WEAVING THE FUTURE, TOGETHER
KOTAHITANGA
ŌTOROHANGA DISTRICT COUNCIL

Water Supply Asset Management Plan

ŌTOROHANGA DISTRICT COUNCIL

FEBRUARY 2024

Te Kaunihera ā-Rohe o Ōtorohanga District Council
Where kiwi can fly

RESPONSIBILITY	Group Manager Engineering
STATUS	DRAFT
NEXT REVIEW DATE	
REVIEW FREQUENCY	Three Years
ASSOCIATED DOCUMENTS	Water Safety Plans, Infrastructure Strategy

REVISION RECORD

Document

Revision	Revision Date	Issued By	Details	PDF Doc ID
Draft 1.0	15 January 2024	Emma Good	Initial issue for internal comment	
Draft 1.2	16 February 2024	Emma Good	Final Draft for Audit review	

1.0 Executive Summary

Ōtorohanga District Council's water supply networks, currently serve the Ōtorohanga and Kāwhia urban communities and the defined rural supply areas of Waipā, Tihiroa and Arohena. Council also administers a stock-water only rural scheme in the Ranginui area. These systems are provided as enablers of community wellbeing.

This Water Supply Asset Management Plan (AMP) aligns with the 30-year Infrastructure Strategy, and is one of the supporting documents for the 2024-2034 Long Term Plan (LTP), showing how Council proposes to:

- Provide affordable, well-designed and maintained water infrastructure to enable economic growth for households, commerce and industry across Ōtorohanga.
- Implement appropriate barriers as detailed in the approved Water Safety Plans against waterborne risks such as protozoa or E. coli to meet public health compliance requirements, through proactive upgrading of the rural and urban schemes.
- Increase resilience against risks such as loss of supply, enable fire-fighting demand to be met with adding new hydrants where required for growth, and managing longer term climate change impacts on surface water takes, through building additional storage to provide at least 36 hours average daily demand, along with replacing asbestos cement water mains that have a high failure rate.

1.1 - Significance of Water to Iwi/Māori

Commented [RM1]: This section should be included in the Stormwater/Wastewater AMP

Council recognises the importance of wai (water) to iwi/Māori:

- That water carries a mauri (life force).
- That water has a wairua (spiritual significance).
- That water supports mahinga kai (traditional food gathering).
- That water tells the stories of tupuna (ancestors).

Council's relationship with iwi in our rohe (district) is developing, and Council expects to engage far more with iwi over the course of this Long Term Plan, particularly in relation to anything involving water.

1.2 - Proactive upgrading of treatment plants

Under the regulations of Taumata Arowai, Council as a water supplier must demonstrate that:

- The quality of the source water used is understood.
- The treatment plants have appropriate barriers to bacterial and protozoal contamination installed, operated and continuously monitored.
- Water for drinking must avoid breaching specified levels of chemical or cyanotoxin determinands known as (MAVs).

Measures are in place to prevent recontamination of water within a distribution system, such as backflow prevention and controls on accessing pipes and plants.

This is consistent with Council's goals of optimising performance and reducing costs for residents, ratepayers and businesses.

Within the treatment plants, getting the water to a suitable clarity to enable effective protozoa and microbiological risk barriers is essential to drinking water safety. In the case of the two urban water supplies, Ōtorohanga and Kāwhia, achieving compliance with the Drinking Water Quality Assurance Rules is well underway and has been consistently achieved over the last six months through a combination of relatively modest treatment process upgrading and improved monitoring processes.

1.3 - The Big Five Issues for Water Supply

Council has identified five issues that will have a significant impact on the way water supply is managed into the future. These are addressed in more detail throughout this document:

1. Climate Change – weather patterns, natural hazards and resilience.
2. Growth – the impact of a growing community.
3. Asset Data Capture – understanding what we have so we can make informed decisions.
4. Resourcing - to advance an ambitious capital works programme.
5. Affordability – meeting government expectations of compliance continues to increase cost to Council to operate water supplies, especially in the rural areas with small rating base. Assets reaching the end of useful life over the next 10 years will require continued investment now that reform is not taking place and assets remaining with councils.

2.0 Introduction

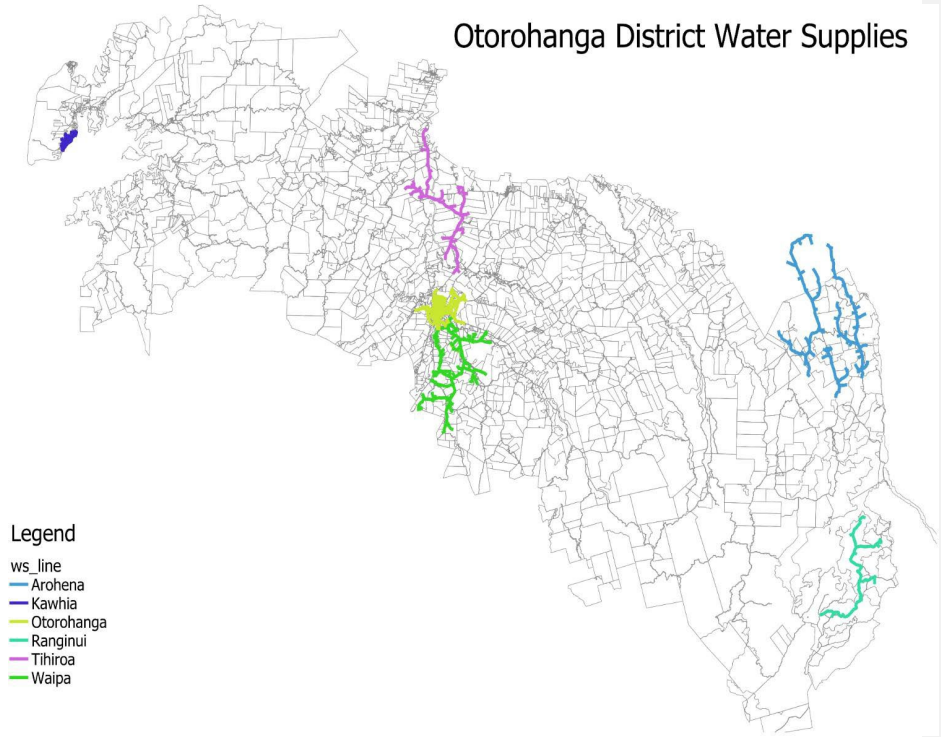


Figure 2.1 – Ōtorohanga District Water Supplies

2.1 Key Directions of Council

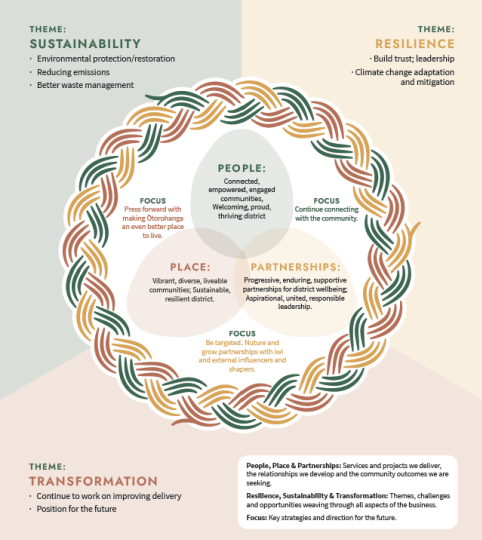
Three years ago, Council adopted a fresh approach to looking at its role and services. We began using the concept of wellbeing as our lens for examining what we did. This, in turn, has led to a much sharper focus on the outcomes wanted from our services and how these services are delivered.

Ōtorohanga is a fabulous district and we want to ensure that everyone who calls this place home is nurtured and enabled to be their best. We want the district to be dynamic, inclusive and unique - a place where kiwi can fly and this means focusing on people, place and partnerships to achieve the outcomes below:

The district vision for the 2021–2031 LTP is:

Ōtorohanga - 'where Kiwi can fly'; A Dynamic, Inclusive and Unique District

Council identified the following outcomes that will guide activities to promote the well-being of our community, and the function and performance of our assets and infrastructure:



2.3 Plan Purpose

The purpose of this Asset Management Plan is to ensure that all of the assets (in this case drinking water supply) are operated and maintained so that they provide the required level of service for present and future customers in a sustainable and cost effective manner through:

- Demonstrating sustainable operation of key strategic assets of the Ōtorohanga District, including funding requirements.
- Ensuring compliance with legislation including the Local Government Act 2002, Health and Safety at Work Act, Health Act, Resource Management Act 1991, Building Act 2004 and Drinking Water Quality Assurance Rules 2022
- Being consistent with key directions of Council and agreed levels of service.

Using a robust risk-assessment approach to identify and prioritise operational, maintenance, renewal and capital development needs.

This plan substantiates budget forecasts put forward in the Ōtorohanga District Council LTP (2024-2034) and associated long term (30) year capital replacement forecasts for water supply.

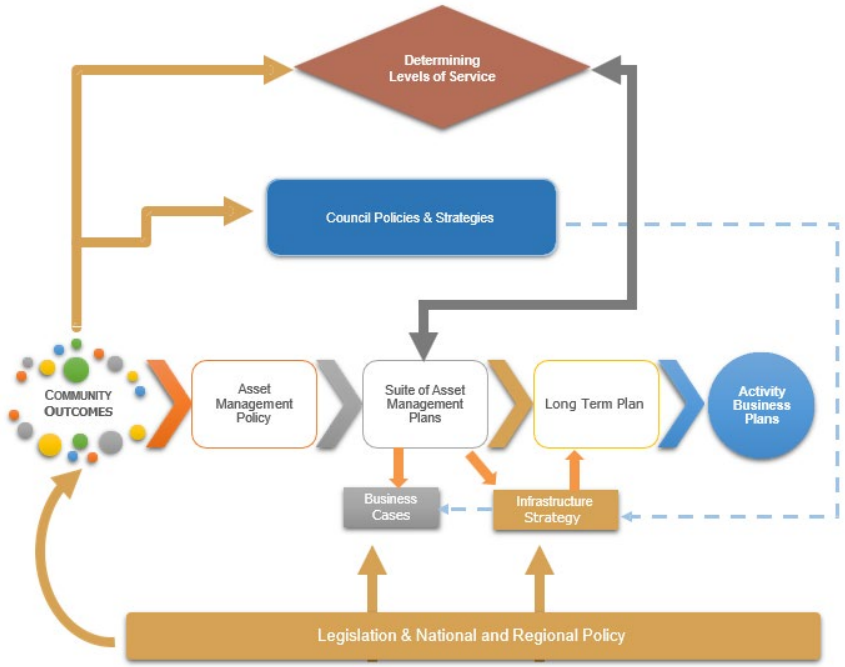
Ōtorohanga District Council will:

- Use the Water Safety Plans on a day-to-day basis as a 'working document', and note amendments to this Asset Management Plan arising from these Water Safety Plans on an annual basis.
- Conduct three-yearly rewrites of the Asset Management Plan in advance of the LTP annual amendments or updates will be undertaken if significant asset management changes occur.

2.4 Relationship with other Plans

In the diagram below are the linkages between Council's high level planning documents as they relate to the Asset Management Plan:

Figure 2.2 – Three-Yearly AMP Flowchart



2.5 Agreed Problem and Benefit Statements

As part of the development of the AMP, the current challenges were summarised to three key problem statements as below:

Table 2.1 – Three Key Problem Statements

	Problem Statements	Benefit Statements	
	Changing climatic conditions will impact both the availability and quality of raw water sourced	Council has invested in increased storage during the last LTP and explored the availability of ground water supply for Ōtorohanga and further raw water storage. Although ground water is not feasible, an earth dam is feasible at Honikiwi but unaffordable currently. The direction currently is to improve the management of our existing resource through metering, leak detection and renewals of pipes. A future water source for Kawhia is to be considered in the next 10 years depending on growth.	People Resilient district Responsible Leadership
	Non-compliance with drinking water quality assurance rules creates risks for users and Council as a supplier.	Council has invested into getting the urban drinking water plants capable of meeting compliance. Further investment is needed into rural plants but is unaffordable to the small rating bases. Council will continue to explore opportunities to meet compliance which will require external funding.	People Sustainable Partnerships
	The central location and attractiveness of the district is increasing growth, placing additional demand on infrastructure and resources.	Understand criticality of piped networks and progressively upgrade to enable customer connections and growth.	Place Resilient district Sustainable

Table 2.2 – What we are doing and how?

What are we doing and how?	
Improved Management of existing resources	Continued renewals programme for water mains $500K in year 1 $250K each year for years 2 - 10 Leak detection $0.16M
Compliance with Drinking Water Standards	**Ōtorohanga/Waipā and Kāwhia Plant:** Continual improvement on the operations and monitoring of the plants to meet compliance. **Arohena Rural Water Scheme** Although Council has been directed by Taumata Arowai to get the Arohena Plants of Huirimu and Kahorekau up to Protozoal compliance. Council cannot afford major upgrades at this time and will leave the schemes under permanent boil water notice until some further investigation is carried out to see how the plants can reach compliance. External funding may be available in the future and there will be some more clarity around the new governments "Local water done well" policy. **Tihiroa:** - Completing improvements to meet compliance.
Supporting Growth within the District	Continue to work with developers to enable development within district and identifying potential growth areas during the renewal program for any future demand.

2.6 Underlying Planning Assumptions

2.6.1 – District Overview and Growth Projections

DISTRICT OVERVIEW

Ōtorohanga District Council is a territorial local authority in the Waikato region of New Zealand. It covers an area of 1976 square kilometres that extends from the shores of the Tasman Sea in the West to the Waikato River in the East. It has diverse topography, productive farmland, extensive native vegetation, ocean beaches and protected harbours.

The principal township is Ōtorohanga, located centrally in the district, with a smaller urban settlement of Kāwhia located at the coast, which is a popular holiday destination.

Figure 2.3 – Ōtorohanga District Map

POPULATION AND GROWTH

District population in 2023 was estimated to be 10,900, up 0.9% from a year earlier. Figures for that same year show that the district's dependency ratio was 60.7% - higher than the New Zealand ratio (54%). This elevated ratio reflects both the slightly higher proportion of residents aged 65 years and older (17%; cf. New Zealand 16.5%) and higher proportion of young people aged under 15 years (20.6%; cf New Zealand 18.5%).

Nearly 30% of the district population identify as of Māori decent (cf. New Zealand – 16.5%) and 11.3% of residents were born overseas.

Population growth is expected to continue albeit gradually. By 2048, resident population is projected to be 12,656[4] with a corresponding growth in households from 3,872 in 2024 to 4,644 by 2048 (20% increase).

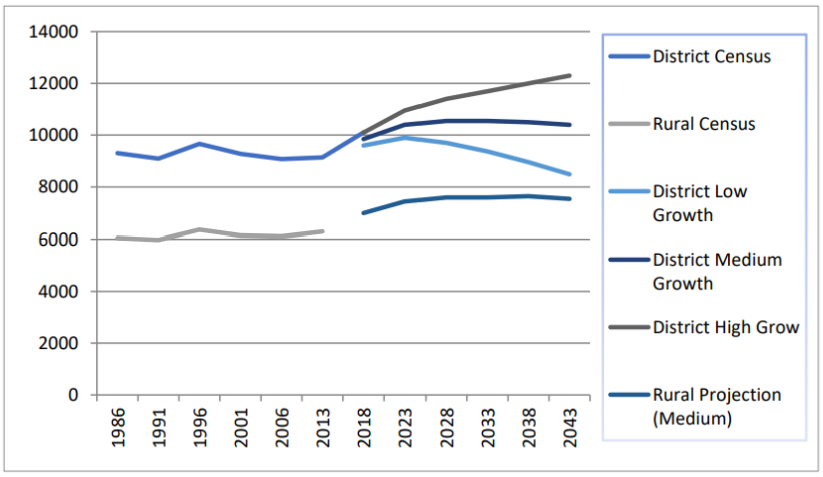


Figure 2.5: Population Growth Forecast

Population insights for Ōtorohanga District from 2022:

Ōtorohanga District's total population was 10,850 in 2022, up 0.5% from a year earlier. Total population grew by 0.2% in New Zealand over the same period.

- Population growth in Ōtorohanga District averaged 1.1%pa over the 5 years to 2022 compared with 1.2%pa in New Zealand.
- Since 1996 growth in Ōtorohanga District reached a high of 2.5%pa in 2016 and a low of -1.0%pa in 2001.

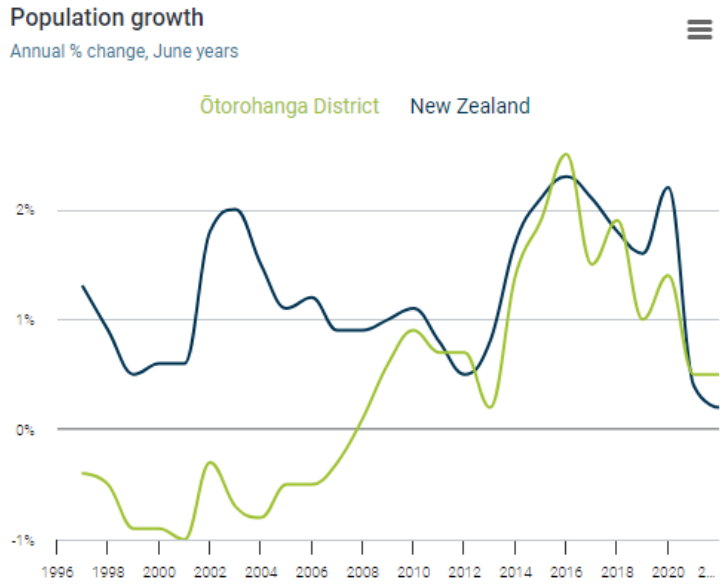


Figure 2.6: Population in Ōtorohanga District, 2006-18 Censuses

Two recent developments are expected to add to residential growth in Ōtorohanga including:

1. The completion of the Waikeria Prison expansion, this facility is to the north of Ōtorohanga and the District's comparably low land values, (against neighbouring Waipā District), will appeal to the new permanent workforce.
2. Completion of stage 1 and 2 of the NKC subdivision on Harper Ave will see the start of construction of an additional 80 dwellings and with the completion of stage 3 & 4 in 2024-25 an additional 40 homes will come online. This increase in demand for water and wastewater will be within existing plant capacities. Assets from stage 1 & 2 have been vested to Council which is the majority of the overall infrastructure for the larger subdivision.

On-going private subdivision activity is expected to yield up to 130 new housing lots within the community by 2025, which would represent an increase in housing stock of circa 10%. How quickly these new lots become occupied is uncertain. Council's previous experience has been that achieving full occupancy of new subdivisions can take 10 years.

However, offsetting the population growth potential with previous census data indicating the average number of occupants per dwelling is falling in comparison with increasing national aged demographic trends. Because of this decline in average household sizes it is estimated that the number of dwellings in the

community would need to increase by approximately 0.4% per annum (5 houses per year) to maintain existing population levels.

It is these peak figures, (which are themselves limited by the accommodation capacity of the town), that effectively determine the services capacity requirements of the community.

For Kāwhia township, the number of permanent residents is estimated to be 384 people which has increased by 41 people since the 2013 census. Holiday season populations are however much higher. While accurate data is not currently available, the best assessment of the temporary peak population is in the order of 3,000 residents for the two to three weeks of Christmas, and often 2,000 during other holiday periods.

It is these peak figures, (which are themselves limited by the accommodation capacity of the town), that effectively determine the services capacity requirements of the community.

ECONOMY

Agriculture is the economic backbone of the district, with 34.8% of the district's employed population listing their occupation as relating to agriculture, forestry and fishing. It is still believed that upwards of 75% of all economic activity in the district is closely associated with the agricultural sector. The prevailing economic climate has been difficult for some of the smaller Ōtorohanga businesses, and there have been some changes to businesses in the retail and service sectors, though it is suspected that these changes have occurred without any substantial net loss or gain in total employee numbers.

Economic Insights for Ōtorohanga District from 2022:

- Among the broad economic sectors, primary industries accounted for the largest proportion of GDP (35.8%) in Ōtorohanga District, which was higher than in New Zealand (5.8%).
- Goods-producing industries accounted for the second largest proportion in Ōtorohanga District (12.2%) compared with 18.5% in New Zealand.
- High-value services accounted for the smallest proportion in Ōtorohanga District (9.1%) compared with 26.7% in New Zealand.

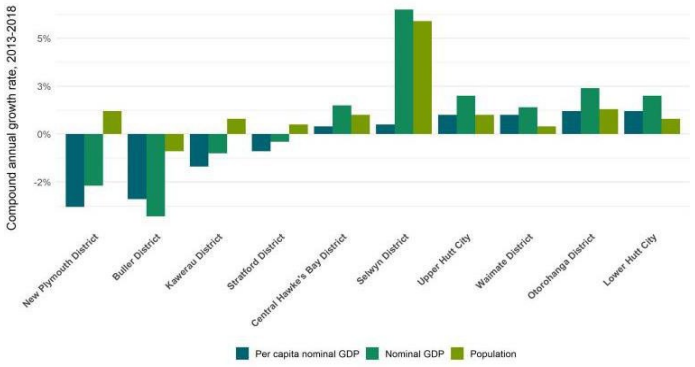


Figure 2.7 – Slowest Growing Territorial Authority Areas (2013-2018)

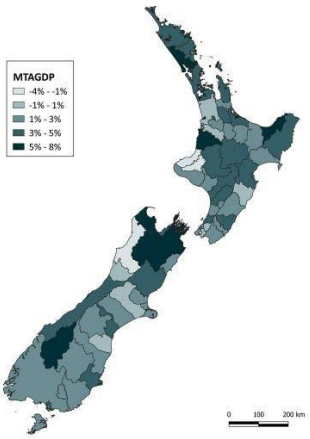


Figure 2.8 – Map of Territorial Authority GDP Per Capita Five-year Growth

2.6.2 - Water Allocation Framework

Since April 2012, Variation 6 to the Regional Plan adopted by the Waikato Regional Council, imposes a water allocation framework on the region that sets limits on how much water can be taken from both surface and sub-surface sources at certain times.

Applications to take water are processed under this framework on a 'first come first served' basis. For many areas of the region, the streams are considered "fully allocated", and as such new applications to take additional water from those sources are likely to be declined.

Council's Water Supply Bylaw, (being revised in 2024), reinforces the need for water abstracted to be used efficiently, focusing on maintaining health and enabling sustainable growth.

Water meters and volumetric charging have been in place for Ōtorohanga since 2017/18, and the 'trickle feed' Rural Water Schemes also have volumetric charging. The Kāwhia township water metering project was completed in 2023.

2.6.3 - Drinking Water Quality Assurance Rules

All significant community supplies are required to meet rigorous quality standards for potable water through the Drinking Water Quality Assurance Rules (established 2022). Previously this was the Drinking Water Standards NZ (DWSNZ), DWSNZ were replaced by the Drinking Water Quality Assurance Rules (DWQAR's) on 15 November 2022. Compliance was hard to measure against the DIA mandatory non-financial measures for the 2022/23 financial year due to the misalignment of the rules and the measures. Council is proactively upgrading treatment plants to ensure compliance with the new rules from the Water Regulator, Taumata Arowai.

Suppliers are required to ensure risk barriers are in place against microbiological, (such as *E. coli*), and protozoa, (such as Giardia).

Overall, the assessment of compliance against the Drinking Water Quality Assurance Rules 2022 has concluded that none of the six water supplies were fully compliant for all of the months from 14 November 2022 to June 2023. The Ōtorohanga Water Supply achieved full compliance at the Treatment Plant, though the two Distribution Zones of Ōtorohanga and Waipā were unable to meet the sampling requirements. This was due to not achieving the required number of free available samples per week. The correct sampling

duration and number of samples per week was the cause of much of the non-compliance seen in both the Treatment Plants and Distribution Zones. These are considered technical non-compliances, rather than being due to improper overall water quality.

2.6.4 - Climate Change

Of New Zealand's 10 most significant climate change risks, based on the National Climate Change Risk Assessment, potable water supplies (availability and quality), due to changes in rainfall, temperature, drought, extreme weather events and ongoing sea-level rise, scored as extreme. A similar score of extreme was given to risks to buildings due to extreme weather events, drought, increased fire weather and ongoing sea-level rise.

Strategies for mitigation will include:

- Greater use of Business Intelligence using data captured from 24-hour plant monitoring to optimise pump run-times so they are only using energy when they need to, or mainly off-peak reducing energy consumption.
- Explore some water meters to 'internet of things' devices that provide large users with instantaneous usage information to help them proactively manage their demand wastage.
- Consider more use of renewable energy sources such as solar panels on treatment plant roofs to power non-critical assets and reduce total carbon footprint of operations.

Storage has increased to 36 hours, (mean daily average demand), across Ōtorohanga since the last LTP for urban supplies. Kāwhia currently has 72 hours storage during normal demand which is more than adequate.

Creation of 'source protection plans' in line with proposed Water Services Act 2021 are underway.

