Items						
Priority	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Comment	Date
Low	D3.1 (PM3G)	Pipe, valve and hydrant failure due to age, condition and material of pipe	Record condition of asset, maintenance carried out and cost of maintenance against each asset on the Asset Management System during routine maintenance/repair programmes in order to utilise this information in asset renewal programmes.	TL-AM / TL-O	Implemented with new Asset Management System	March 2018
Low	D4.1 (PM6G) D6.1 (PM2)	Third party contractor/developer work on WDC reticulation (not directly engaged by WDC)	This is part of engagement of contractors. Contractors to submit disinfection procedures, Health and Safety plans, detailed design of work to be carried out and communications plan for affected customers to the relevant WDC staff for approval before work is carried out.	Contractors and AE / PE	Implemented	March 2018
Medium	S2.1 (PM3, PM4) S3.1 (PM2G)	Managing activities in the catchment	WDC to liaise with BOPRC as follows: 1) BOPRC to inform WDC of new discharge consents and WDC to provide comments on these consents. 2) WDC to send BOPRC submissions opposing new applications for septic tanks within groundwater capture zone.	Business as usual with resource consents	implemented	March 2018
Medium	T4.3 (PM1)	Inadequate/incorrect sampling	Review treatment plant sampling spreadsheet periodically for anomalies.	TL-WTP	completed	June 2018
Low	D1.1 (PM5G)	Contamination from backflow	Operations department to discuss with building control department to include backflow prevention devices as part of the building control checklist when carrying out building inspections.	AE / TL-AM	Discussions held - Part of building inspection process for consented works	July 2018

Table 23: Improvement Plan – Completed Items

Priority	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Comment	Date
High	S3.1 (PM3G)	Managing activities in the catchment	Pesticide suite testing on raw water was undertaken in September 2013 and again in July 2018	TL-WTP	Completed	July 2018
Medium	T4.3 (PM2G)	Water Operator Authorisation assessment	Water Operator Authorisation. Authorisation assessments by DWA were undertaken with WDC operators in September 2018. The next assessments to be carried out in 2021.	TL-WTP / WTP-O	Completed	September 2018
High	S2.2	Bore head Security	Johnson Rd: Installation of testable backflow preventer (double check) on bore headworks.	AE / PM	Completed	October 2018
Medium	T5.5 (PM1)	Chlorine supply exhausted	Spare chlorine cylinder on site with auto changeover when supply is exhausted.	TL-WTP / WTP-O	Completed	November 2018

Appendix F: Report on adequacy of a Drinking Water Supply's Water Safety Plan



Report on adequacy of a Drinking Water Supply's Water Safety Plan

Drinking Water Supply Rangitāiki Plains (RAN007)

Central North Island Drinking Water Assessment Unit – Toi Te Ora
PO Box 2120
Tauranga 3110

Report Identifier
RAN007_RangitāikiPlains_WSPadequacy_240619_v1

Executive Summary

Water Safety planning is internationally recognised as the most effective means of consistently ensuring the safety of a drinking-water supply. Six principles underpin the foundation of effective water safety planning:

1. A high standard of care must be embraced
2. Protection of source water is of paramount importance
3. Maintain multiple barriers against contamination
4. Change precedes contamination
5. Suppliers must own the safety of drinking water
6. Apply a preventive risk management approach

Under the Health Act, this supply falls into the category of a minor drinking water supply. Section 69Z of the Act requires that the supply have an approved and implemented water safety plan.

Non-conformances: These are areas of the WSP that must be corrected or amended before the plan can be approved. These relate directly to, or give practical effect to the requirements of the Health Act.

Recommendations – These are areas of the WSP where suggestions for improvement have been made that are not mandatory requirements. They do not affect approval of the plan.

The Rangitāiki Plains public water supply - Water Safety Plan (WSP) comprehensively sets out details of the water supply including descriptions, control points and critical control points, risk identification and assessment information, planned improvements, and corrective actions and contingency plans.

Whakatane District Council's (WDC) adoption of a more comprehensive approach to water safety planning is commendable and acknowledged by the Bay of Plenty and Lakes District Health Boards.

The WSP for Rangitāiki Plains public water supply WSP has been approved with one recommendation.

Description of drinking water supply

The WSP describes a WDC owned and operated public water supply consisting of a dual source; a spring source (Braemar) and two deep bore sources (Johnson Road). Treatment consists of gas chlorine. Chlorine residual disinfection is maintained in the reticulation. Storage consists of a 4,500 m³ and 250 m³ concrete reservoirs. The population supplied is approximately 2,700 people. Known connections are metered and have a backflow prevention device. The supply has recently been separated from the Te Teko and Edgecumbe networks, which are now supplied by the Otumahi supply with an emergency connection between the two supplies.

The source water has arsenic present and a priority 2 determinand for arsenic has been assigned to the distribution zone.

The previous WSP version 1.03 referred to utilising the Rural Agricultural Drinking-water Supply Guidelines as the supply likely met the required definition. However, this version clearly sets out that the supply is being administered as a networked community scheme and that WDC will review whether to seek a formal change to a Rural Agricultural Drinking-water Supply. Therefore the non-

conformance made in the previous adequacy report related to the supplies registration status has been adequately resolved.