2.7 - Three Waters Reform - Local Water Done Well

Preparing our programmes for the wastewater, water supply and stormwater groups of activities have been a challenge for us in this Long Term Plan. We started the process with the expectation that our assets for the three waters would be transferred to one of the ten water management entities legislated for by the previous government and that this transfer would occur no later than July 2026. In late 2023 the incoming National Coalition Government clearly signalled that the three waters legislation would be repealed and replaced by a new regime – *Local Water Done Well*. Details of the new regime are still being worked on. To date we have been told that:

- Drinking water, stormwater and wastewater will remain in local control
- There will be stricter rules for water quality and investment in infrastructure
- Councils will need to ringfence money for water infrastructure
- New or replacement water infrastructure will be loan funded and paid back from either rates or user charges.

2.7.1 - What does this mean for us?

It's business as usual until there is more information on the government's intentions with respect to the three waters. We have updated our water asset management plans and our Infrastructure Strategy for the next 10 and 30 years respectively so we know what work needs to be done and when. We have also made provision in our Long Term Plan programmes for the ongoing management and operation of our water infrastructure by Council staff. This means re-engaging a water manager - we had left this position vacant when it was thought that the three waters would be transferred to one of the new water entities - and ensuring we have the right staff resources in place to operate and maintain the networks.

Overall, our water assets are in good shape although there is work needed in 2024 to ensure that some of our rural water supply schemes comply with government drinking water standards (Taumata Arowai). The accelerated programme of works we started in 2021 has been hugely important for the district. It has enabled us to catch-up on renewing assets that are worn out and increase the capacity of these assets to give us some head room for growth.

2.7.2 - Costs

At this stage, we are not anticipating having to build new assets or undertake any major improvement works of existing assets. However, we are budgeting for more loans to help pay for assets when they need replacing as our depreciation reserves are unlikely to be big enough to cover these costs. This will mean that we will have a bigger debt to service in the future for some water schemes.

Water use charges for Ōtorohanga residents will increase on average X% per annum for the next three years. This is to cover increased costs due to inflation for the treatment and supply of clean drinking water.

Commented [CP2]: Don't forget to put this in 😊

2.7.3 - Looking into the Future

Until we have more detail about *Local Water Well Done*, it is difficult to determine Council's future role in water management. However, once these details are made public, we will utilise the channels we have available nationally and regionally to participate in the discussions on your behalf to help ensure that the government's proposals are workable at the local level.

Roading is our backbone and water is our lifeblood - we know these things don't come cheaply. We expect that as the environmental and health standards for the delivery of quality water services continue to rise so too will the cost to customers. Finding efficient, affordable ways for the delivery of water services is an issue we share with our neighbours and we will be encouraging ongoing regional conversations around making improvements. This may mean joining with others to get better economies of scale in the delivery of services.

3.0 Asset Management Practices

3.1 - Asset Management Criteria

The six most important criteria for asset management planning, as identified in an NZIER study, are listed below along with Ōtorohanga District Council's current self-assessment:

Table 3.1: Criteria for Asset Management Planning

Objective	Information Summary	Self-Evaluation
1. Obtain financial information that accurately indicates the current investment in the potable water supply.	Financial information based on accurate records and independent review of valuations.	High degree of confidence. 'Highly Reliable'.
2. Obtain data that indicates the age, condition and performance of the potable water infrastructure services.	Age and performance records are good; information on the condition of the infrastructure is based on historical data and scientific research rather than in situ condition assessments.	Fair degree of confidence. 'Less Reliable'.
3. Obtain information on the setting, delivering and measuring levels of service and compliance for potable water infrastructure services.	Levels of service and compliance are stringently monitored by the Waikato District Health Board and Waikato Regional Council.	High degree of confidence. 'Highly Reliable'.
4. Obtain information on processes that forecast future demand for potable water infrastructure services.	Population forecasts suggest limited population growth in the district hence future water demand is based on current usage figures with any growth offset against savings in water usage and reducing unaccounted for water.	High degree of confidence. 'Highly Reliable'.
5. Identify the governance model adopted to oversee the delivery for potable water infrastructure services (including delegated authority).	Strong governance model is in place via Community Boards and Council.	High degree of confidence. 'Highly Reliable'.
6. Identify the service delivery mechanisms being used in the potable water infrastructure services.	Established water schemes with delivery methods and infrastructure clearly defined.	High degree of confidence. 'Highly Reliable'.

3.2 - Data Provision Process and Systems

Asset information is captured and stored in the AssetFinda software programme. AssetFinda is an advanced Asset Management System that utilises three key interfaces: Web, GIS and mobile devices e.g. iPad's and smart phones, to help us improve our asset management practices. AssetFinda is fully compliant with National Asset Management Standards (NAMS) and national asset accounting standards.

Ōtorohanga District Council has also invested in a dedicated Asset Team to ensure the asset management system and planning around it are fully utilised. The flow chart below shows the process used to check and capture information related to service requests for non-routine maintenance.

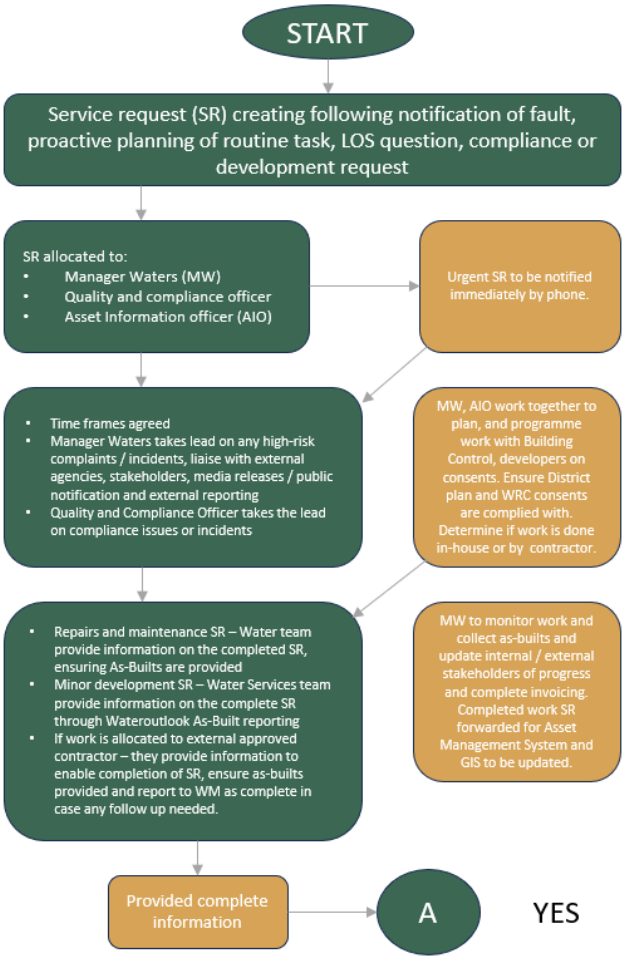


Figure 3.1 - Service Request Processing for Water Services

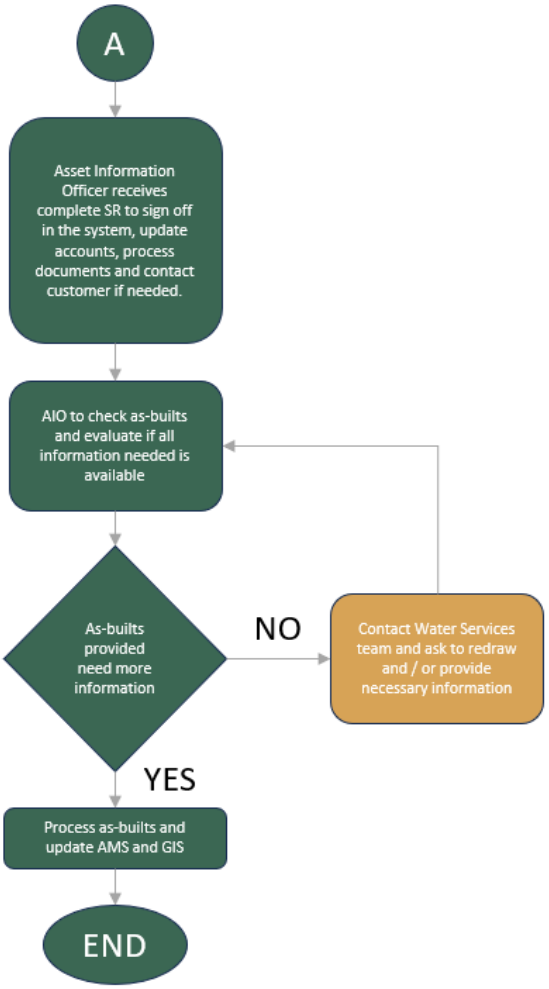


Figure 3.1 – Service Request Processing for Water Services (continued)

3.3 - Definition and Management of Critical Risks

3.3.1 - Critical Risks

Risks that would have a significant impact for the water supply, based on ability to meet published levels of service, and detrimental effect on users include:

Table 3.3.1.: Management of Critical Risks

Event	Controls in place or proposed
Breach of Drinking Water Quality Assurance Rules leading to contamination of either *E. coli* or Protozoa.	Continuous monitoring of water quality through plant, interventions in place for loss of protozoa controls or Chlorine effectiveness. External sampling carried out, results monitored by District Health Board.
Failure of raw water intake or supply line.	Increased water storage to 36 hours and critical infrastructure identified and replaced.
Failure of critical bulk water main from reservoir.	Assess feasibility of installing automated 'high flow' earthquake valves along with flexible connection to reservoir.
Backflow failure into reticulation, or leak on high use property.	Backflow Policy developed and improved carrier filling station
Poor quality raw water leading to inability to produce suitable quantities of compliant treated water.	Ability to run off storage for a period of time while river conditions improve
Loss of treatment plant operation due to natural hazard such as earthquake or significant power outage.	Increase treated water storage, ensure plants have 24 hour automated standby generator capacity especially for microbiological and protozoa risk barriers, that is tested annually.

3.4 - Programme / Project Prioritisation of Renewals

Council's process to programme and prioritise renewals is as set out below:

Figure 3.2 - Process Flow for Programming and Prioritising of Renewals

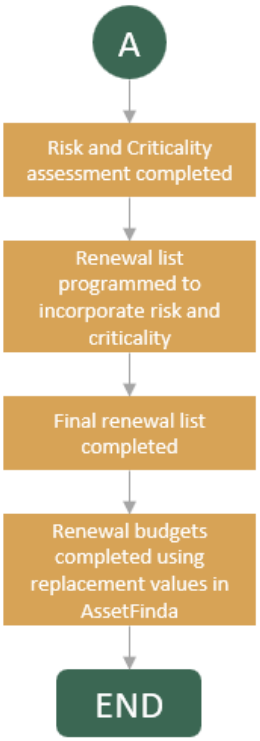


Figure 3.2 - Process Flow for Programming and Prioritising of Renewals (continued)

3.5 - Valuation Practices and Process

Valuations have been completed in accordance with the following standards:

- New Zealand International Accounting Standard No 16 (NZIAS 16).
- New Zealand Infrastructure Valuation and Depreciation Guidelines, issued by the National Asset Management Steering Group (NAMS) of Ingenium.

Process used for the valuations is as follows:

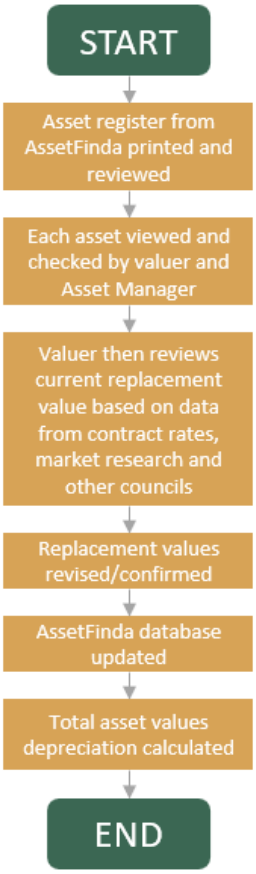


Figure 3.3 - Process Flow for Valuations

All asset records stored in the Univerus Assets database are subjected to a site verification to check that the asset exists and its key attributes are correct.

Regular auditing queries are run to check data in key attribute fields to enhance data integrity, this includes size/dimension, installation date and material type and to check for unit rate and base life consistency across each asset or component type. Unit rates are determined by analysing the previous valuation and applying inflation rates, analysing current contract rates and considering supplier cost increases over the period.

3.6 - Financial Forecasts

Financial forecasts of expenditures and revenues related to water supply activities are developed by Council staff within the NCS MagiQ financial management system.

Inputs to the forecasting process are provided by appropriately skilled Council staff, or where considered necessary, by appropriate external specialists.

The developed forecasts are scrutinised by both senior Council staff, Council's elected members and Council's auditors.

Previous evidence suggests that the forecasting process is robust, and has contributed to Council's water supply services being delivered in a cost-effective manner. See appendix 1 & 2 for OPEX and CAPEX budgets.

3.7 - Performance Measures

Council uses the mandatory performance measures in the Local Government Act to report annually to the community on the performance of water supplies.

Key performance measures can be split into three categories:

- Financial
- Health
- Environmental

Financial measures are initially assessed by the effect that expenditure has on rates and metered water charges to ensure budgeted expenditure is acceptable and then by measuring actual costs against budgeted costs. This is closely monitored internally on a monthly basis and by the Council's elected members on a quarterly basis.

Health impacts are annually audited by an independent external expert. Their 2022-23 report outlined several non-compliances due to technical interpretation of the DWAR's and their relation to the DIA mandatory measures.

Environmental performance is assessed annually by Waikato Regional Council staff, relating to consented abstraction. Increasing levels of usage by the Rural Water Schemes are resulting in 'letters of direction' to ensure daily limits are complied with. Greater compliance would require the Rural Water Committees to ensure they actively monitor their demands and ensure users have adequate storage on-site to avoid 'emergencies' to cater for stock drinking needs.

There are fully functional working relationships between Council staff and all of the above parties.

4.0 - Levels of Service

4.1 - Customer Expectations

Improved storage and reticulation systems and reticulation maintenance, (including regular flushing programmes), has reduced recorded complaints of 'dirty' water that previously occurred on the Kāwhia, Tihiroa and Ōtorohanga schemes. Improved reticulation management issues have solved some of the complaints of poor supply pressure in the RWS schemes, although there is an on-going need for users to ensure they have adequate on-site storage to reflect the 'trickle feed' supply.

Overall, very few complaints are received in respect of water supply or quality, the only significant exception being in the past to the taste and smell of water from the Ōtorohanga supply during very dry periods in summer when the Waipā River falls to low levels. During the last LTP, Council invested and installed an activated carbon plant to resolve the taste and odour issues.

4.2 - Technical Levels of Service

Table 4.1: Water Supply Technical Levels of Service

	Service Characteristic	Performance Indicator	Target Level of Service	Performance results
1	Safety of drinking water	DIA Mandatory measure: The extent to which the local authority's drinking water supply complies with: Part 4 of the drinking- water standards (bacteria compliance criteria); and Part 5 of the drinking- water standards (protozoal compliance criteria).	No public health Incidents related to drinking water quality	2022/23 result - Partially achieved. The year was split into two using both the DWS & DWQAR's. Ōtorohanga and Kāwhia were both partially non-compliant due to technical issues with the sampling schedule.
2	Maintenance of the reticulation network	DIA Mandatory measure: The percentage of real water loss from the local authority's networked reticulation system (including a description of the methodology used to calculate this).	Of the annual volume of water produced through the treatment plants, the volume that remains unaccounted for (whether leaks, unauthorised takes, flushing or firefighting), reduces year to year and <30%	Unaccounted water in Ōtorohanga and Kāwhia is still higher than expected. Water meters, plant upgrades and water main renewals are showing improvements in Kāwhia. Ōtorohanga requires leak detection methods to be implemented to understand the high levels of unaccounted water.

Table 4.1: Water Supply Technical Levels of Service (continued)

	Service Characteristic	Performance Indicator	Target Level of Service	Performance results
3	Fault response times:	DIA Mandatory measure: Where the local authority attends a call-out in response to a fault or unplanned interruption to its networked reticulation system, the following median response times are measured: Time between call and site attendance for urgent and non-urgent call-outs: Time between call and actual resolution of urgent and non-urgent call-outs	Median response time to: Urgent call-outs (<3hr 55mins) Non-urgent call-outs (<26hr 20mins) Median resolution times for: Urgent call-outs (<18 hrs) Non-urgent call-outs (<31 hrs)	2022/23 results Response times: Urgent call-outs (1.05 hrs) Non-urgent call-outs (4.65 hrs) Median resolution times: Urgent call-outs (1.65 hrs) Non-urgent call-outs (4.95 hrs)
4	Customer satisfaction	DIA Mandatory measure: The total number of drinking water complaints per 1000 connections received by the local authority about any of water clarity; water taste; pressure or flow; continuity of supply; and the local authority's response to any of these issues	≤5 complaints	19 complaints for 2022/23 year
5	Demand Management	Average consumption of drinking water per day per resident within the Ōtorohanga District	390L per person per day	Ōtorohanga: 290L person/day Kāwhia: 193L person/day

5.0 - Council Administered Water Supplies – General Information

5.1 - Nature of Activity

Ōtorohanga District Council owns and administers two urban water supply schemes for Ōtorohanga and Kāwhia, and four Rural Water Supply (RWS) schemes (Arohena, Tihiroa, Ranginui and Waipā), mainly for agricultural purposes. Estimated usages of water produced by the various supplies are listed in the table below:

Table 5.1: Estimated Usage of Water (as % volume)

Estimated Usage of Water (as % volume)				
Water Supply	**Domestic**	**Industrial / Commercial**	**Farm Stock**	**Irrigation (sports fields)**
Ōtorohanga Community	70	23	5	2
Kāwhia Community	90	10	nil	nil
Waipā RWS	15	nil	85	nil
Tihiroa RWS	8	nil	92	nil
Arohena RWS (overall)	8	nil	92	nil
Ranginui RWS	nil	nil	100	nil

Issues discussed in this section are generally relevant to all of these supplies, though Ranginui is a non-potable supply, as reflected in the table above.

The urban and rural schemes differ in that the urban schemes are 'on-demand' pressure supplies, capable of providing adequate fire-fighting water flows direct from reticulation, whilst the rural schemes are designed to work on the flow restricted 'trickle feed' principle, whereby smaller continuous flows of water are provided, requiring use of on-site storage to meet instantaneous demand.

5.2 - Rationale for Delivery of Activity

Having established reticulated water services to the urban communities of Ōtorohanga and Kāwhia and to some rural areas, to enable growth and prosperity, the Local Government Act 2002 imposes significant obligations on Council to continue this activity.

Council's water supplies are relevant to the following broad desired community outcomes:

- Liveable
- Resilient
- Connected
- Prosperous
- Sustainable

5.3 - What is the Extent of Council's Responsibility?

With the establishment of Taumata Arowai and the Water Services Act 2021, there is a clear directive that with everything Council does in the water space, we must give effect to Te Mana o te Wai. Te Mana o te Wai is best described as the Korowai that sits above all things water, and Council services will need to have this message as part of our planning going into the future.

Overall, Council is responsible for ensuring a reliable and compliant supply of potable water to the urban communities of Ōtorohanga and Kāwhia, and being clear on the quality of the water to those rural areas where water supply schemes have been established. To do this, Council:

- Undertakes strategic planning, asset management, operations and associated supervision and administrative activity, including charging for water.
- Co-operates with Taumata Arowai as the mandated water regulator to ensure that treated water meets relevant standards.
- Ensures compliance with the operative Regional Plan for consents for this activity issued under the Resource Management Act 1991.

5.4 - Potentially Associated Negative Effects

Potential significant adverse effects of water supply activities are health (if the supply of potable water to the consumers' point of supply does not meet the Drinking Water Quality Assurance Rules), environmental (water abstraction, discharge of backwashed water), and economic (costs imposed annually on ratepayers to provide the required budgets for meeting legislative standards and resilient infrastructure).

To enable Council to give effect to Te Mana o te Wai, we must continuously seek efficiency in the usage of water and unaccounted for water.

As costs to deliver compliant water services increase, (as more obligations and reporting requirements are imposed on Council), some RWS customers may seek to withdraw from the schemes, which may make the existing supply schemes unaffordable in favour of other private supply arrangements. This would be a backward step in providing safe drinking water as some users may return to lesser quality of water as a result. The sustainability of the schemes relies heavily on volume of users.

5.5 - Water Source Chemistry

The water sources providing raw water to Council's supplies are variable, but testing has shown no significant chemical or radiological components that require monitoring or control. The Water Services Act 2021 adds to the level of monitoring, testing and reporting that Council must do, including developing 'source protection plans' to ensure the plants have the technical capacity to successfully 'treat' and supply water in compliance with standards.

5.6 - Asset Information

Information on Council water supply assets is reliant on two main sources - these being a GIS based 'AssetFinda' Asset Management System and a NCS MagiQ electronic document handling system. The quality of spatial information on water pipes is now considered to be good, with more than 95% of pipes accurately recorded.

5.7 - Asset Condition

The earliest reticulated community water supply infrastructure in the Ōtorohanga District was established in Ōtorohanga in the 1930s, but all elements of this first infrastructure have now been replaced.

The majority of current water treatment and supply infrastructure in Council's water schemes was established between 1959 and 1986, with the oldest remaining assets generally being asbestos cement ('AC') water mains in Ōtorohanga.

Most significant water supply assets are generally believed to be in good condition, but during the past two or 3 years a number of AC mains are reaching the end of their useful life and renewals of the older mains is underway with 5.8km of AC pipes renewed in the last 3 years.

5.8 - Rural Water Schemes (RWS) and Conditions of Supply

The rural supplies were established through intensive development in the 1980's by farmers taking advantage of central government subsidies that were available at that time. The areas supplied by the RWS schemes are limited to those properties for which an appropriate capital contribution has been paid, and these areas are formally defined through Gazetting.

Whilst the assets of the RWS schemes are vested in Council, farms connected paid significant capital contributions when the schemes were established. This creates a challenge where some supplied properties believe their contribution should equate to ownership rather than just being involved in the decision making process and making recommendations. Council will continue to involve the RWS committees in the management of the schemes. Discussions during the 3 waters reform process revealed that the committees were more concerned with input into the operations of the schemes rather than the ownership, with the responsibility of suppling water remaining with Council.

Some key terms and conditions of supply that apply to those connected for these schemes include:

- Available flows to all connections to be limited by orifice flow restrictors. Size of the orifice being based upon demand projections for individual properties at the time of scheme commissioning. The restrictions have been relaxed over many years and will need to be reintroduced over the next LTP.
- All private reticulation is to be isolated from public reticulation by an air gap or other approved backflow prevention device.
- All customers required to have on-site water storage capacity adequate for 24 hours' consumption at peak demand rates under restricted flow
- No assurance of continuity of supply is given; if a property requires continuous supply they are responsible for providing the necessary back-up arrangements.
- Customers required to notify Council of any substantial changes in demand for water; large increases in demand, combined with adjustment or removal of restrictors may result in localised water shortages.
- Defined range of measures in response to non-compliance with terms and conditions.

5.9 - Water Services Delivery

Ōtorohanga District Council uses an in-house team of five water services operators rather using contracted external suppliers. Whilst predominantly operators of the treatment plants, this team can deal with minor but urgent matters such as locating tobies, fixing small leaks and responding to service requests. Costs for the in-house service are lower than previously invoiced annually by contractors, and more importantly ratepayers value the 'ownership of the network' these staff provide.

In addition, there is greater supervision and management control over the daily tasks, responses to emergencies, flexibility and a decrease in administration in the absence of contract preparation and management. The latter allows engineering staff to apply time to the growing demands of the Drinking Water Quality Assurance Rules and the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.

More and more the water services team are spending more time with plant operation than reticulation and this has led to a considerable amount of work being contracted out to local firms, such as the larger or more

complex repairs, development and renewals. Traffic Management requirements has made repairing small leaks within the roads far more complex, more expensive and time consuming for the water services team to deal with within the normal daily tasks.

5.10 - Demand Trends

The 5% increase in housing numbers in Ōtorohanga recorded between 2013 and 2018 does not coincide with an increase in water consumption, mainly due to the installation of water meters and imposing volumetric charging in the same period. Over the next 10 years once Westridge subdivision is fully built up we could see an increase in demand of up to 150m^3 per day, the supplies are considered to have sufficient capacity to meet demand for the next 10 years.

5.11 - Drinking Water Quality Assurance Rules (DWQAR) Compliance

The externally provided 2022-23 DWQAR Compliance Report notes:

An official assessment of the performance of Ōtorohanga District Council as a 'water supplier', against the Drinking Water Quality Assurance Rules, and the Water Services Act 2021 has been completed for the period 1 July 2022 – 30 June 2023. This was a complicated reporting period due to the change from the Drinking Water Standards to the Drinking Water Quality Assurance Rules did not change until 15 November. This meant that there was the need to report against both sets of rules when the DIA mandatory measures reflect the DWSNZ.

5.11.1 - Drinking Water Standards NZ

Overall, the Council's performance over the compliance period is slightly worse than previous years in accordance to the DWSNZ, with the exception of the Ōtorohanga Water Treatment Plant, which through the hard work of council staff was able to achieve full compliance for six months of the compliance year. Unfortunately, Kāwhia, Tihiroa and Arohena Treatment Plants, could not achieve bacterial compliance with Criterion 2B, DWSNZ. This was due to turbidity events throughout the compliance year. Protozoa compliance also was not able to be demonstrated for these two treatment plants.

All distribution zones achieved full compliance in accordance with section 4.3.1: criterion 6A apart from Ōtorohanga zone due to sampling intervals.

The full compliance report is attached as Appendix 3

5.11.2 - Drinking Water Quality Assurance Rules

Overall, the assessment of compliance against the Drinking Water Quality Assurance Rules 2022 has concluded that none of the six water supplies were fully compliant for all of the months from 14 November 2023 to June 2023. The Ōtorohanga Water Supply achieved full compliance at the Treatment Plant, though the two Distribution Zones of Ōtorohanga and Waipā were unable to meet the sampling requirements. This was due to not achieving the required number of free available samples per week. The correct sampling duration and number of samples per week was the cause of much of the non-compliance seen in both the Treatment Plants and Distribution Zones. These are considered technical non-compliances, rather than being due to improper overall water quality.

Council has undertaken some significant work in the past few years to provide potable water to the residents of the district. The treatment in place is more than capable of producing high quality treated water, (apart from the Arohena treatment plants), and once the minor technical issues have been resolved, then Ōtorohanga, Kāwhia and Tihiroa water supplies can be fully compliant.

The situation regarding the rural water supplies is very different, as the treatment systems are effectively unable to meet compliance with the DWQAR's, particularly in respect of protozoa. As of February 2021 following a positive *E. coli* result in Arohena, the Arohena Rural Water Scheme are now under a permanent Boil Water Notice.

The full compliance report is attached as Appendix 4

For each of the schemes the options available to meet the Drinking Water Quality Assurance Rules are:

- Significantly upgrading existing treatment plant(s), or constructing entirely new treatment plant(s) recognising the equipment and staffing resource to reliably achieve DWQAR compliance would require central government funding to be achievable; or
- Restricting the use of the existing RWS supply(s) to the provision of non-potable water for agricultural purposes only.
- Cease operation of the supply entirely.

Pragmatically, Options 1 and 2 were most likely under the proposed reform of Drinking Water supplies in NZ, following the new government's 100 day plan to repeal the Three Waters Reform the RWS committees will need to revisit this.

In terms of decisions in the LTP, each RWS committee will be consulted on the plans going forward which may require significant investment over the next 3 years. The overall responsibility sits with Council as the network supplier.

Achieving compliance with the DWQAR's will undoubtedly place increased financial burdens on all Rural Council administered water schemes, and unless Council moves to district wide scheme funding, the impact will be greatest on the smaller rural schemes, regardless that they consume water primarily for farm stock. It is also unfortunate that for the rural treatment plants, achieving compliance with the DWQAR's will not eliminate all of the most significant health related risks associated with these supplies, since the issues of potential on-site contamination will not be addressed. The diagram below highlights the various ways houses in these rural water supply areas obtain their water:

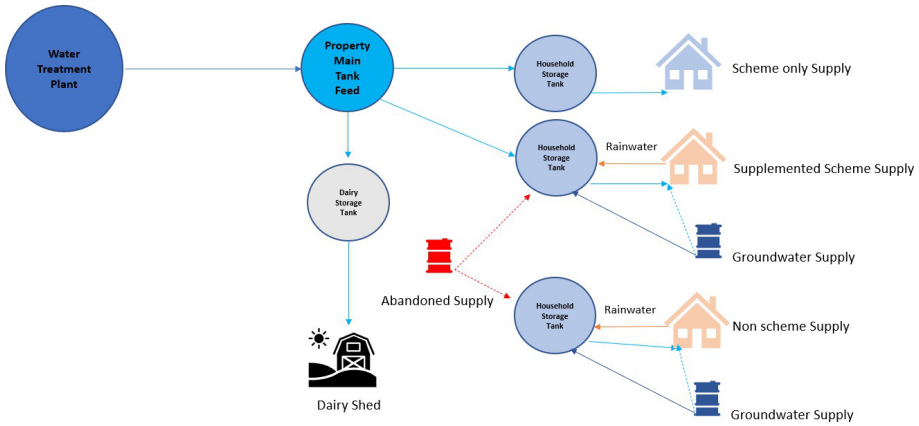


Figure 5.1: Various Ways Houses in these Rural Water Supply Areas Obtain their Water

It has been Council's experience that significant health related issues are more likely to arise within private reticulation on farms than in the 'public' water treatment and reticulation components that will be affected by imposition of the DWQAR's. Observed on-site contamination issues have included introduction of chemical stock dosing into household water supplies, insecure storage tanks (occasionally containing dead animals or birds), and cross-connection of cattle troughs to household supplies.

5.12 - Maintenance and Renewal Strategies

Council's strategy towards water supply asset maintenance and renewal can be summarised as follows:

Water treatment plant and pump station assets: These assets have been proactively upgraded to meet the Drinking Water Quality Assurance Rules through continued locally funded investment. All assets receive routine planned maintenance, and except for critical water safety assessment tools such as Chlorine Analysers or UV bulbs that are replaced as per manufacturers recommendations, components are replaced typically based upon evidence of impending failure, or other observed performance deficiencies.

The annual Drinking Water Compliance report notes enhancements to Protozoa compliance are required for Ōtorohanga Rural Water Schemes, which aligns with projects proposed in the draft LTP.

Water reticulation assets: Water mains and associated valves and hydrants receive programmed maintenance such as periodic flushing (pipes) and open-close operation (valves). Renewals of these items are based upon observed performance deficiencies (i.e. pattern of mains or lateral failures, valve leaks), or other evidence of advanced deterioration. An example of this latter criteria has been Council's on- going programme to replace all existing known old (circa 1930) concrete water mains in the Ōtorohanga community, which is now completed.

Since 2014, the water services team have used an Asset Information Officer (previously Technical Services Officer), whose principal role is to make use of asset management software to manage asset management and replacement in a more effective manner. This improvement has been driven by a desire to meet level of service requirements and more effectively manage operating and maintenance costs.

Increasing the use of this formal asset management system to reduce the risk associated with relying heavily upon the knowledge and experience of relevant staff and contractors to identify maintenance and renewal requirements is of strategic importance.

Verifying, correcting, and improving the data contained in the AssetFinda system has enabled staff to align renewal budgets with long-run averages in a scientific manner thus improving budgeting accuracy and confidence levels.

5.13 - Health Risk Assessments

Taumata Arowai requires a more proactive approach that requires significant water supplies to be fully characterised, risks identified, and a comprehensive strategy for managing those risks presented via Water Safety Plans (WSPs).

Council currently has two comprehensive WSPs, for the Ōtorohanga and Kāwhia supplies and are integral to this AMP. These are under review and updated by an external expert to ensure they are still relevant and fit for purpose.

For the rural water supplies, significant health risks have been previously identified, and many of these have been progressively resolved through improvements to infrastructure and operating practices. These include the introduction of chlorine disinfection to the Taupaki supply of the Arohena RWS, and the conversion of the Ranginui RWS to a non-potable supply. These rural schemes have smaller, less comprehensive WSPs. These will need to be updated to meet requirements of DWQAR's in the first year of this LTP.

Despite these improvements, none of Council's rural water supplies have the barriers against protozoa that are required by the DWQAR's, and it has been assessed as being impractical to modify the existing water treatment plants to provide protozoa barriers to the required standard without external funding support. As a result of these lack of barriers, the Waikato DHB imposed a permanent boil water notice on the Arohena Rural Water Schemes from February 2021.

5.14 - Adopted Processes and Standards for Work on Water Assets

The following general policies, processes and standards are routinely adopted to minimise health risks in relation to Council administered water supplies:

- Regional Infrastructure Technical Specification (RITS)

  Council requires developers to apply the Regional Infrastructure Technical Specification (RITS) developed jointly by councils in the Waikato region. This works well for greenfields development, and recognising that some development is of in-fill or intensification type, we also adopt the following processes:

- Authorisation to Work on Council Mains

  Work on Council water mains may only be conducted by contractors who have been approved by Council following agreement on Health and Safety processes along with having the equipment and competency to ensure the work is in accordance with standards specified by Council.

- Shut Down Procedures

  Any work or situation that very significantly interrupts Council's water services is managed in accordance with Council's water shut-down procedures. These specify requirements in respect of planning, application, approval, public notification, and management of the shutdown event. Any major shutdowns must be authorised by the Council's Chief Executive Officer. The Council holds a confidential list of properties requiring specific water needs, for example constant supply for kidney dialysis equipment.

- Testing and Disinfection – New Mains

  Inspection and testing of new water mains or completed major repairs to existing mains is undertaken by experienced Council services staff. Water mains are not connected or put into service until all tests and approvals are given by Council and supervised flushing of the service is undertaken.

- Backflow Prevention

  Council is updating its Water Bylaw to ensure the requirements on Backflow Devices will align with the Building Act 2004, Water Services Act 2021, and any future changes to legislation. Currently new or modified water connections requiring backflow prevention are addressed at the time of application/installation or through the Building Consent process.

  All rural water supply connections are required to have an air gap separation into a tank or another approved form of backflow prevention device, usually simple non return valves. These are inspected for compliance.

- Health and Safety, Signage and Security

  As required by the Health and Safety at Work Act 2015 and Council's Health and Safety Policy, health and safety inspections are integral to day to day operations. Staff receive training and support to enable identification and timely resolution of significant issues. Council has a Health, Safety and Wellbeing Advisor who works with Water Services staff to identify and manage risks.

  Plants and premises have a security lock system along with clearly visible warning signage. Only approved persons are permitted into treatment areas and must follow clear and well-documented procedures. Where possible valves and other accessible controls are installed in a manner that restricts potential for malicious tampering.

- Water Take Agreements

  A limited number of contractors currently have approval to take 'bulk' quantities of water from Council mains on a commercial basis. All applications for Permits to Take Water from Fire Hydrants are received and approved by the Assets Team. Such approval is reviewed annually and is governed by a strict set of conditions intended to reduce potential for associated hazards such as backflow or

other contamination of the potable supply, as demand increases a designated fill point will be required.

- Infectious Diseases

  Council requires that persons working with sewerage are tested and inoculated for Hepatitis and other infectious diseases and that any contractor or staff member infected with such disease is excluded from contact with water services.

- Cross Contamination – Water and Wastewater

  Council requires all contractors working on water and wastewater services to follow the Hygiene Code of Practise to ensure contamination is not carried from sewage to the water system. This includes appropriate delays between working on the two services and use of separate sets of water and wastewater tools.

5.15 - Water Fluoridation

Fluoride is not currently added to any of the Council administered water supplies. Addition of fluoride is not simple and may be expensive but appears to have significant benefits in respect of dental health, but is also the subject of strong public contention, on the basis of other perceived possible adverse physical effects.

In November 2022 the Ministry of Health wrote to 27 Local Authorities outlining they were actively considering a potential directive to fluoridate, under section 116E of the Health Act 1956, Ōtorohanga District Council was one of those being considered. As at September 2023 this still remains under active consideration due to further considering the impact of several wider factors including Three Waters Reform and capacity across the sector.

Council has received a few requests from individual residents for fluoridation of water, but it is also known that there would be widespread opposition to such measures, and that surveys undertaken by other local authorities have shown a strong majority against the addition of fluoride. As such, Council does not at this time intend to pursue the issue further, unless directed to do so by central government.

Currently there is no consideration in the future plans to fluoridate the Council water supplies.

5.16 - Raw Water Allocation

All of Council's water supplies are required to hold Resource Consents from the Waikato Regional Council (WRC) in respect of taking water from surface sources. Increasing development throughout the region has resulted in more demand to access raw water, and in response to this Waikato Regional Council has put in place a 'water allocation' framework that will ensure that available water resources are fairly and effectively allocated to the various parties requiring water.

The allocation model adopted by WRC considers that the quantity of water currently taken, (or proposed to be taken in the near future), from the upper Waipā River or its tributaries by existing users during the period between October and April is at the limit of what is sustainable without significant adverse environmental effects. As such it is not currently possible to obtain resource consents to take additional water from these sources during these months.

Whilst the quantities of water that Council is consented to take from the Waipā River for the Ōtorohanga and Tihiroa water supplies are sufficient for current and probable near-future needs, it is of concern that if there was substantial increased demand for water from either of these sources, the inability to take more water from the river during the October to April period would pose a significant constraint on the ability to meet this demand.

Government funding received in 2021 allowed Council to explore alternative water supplies for Ōtorohanga. The first was drilling for an underground source, this was not successful and abandoned at 200m. The second was to construct 380,000 m^3 earth dam on Te Raumauku Road on Council owned farmland. A feasibility study was carried out and it is feasible but determined to be unaffordable currently with early

estimates between $5 - 8 million to construct. Although unaffordable it is still considered a viable option of additional water storage for Ōtorohanga in the long term.

Council has since built an additional 500m^3 reservoir on Mountain View Road and 2 additional 400m^3 reservoirs on the Waipā RWS to increase resilience in weather events.

5.17 - Unaccounted for Water

It is considered inevitable that some water will be unaccounted for from reticulated water supplies, either through leakage from mains or private lateral pipelines, unknown connections, meter faults or premature failure of connections such as tapping bands.

The magnitude is dependent on the extent and condition of public and private reticulation, the average working pressures in the reticulation, the standard of reticulation maintenance (potentially including leak detection surveys), and public attitudes towards water conservation, for example willingness to fix leaky taps etc. These losses or wastages in total typically account for between ten and forty percent of water produced by a treatment plant. It is generally accepted that leakage proportions below 10% are extremely difficult to achieve in anything but very small or very new public reticulation systems, urban community water losses are deemed acceptable between 15-20%.

For 2022/23 possible unaccounted for water has been assessed at 42% in Ōtorohanga, and 35% for Kāwhia. These estimates are based on a combination of comparing the water volume supplied by the water plant versus the total volume recorded by all of the water meters at the receiving properties, and measuring minimum night flows. Due to the large water loss increase for the Ōtorohanga community from 2021/22's 32% water loss, leak detection is a key project to ensure that in this 2024/34 LTP cycle the Ōtorohanga community achieves the levels of service for unaccounted for water.

Council's rural water supplies are more difficult to assess as meters tend to under-read in the very low flows at points of supply in 'trickle feed' connections. Current estimates are between 20% and 30% of the water produced by a given treatment plant is unaccounted for. These levels of losses are fairly typical of those found for 'trickle feed' supplies.

5.18 - Water Metering & Other Demand Control Measures

Council's rural water supplies have a significant element of demand control, with allocated quota of water delivered to particular properties on a metered trickle feed basis, with charges for water based wholly or in part on metered consumption, which is assessed at six-monthly intervals.

Escalating demand for water and other development issues on the rural supplies has however resulted in some circumvention of these controls, the most notable of which has been exceeding quotas and widespread removal of flow restrictors.

There has at times been elevated localised demand for water within some of the RWS schemes that has made effective supply management challenging, but it has generally been possible to resolve these issues informally without the need for stronger actions such as forcefully imposing the designed supply quotas and re-installation of flow restrictors as they were originally specified.

Installation of water meters in Ōtorohanga has been completed and volumetric charging is in place.

Demand issues in the Kāwhia community are very different, and centre on managing the peak demand over a brief period around Christmas and the New Year, when the population of the town increases dramatically. Kāwhia water meters installation were completed in 2022 but there is no volumetric charging for domestic use.

5.19 - Water Take Reporting

Since 2010 Council has been required to provide enhanced reporting of the quantities of raw water taken by its water supplies. The requirements are in essence to keep auditable daily records of the cubic metres taken using an accurate water measuring device or system that provides, or provides for, electronic storage of the data.

The measurement devices require calibration every five years. Council supplies are now fully compliant with these requirements.

5.20 - Significant Programmed Works

Below is a table identifying the significant CAPEX spend for all Water Supply Schemes for Ōtorohanga District Council planned for the 2024-34 LTP.

Project	Primary Driver	Year/s	Cost $M	Financial Data Confidence	Description and objectives of the project	Benefits/ Justification of the project	Project Stage
Renewals	End of service life/condition	2-10	$0.25 each year for years 2-10.	Staff cost estimate	Pipe renewals for all water schemes	Effective Infrastructure and service delivery	Execution
Renewals	End of service life/condition	1-10	$0.2	Staff cost estimate	Plant renewals for all RWS	Effective Infrastructure and service delivery	Execution
Renewals	End of service life/condition	1-10	$0.18	Staff cost estimate	Point renewals for all water schemes	Effective Infrastructure and service delivery	Execution
Water meter renewals	End of service life/condition	1-10	$0.3	Staff cost estimate	Renewals of water meters for all water schemes	Effective Infrastructure and service delivery	Execution
Water Main renewal	End of service life/condition	1	$0.5	Engineer estimate	Main replacements on Main North Road & Turongo St	Effective Infrastructure and service delivery	Execution
Development Sundry	Growth	1-10	$0.5	Estimate	Enable growth projects	Improvements that trigger through development	Execution
Leak Detection	Increasing water loss	1	$0.160	Consultant price	Identify issue areas for targeted renewals – Ōtorohanga scheme	Community wellbeing, complying with resource consent conditions	Execution
Tihiroa Resource Consent renewal	Resource Consent compliance	1	$0.15	Staff cost estimate	Application for resource consent expires 07/2026	Community health and wellbeing, ensuring as a water supplier we are	Initiation & Execution

						supplying safe drinking water	
Tihiroa smart meter project	Increasing water loss	1	$0.07	Staff cost estimate	Renewing water meters on Tihiroa RWS with smart meters	Community wellbeing, complying with resource consent conditions	Execution
Tihiroa high lift pumps	End of service life/condition	1	$0.06	Staff cost estimate	Renewal of Tihiroa Treatment plant high lift pumps	Effective Infrastructure and service delivery	Execution
Cannon Road Water main renewal	End of service life/condition	1	$0.1	Staff cost estimate	Pipe renewal – Tihiroa Rural Scheme	Effective Infrastructure and service delivery	Execution
Ōtorohanga Resource Consent Renewals	Resource Consent Compliance	3	$0.15	Staff cost estimate	Application for resource consent expires 10/2028	Community health and wellbeing, ensuring as a water supplier we are supplying safe drinking water	Initiation & Execution
MEICA renewals Network & Plant	End of service life/condition	1-10	$0.21	Staff cost estimate	Mechanical, Electrical, Instrumentation, Controls & Automation renewals for all water schemes	Effective Infrastructure and service delivery	Initiation & Execution
Ōtorohanga Water Treatment Plant – Clarifier Upgrades	LOS	4	$0.30	Staff cost estimate	Water Treatment plant Clarifier Brentwood Tubes upgrade.	Community health and wellbeing, ensuring as a water supplier we are supplying safe drinking water	Planning
Ōtorohanga Water Treatment Plant – staff facilities upgrade	End of service life/condition	1	$0.09	Staff cost estimate	Upgrade of the office facilities at the Ōtorohanga treatment plant	Improvements	Execution
Designated carrier fill station	LOS	2	$.05	Staff cost estimate	Upgrade of current water take hydrant to include backflow and monitoring	Community health and wellbeing, ensuring as a water supplier we are supplying safe drinking water	Execution
Ōtorohanga Treatment Plan – Filter media renewal	LOS	5 & 10	$0.2	Staff cost estimate	Replacement of Sand filter media in Y5 & filter roses in Y10	Effective Infrastructure and service delivery	Execution

Ōtorohanga & Kāwhia Treatment Plant Pump renewals	End of service life/condition	1-10	$0.175	Staff cost estimate	Renewal of pumps at Water Treatment Plants	Effective Infrastructure and service delivery	Execution
Sundry Renewals	End of service life/condition	1-10	$1.55	Staff cost estimate	General budget for renewal for all water schemes	Effective Infrastructure and service delivery	Execution
Sludge Pond Backwash discharge	LOS	2	$0.05	Staff cost estimate	Disposing of Backwash pond sludge	Community health and wellbeing, ensuring as a water supplier we are supplying safe drinking water	Execution
Treatment Plant H&S Improvements	End of service life/condition	1-10	$0.05	Staff cost estimate	General H&S improvements for Kawhia and Otorohanga Plants	Improvements	Execution
Building Improvements	End of service life/condition	1-10	$0.03	Staff cost estimate	General Building improvements for Kawhia and Otorohanga Plants	Improvements	Execution
Turbidity meter renewals	End of service life/condition	6	$0.04	Staff cost estimate	Renewal of turbidity meters	Effective Infrastructure and service delivery	Execution

6.0 - Ōtorohanga Community Water Supply Scheme (including Waipā RWS)

6.1 - Description

The treatment plant that serves the Ōtorohanga community also supplies water to the Waipā RWS scheme area, the plant schematic is shown on the next page.

Table 6.1: Technical Description of Ōtorohanga/Waipā Water Scheme

Date Commissioned	1930's onwards; current treatment plant and much of reticulation from 1959 onwards.
Water Source	Waipā River above Ōtorohanga
Properties Connected	Circa 1,500 - Ōtorohanga 128 Waipā RWS
Significant Connected Properties	4 schools, 2 marae, rest home
Metered Connections	Ōtorohanga 1,612, 134 meters of the Waipā RWS as of January 2024.
Population Served	3,030 Ōtorohanga 175 Waipā RWS (estimated)
Water Take Quantity	Maximum circa 4300 m^3/day Average daily water take 2200 m^3/day Maximum Consented 5000 m^3/day (approximately 3% of Q5 flow)
Treatment Process Summary	River source, Activated Carbon Treatment, clarification, rapid sand filtration, pH correction, chlorine disinfection. Continuous monitoring of FAC and clear water turbidity automation of chemical disinfectant dosing, telemetric monitoring of operational parameters.
Treatment Plant Design Capacity	4,000 m^3/day
Supply Type	On-demand pressure supply in Ōtorohanga Community, Trickle Feed supply with on-site storage (Waipā RWS).
Pressure Systems	Generally pumped to storage, gravity feed to properties, but also two pumped supply zones in Ōtorohanga, one in Waipā RWS.
Storage Capacity (shared)	3,900 m^3, (3,100 m^3 in Ōtorohanga)
Worst Case Reticulation Failure	Major Failure of 200mm main on Thomson Avenue. Would drain reservoirs in approximately 3.5 hours if not isolated.
Extent of Reticulation	106.7km (57.1km Ōtorohanga, 49.6 Km Waipā RWS) pipes, 15 to 315mm diameter
Relevant Resource Consents	For water take (RC130076.01 expiry October 2028), discharge of process water (RC130076.02 expiry October 2028), disposal of sludge (RC10872 – currently being renewed), Land use bed structure (RC130076.03 expiry October 2028)

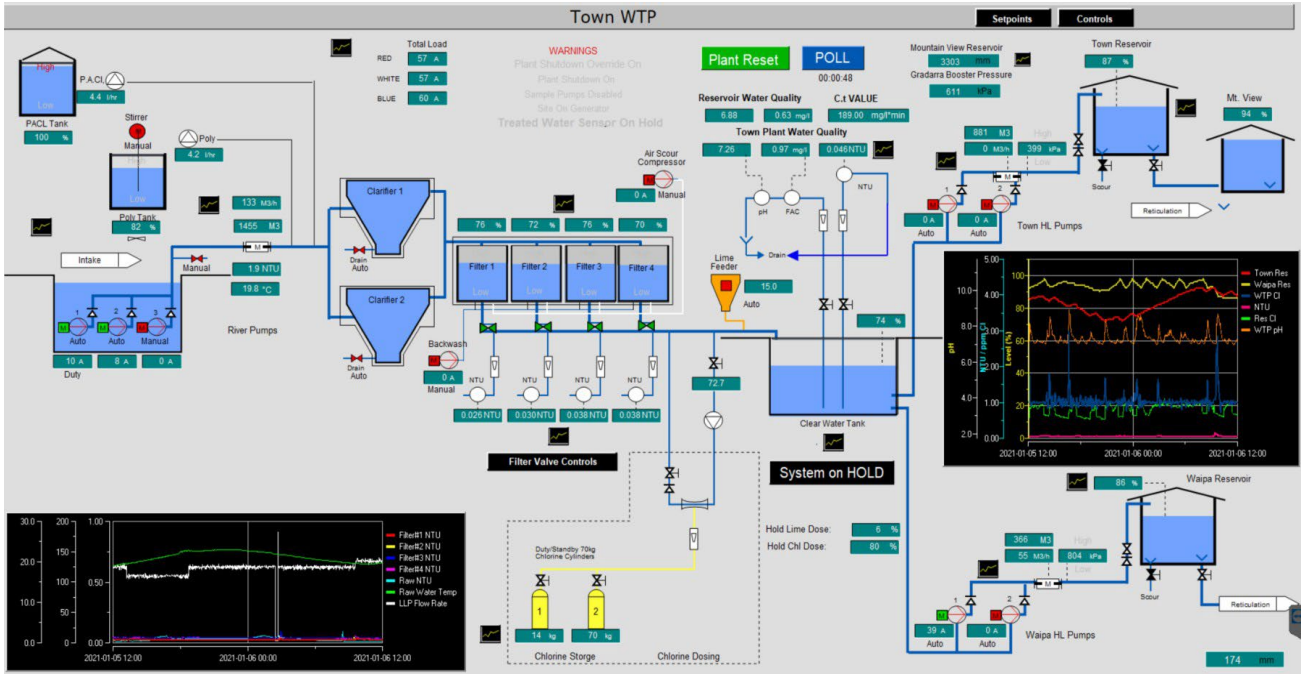

Town WTP
Setpoints
Controls
Plant Reset
POLL
00:00:48
WARNINGS
Plant Shutdown Override On
Plant Shutdown On
Sample Pumps Disabled
Site On Generator
Treated Water Sensor On Hold
Total Load
RED 57 A
WHITE 57 A
BLUE 60 A
PACL Tank
Stirrer
Manual
Poly
Poly Tank
Intake
River Pumps
Clarifier 1
Clarifier 2
Filter 1
Filter 2
Filter 3
Filter 4
Backwash
Air Scour Compressor
Reservoir Water Quality
C.t VALUE
Town Plant Water Quality
Lime Feeder
Clear Water Tank
Filter Valve Controls
System on HOLD
Hold Lime Dose:
Hold Chl Dose:
Duty/Standby 70kg Chlorine Cylinders
Chlorine Storge
Chlorine Dosing
Mountain View Reservoir
Gradarra Booster Pressure
Town Reservoir
Mt. View
Town HL Pumps
Reticulation
Waipa Reservoir
Waipa HL Pumps
Town Res
Wapa Res
WTP Cl
NTU
Res Cl
WTP pH
Filter#1 NTU
Filter#2 NTU
Filter#3 NTU
Filter#4 NTU
Raw NTU
Raw Water Temp
LLP Flow Rate