Adequacy of risk assessment methodology

Risk assessment methodology is based on a mixture of Ministry of Health Guides and the AS/NZS 4360:1999 standard. The methodology, scope and description of the water supply, including identification and description of critical point and critical control points is adequate.

Adequacy of risk identification and analysis

The risk identification and analysis is adequate. Public health risks for all common supply elements and their possible causes have been adequately identified. The qualitative risk assessment as per the Ministry of Health framework is adequate.

Adequacy of control measures

Preventative or control measures have been identified for most public health risks/events and are considered to be adequate. Critical Points have been clearly identified. Chlorination has been identified as the current operational Critical Control Point. Continuous free available chlorine, pH and turbidity have been identified as the monitored and alarmed parameters. Critical limits for these parameters are clearly listed. Corrective actions associated with each critical limit are included and considered adequate for this supply. Preventative measures, indicators and corrective actions for non-Critical Control Point risks are considered adequate for this supply.

In this version of the WSP improvements have been added to reflect recommendations made in the previous adequacy report including reviewing approaches to total coliforms, development and implementation of a standard operating procedure for hygiene, and the collation and development of other standard operating procedures.

The wording around the frequency of calibrating turbidity meters still appears to be incorrect (calibration should be every three months, not annually). For the purposes of meeting the Health Act and the drinking-water standards, this will be checked as part of future Analyst Authorisation assessments.

Recommendation 1: Amend risk tables to be more general to accurately reflect that different methods have different timeframes e.g., some are three months or six months.

Adequacy of improvement schedule

An improvement schedule is included and appears to be aimed at addressing preventative measures, monitoring or corrective actions that are currently absent or ineffective. Many improvement schedule items cover multiple council-owned water supplies. The scope and detail of the improvement item is considered adequate.

In this version of the WSP improvements have been added and/or modified to indicate a timetable to adequately prevent, reduce and eliminate the public health risk related to arsenic. Specifically,

investigation is to occur by June 2019 and implementation of the chosen option to achieve arsenic removal by October 2022. Therefore the non-conformance made in the previous adequacy report related to the timetable to prevent, reduce and eliminate the public health risk related to arsenic has been adequately resolved.

Decision

WSP for Rangitāiki Plains has been approved.

It is expected that the water supplier begin to implement this WSP within one month.

The Health Act sets out the maximum expiry of a WSP however due to the transition to the new WSP framework it is expected that plans approved now may need to be updated to include elements of the new framework that are absent or deficient. Therefore the approval of this WSP is subject to the DWA requiring its alteration (to meet the new WSP framework) within a specified period of time in consultation with WDC.

Please be aware that if significant changes are made to either the processes used to treat water or to the raw water source, the WSP must be revised and re-submitted for approval by a drinking water assessor.

Information in this report will be provided to the Ministry of Health (in accordance with requirements of Section 69ZZZB of the Health Act).

Attachments

Nil.

Completed 28 June 2019.



Grant King
Drinking Water Assessor
Central North Island Drinking Water Assessment Unit – Toi Te Ora

Assessment Report Information

Report identifier	RAN007_RangitāikiPlains_WSPadequacy_240619_v1
Drinking Water Assessment Unit (Inspection Body)	Central North Island Drinking Water Assessment Unit – Toi Te Ora PO Box 2120 Tauranga 3110 07 5773788
District Health Board	Bay of Plenty District Health Board
Drinking Water Assessor	Grant King
Assessment Date	24/06/2019
Description of assessment work	Assessment of adequacy of Water Safety Plan for Supply: RAN007 Rangitāiki Plains Zone: RAN007PR Rangitāiki Plains Plant: TP00324 Braemar Plant Source: G00220 Braemar Springs Source: G00221 Johnson Road Bore (North) Source: G00548 Johnson Road Bore (South)
Equipment Used	Nil.
Water Supply Owner / Person Responsible	Whakatane District Council Tomasz Krawczyk
Assessment method	Standard assessment as per Scope Procedure 3 Standard specified in Health Act 1956
Documents and Information	<ul style="list-style-type: none"> • Drinking Water Standards for New Zealand 2005 (revised 2018) • Rangitāiki Plains Public Water Supply – Water Safety Plan. Version 1.03, March 2019 T01616400R014 WSP Rangitāiki_Plains_Final.docx (A1294543) • Rangitāiki Plains Public Water Supply – Water Safety Plan. Version 1.04, June 2019 T01616400R014 WSP Rangitāiki_Plains_Final.docx (A1294543)
Site of Assessment	Central North Island Drinking Water Assessment Unit – Toi Te Ora 510 Cameron Road, Tauranga
Omissions from proposed assessment	Nil
Sub-contracted work	Nil
Document checked by:	Cameron Huxley IANZ Accredited Drinking Water Assessor Date: 01/07/2019
Release of report authorised by:	Grant King IANZ Accredited Drinking Water Assessor Signature:  Date: 02/07/2019

If you do not agree with the findings of this report a written appeal must be lodged with the Peter Wood, Technical Manager, Central North Island Drinking Water Assessment Unit, C/- MidCentral Public Health Service, PO Box 11-036, Palmerston North 4442 within 2 months of receipt of this report. The Technical Manager will arrange for a review to be undertaken using the Ministry of Health appeals procedure.