Figure 6.1: Ōtorohanga Water Treatment

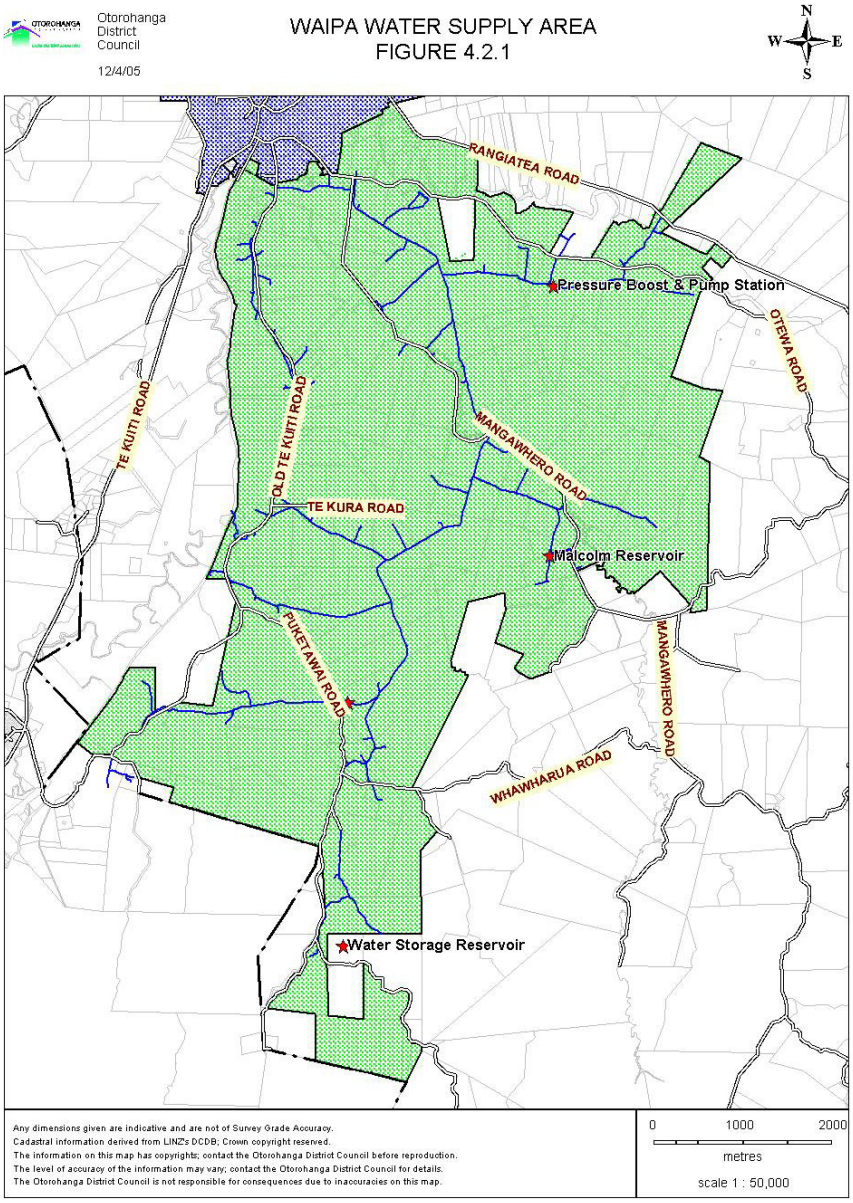


Figure 6.2: Waipā Water Supply Area

6.2 - Condition

While the water treatment plant is almost 60 years old, it was substantially constructed, has been well maintained, and has in more recent years received significant data and control technology upgrading the basic structure and configuration remains the same. As such it is in a sound condition, though some concrete components are beginning to display signs of deterioration.

As stated previously, all of the town's earliest water infrastructure dating back to the 1930s has now been replaced and the majority of remaining reticulation was installed between the late 1950's and early 1970s. Some of this reticulation, in particular asbestos cement pipes, are now approaching the end of their expected lives and hence some extensive renewal requirements are ahead, as indicated in the projection below for the next 30 years:

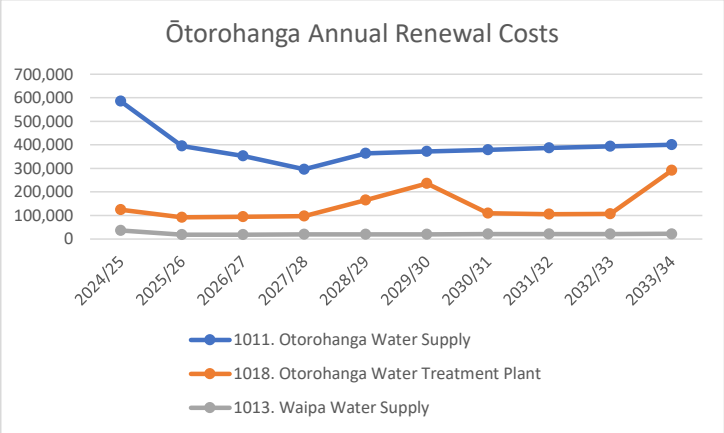


Figure 6.3 – Ōtorohanga Water Annual Renewal Cost Trend

The Waipā RWS comprises only reticulation and storage facilities, as shown on the map on the previous page. These were constructed in 1989 and are therefore relatively new and generally in excellent condition, with a remaining life of at least 50 years expected for the pipes. As part of the 2021-31 LTP two new 400m^3 reservoirs have been constructed to increase storage capacity within the scheme and bulk water meters were placed around the network for monitoring demand. No more substantial renewals are expected within the next 30 years.

Commented [ML3]: Will the graph get updated now brendan has data

Commented [EG4R3]: Yes, I will wait till he has done his budget thing. Can this wait to deliver to others to read?

Commented [EG5R3]: Done

Commented [EG6]: update

Commented [EG7R6]: Done

6.3 - Performance

The Ōtorohanga Water Safety Plan (WSP) was submitted to the Taumata Arowai water supplier portal, Hinekorakau, in draft format when the regulator was established. This WSP is currently under review and this section will outline findings and recommendations when completed and adopted by council.

An assessment against this WSP will be done to ensure that it is meeting the Drinking Water Quality Assurance Rules set out by Taumata Arowai.

There are occasions where peak demand for water can exceed the treatment capacity of the plant, usually during prolonged periods of hot dry weather and high source water temperatures Such supply shortfalls are generally short-lived and can be supplied by drawing water from reservoir storage.

The reticulation systems in both Ōtorohanga and Waipā RWS are considered to be adequate, with few instances of inadequate water supply quantities or pressures.

Although water restrictions have been common during the summer in Kāwhia, they are very rare amongst all the other schemes.

6.4 - Risk Assessment

The potential health risks associated with the Ōtorohanga / Waipā water supply, and the approaches taken to managing those risks, are described in detail in the Ōtorohanga Water Safety Plan Document, which is separate to this AMP.

6.5 - Future Demand

Demand for water from the Ōtorohanga water treatment plant, (which includes water supplied to the Waipā RWS scheme), over the 2001-2020 period is shown below. For the Ōtorohanga township, the population increased over 500 people in three years to 3,027 in 2018. The current forecast is 3,240 for 2020, which is about a 7% increase in two years. The graphs below of mean Treatment Plant outflow in the period 2001 to 2019, show whilst the population increased, the introduction first of water meters, then volumetric charges from 2018, the township uses 25% less water now than in 2001. With 1,340 metered water connections in Ōtorohanga, similar levels of growth in the next 10 years could be catered for, with only minor improvements to water treatment processes such as additional coagulation and sand filter capacity.

During the summer months the demand from the Waipā RWS can account for up to 35% of the water produced by the town plant.

Overall demand is still within the treatment plant capacity, but improvements will be needed into the future to improve capacity of the plant, modifications to the clarifiers is signalled in year 4 to increase flow through the plant and help treat warmer water from the river.

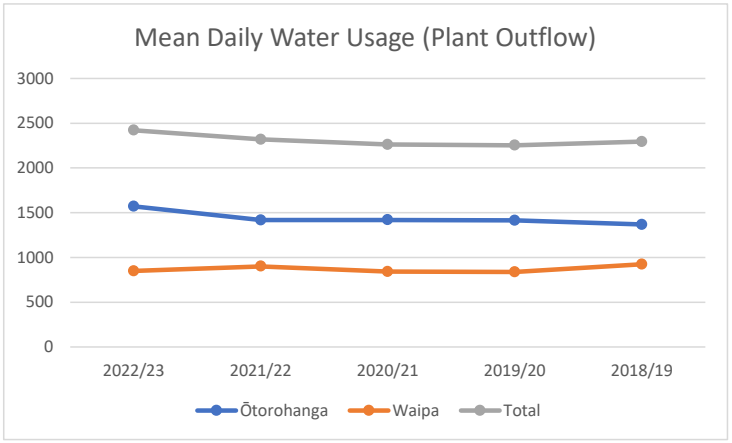


Figure 6.4 – Mean Daily Water Usage (Plant Outflow)

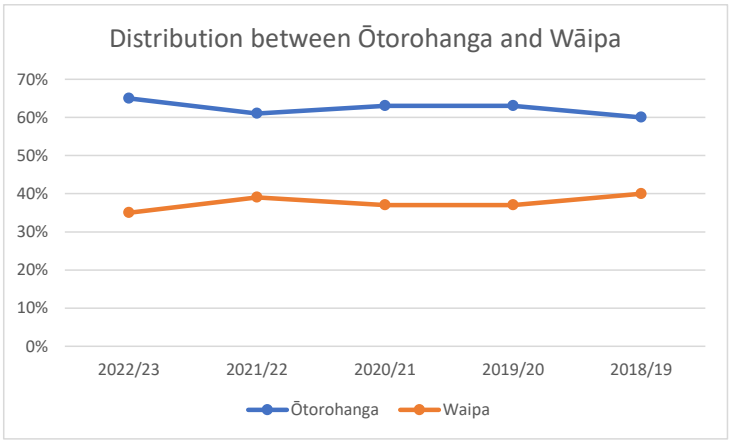


Figure 6.5 – Distribution between Ōtorohanga and Waipā

This water saving can then be allocated to new residential development or business ventures requiring water. Unless a substantial new water consuming business comes to the community, it seems unlikely that overall demand for water in Ōtorohanga will exceed current levels in the near future.

For the Waipā RWS area, limitations in respect of reticulation restrict potential for significant growth, compared to higher consumption by existing users. The intensification of farming activities in the Waipā RWS area is believed to be the driver for the red trend line in the graph above. This slow increase in consumption can be accommodated due to the 'trickle feed' nature of the scheme, but remains reliant on users ensuring they have at least 24 hours' storage on site. However, land use changes in the next District Plan review may trigger an increase in lifestyle property subdivisions close to town, within the Waipā RWS area that may result in an increase in request for connections.

After due consideration and discussion with the Waipā Rural Water Scheme committee, $750 000 was allocated to the construction of two additional reservoirs, nominally 400m^3 each, in order to double the scheme's water storage. The motivation for this was improving the resilience of the scheme and reducing

the risk of water being unavailable to replenish the farmers 24hour storage tanks, this was completed in year 3 of the 2021-31 LTP

6.6 - Ability to Accommodate Demand Changes

The capacity of the treatment plant is currently sufficient to meet demand from the Ōtorohanga and Waipā RWS areas under any normal circumstances. At Mean Day, Maximum Month (MDMM) consumption levels at the maximum water treatment capacity is however more than 90% utilised, and the plant capacity may be exceeded during prolonged periods of dry hot weather when extensive use is made of water for gardening and leisure purposes.

Increased storage across Ōtorohanga and Waipā RWS has reduced this risk and Council can now feed the Thomson Ave reservoirs from the Mountain View reservoirs under controlled situations and has been done successfully on one occasion.

Replacement of the rising main from the plant to the reservoirs in 2022 has also improved resilience in the network. Replacement of the main trunk line into town in the future will improve resilience further. There are no indications at this time that this line needs replacing before its useful life.

The capacity of existing distribution reticulation in both the Ōtorohanga community and the Waipā RWS is currently considered to be adequate to meet likely demands within at least the next 10 years. If further significant residential development occurs in Ōtorohanga it is currently considered likely to occur in the vicinity of the main storage reservoirs at Thomson Ave, and such additional demand could be easily supplied and may in fact benefit the operation of the existing pumped pressure zone that serves part of this area. Depending on the location of the future development, an additional reservoir would be considered as part of any design.

The introduction of a water allocation framework by Waikato Regional Council that limits the amount of water that can be taken from the Waipā River has also caused a need for consideration to be given to what priorities should exist in respect of water supply to new developments in either the Ōtorohanga community or the Waipā RWS area, and an agreement has been reached between the two parties that places decisions regarding this in the hands of the Ōtorohanga Community Board.

6.7 - Alternative Supply Options

No consideration is being given at this point to replacing the Waipā River as the primary water source for the Ōtorohanga/Waipā RWS supply. Whilst it is sometimes subject to significant turbidity variations, these can be managed (including by temporarily shutting down the plant at times of extreme discoloration) and the river is otherwise a reliable source with adequate capacity.

Another possible alternative source for an augmenting source of water is from groundwater bores, but previous investigation has shown this is unlikely. As stated above the large storage dam on Te Raumauku Road is feasible but unaffordable at this time.

7.0 - Kāwhia Rural Water Supply Scheme

7.1 - Description

The treatment plant that serves the Kāwhia community and the scheme detail and plant schematic is shown below.

Figure 7.1 – Kāwhia Community Water Supply

Table 7.1: Technical Description of Kāwhia Rural Water Scheme

Date Commissioned	1970's onwards; current treatment plant and much of reticulation from 1970 onwards
Water Source	Kāwhia springs
Properties Connected	Circa 417 - Kāwhia
Significant Connected Properties	1 school, 1 marae.
Metered Connections	Kāwhia has 397 as of January 2024
Population Served	400 year-round and summer holiday 3000
Water Take Quantity	Maximum circa - 400m^3/day (2019/20) Average daily water take - 330m^3/day (2019/20) Maximum Consented - 600m^3/day effective from 20 December to 10 January & 450m^3/day for the balance of the calendar year
Treatment Process Summary	Spring source, clarification, rapid sand filtration, chlorine disinfection. Continuous monitoring of FAC and clear water turbidity automation of chemical disinfectant dosing, telemetric monitoring of operational parameters.
Treatment Plant Design Capacity	500m^3/day, the limiting factor here is the source which is spring feed.
Supply Type	Spring feed
Pressure Systems	Generally pumped to storage, gravity feed to properties.
Storage Capacity (shared)	Circa 1,180m^3, (comprising of 2 x 400m^3 and 1 x 380m^3 reservoir tanks) 100m3 at the plant
Worst Case Reticulation Failure	Failure of 150mm main from the 3 reservoirs, would drain reservoirs in 5 hours if not isolated
Extent of Reticulation	13.9km of pipes, 15 to 150mm diameter
Relevant Resource Consents	For water take (RC120401 expiry November 2030) and water use (RC120393 expiry November 2030)

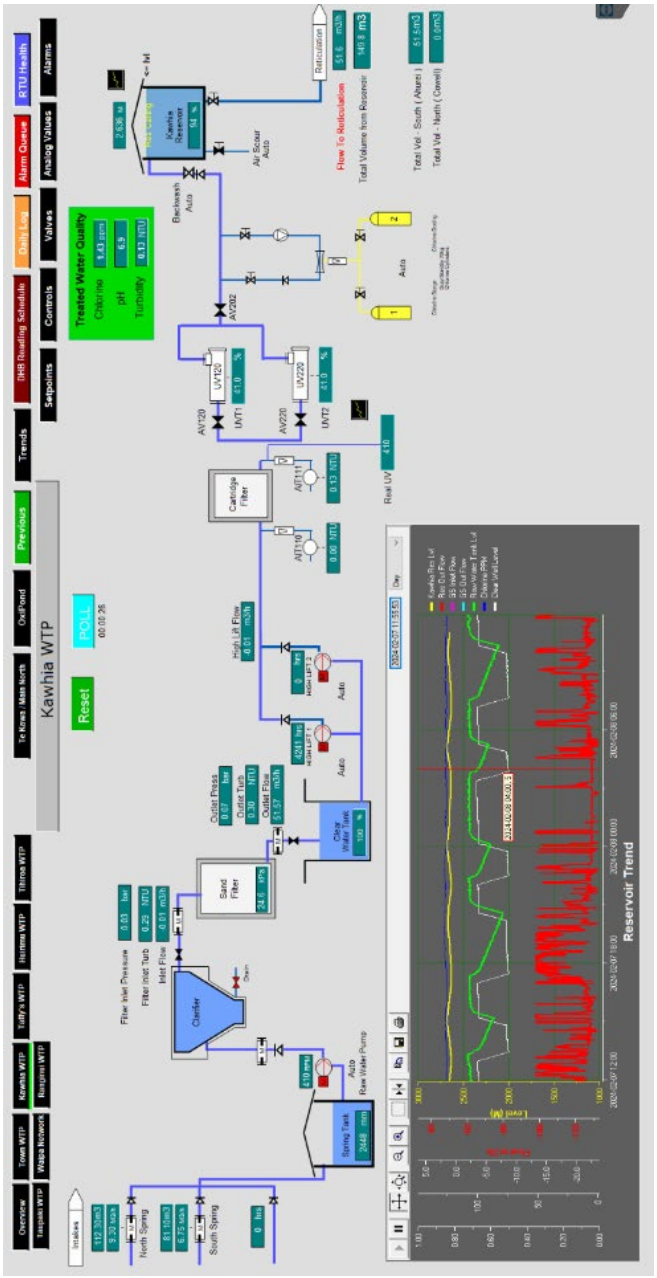


Figure 7.2: Kāwhia Water Treatment Plant

7.2 - Condition

The water treatment plant at Kāwhia is a relatively basic facility and received significant investment in the filtration system in 2022 with the removal of the old clarifier and sand filter and the installation of a new greensand filter. This investment has improved the reliability of the plant.

Whilst two UV units were installed in 2015, they are not utilised as they are not reliable and expensive to operate. The condition of the reticulation system is generally good.

Kāwhia has had significant water main renewals over the last 3 years and water meters installed on domestic properties.

A projection of required pipe and equipment renewal costs for the treatment plant and the Kāwhia reticulation is presented below, based on existing asset inventory data.

The pronounced peak renewal requirements commencing in around 2040 reflects that the majority of the Kāwhia supply was installed in the 1970's, and that there are as yet no indications that any substantial lengths of pipe will require premature replacement.

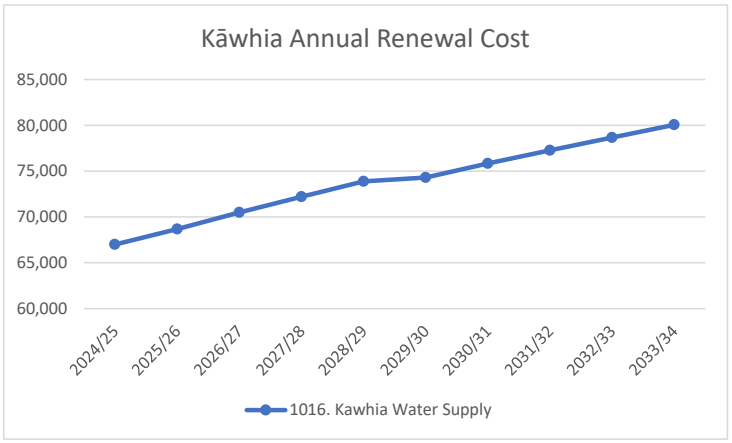


Figure 7.3 – Kāwhia Water Annual Renewal Cost Trend

Commented [EG8]: Update when budgets all sorted in magiq

Commented [ML9R8]: The formatting of this graph needs fixing

Commented [EG10R8]: Will be done when Brendan has done budget stuff

Commented [EG11R8]: Done

7.3 - Performance

The water plant is the most efficient it has been for a number of years with the improvement during the last LTP.

This sound performance is in part due to the decommissioning of the bore source, the water from which was relatively high in iron and manganese and therefore more difficult to effectively treat than the water from the springs, which is apparently from a different aquifer, and has more favourable chemistry.

The 2022/23 Drinking Water Assessment showed compliance at the treatment plant was not met mainly due to 4 samples being of high pH level and misunderstanding of the new rules and the requirements for minimum duration between samples. During the time from November when the DWAR's came into force we sampled more then what was needed causing technical non-compliance for the second half of the 2022/23 financial year. Since this compliance report was completed council has altered the sample schedule to comply with the DWQAR's going forward.

The Kāwhia Water Safety Plan was assessed and approved in June 2018, this was then transferred into the template Taumata Arowai, made available to Local Authorities and submitted into their online portal, Hinekorakau.

7.4 - Risk Assessment

The potential health risks associated with the Kāwhia water supply and the approaches taken to managing those risks are described in detail in the Kāwhia Water Safety Plan Document, which is separate to this AMP.

7.5 - Future Demand

As a coastal community with a steadily increasing proportion of temporarily occupied dwellings, (now making up the majority in the community), Kāwhia has large seasonal variations in water consumption associated with tourism and holiday home occupation, with the extent of these variations being very dependent on weather conditions, particularly over the peak holiday periods.

An extended period of good or poor weather over the summer period can significantly affect both the peak and average annual water consumption for any year. This high level of variability is illustrated in the graph below, with annual MDMM water consumption exhibiting variations of more than 40% over the period considered, and as such it is extremely difficult to define any long term trends.

Since the installation of domestic water meters, improvements at the plant and the latest renewals there has been a reduction in water consumption over the year.

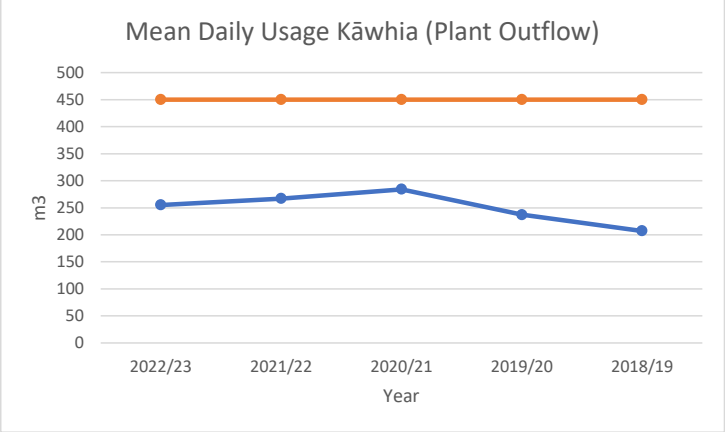


Figure 7.4 – Mean Daily usage (Plant outflow)

The trend graph of Figure 7.4 shows there is adequate capacity for growth. The largest challenge is catering for the peak demand over the Christmas-New Year's holiday period as shown in *Figure 7.5* below:

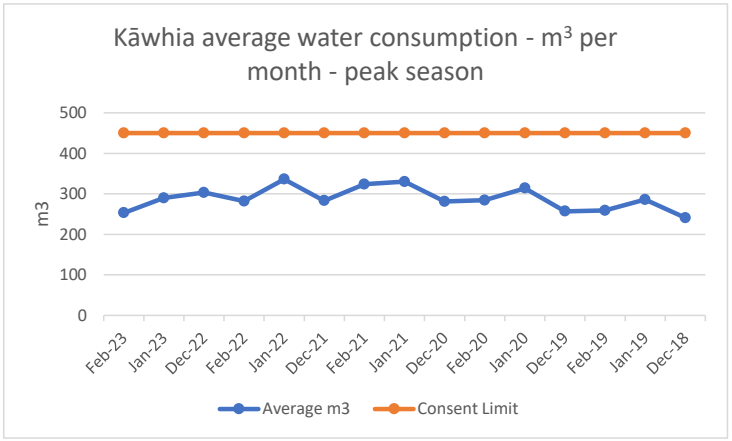


Figure 7.5 – Kāwhia Average Water Consumption Per Month

8.0 - Tihiroa Rural Water Supply Scheme

8.1 - Description

The Tihiroa Rural Water Scheme and treatment plant serves the Tihiroa community and the scheme details and plant schematic are shown below:

Table 8.1: Technical Description of Tihiroa Rural Water Scheme

Date Commissioned	1986
Water Source	Waipā River
Properties Connected	35
Significant Connected Properties	None
Metered Connections	60 (serving all connected properties)
Population Served	Circa 400 (majority of water used for farm stock)
Maximum Consent Water Take Quantity	1,500m³ May to October and 1,500m³ for the remainder of the year
Treatment Process Summary	River source, clarification, rapid sand filtration, chlorine disinfection. Minor automation, with telemetric monitoring of operational parameters.
Treatment Plant Design Capacity	1,800m^3/day
Supply Type	Trickle Feed supply with 24 hours on-site storage, air-gap or other approved backflow protection at each property
Pressure Systems	Combined rising/falling main to storage, gravity/pumped pressure supply
Storage Capacity (shared)	400m^3 = 8 hours at MDMM demand
Extent of Reticulation	34.7km of pipes, 15 to 125mm diameter
Relevant Resource Consents	RC114845 (Surface water take – expiry June 2026); RC121172 – expiry June 2026); RC114846 (Backwash water discharge – expiry June 2026)

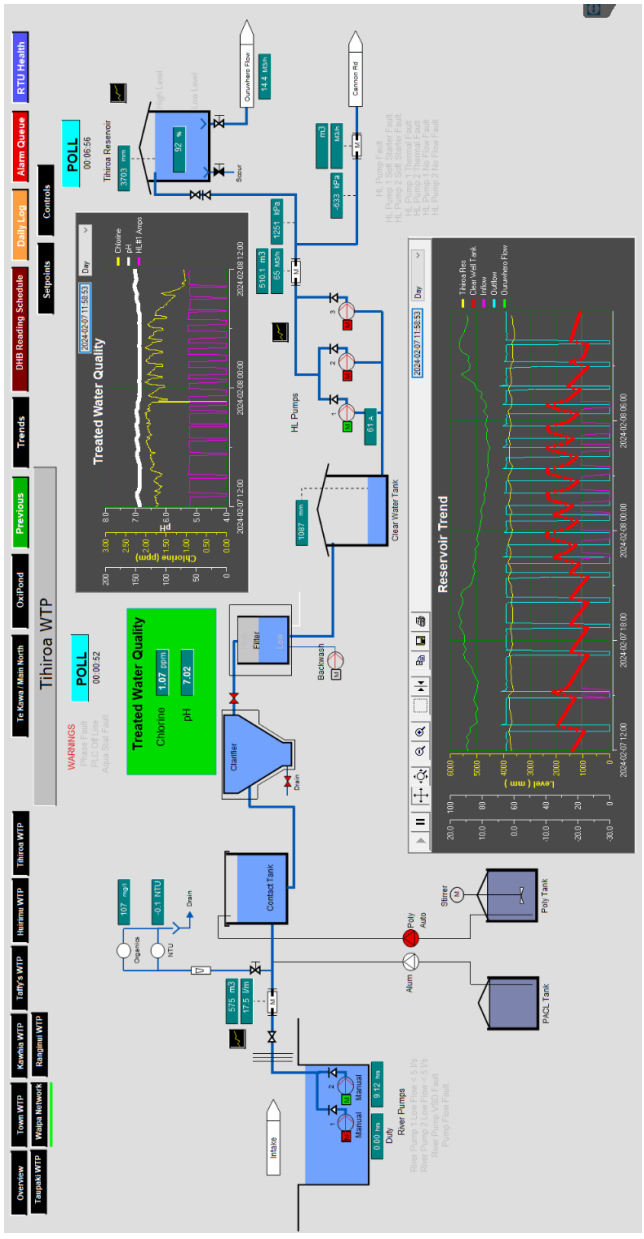


Figure 8.1 – Tihiroa Water Treatment Plant

8.2 - Condition

The condition of water treatment equipment is variable, whilst reticulation assets are generally in good condition.

Reticulation failures were common on the rising main from the plant and are common in the Cannon Road supply. The Rising main has been replaced and the Cannon Road line is planned for 2024.

These leaks are as a result of increased pressures from demand and incorrectly sized pipework during the original installation.

The sand filter was replaced in 2023 which has improved the quality of the water from the plant.

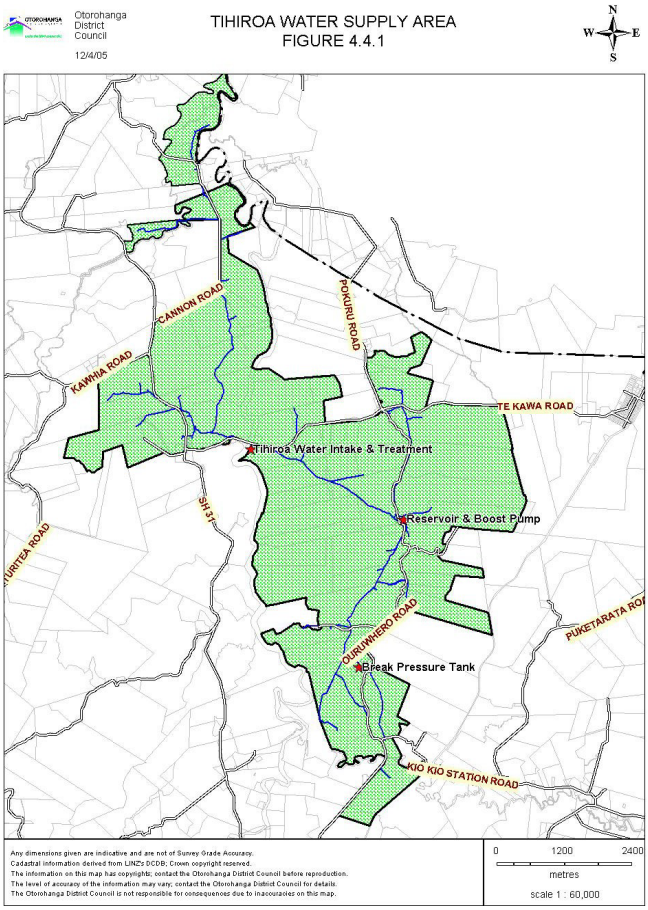


Figure 8.2 – Tihiroa Water Supply Area

A projection of required equipment renewal costs for the Tihiroa Scheme for the next 30 years is presented below, based on existing asset inventory data:

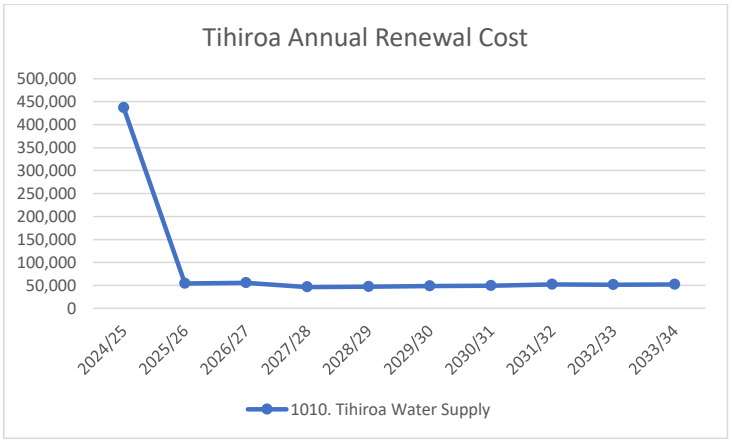


Figure 8.3 – Tihiroa Water Annual Renewal Cost Trend

Commented [EG12]: Update graph when new budgets in magiq

Commented [EG13R12]: Done

The plant has had a new sand filter installed and apart from the replacement of the rising main and the Cannon Road main there are no substantial reticulation renewals expected to be required until after 2060.

8.3 - Performance

The Tihiroa Water Safety Plan was drafted into the template Taumata Arowai, made available to Local Authorities and submitted into their online portal, Hinekorakau in 2022.

The 2022/23 Drinking Water Assessment showed compliance at the treatment plant was not met mainly due to 4 samples showing high turbidity in January and February 2023 and misunderstanding of the new rules and the requirements for minimum duration between samples. During the time from November when the DWAR's came into force, we sampled more then what was needed causing technical non-compliance for the second half of the 2022/23 financial year. Since this compliance report was completed council has altered the sample schedule to comply with the DWQAR's going forward.

8.4 - Risk Assessment

Improvements to the plant and the new sand filter and monitoring equipment has reduced the risk to the supply presented by variable in turbidity and the plant is now considered a low if used as a drinking water supply. To maintain this risk assessment the plant does require more supervision and attendance by water services staff. This will have an increase in operational costs, however minor.

8.5 - Future Demand

Demand for water from this scheme has historically been variable over much of the scheme's life, ranging from little more than 130,000 m^3/year to over 250,000 m^3/year, as illustrated by the recent data in the graph below:

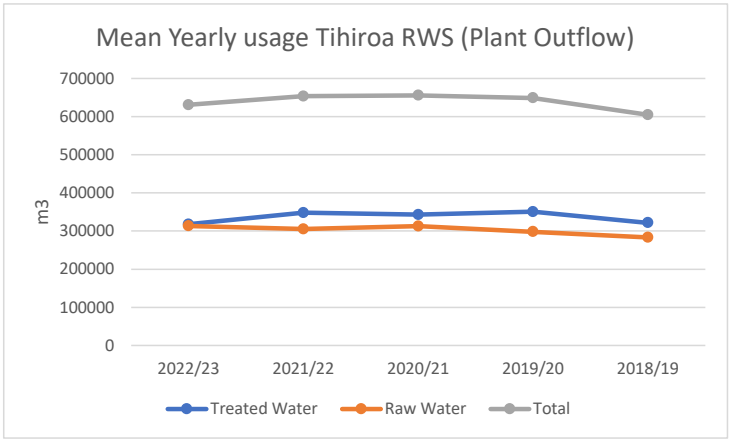


Figure 8.4 – Tihiroa Rural Water Supply

The reasons for this very variable pattern of demand variation are not clear since there has been little change in the extent and use of land supplied by the scheme, and the variations have often been out of step with those on the other rural schemes which are typically weather related. Tihiroa RWS is experiencing water loss issues similar to the Ōtorohanga Scheme, which have not been easy to locate, and unauthorised connections cannot be dismissed.

The Management Committee of the scheme has also adopted a strong stance that the scheme should be run primarily to provide water for farming rather than residential purposes, and as such it is considered unlikely that reticulation would be extended in the near future to serve areas such as Kio Station Road, where lifestyle block development is taking place.

That being said, if water losses can be reduced there is the potential for additional connections or extension of the scheme. Increasing the connections will help reduce the costs to users.

8.6 - Ability to Accommodate Demand Changes

The scheme in its current form is able to accommodate significant additional demand. If the capacity of the scheme was found to be inadequate a probable response would be stricter imposition of water quotas and flow restriction devices in accordance with the original design of the scheme.

A more significant concern for this scheme would be the potential for a significant decrease in demand to the levels previously seen in 2001/2 and 2008/9. If this was to occur a significant increase in water charges could be required, particularly if the decline in demand followed shortly after a significant investment in plant upgrading.

There is surplus supply available for around nine months every year. However, during the summer season peak demand is limited by low flow water take parameters and as such there is no surplus capacity at this time.

8.7 - Ability to Comply with Drinking Water Quality Assurance Rules

The Waipā River at Tihiroa is considered to be a higher risk source due to the confluence of the Mangapu River, and as such significant upgrades to the treatment plant have been completed to ensure the Tihiroa RWS is capable of complying with the DWQAR's

The plant in its current form is capable with reaching compliance with improved monitoring and increased supervision.

9.0 - Arohena Rural Water Supply Scheme

9.1 - Description

The Arohena RWS scheme consists of three separate water supplies, (Kahorekau, Huirimu and Taupaki), serving rural areas in the east of the district. Because these supplies are considered together for administrative and financial purposes, relevant information will be presented within a single section in this Asset Management Plan.

The areas served by the individual supplies are shown in the following maps. All of the Arohena water supplies were commissioned in 1982 and source water from small rocky streams flowing from predominantly native bush catchments. All supplies employ rapid sand filtration and chlorine disinfection.

All of the scheme supplies water on a trickle feed basis into tanks with 24 hours' on-site storage capacity, which are separated from the supply reticulation by an air-gap or other approved backflow protection device. In February 2021 the Ministry of Health, following a positive E-Coli test in Arohena, placed the scheme as a whole under a permanent boil water notice. The Arohena School was lifted out of this with installation of a point of use filter and UV unit which council maintain and test.

An outline technical description of the supplies within the Arohena scheme is presented in the table below:

Table 9.1: Technical Description of Arohena Rural Water Scheme

	Kahorekau	**Huirimu**	**Taupaki**
Water Source (Stream)	Manga Kouma	Makomako	Mangare
Properties Connected	13	14	7
Metered Connections	33	32	8
Population Served (approx.)	120	120	20
Treatment Plant Design Capacity (m^3/day)	1,037	1,037	216
Storage Capacity (m^3)	350	860	40
Extent of Reticulation (km)	27.8	23.2	9.2
Reticulation Diameter (mm)	25 to 150	25 to 125	25 to 100
Ministry of Health Grading – Water Source & Treatment Plant	Ungraded	Ungraded	Ungraded
Relevant Resource Consents	Water Take RC136074.02 Water Use RC136074.01 Expires 31/08/51	Water Use RC136074.01 Water Take RC136074.02 Expires 31/08/51	Water Take RC136074.02 Water Use RC136074.01 Expires 31/08/51

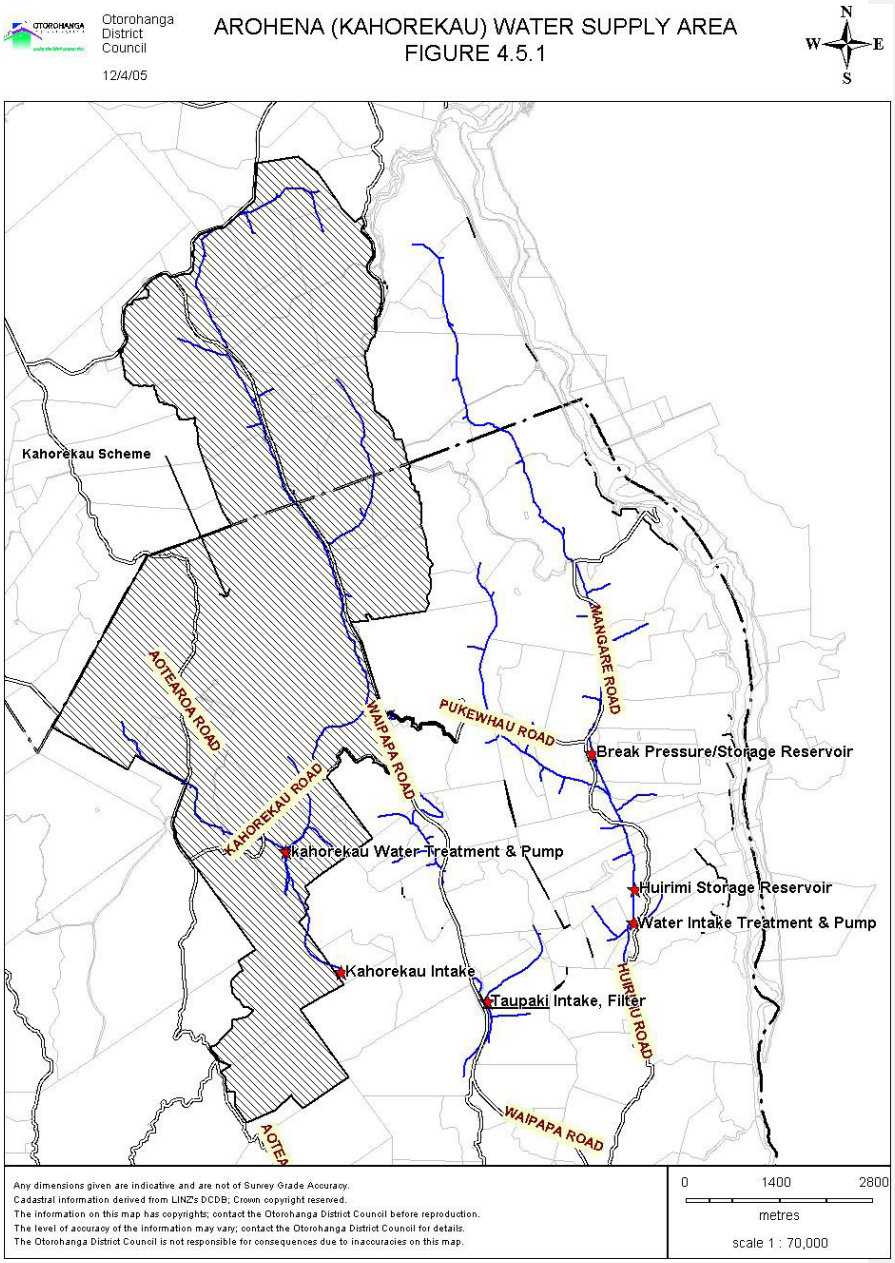


Figure 9.1 – Arohena (Kahorekau) Water Supply Area

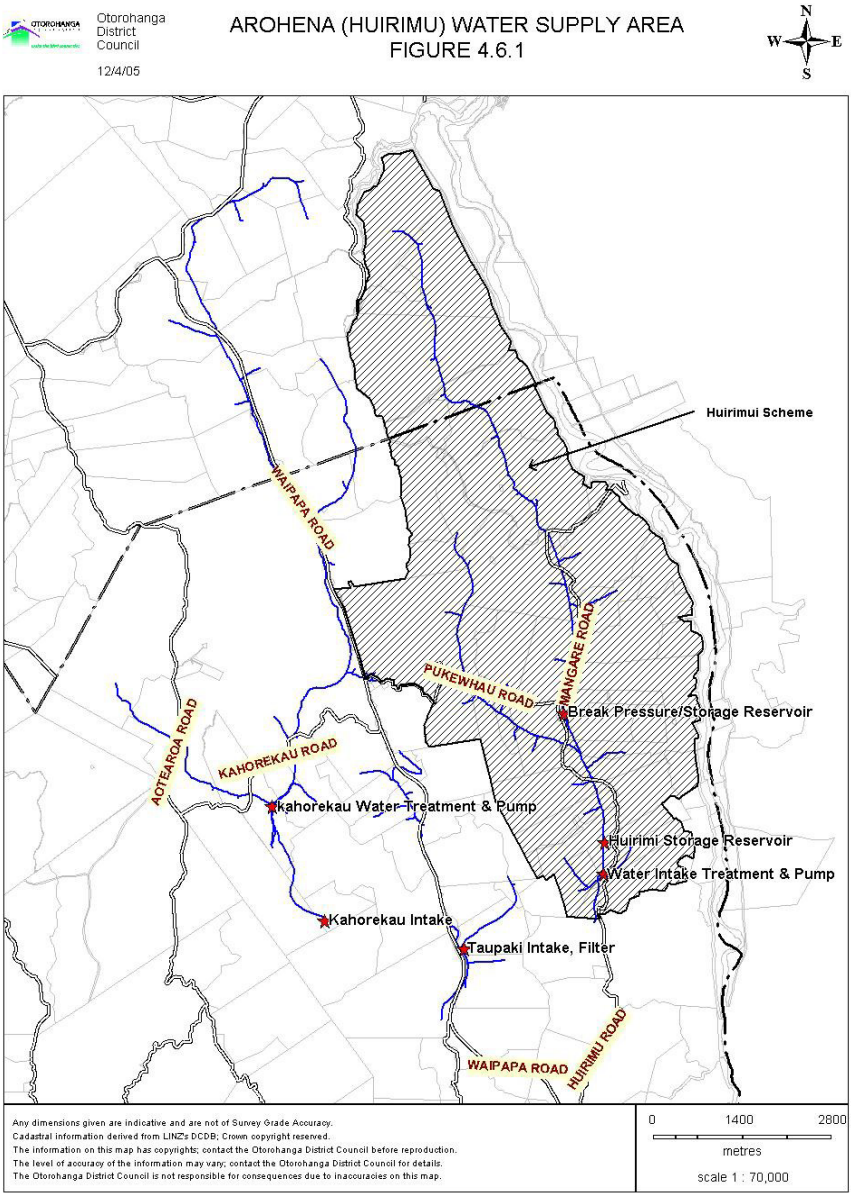


Figure 9.2 – Arohena (Huirimu) Water Supply Area

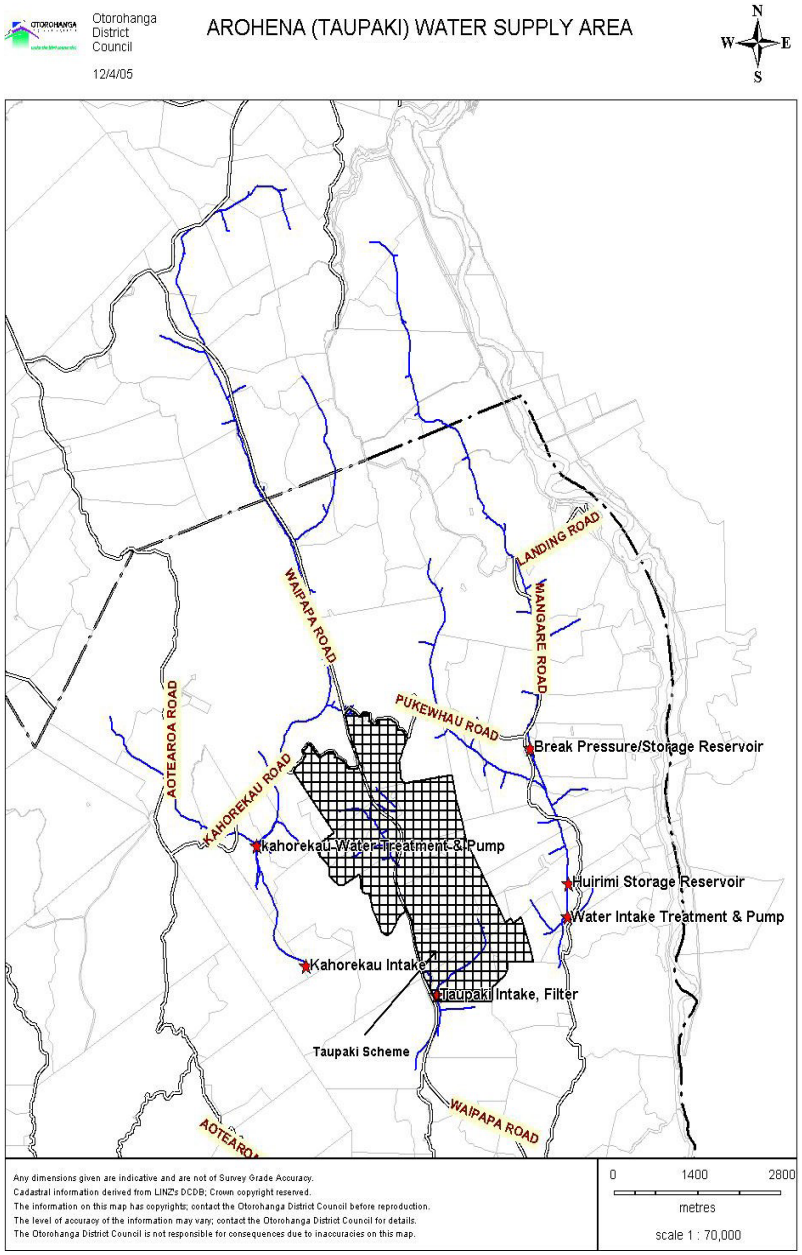


Figure 9.3 – Arohena (Taupaki) Water Supply Area

9.2 - Condition

The scheme is not particularly old, and its assets are generally in good condition. Reticulation failures, (including those resulting from accidental damage), are very rare, and little need for reticulation renewal is expected before 2060.

As such, the required renewals in the shorter term are mainly limited to water treatment, storage equipment and water meters. A projection of such required equipment renewal costs for the Arohena schemes over the next 30 years is presented below:

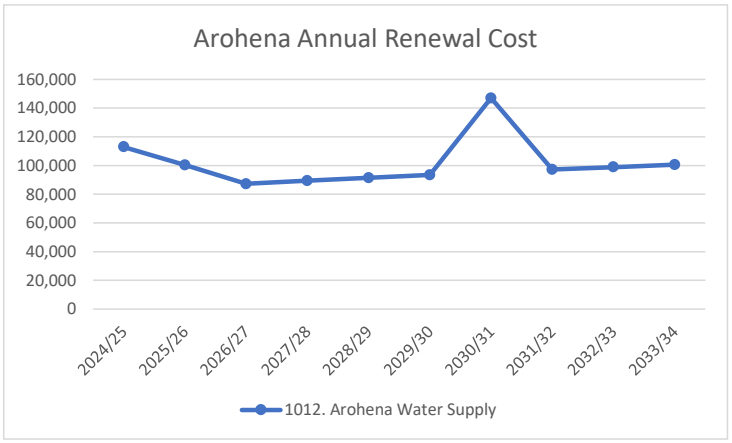


Figure 9.4 – Arohena Water Annual Renewal Cost Trend

Commented [EG14]: Update with new projections

Commented [EG15R14]: Done

As was the case for the other rural water supplies, virtually all of the renewal costs over the next 30 years are for plant items, as the reticulation is little more than halfway through its expected life.

9.3 - Performance

There are three separate water supplies which make up the Arohena water supply. They are referred to by their treatment plant names - Huirimu, Kahorekau and Taupaki.

Compliance with the DWQAR's can be seen in the 2022/23 Compliance report in appendix 4. The Arohena RSW did not achieve compliance for the three plants due to not having sufficient protozoa barriers and technical understanding of the DWQAR's. Due to high turbidity levels, a positive E-Coli sample, and the nature of the water take supply, the scheme was put onto a permanent boil water notice in February 2021. Refer to section 5.11.2 to understand work completed so far for upgrades of the Arohena treatment plants to ensure compliance is achieved with the DWQAR's.

A basic Water Safety Plan is in place for Taupaki from the template provided by Taumata Arowai. Development of a comprehensive WSP is planned for year 1.

The systems within the scheme are largely reliant on gravity for flow, resulting in low power costs and efficient operation. The only regular operational performance issues are blockages of the water intake structures, associated reticulation and/or the sand filter by silt and other water borne debris arising from very heavy rainfall in the steep, bush clad catchments. This has in the past resulted in both regular brief interruptions of supply (typically due to the sand filter requiring additional backwashing) and also some more extended loss of service when the intake structure and pipes have required substantial cleaning.

9.4 - Risk Assessment

Where RWS users do not have adequate on site storage for their peak demands, the cumulative demand can either cause a breach of the relevant resource consents covering abstraction limits or create backflow issues if their connections are not in compliance with Council's requirements. Compliance with consents is generally satisfactory on Huirimu and Taupaki but Kahorakau has had several challenges over the last few years with over abstraction. Council has now put controls in place to restrict over abstraction.

9.5 - Future Demand

Whilst the three individual water supplies within the Arohena scheme have displayed quite variable annual consumption, when considered as a whole, the scheme has a much better defined and more consistent recent trend in respect of water use, as can be seen from the graphs below. Since the scheme was commissioned there has been progressive conversion of dry stock farms to dairy units, with resultant increases in water consumption.

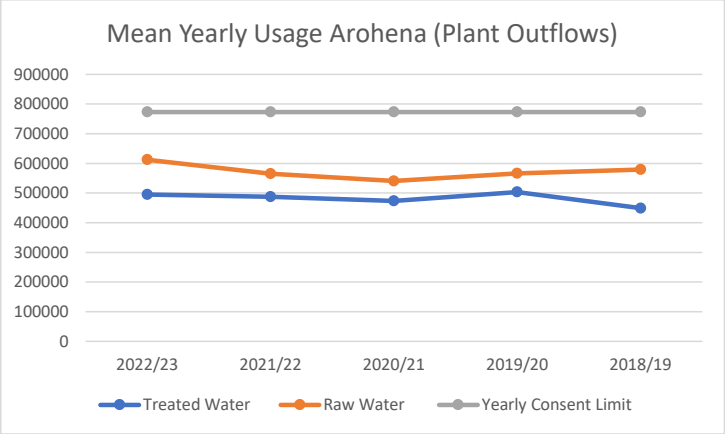


Figure 9.5 – Arohena Scheme Annual Consumption – All Supplies

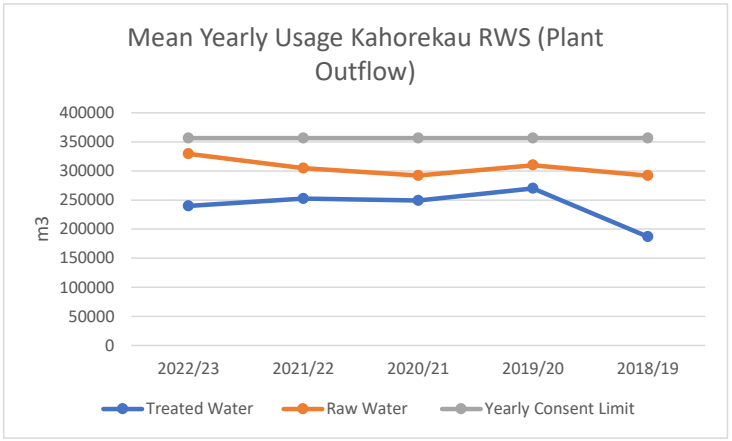


Figure 9.6 – Kahorekau Supply Annual Consumption

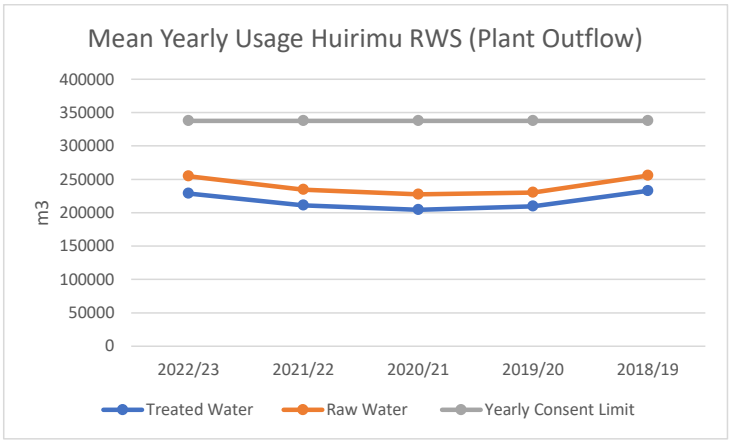


Figure 9.7 – Huirimu Supply Annual Consumption

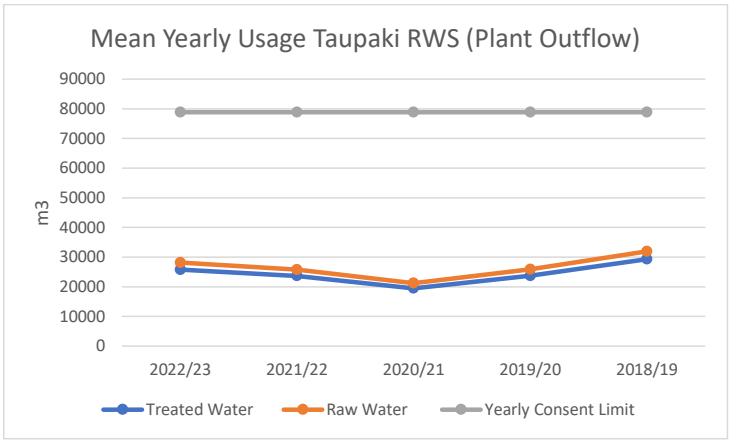


Figure 9.8 – Taupaki Supply Annual Consumption

Current best estimates for future consumption on the Kahorekau supply are an operating range between 200,000 - 250,000m^3 per year, which the current plant and infrastructure can handle without the need for increased capacity.

The underlying demand trend for Huirimu is relatively consistent at around +3% per annum and current best estimates for future consumption are around 200,000 – 250,000m^3 per year, which the current plant and infrastructure can handle without the need for increased capacity.

The pattern of demand from the Taupaki supply has been relatively consistent at around 20,000 – 30,000m^3 per annum. The area has already been fully developed for some time, any future increased demand will only be driven by water usage, and it is believed that a year like 2018/19 would represent something close to maximum demand. The current plant and infrastructure can handle the need for increased capacity.

In general, it is believed that most of the potential dairy conversions have now been completed, and this, combined with other economic factors will limit the potential for further increases of demand in the future. As such, it is believed that potential further increases in demand on all supplies are unlikely to exceed the current operating bands of the water treatment plants, and hence investments for additional capacity are unlikely to be required.

9.6 - Ability to Accommodate Demand Changes

The Kahorekau and Huirimu supplies within the Arohena Scheme are considered to be approaching the limits of their capacity.

There is very limited ability to meet any increases of demand with limitations on water taken from the very small streams being the most significant constraint. Additionally, the monitoring records indicate that at peak use months of the year, the Resource Consent limits are close to restrictive, and it could potentially be difficult to renew the existing consents.

There are no other readily available surface water sources to provide a 'top up' supply, and whilst it might be possible to develop groundwater source(s) for this purpose, the feasibility of doing so has not yet been investigated.

Council has taken steps to control further increases in water consumption through re-installation of flow restrictors on individual properties to ensure that properties do not take substantially more water from the scheme than was allocated to them when the supplies were commissioned.

9.7 - Ability to Comply with Drinking Water Quality Assurance Rules

In October 2023 Council received instruction to provide a funding plan to bring Kahorekau and Huirimu up to protozoa compliance. Council has adopted the position that no further action is to be taken on increasing the investment in these schemes given the small rating base and will continue to leave the schemes under permanent boil water notice indefinity.

However, we are currently investigating the required compliance needed to meet the DWQAR as there have been changes in the standards that need to be met for rural water supplies, which is different to the previous Drinking Water Standards.

9.8 - Alternative Supply Options

The only practical alternative to the existing water supply arrangements, (or variations of them), is for currently connected properties to develop their own water supply systems, generally relying on bore water sources, since there are very limited surface water resources in the area. Some properties have already developed productive bores as back-up supplies.

Such individual supplies could either be used to reticulate entire properties or to augment the existing RWS supply.

10.0 - Ranginui Rural Water Supply Scheme

10.0 - Description

The Ranginui RWS scheme has been for stock water only since 2018, and serves the area shown overleaf. An outline technical description of the scheme is presented in the table below:

Table 10.1: Technical Description of Ranginui Rural Water Scheme

Date Commissioned	1982
Water Source	Upper Waipapa River
Properties Connected	16 meters, 6 properties
Population Served	Nil - water used for farm stock only
Water Take Quantity	Maximum Consented 750m^3/day
Treatment Process Summary	Stream source, rapid sand filtration, and chlorine disinfection. No significant automation or remote monitoring / control.
Treatment Plant Design Capacity	1,000m^3/day
Supply Type	Trickle Feed supply with 24 hours on-site storage, air-gap or other approved backflow protection at each property
Pressure Systems	Generally pumped to storage, gravity feed to properties, but also pumped pressure supply to largest customer.
Storage Capacity (shared)	25m^3 at Plant = 8 hours at MDMM demand
Worst Case Reticulation Failure	Any significant failure of large trunk main has potential to drain reservoir before being detected
Extent of Reticulation	19.8km of pipes, 20 to 100mm diameter
MoH Water Grading	U (ungraded)
Relevant Resource Consents	RC142886 (Water Take) – expiry date May 2042

10.1 - Condition

The scheme is not particularly old, and its assets are generally in sound condition. A projection of required equipment renewal costs for the Ranginui scheme over the next 10 years follows, based on existing asset inventory data. Pipe replacement costs have not been included since no substantial reticulation renewals are expected to be required until after 2060.

Renewal costs are projected to be modest, with the only significant item being the renewal of the timber tank reservoir in 2023/24.

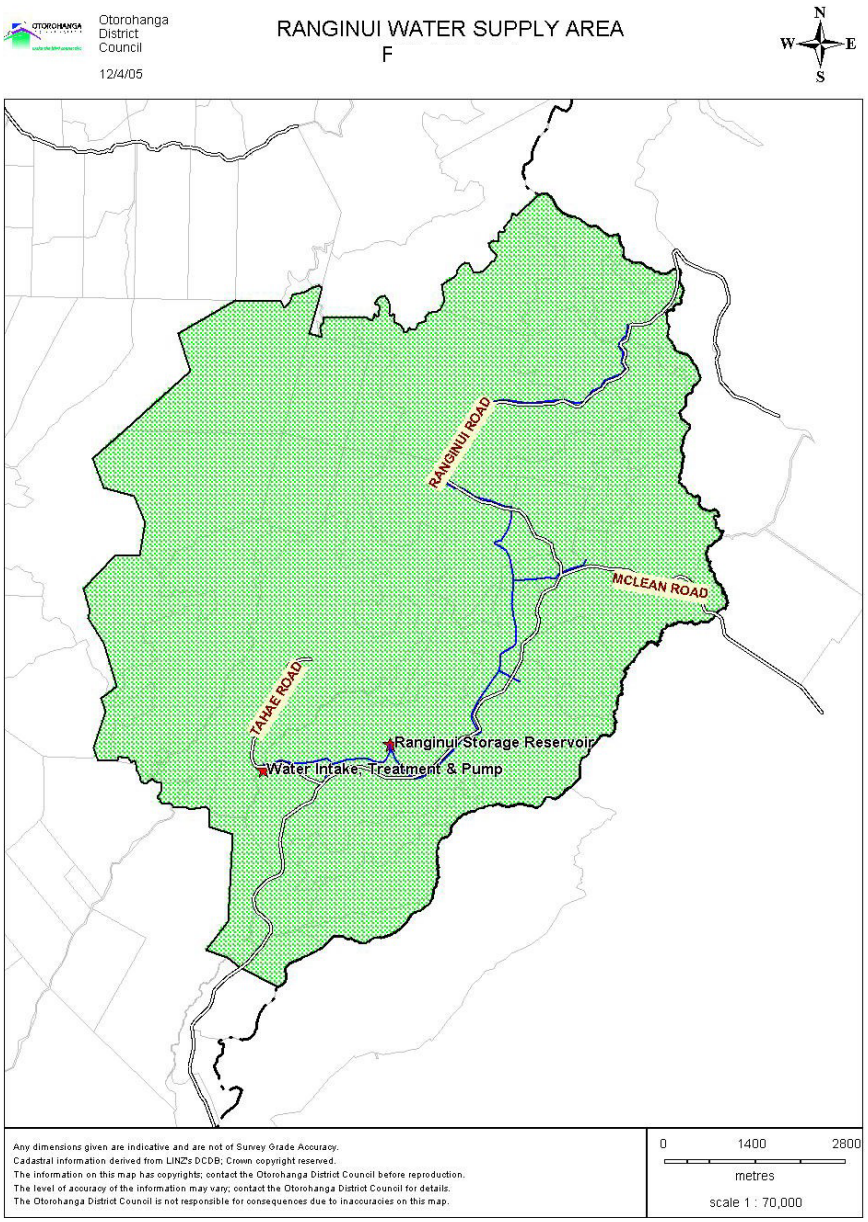


Figure 10.1 – Ranginui Water Supply Area

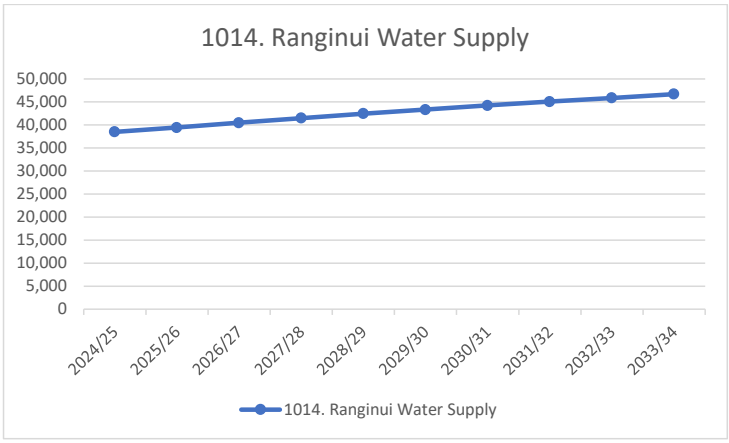


Figure 10.2 – Ranginui Water Annual Renewal Cost Trend

Commented [EG16]: Update

10.2 - Performance

As the RWS is non-potable (agricultural purposes only), there is no Water Safety Plan or compliance against DWQAR's.

Reticulation failures are rare, and usually result from accidental damage to pipes caused by farming operations. Lack of reliable location information for some parts of the scheme also contributes towards such incidents.

In May 2022 Ranginui RWS was granted a new water take consent from the Waikato Regional Council, all conditions have been met.

10.3 - Risk Assessment

As part of converting this RWS to agricultural use only, all connected properties signed statutory declarations agreeing to cease use of this water for potable purposes.

With these health risks removed, the largest risk to the scheme is users ceasing to utilise it due to costs, causing it to be financially unviable. The infrastructure is simple and reliable, and because of the requirement for on-site water storage as part of the trickle-feed approach, occasional temporary interruption of supply would not be expected to have serious consequences.

10.4 - Future Demand

The overall demand for water is heavily dependent on the consumption of a very few large water users, with one of these properties typically using more than 50% of the water produced. This can make demand for water very variable.

This variability was strongly evident during the early 2000's, when changes of management for the largest property saw a 60% increase in overall demand that was then followed by a decrease of similar proportions, bringing demand back to levels recorded in the early 1990's.

The level of charges for water has been a significant concern for this largest property, with the owners indicating that they might leave the scheme if charges were significantly raised in the future.

There has, at various time, been discussion amongst scheme members of closing the scheme as the majority of the members appear to have alternative bore supplies which might potentially be more cost effective.

Because of this dependence on a few large properties, future demand behaviour is relatively difficult to predict, and it is believed that little can be inferred from historical demand data. There is potential for increasing demand to arise from more intensive farming, but there is also potential for substantial decreases in demand if one or more major customers should choose to leave the scheme and utilise other means of water supply.

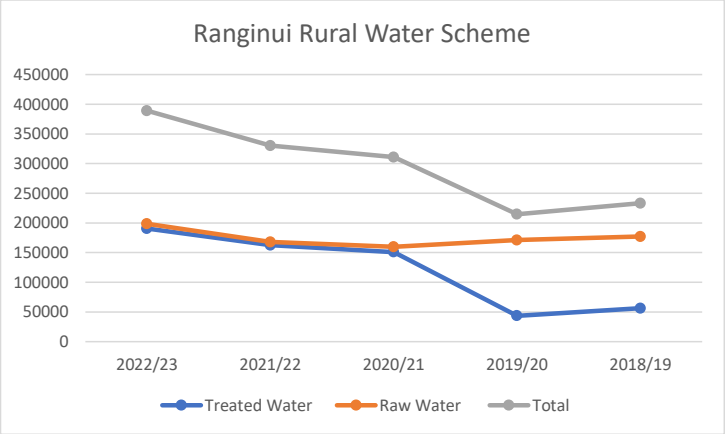


Figure 10.3 – Ranginui Rural Water Scheme Annual Consumption

10.5 - Ability to Accommodate Demand Changes

Increasing demand for water is not a concern for this scheme since the source, treatment plant and reticulation all have significant excess capacity at current levels of demand. Increasing demand would be beneficial for consumers since unit charges for water could be lowered.

Any significant decrease in demand could potentially be critical to the viability of the scheme since it could trigger a 'vicious circle' of increasing water charges to meet relatively fixed costs and further reduced demand if properties chose to leave the scheme. Such a process could quickly lead to a situation where the scheme was no longer financially viable.

There is considered to be little scope for restructuring water charges to offer further incentives for large water users to continue taking water from the scheme.

11.0 - Asset Management Improvement Plan

Several items were identified in the past three water asset management plans related to improvements to be pursued in the following years, and these items are listed below as they are still relevant to ongoing progress in asset management. Where these previous objectives have been achieved is also noted.

11.1 - Water Supply Scheme's DWQAR compliance

Ōtorohanga District Council will continue to work alongside Taumata Arowai, elected members and Drinking Water Compliance experts to develop a stance on how we manage all of our water supply networks' ability to comply with the Drinking Water Quality Assurance Rules.

11.2 - Continuing Emphasis on Collection of Work History Data

Recording of work history, (in particular pipe failures), within the asset management system is considered to have significant benefits and has recently been implemented in the day to day workflow systems. The goal over the forthcoming years is to build an accurate historical record of the maintenance, and feed this data into the condition assessment of the item in question and hence ensure that the renewals which take place are accurately prioritised. The desired outcome from this is continuity of services at the least possible cost. (Avoid costly emergency work due to unforeseen failure of equipment and infrastructure).

While on the flip side, this would also reduce the number of early renewals where assets still have significant useful life remaining.

11.3 - Forward Works Programme to inform Renewals

With the continued focus of working on understanding the condition of our water supply networks and ensuring this and the above work history data flows into our Asset Management System, a forward works programme will be created and maintained which will ensure our renewal budgets are spent on areas which need the investment.

11.4 - Leak Detection

With our water loss being identified as an issue for Ōtorohanga Water supply networks, money has been added into the budget to ensure problem areas are identified to ensure we are looking after our water and providing sustainable water delivery into the future.

Three Waters CAPEX Budgets

	2024/25 Long Term Plan Year 1	2024/25 Long Term Plan Year 2	2024/25 Long Term Plan Year 3
Grand Total	**2,516,000**	**1,982,351**	**1,687,408**
Resiliant Infrastructure: Stormwater	176,000	226,525	211,452
1040. Otorohanga Stormwater	150,000	199,875	194,620
Capital Expenditure	150,000	199,875	194,620
Capital Growth	75,000	51,250	52,600
Capital Level of Service	40,000	112,750	0
Capital Renewals	35,000	35,875	142,020
1041. Kawhia Stormwater	26,000	26,650	16,832
Capital Expenditure	26,000	26,650	16,832
Capital Renewals	26,000	26,650	16,832
Resiliant Infrastructure: Wastewater	798,500	879,963	503,382
1023. Otorohanga Sewerage	798,500	879,963	503,382
Capital Expenditure	798,500	879,963	503,382
Capital Growth	50,000	51,250	52,600
Capital Renewals	748,500	828,713	450,782
Resiliant Infrastructure: Water Supply	1,541,500	875,863	972,574
1010. Tihiroa Water Supply	436,500	54,325	55,756
Capital Expenditure	436,500	54,325	55,756
Capital Renewals	436,500	54,325	55,756
1011. Otorohanga Water Supply	635,000	445,875	405,020
Capital Expenditure	635,000	445,875	405,020
Capital Growth	50,000	51,250	52,600
Capital Renewals	585,000	394,625	352,420
1012. Arohena Water Supply	113,000	100,451	87,316
Capital Expenditure	113,000	100,451	87,316
Capital Renewals	113,000	100,451	87,316
1013. Waipa Water Supply	36,500	18,450	18,936
Capital Expenditure	36,500	18,450	18,936
Capital Renewals	36,500	18,450	18,936
1014. Ranginui Water Supply	38,500	39,462	40,502
Capital Expenditure	38,500	39,462	40,502
Capital Renewals	38,500	39,462	40,502
1016. Kawhia Water Supply	67,000	68,675	70,484
Capital Expenditure	67,000	68,675	70,484
Capital Renewals	67,000	68,675	70,484
1018. Otorohanga Water Treatment Plant	215,000	148,625	294,560
Capital Expenditure	215,000	148,625	294,560
Capital Level of Service	90,000	56,375	42,080
Capital Renewals	125,000	92,250	252,480

*Report Contains Filters

2024/25 Long Term Plan Year 4	2024/25 Long Term Plan Year 5	2024/25 Long Term Plan Year 6	2024/25 Long Term Plan Year 7	2024/25 Long Term Plan Year 8	2024/25 Long Term Plan Year 9
2,047,122	**1,614,791**	**1,754,308**	**1,669,498**	**1,685,653**	**1,672,376**
216,678	221,703	226,326	230,949	235,371	239,592
199,430	204,055	208,310	212,565	216,635	220,520
199,430	204,055	208,310	212,565	216,635	220,520
53,900	55,150	56,300	57,450	58,550	59,600
0	0	0	0	0	0
145,530	148,905	152,010	155,115	158,085	160,920
17,248	17,648	18,016	18,384	18,736	19,072
17,248	17,648	18,016	18,384	18,736	19,072
17,248	17,648	18,016	18,384	18,736	19,072
515,823	527,785	538,791	549,797	560,323	570,372
515,823	527,785	538,791	549,797	560,323	570,372
515,823	527,785	538,791	549,797	560,323	570,372
53,900	55,150	56,300	57,450	58,550	59,600
461,923	472,635	482,491	492,347	501,773	510,772
1,314,621	865,303	989,191	888,752	889,959	862,412
46,354	47,429	48,418	49,407	52,109	51,256
46,354	47,429	48,418	49,407	52,109	51,256
46,354	47,429	48,418	49,407	52,109	51,256
619,850	419,140	427,880	436,620	444,980	452,960
619,850	419,140	427,880	436,620	444,980	452,960
53,900	55,150	56,300	57,450	58,550	59,600
565,950	363,990	371,580	379,170	386,430	393,360
89,474	91,548	93,458	147,073	97,192	98,936
89,474	91,548	93,458	147,073	97,192	98,936
89,474	91,548	93,458	147,073	97,192	98,936
19,404	19,854	20,268	20,682	21,078	21,456
19,404	19,854	20,268	20,682	21,078	21,456
19,404	19,854	20,268	20,682	21,078	21,456
41,503	42,466	43,351	44,236	45,084	45,892
41,503	42,466	43,351	44,236	45,084	45,892
41,503	42,466	43,351	44,236	45,084	45,892
72,226	73,901	74,316	75,834	77,286	78,672
72,226	73,901	74,316	75,834	77,286	78,672
72,226	73,901	74,316	75,834	77,286	78,672
425,810	170,965	281,500	114,900	152,230	113,240
425,810	170,965	281,500	114,900	152,230	113,240
328,790	5,515	45,040	5,745	46,840	5,960
97,020	165,450	236,460	109,155	105,390	107,280

*Report Contains Filters

2024/25 Long Term Plan Year 10
1,926,245
243,813
224,405
224,405
60,650
0
163,755
19,408
19,408
19,408
580,421
580,421
580,421
60,650
519,771
1,102,011
52,159
52,159
52,159
460,940
460,940
60,650
400,290
100,680
100,680
100,680
21,834
21,834
21,834
46,700
46,700
46,700
80,058
80,058
80,058
339,640
339,640
48,520
291,120

*Report Contains Filters

Three Waters OPEX Budgets

	2024/25 Long Term Plan Year 1	2024/25 Long Term Plan Year 2	2024/25 Long Term Plan Year 3	2024/25 Long Term Plan Year 4
Grand Total	**6,259,199**	**6,327,904**	**6,574,681**	**6,765,542**
Resiliant Infrastructure: Stormwater	484,734	511,890	516,656	522,790
1040. Otorohanga Stormwater	310,184	333,793	342,736	352,366
Operating Expenditure	268,273	289,270	297,458	306,393
Finance Costs	10,304	9,303	8,454	7,518
Increase (decrease) in reserves	148,441	161,027	166,288	173,024
Internal charges and overheads applied	56,528	59,490	61,700	63,327
Other operating funding applications	24,500	25,112	25,774	26,411
Payments to staff and suppliers	28,500	34,338	35,242	36,113
1041. Kawhia Stormwater	73,266	77,462	79,154	80,678
Operating Expenditure	73,266	77,462	79,154	80,678
Finance Costs	5,476	4,935	4,661	4,407
Increase (decrease) in reserves	36,435	39,588	40,617	41,566
Internal charges and overheads applied	17,855	19,102	19,674	20,152
Other operating funding applications	6,500	6,663	6,838	7,007
Payments to staff and suppliers	7,000	7,174	7,364	7,546
Resiliant Infrastructure: Wastewater	1,423,530	1,258,933	1,291,152	1,348,882
1020. Otorohanga Sewerage Loan	143,195	145,158	140,044	135,719
Operating Expenditure	143,195	145,158	140,044	135,719
Finance Costs	138,225	139,947	134,704	130,265
Internal charges and overheads applied	4,970	5,211	5,340	5,454
1023. Otorohanga Sewerage	1,280,335	1,113,775	1,151,108	1,213,163
Operating Expenditure	1,280,335	1,113,775	1,151,108	1,213,163
Increase (decrease) in reserves	334,794	372,518	388,712	396,691
Internal charges and overheads applied	255,541	267,707	278,476	286,096
Other operating funding applications	30,500	31,263	32,086	32,879
Payments to staff and suppliers	659,500	442,287	451,834	497,497
Resiliant Infrastructure: Water Supply	4,494,130	4,702,239	4,906,917	5,029,589
1010. Tihiroa Water Supply	457,959	513,467	524,272	506,705
Operating Expenditure	457,959	513,467	524,272	506,705
Finance Costs	30,280	33,319	31,782	30,244
Increase (decrease) in reserves	88,433	103,596	103,513	104,313
Internal charges and overheads applied	162,446	169,708	176,683	181,558
Other operating funding applications	5,300	5,432	5,576	5,713
Payments to staff and suppliers	171,500	201,412	206,718	184,877
1011. Otorohanga Water Supply	807,126	799,368	823,076	851,872
Operating Expenditure	806,967	799,368	823,076	851,872
Increase (decrease) in reserves	329,082	303,530	310,148	325,447
Internal charges and overheads applied	268,885	281,613	293,060	301,123
Other operating funding applications	22,500	23,063	23,670	24,255
Payments to staff and suppliers	186,500	191,162	196,198	201,047
1012. Arohena Water Supply	391,152	413,673	431,050	446,279

Operating Expenditure	391,152	413,673	431,050	446,279
Finance Costs	159	0	0	0
Increase (decrease) in reserves	91,922	104,013	110,736	117,531
Internal charges and overheads applied	158,571	165,648	172,508	177,289
Other operating funding applications	12,500	12,812	13,150	13,475
Payments to staff and suppliers	128,000	131,200	134,656	137,984
1013. Waipa Water Supply	252,729	261,803	267,031	273,791
Operating Expenditure	252,729	261,803	267,031	273,791
Finance Costs	22,888	21,890	20,892	19,893
Increase (decrease) in reserves	57,222	61,863	62,656	63,044
Internal charges and overheads applied	52,919	55,357	57,559	59,122
Other operating funding applications	9,700	9,943	10,204	10,457
Payments to staff and suppliers	110,000	112,750	115,720	121,275
1014. Ranginui Water Supply	100,073	106,460	111,759	116,518
Operating Expenditure	100,073	106,460	111,759	116,518
Increase (decrease) in reserves	29,239	32,952	35,712	38,477
Internal charges and overheads applied	42,234	44,194	45,960	47,210
Other operating funding applications	2,600	2,665	2,735	2,803
Payments to staff and suppliers	26,000	26,649	27,352	28,028
1015. Otorohanga Water Loan	81,241	92,887	88,251	85,038
Operating Expenditure	81,241	92,887	88,251	85,038
Finance Costs	79,619	91,187	86,509	83,258
Internal charges and overheads applied	1,622	1,700	1,742	1,780
1016. Kawhia Water Supply	397,152	417,530	422,917	433,774
Operating Expenditure	397,152	417,530	422,917	433,774
Finance Costs	33,302	36,074	34,755	33,631
Increase (decrease) in reserves	98,556	108,122	105,268	109,781
Internal charges and overheads applied	157,944	165,351	172,066	176,795
Other operating funding applications	8,500	8,712	8,942	9,163
Payments to staff and suppliers	98,850	99,271	101,886	104,404
1018. Otorohanga Water Treatment Plant	652,450	683,547	764,232	799,575
Operating Expenditure	652,450	683,547	764,232	799,575
Finance Costs	29,669	32,763	31,217	29,670
Increase (decrease) in reserves	54,062	63,238	72,312	91,823
Internal charges and overheads applied	326,219	341,032	355,097	364,923
Other operating funding applications	5,500	5,638	5,786	5,929
Payments to staff and suppliers	237,000	240,876	299,820	307,230
Trusted Leadership & Relationships	1,354,407	1,413,504	1,474,329	1,516,037
1017. Water Services Department	1,354,407	1,413,504	1,474,329	1,516,037
Operating Expenditure	1,354,407	1,413,504	1,474,329	1,516,037
Internal charges and overheads applied	630,397	664,961	709,484	735,624
Other operating funding applications	2,200	2,246	2,295	2,341
Payments to staff and suppliers	721,810	746,297	762,550	778,072

2024/25 Long Term Plan Year 5	2024/25 Long Term Plan Year 6	2024/25 Long Term Plan Year 7	2024/25 Long Term Plan Year 8	2024/25 Long Term Plan Year 9	2024/25 Long Term Plan Year 10
6,940,915	**7,083,898**	**7,463,038**	**7,401,179**	**7,486,887**	**7,607,711**
540,825	543,075	545,400	560,399	563,014	566,139
375,981	385,251	394,320	416,035	425,430	435,303
326,482	334,994	343,588	362,091	370,668	379,705
6,466	5,487	4,507	3,616	2,744	2,031
191,368	198,258	205,453	222,758	230,231	237,837
64,674	65,941	66,986	67,799	68,557	69,483
27,024	27,587	28,150	28,690	29,204	29,718
36,950	37,721	38,492	39,228	39,932	40,636
84,918	86,331	87,396	91,206	92,548	93,951
84,918	86,331	87,396	91,206	92,548	93,951
4,171	3,935	3,700	3,464	3,228	2,992
45,328	46,322	47,032	50,480	51,534	52,606
20,528	20,873	21,153	21,453	21,694	21,978
7,169	7,319	7,469	7,611	7,748	7,885
7,722	7,882	8,042	8,198	8,344	8,490
1,366,542	1,389,360	1,646,701	1,463,039	1,480,492	1,508,302
129,425	121,750	114,416	107,102	99,798	92,483
129,425	121,750	114,416	107,102	99,798	92,483
123,865	116,091	108,685	101,279	93,890	86,502
5,560	5,659	5,731	5,823	5,908	5,981
1,237,117	1,267,610	1,532,285	1,355,937	1,380,694	1,415,819
1,237,117	1,267,610	1,532,285	1,355,937	1,380,694	1,415,819
437,306	448,949	470,488	508,057	522,149	540,939
292,431	298,449	303,457	306,878	310,225	314,474
33,641	34,343	35,045	35,715	36,356	36,997
473,739	485,869	723,295	505,287	511,964	523,409
5,162,973	5,273,213	5,385,353	5,484,843	5,543,179	5,625,753
519,866	524,618	531,995	541,868	547,699	554,077
519,866	524,618	531,995	541,868	547,699	554,077
28,707	27,170	25,632	24,095	22,558	21,020
110,502	108,829	110,436	115,827	117,343	118,842
185,646	189,542	192,784	194,913	197,052	199,757
5,846	5,968	6,090	6,206	6,318	6,429
189,165	193,109	197,053	200,827	204,428	208,029
903,549	924,466	951,097	983,770	1,001,028	1,022,556
903,549	924,466	951,097	983,770	1,001,028	1,022,556
365,202	374,948	385,720	410,121	419,388	431,937
307,820	314,184	319,491	323,055	326,552	331,037
24,817	25,335	25,853	26,347	26,820	27,293
205,710	209,999	220,033	224,247	228,268	232,289
466,679	477,271	491,655	508,955	514,397	525,115

466,679	477,271	491,655	508,955	514,397	525,115
0	0	0	0	0	0
130,416	133,961	141,934	154,080	154,495	159,616
181,291	185,107	188,287	190,349	192,426	195,073
13,788	14,075	14,362	14,638	14,900	15,162
141,184	144,128	147,072	149,888	152,576	155,264
281,734	285,499	288,870	298,302	299,442	302,766
281,734	285,499	288,870	298,302	299,442	302,766
18,895	17,896	16,898	15,900	14,901	13,903
67,619	68,327	68,851	72,952	71,763	72,591
60,433	61,679	62,713	63,427	64,136	65,010
10,699	10,922	11,146	11,358	11,562	11,767
124,088	126,675	129,262	134,665	137,080	139,495
123,324	126,348	130,881	136,892	136,425	140,951
123,324	126,348	130,881	136,892	136,425	140,951
43,519	44,890	47,942	52,751	51,124	54,351
48,258	49,254	50,079	50,649	51,210	51,909
2,868	2,928	2,987	3,045	3,099	3,154
28,679	29,276	29,873	30,447	30,992	31,537
83,319	80,206	75,773	71,449	67,163	62,871
83,319	80,206	75,773	71,449	67,163	62,871
81,505	78,360	73,903	69,549	65,235	60,920
1,814	1,846	1,870	1,900	1,928	1,951
449,395	456,350	465,528	460,943	462,918	471,439
449,395	456,350	465,528	460,943	462,918	471,439
32,507	31,382	30,258	29,134	28,009	26,885
119,954	121,870	126,630	118,757	117,581	122,382
180,732	184,474	187,593	189,687	191,751	194,383
9,376	9,571	9,766	9,954	10,132	10,310
106,826	109,053	111,281	113,411	115,445	117,479
784,311	814,468	837,653	853,861	868,018	877,025
784,311	814,468	837,653	853,861	868,018	877,025
28,123	26,577	25,030	23,483	21,937	20,390
117,789	136,143	148,823	157,029	163,422	163,479
373,129	380,945	387,464	391,725	395,983	401,428
6,066	6,193	6,320	6,440	6,556	6,672
259,204	264,610	270,016	275,184	280,120	285,056
1,550,796	1,583,987	1,611,901	1,628,803	1,646,089	1,668,953
1,550,796	1,583,987	1,611,901	1,628,803	1,646,089	1,668,953
1,550,796	1,583,987	1,611,901	1,628,803	1,646,089	1,668,953
755,548	774,671	788,519	791,389	795,375	804,941
2,385	2,427	2,468	2,510	2,550	2,589
792,863	806,889	820,914	834,904	848,164	861,423

Drinking-Water Standards for New Zealand 2005 (Revised 2018) (DWSNZ) Compliance Assessment of Ōtorohanga District Council Water Supplies for Quarter 3 – 2022 and Quarter 4 – 2022 (until November 13th 2022)

3 Waters Consulting Limited have been asked to be the independent external expert in providing specialist drinking water expertise. An independent review of the Ōtorohanga District Council (ODC) water supplies compliance against the Ministry of Health Drinking Water Standards for New Zealand has been undertaken. The compliance period reviewed is that of Quarter 3 – 2022 (1st July 2022 to 30th September 2022) and Quarter 4 – 2022 (1st October 2022 – 13th November 2022). Please note, the DWSNZ remained operative until the 14th of November 2022. From this date the new Water Services (Drinking Water Standards for New Zealand) Regulations 2022 and associated Drinking Water Quality Assurance Rules 2022 (DWQAR) became the operative requirements for water suppliers to meet.

This independent review only assesses the Ōtorohanga District Council water supplies against the DWSNZ from 1st July 2022 until the 13th of November 2022. A subsequent compliance assessment audit information and associated Letter of Compliance against the DWQAR, covers the time period of 14th November 2022 until 30th June 2023.

The system that has been used for this assessment is the identical system that was used by Drinking Water Assessors (DWA) prior to November 2021. The system is referred to as "DWA Function 1: Assessing drinking water supplier compliance with Drinking Water Standards New Zealand 2005/18".

The findings of this assessment and the method that was used are detailed in the below boxes.

DWSNZ 2005(revised 2018) Compliance Recording Sheet

Date	October 2023
Person completing assessment & experience	Mark Palmer - Drinking Water Compliance Specialist Mark Palmer has a Bachelor of Applied Science (Honours) degree in Environmental Management (University of Otago), Postgraduate Diploma in Health Sciences (with Distinction) endorsed in Hazard Assessment and Management (University of Otago), Graduate Diploma (With Distinction) in Environmental Health (Massey University) and a Diploma in Drinking Water Assessment (Opus). Mark has approximately eight years' experience in drinking water assessment, having worked as part of the Waikato Drinking Water Assessment Service of the Waikato Public Health Unit – Health NZ. Until November 2021 Mark was the only Public Health full-time employed Drinking Water Assessor (with a consultant assisting) for the Waikato Region. Mark uses his previous experience and knowledge to undertake independent expert verification and compliance assessments.

Council audited or drinking-water supply name	Ōtorohanga District Council Water supplies of: Otorohanga water supply Arohena water supply Kawhia water supply Tihiroa water supply
Information reviewed	ODC use the Water Outlook database for recording the overall compliance data of the water supplies. This includes all of the treatment plants' performance (criterion 2B), continuous monitoring data particularly for the Otorohanga Treatment Plant, and Distribution Zone results. The bacterial (*E. coli* and total coliform), manual turbidity and chlorine results; sample data for the water leaving the treatment plants was contained in each respective treatment plants' monthly Excel spreadsheets downloaded from Water Outlook. For Otorohanga Treatment Plant the continuous monitoring monthly results (showing the compliance monitoring period (CMP) 1-day) and turbidity results downloaded from SCADA and Water Outlook. These results were used to assess the compliance against section 4 – DWSNZ (Bacterial) and combined with the findings of the treatment plant for compliance against Section 5 – DWSNZ (protozoa). ODC sent through the compliance monthly reports which gave a conclusive record of the monthly compliance for each plant along with the downloaded SCADA 'raw' continuous monitoring data for the Otorohanga Water Treatment Plant for all months of both quarters. Obtaining all compliance 'raw' data meant that the auditor did not need to randomly select the 5 days 'raw' data, rather the external expert was able to review all of the months of continuous monitoring data for the Otorohanga Treatment Plant. The information and data obtained for this assessment is detailed below for each respective Treatment Plant. **Treatment Plants** <u>Otorohanga (TP00173) Water Treatment Plant</u> Otorohanga WTP - DWSNZ Compliance (Monthly) - 2022-07 Otorohanga WTP - DWSNZ Compliance (Monthly) - 2022-08 Otorohanga WTP - DWSNZ Compliance (Monthly) - 2022-09 Otorohanga WTP - DWSNZ Compliance (Monthly) - 2022-10 Otorohanga WTP - DWSNZ Compliance (Monthly) - 2022-11 Otorohanga WTP - DWSNZ Compliance (Monthly) RAW DATA - 2022-07 Otorohanga WTP - DWSNZ Compliance (Monthly) RAW DATA - 2022-08 Otorohanga WTP - DWSNZ Compliance (Monthly) RAW DATA - 2022-09 Otorohanga WTP - DWSNZ Compliance (Monthly) RAW DATA - 2022-10 Otorohanga WTP - DWSNZ Compliance (Monthly) RAW DATA - 2022-11

	2022 07 to 11 Otorohanga Retic Huirimu (TP00689) Water Treatment Plant 2022 07 to 11 Huirimu WTP DWS 2B_6A Compliance Report Kahorekau (TP00690) Water Treatment Plant 2022 07 to 11 Kahorekau WTP DWS 2B_6A Compliance Report Taupaki, Arohena (TP00691) Water Treatment Plant 2022 07 to 11 Taupaki WTP DWS 2B_6A Compliance Report Kawhia (TP00169) Water Treatment Plant Kawhia WTP DWS 2B_6A Compliance Report - 2022-07 Kawhia WTP DWS 2B_6A Compliance Report - 2022-08 Kawhia WTP DWS 2B_6A Compliance Report - 2022-09 Kawhia WTP DWS 2B_6A Compliance Report - 2022-10 Kawhia WTP DWS Protozoal Compliance Report - 10 Oct onward - 2022-10 Kawhia WTP DWS Protozoal Compliance Report - 10 Oct onward - 2022-11 2022 07 to 11 Kawhia WTP DWS 2B_6A Compliance Report Tihiroa (TP00686) Water Treatment Plant 2022 07 to 11 Tihiroa WTP DWS 2B_6A Compliance Report **Distribution Zones** The sample results that had been obtained by the water supplier were in the form of Water Outlook downloaded Excel spreadsheets. These samples were taken from the distribution zone and were analysed for *E. coli*, and total coliform. ODC do not have P2's in place in any distribution zone. Using the spreadsheet, the number of samples, maximum interval between samples and days of the week were calculated and the information checked for consistency. It is noted that the sampling and analysis is undertaken by CoLab which is an IANZ accredited and approved laboratory for the analysis of all required determinands by ODC. The Excel spreadsheets reviewed were part of the Criterion 2B, DWSNZ results for the respective Treatment Plant, and are therefore shown under the Treatment Plants above. The below distribution zones were assessed: Otorohanga (OTO001OT) Waipa (OTO001WA) Mangare Road, Arohena (ARO001MA)

	Aotearoa Road, Arohena (ARO001AO) Arohena (ARO001AR) Kawhia Township (KAW001KA) Tihiroa (TIH001TI)

GENERAL COMPLIANCE

Compliance assessment period	Quarter 3 – 2022 (1st July 2022 to 30th September 2022) Quarter 4 – 2022 (1st October 2022 – 13th November 2022)
What is risk category of supply audited eg high risk? – identifies priority for verification of data. Other comments on	The water supplies of Otorohanga, Tihiroa and Kawhia would not be deemed high risk due to appropriate bacterial (including chlorination) and protozoa treatment. However, the Arohena water supply would be considered medium to high risk due to inadequate protozoa removal which is rapid sand filtration without coagulation – if coagulation was in place, the risk would be reduced. This water supply is however chlorinated which does assist in decreasing the bacterial risk but not protozoan.
Method of data provision from water supplier to DWA (DWO/Alternative electronic/paper/in person during visit – detail dates and reason for visit)	Through electronic means of sample results, raw data and monthly compliance detail for the treatment plants downloaded from the monitoring database of Water Outlook and forwarded.
What data is audited over compliance assessment period? – Overview of: • What selection of data was chosen and why? • What parameters are audited • What timeframes will be audited • Which areas of compliance were chosen for audit and why? • Which supplies were chosen to select data from? Risk based approach used to determine this <u>Within each section below is details around selection of data</u>	All of the four water supplies compliance monitoring data was reviewed for the two Quarters of Quarter 3 – 2022 (1st July 2022 to 30th September 2022) and Quarter 4 – 2022 (1st October 2022 – 13th November 2022) For the treatment plants the audit reviewed for each individual plant: The monthly compliance reports (which had parameters as turbidity results, FACE, *E.* coli, total coliforms) and information indicating issues that had occurred at the plants on any particular month (s). For Otorohanga Treatment Plant the monthly compliance reports included the daily CMP filter results (for standard coagulation / sedimentation /filtration criteria) for all four filters, the minutes in service and whether the filter met the Section 5.4 requirement. The CMP daily FACE minutes, minimum FACE, minimum chlorine contact time and disinfection turbidity,

	Bacterial (*E. coli* and total coliform) sample results for the distribution zone were analysed, these downloaded from Water Outlook and forwarded from ODC.

Compliance assessment based on: a. Whole compliance data set. b. Audit of selection of data records (state %) Note: this may be determined by what criteria they are trying to comply with (e.g. secure groundwater and crypto monitoring requires whole compliance data set)	For the Otorohanga Treatment Plants the monthly compliance reports were viewed, with the raw SCADA minute by minute continuous monitoring data reviewed for all months of the Quarter 3 and Quarter 4 (until November 13th 2022) period. All bacterial, FACE and turbidity results for the criterion 2B treatment compliance were viewed for the five treatment plants using criterion 2B. For the distribution zones, the bacterial results were viewed via an Excel spreadsheet downloaded from Water Outlook database.

TREATMENT PLANTS

Bacterial Compliance

Record compliance criterion used. – and compliance periods for these criterion (e.g 1, 2A, 2B etc)	Compliance Criterion stated below, was for both Quarter 3 – 2022 (1st July 2022 to 30th September 2022) and Quarter 4 – 2022 (1st October 2022 – 13th November 2022) Criterion 2A – compliance requirements under Section 4.2.2 a of the DWSNZ Otorohanga (TP00173) Water Treatment Plant Criterion 2B - compliance requirements under Section 4.2.2 b of the DWSNZ Huirimu (TP00689) Water Treatment Plant Kahorekau (TP00690) Water Treatment Plant Taupaki, Arohena (TP00691) Water Treatment Plant Kawhia (TP00169) Water Treatment Plant Tihiroa (TP00686) Water Treatment Plant
What parameters and timeframe were audited and from which supplies? – if not full data set must be minimum 10 different sampling days	Continuous data for the days stated above were reviewed through both Quarter 3 and Quarter 4, 2022 (until November 13th 2022).

	All monthly compliance reports and sample results were forwarded using Excel spreadsheets that were downloaded from Water Outlook database and forwarded from ODC. For Otorohanga Treatment Plant the raw minute by minute SCADA results for both of the Quarter 3 and Quarter 4, 2022 were forwarded for assessment. The Parameters audited for Otorohanga Treatment Plant were: - Turbidity - Continuous FACE - Hydraulic retention time - Minimum C.t value For the other Treatment Plants, the parameters audited were: - *E. coli* / total coliforms - FACE - Turbidity
Comments on whether compliance criterion met / not met and reasons	Compliance Criterion 2A for Otorohanga Treatment Plant and Criterion 2B for the other Treatment Plants. **<u>Quarter 3 – 2022 (1st July 2022 to 30th September 2022)</u>** **Otorohanga (TP00173) Water Treatment Plant** Compliance Criterion 2A – was met for the full compliance Quarter 3, 2022 of 1st July 2021 to 30th September 2022. **Huirimu (TP00689) Water Treatment Plant** <u>DWSNZ Requirements</u> *E. coli* Minimum samples per compliance quarter = 7 Maximum interval between samples = 22 Minimum days of week to be used = 3 FACE Minimum samples per compliance quarter = 13 Maximum interval between samples = 11 Minimum days of week to be used = 5 No sample <.20 mg/l Turbidity

Minimum samples per compliance quarter = 13
Maximum interval between samples = 11
Minimum days of week to be used = 5

Number (exceedance according to Table A1.4
>1.0 NTU

Number (none allowed)
> 2.0 NTU

Actual Obtained for Criterion 2B – Huirimu (TP00689) WTP for full compliance period:

E. coli

Minimum samples per compliance quarter = 7
Maximum interval between samples = 21
Minimum days of week to be used = 5

FACE

Minimum samples per compliance quarter = 28
Maximum interval between samples = 5
Minimum days of week to be used = 5

No sample <.20 mg/l
Number = 0

Turbidity

Minimum samples per compliance quarter = 27
Maximum interval between samples = 7
Minimum days of week to be used = 5

Number (exceedance according to Table A1.4
>1.0 NTU – 18

Number (none allowed)
> 2.0 NTU - 9

Huirimu WTP bacterial criterion 2B not met for Quarter 3, 2022, due to turbidity exceedances outside of allowable.

Kahorekau (TP00690) Water Treatment Plant

DWSNZ Requirements

E. coli

Minimum samples per compliance quarter = 7
Maximum interval between samples = 22
Minimum days of week to be used = 3

FACE

Minimum samples per compliance quarter = 13
Maximum interval between samples = 11
Minimum days of week to be used = 5

No sample <.20 mg/l

Turbidity

	Minimum samples per compliance quarter = 13 Maximum interval between samples = 11 Minimum days of week to be used = 5 Number (exceedance according to Table A1.4 >1.0 NTU Number (none allowed) > 2.0 NTU <u>Actual Obtained for Criterion 2B – Kahorekau (TP00690) WTP for full compliance period:</u> *E. coli* Minimum samples per compliance quarter = 5 Maximum interval between samples = 27 Minimum days of week to be used = 5 FACE Minimum samples per compliance quarter = 27 Maximum interval between samples = 6 Minimum days of week to be used = 5 No sample <.20 mg/l Number = 2 samples below 20 mg/ Turbidity Minimum samples per compliance quarter = 25 Maximum interval between samples = 7 Minimum days of week to be used = 5 Number (exceedance according to Table A1.4 >1.0 NTU – 17 Number (none allowed) > 2.0 NTU - 5 Kahorekau WTP bacterial criterion 2B <u>not met</u> for Quarter 3, 2022 due to elevated turbidity samples and not enough *E. coli* / total coliform samples obtained, and maximum interval breached between samples. **Taupaki, Arohena (TP00691) Water Treatment Plant** <u>DWSNZ Requirements</u> *E. coli* Minimum samples per compliance quarter = 7 Maximum interval between samples = 22 Minimum days of week to be used = 3 FACE Minimum samples per compliance quarter = 13 Maximum interval between samples = 11 Minimum days of week to be used = 5 No sample <.20 mg/l

Turbidity

Minimum samples per compliance quarter = 13
Maximum interval between samples = 11
Minimum days of week to be used = 5

Number (exceedance according to Table A1.4
>1.0 NTU

Number (none allowed)
> 2.0 NTU

Actual Obtained for Criterion 2B – Taupaki, Arohena (TP00691) WTP for full compliance period:

E. coli

Minimum samples per compliance year = 7
Maximum interval between samples = 21
Minimum days of week to be used = 5

FACE

Minimum samples per compliance year = 28
Maximum interval between samples = 5
Minimum days of week to be used = 5

No sample <.20 mg/l
Number = 0

Turbidity

Minimum samples per compliance year = 27
Maximum interval between samples = 5
Minimum days of week to be used = 5

Number (exceedance according to Table A1.4
>1.0 NTU – 8

Number (none allowed)
> 2.0 NTU - 1

Taupaki, Arohena WTP bacterial Criterion 2B not met for Quarter 3, 2022, due to turbidity exceedances outside of allowable.

Kawhia (TP00169) Water Treatment Plant

DWSNZ Requirements

E. coli

Minimum samples per compliance quarter = 7
Maximum interval between samples = 22
Minimum days of week to be used = 3

FACE

Minimum samples per compliance quarter = 13
Maximum interval between samples = 11
Minimum days of week to be used = 5

No sample <.20 mg/l

Turbidity

	Minimum samples per compliance quarter = 13 Maximum interval between samples = 11 Minimum days of week to be used = 5 Number (exceedance according to Table A1.4 >1.0 NTU Number (none allowed) > 2.0 NTU <u>Actual Obtained for Criterion 2B – Kawhia (TP00169) WTP for full compliance period:</u> *E. coli* Minimum samples per compliance quarter = 7 Maximum interval between samples = 21 Minimum days of week to be used = 5 FACE Minimum samples per compliance quarter = 36 Maximum interval between samples = 7 Minimum days of week to be used = 5 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance quarter = 38 Maximum interval between samples = 7 Minimum days of week to be used = 5 Number (exceedance according to Table A1.4 >1.0 NTU – 0 Number (none allowed) > 2.0 NTU - 0 Kawhia WTP bacterial Criterion 2B <u>met</u> for Quarter 3, 2022. **Tihiroa (TP00686) Water Treatment Plant** <u>DWSNZ Requirements</u> *E. coli* Minimum samples per compliance quarter = 7 Maximum interval between samples = 22 Minimum days of week to be used = 3 FACE Minimum samples per compliance quarter = 13 Maximum interval between samples = 11 Minimum days of week to be used = 5 No sample <.20 mg/l Turbidity Minimum samples per compliance quarter = 13 Maximum interval between samples = 11 Minimum days of week to be used = 5 Number (exceedance according to Table A1.4

	>1.0 NTU Number (none allowed) > 2.0 NTU <u>Actual Obtained for Criterion 2B – Tihiroa (TP00686) WTP for full compliance period:</u> *E. coli* Minimum samples per compliance quarter = 9 Maximum interval between samples = 21 Minimum days of week to be used = 7 FACE Minimum samples per compliance quarter = 39 Maximum interval between samples = 5 Minimum days of week to be used = 5 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance quarter = 39 Maximum interval between samples = 5 Minimum days of week to be used = 5 Number (exceedance according to Table A1.4 >1.0 NTU – 6 Number (none allowed) > 2.0 NTU - 6 Tihiroa WTP bacterial Criterion 2B <u>not met</u> for Quarter 3, 2022, due to turbidity exceedances outside of allowable. **<u>Quarter 4 – 2022 (1st October 2022 – 13th November 2022)</u>** **Otorohanga (TP00173) Water Treatment Plant** Compliance criterion 2A – was met for the full compliance Quarter 4, 2022 of 1st October 2022 to 13th November 2022. **Huirimu (TP00689) Water Treatment Plant** <u>DWSNZ Requirements</u> *E. coli* Minimum samples per compliance quarter = 3 Maximum interval between samples = 22 FACE Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 No sample <.20 mg/l

	Turbidity Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 Number (exceedance according to Table A1.4 >1.0 NTU Number (none allowed) > 2.0 NTU <u>Actual Obtained for Criterion 2B – Huirimu (TP00689) WTP for full compliance period:</u> *E. coli* Minimum samples per compliance quarter = 1 Maximum interval between samples = 32 FACE Minimum samples per compliance quarter = 13 Maximum interval between samples = 8 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance quarter = 13 Maximum interval between samples = 8 Number (exceedance according to Table A1.4 >1.0 NTU – 10 Number (none allowed) > 2.0 NTU - 3 Huirimu WTP bacterial Criterion 2B <u>not met</u> for Quarter 4, 2022, due to not *E. coli /* total coliforms minimum sampling not met, maximum interval between *E. coli /* total coliforms samples not met and turbidity exceedances outside of allowable. **Kahorekau (TP00690) Water Treatment Plant** <u>DWSNZ Requirements</u> *E. coli* Minimum samples per compliance quarter = 3 Maximum interval between samples = 22 FACE Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance quarter = 5 Maximum interval between samples = 11

	Number (exceedance according to Table A1.4 >1.0 NTU Number (none allowed) > 2.0 NTU <u>Actual Obtained for Criterion 2B – Kahorekau (TP00690) WTP for full compliance period:</u> *E. coli* Minimum samples per compliance quarter = 1 Maximum interval between samples = 32 FACE Minimum samples per compliance year = 14 Maximum interval between samples = 6 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance year = 14 Maximum interval between samples = 6 Number (exceedance according to Table A1.4 >1.0 NTU – 8 Number (none allowed) > 2.0 NTU - 2 Kahorekau WTP bacterial Criterion 2B <u>not met</u> for Quarter 4, 2022, due to not *E. coli /* total coliforms minimum sampling not met, maximum interval between *E. coli /* total coliforms samples not met and turbidity exceedances outside of allowable. **Taupaki, Arohena (TP00691) Water Treatment Plant** <u>DWSNZ Requirements</u> *E. coli* Minimum samples per compliance quarter = 3 Maximum interval between samples = 22 FACE Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 No sample <.20 mg/l Turbidity Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 Number (exceedance according to Table A1.4 >1.0 NTU

	Number (none allowed) > 2.0 NTU Actual Obtained for Criterion 2B – Taupaki, Arohena (TP00691) WTP for full compliance period: *E. coli* Minimum samples per compliance quarter = 1 Maximum interval between samples = 32 FACE Minimum samples per compliance year = 14 Maximum interval between samples = 6 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance year = 14 Maximum interval between samples = 6 Number (exceedance according to Table A1.4 >1.0 NTU – 4 Number (none allowed) > 2.0 NTU - 1 Taupaki, Arohena WTP bacterial Criterion 2B not met for Quarter 4, 2022, due to not *E. coli* / total coliforms minimum sampling not met, maximum interval between *E. coli* / total coliforms samples not met and turbidity exceedances outside of allowable. **Kawhia (TP00169) Water Treatment Plant** DWSNZ Requirements *E. coli* Minimum samples per compliance quarter = 3 Maximum interval between samples = 22 FACE Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 No sample <.20 mg/l Turbidity Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 Number (exceedance according to Table A1.4 >1.0 NTU Number (none allowed) > 2.0 NTU

	Actual Obtained for Criterion 2B – Kawhia (TP00169) WTP for full compliance period: *E. coli* Minimum samples per compliance quarter = 0 Maximum interval between samples = 42 FACE Minimum samples per compliance year = 19 Maximum interval between samples = 5 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance year = 19 Maximum interval between samples = 5 Number (exceedance according to Table A1.4 >1.0 NTU – 0 Number (none allowed) > 2.0 NTU - 0 Kawhia WTP bacterial Criterion 2B not met for Quarter 4, 2022, due to not *E. coli* / total coliforms minimum sampling not met and maximum interval between *E. coli* / total coliforms samples not met. **Tihiroa (TP00686) Water Treatment Plant** DWSNZ Requirements *E. coli* Minimum samples per compliance quarter = 3 Maximum interval between samples = 22 FACE Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 No sample <.20 mg/l Turbidity Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 Number (exceedance according to Table A1.4 >1.0 NTU Number (none allowed) > 2.0 NTU Actual Obtained for Criterion 2B – Tihiroa (TP00686) WTP for full compliance period: *E. coli* Minimum samples per compliance quarter = 1

	Maximum interval between samples = 32 FACE Minimum samples per compliance year = 18 Maximum interval between samples = 5 No sample <.20 mg/l Number = 0 Turbidity Minimum samples per compliance year = 18 Maximum interval between samples = 5 Number (exceedance according to Table A1.4 >1.0 NTU – 0 Number (none allowed) > 2.0 NTU - 1 Tihiroa WTP bacterial criterion 2B not met due to turbidity exceedance above allowable, *E. coli /* total coliforms minimum sampling not met and maximum interval between *E. coli /* total coliforms samples not met.
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Reviewed the monthly compliance reports and sample results that were forwarded using Excel spreadsheets that were downloaded from Water Outlook database. For Otorohanga Treatment Plant the raw minute by minute SCADA results for both Quarters were also reviewed.

Protozoa Compliance

Record Log Credit required - Catchment Risk Assessment or Crypto Monitoring used to achieve log credits?	Protozoa monitoring and CRA for Otorohanga WTP – 3-Log Catchment Risk Assessments for all supplies. Huirimu WTP - 4-Log Kahorekau WTP – 3-Log Taupaki, Arohena WTP – 3-Log Kawhia WTP – 3-Log Tihiroa WTP - 4-Log
List treatment processes in place that meet DWSNZ criteria – including compliance monitoring periods for those treatment processes.	Otorohanga Treatment Plant - Coagulation, sedimentation & Filtration (CMP – 1 Month) Huirimu Water Treatment Plant - Rapid Sand filtration (CMP – 1 Month)

	<u>Kahorekau Water Treatment Plant</u> - Rapid Sand filtration (CMP – 1 Month) <u>Taupaki, Arohena Water Treatment Plant</u> - Rapid Sand filtration (CMP – 1 Month) <u>Kawhia Water Treatment Plant</u> - Coagulation, sedimentation & Filtration (CMP – 1 Month) - Ultraviolet disinfection (CMP – 1 Month) <u>Tihiroa Water Treatment Plant</u> - Coagulation, sedimentation & Filtration (CMP – 1 Month)
What parameters and timeframe were audited and from which supplies? – if not full data set must be minimum 10 different sampling days	The continuous data for the days stated above were reviewed through both Quarter 3 and Quarter 4, 2022 (until 13th November 2022). The data reviewed was chosen based upon the Compliance monthly reports. Any possible discrepancies or perceived transgressions highlighted in the compliance monthly reports resulted in this Drinking Water Compliance Specialist requesting that particular day(s) of compliance data for assessment. <u>Otorohanga Treatment Plant</u> Parameters assessed: - Filter turbidity for all four filters - flow - Any missing data <u>Huirimu Water Treatment Plant</u> - No continuous monitoring data available <u>Kahorekau Treatment Plant</u> - No continuous monitoring data available <u>Taupaki, Arohena Treatment Plant</u> - No continuous monitoring data

	available Kawhia Treatment Plant Parameters assessed: - Filter turbidity - flow - Any missing data Tihiroa Treatment Plant - No continuous monitoring data available
What log credits are possible for each treatment process? – Which ones achieved those log credits and why? **Total log credits achieved:** all treatment processes combined	**Otorohanga Treatment Plant** Quarter 3 – 2022 (1st July 2022 to 30th September 2022) Coagulation, sedimentation & filtration – 3-log Log credit possible – 3-log Achieved – 3-log *Compliant with Section 5 (Protozoa), DWSNZ for Quarter 3, 2022* Quarter 4 – 2022 (1st October 2022 – 13th November 2022) Coagulation, sedimentation & filtration – 3-log Log credit possible – 3-log Achieved – 0-log *Compliant with Section 5 (Protozoa), DWSNZ for Quarter 4, 2022* **Huirimu Water Treatment Plant** Quarter 3 – 2022 (1st July 2022 to 30th September 2022) Rapid Sand filtration – 0-log Log credit possible – 0-log

	Achieved – 0-log <u>Reason for not meeting:</u> The treatment in place does not meet the required for inactivation or removal of protozoa. <u>Quarter 4 – 2022 (1st October 2022 – 13th November 2022)</u> Rapid Sand filtration – 0-log Log credit possible – 0-log Achieved – 0-log <u>Reason for not meeting:</u> The treatment in place does not meet the required for inactivation or removal of protozoa. **Kahorekau Water Treatment Plant** <u>Quarter 3 – 2022 (1st July 2022 to 30th September 2022)</u> Rapid Sand filtration – 0-log Log credit possible – 0-log Achieved – 0-log <u>Reason for not meeting:</u> The treatment in place does not meet the required for inactivation or removal of protozoa. <u>Quarter 4 – 2022 (1st October 2022 – 13th November 2022)</u> Rapid Sand filtration – 0-log Log credit possible – 0-log Achieved – 0-log <u>Reason for not meeting:</u> The treatment in place does not meet the required for inactivation or removal of protozoa.

	Taupaki, Arohena Water Treatment Plant Quarter 3 – 2022 (1st July 2022 to 30th September 2022) Rapid Sand filtration – 0-log Log credit possible – 0-log Achieved – 0-log Reason for not meeting: The treatment in place does not meet the required for inactivation or removal of protozoa. Quarter 4 – 2022 (1st October 2022 – 13th November 2022) Rapid Sand filtration – 0-log Log credit possible – 0-log Achieved – 0-log Reason for not meeting: The treatment in place does not meet the required for inactivation or removal of protozoa. **Kawhia Water Treatment Plant** Quarter 3 – 2022 (1st July 2022 to 30th September 2022) Coagulation, sedimentation & filtration – 3-log Log credit possible – 3-log Achieved – 0-log Reason for not meeting: Kawhia WTP did not achieve any log credits due to not meeting the turbidity requirements in July 2022. Turbidity was above 0.3 NTU for more than 5%, 0.50 NTU for more than 1% and 1 NTU for the duration of 3 minutes or more. Quarter 4 – 2022 (1st October 2022 – 13th November 2022)

	Coagulation, sedimentation & filtration – 3-log Log credit possible – 6-log Achieved – 0-log <u>Reason for not meeting:</u> Kawhia WTP did not achieve any log credits due to not meeting the turbidity requirements in October and November 2022 (until 13th November). Turbidity was above 0.3 NTU for more than 5%, 0.50 NTU for more than 1% and 1 NTU for the duration of 3 minutes or more. **Tihiroa Water Treatment Plant** <u>Quarter 3 – 2022 (1st July 2022 to 30th September 2022)</u> Coagulation, sedimentation & filtration – 3-log Log credit possible – 3-log Achieved – 0-log <u>Reason for not meeting:</u> Tihiroa WTP did not achieve any log credits due to no continuous monitoring data being available and forwarded for assessment. <u>Quarter 4 – 2022 (1st October 2022 – 13th November 2022)</u> Coagulation, sedimentation & filtration – 3-log Log credit possible – 3-log Achieved – 0-log <u>Reason for not meeting:</u> Tihiroa WTP did not achieve any log credits due to no continuous monitoring data being available and forwarded for assessment.

Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Reviewed the Otorohanga Treatment Plant the raw minute by minute SCADA results and monthly compliance reports for both Quarters of the compliance period.

Cyanotoxin Compliance

Cyanotoxin compliance applicable or not applicable? Complies?	Not officially assigned to the treatment plants, however, there is a cyanotoxin management protocol in place. Therefore, is compliant.
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Not applicable

Chemical Compliance

Plumbosolvent compliance determined – notices sent out? – evidence?	Six monthly notices -Waitomo News
Does the treatment plant have P2's assigned? (list) – if applicable	Not applicable
Summary and comment on compliance monitoring gathered for report whether or not data was assessed for this. Justification either way	Not applicable
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Not applicable

Radiological Compliance

Radiological compliance applicable or not applicable? When was testing done	N/A – all surface water sources

DISTRIBUTION ZONE

Bacterial Compliance

Record compliance criterion used. – and compliance periods for these criterion	DWSNZ section 4.3.1: criterion 6A using *E. coli* monitoring and total coliforms only for all water supplies. **Otorohanga Distribution Zone** Quarter 3 – 2022 (1st July 2022 to 30th September 2022)

	DWSNZ requirements Minimum samples per compliance quarter = 13 Maximum interval between samples = 11 Minimum days of week to be used = 5 Actual obtained for Zone for compliance quarter: Samples obtained = 13 Maximum interval between samples = 14 Minimum days of week used = 5 Quarter 4 – 2022 (1st October 2022 – 13th November 2022) DWSNZ requirements Minimum samples per compliance quarter = 5 Maximum interval between samples = 11 Minimum days of week to be used = 5 Actual obtained for Zone for compliance quarter: Samples obtained = 5 Maximum interval between samples = 11 Minimum days of week used = 5 **Waipa Distribution Zone** Quarter 3 – 2022 (1st July 2022 to 30th September 2022) DWSNZ requirements Minimum samples per compliance year = 3 Maximum interval between samples = 45 Minimum days of week to be used = 2 Actual obtained for Zone for compliance quarter: Samples obtained = 3 Maximum interval between samples = 38 Minimum days of week used = 2 Quarter 4 – 2022 (1st October 2022 – 13th November 2022) DWSNZ requirements Minimum samples per compliance quarter = 1 Maximum interval between samples = 45 Minimum days of week to be used = 2 Actual obtained for Zone for compliance quarter:

	Samples obtained = 7 Maximum interval between samples = 25 Minimum days of week used = 5 **<u>Mangare Road, Arohena Distribution Zone</u>** <u>Quarter 3 – 2022 (1st July 2022 to 30th September 2022)</u> <u>DWSNZ requirements</u> Minimum samples per compliance quarter = 3 Maximum interval between samples = 45 Minimum days of week to be used = 2 <u>Actual obtained for Zone for compliance quarter:</u> Samples obtained = 3 Maximum interval between samples = 38 Minimum days of week used = 2 <u>Quarter 4 – 2022 (1st October 2022 – 13th November 2022)</u> <u>DWSNZ requirements</u> Minimum samples per compliance quarter = 1 Maximum interval between samples = 45 Minimum days of week to be used = 1 <u>Actual obtained for Zone for compliance quarter:</u> Samples obtained = 1 Maximum interval between samples = 33 Minimum days of week used = 7 **<u>Aotearoa Road, Arohena Distribution Zone</u>** <u>Quarter 3 – 2022 (1st July 2022 to 30th September 2022)</u> <u>DWSNZ requirements</u> Minimum samples per compliance quarter = 3 Maximum interval between samples = 45 Minimum days of week to be used = 2 <u>Actual obtained for Zone for compliance quarter:</u> Samples obtained = 16 Maximum interval between samples = 38 Minimum days of week used = 3

	Quarter 4 – 2022 (1st October 2022 – 13th November 2022) DWSNZ requirements Minimum samples per compliance quarter = 1 Maximum interval between samples = 45 Minimum days of week to be used = 1 Actual obtained for Zone for compliance quarter: Samples obtained = 1 Maximum interval between samples = 34 Minimum days of week used = 2 **Arohena Distribution Zone** Quarter 3 – 2022 (1st July 2022 to 30th September 2022) DWSNZ requirements Minimum samples per compliance quarter = 3 Maximum interval between samples = 45 Minimum days of week to be used = 2 Actual obtained for Zone for compliance quarter: Samples obtained = 7 Maximum interval between samples = 39 Minimum days of week used = 3 Quarter 4 – 2022 (1st October 2022 – 13th November 2022) DWSNZ requirements Minimum samples per compliance quarter = 1 Maximum interval between samples = 45 Minimum days of week to be used = 1 Actual obtained for Zone for compliance quarter: Samples obtained = 1 Maximum interval between samples = 34 Minimum days of week used = 1 **Kawhia Township Distribution Zone** Quarter 3 – 2022 (1st July 2022 to 30th September 2022) DWSNZ requirements Minimum samples per compliance quarter = 3

	Maximum interval between samples = 45 Minimum days of week to be used = 2 <u>Actual obtained for Zone for compliance quarter:</u> Samples obtained = 3 Maximum interval between samples = 38 Minimum days of week used = 3 <u>Quarter 4 – 2022 (1st October 2022 – 13th November 2022)</u> <u>DWSNZ requirements</u> Minimum samples per compliance quarter = 1 Maximum interval between samples = 45 Minimum days of week to be used = 2 <u>Actual obtained for Zone for compliance quarter:</u> Samples obtained = 6 Maximum interval between samples = 25 Minimum days of week used = 5 **<u>Tihiroa Distribution Zone</u>** <u>Quarter 3 – 2022 (1st July 2022 to 30th September 2022)</u> <u>DWSNZ requirements</u> Minimum samples per compliance quarter = 3 Maximum interval between samples = 45 Minimum days of week to be used = 2 <u>Actual obtained for Zone for compliance quarter:</u> Samples obtained = 6 Maximum interval between samples = 28 Minimum days of week used = 4 <u>Quarter 4 – 2022 (1st October 2022 – 13th November 2022)</u> <u>DWSNZ requirements</u> Minimum samples per compliance quarter = 1 Maximum interval between samples = 45 Minimum days of week to be used = 1 <u>Actual obtained for Zone for compliance quarter:</u> Samples obtained = 1 Maximum interval between samples = 34

	Minimum days of week used = 1
Summary of results completed for inclusion in report (eg download data via Excel) – What parameters and timeframe were audited?	Bacterial parameters of *E. coli* and total coliform – this for criterion 6A compliance using *E. coli* monitoring only for all water supplies. This data was for the Quarter 3 – 2022 and Quarter 4 – 2022 compliance periods of 1st July 2022 to 30th September 2022 (Quarter 3 – 2022), and 1st October 2022 to 13th November 2022 (Quarter 4 – 2022).
Comments on whether compliance criterion met / not met and reasons	All distribution zones apart from Otorohanga Distribution Zone in Quarter 3, 2022, met the number of samples, maximum intervals between samples and minimum days of the week. The Otorohanga Distribution Zone did not meet the required maximum interval between samples in Quarter 3, 2022. The number of samples and days of the week were met. **Overall, apart from the Otorohanga Distribution Zone in Quarter 3, 2022, full compliance with the bacterial section of the DWSNZ was demonstrated for the Otorohanga District Council Distribution Zones**.
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Excel spreadsheet contained all of the sample results obtained from ODC. Analysis of the samples is undertaken the Co-Lab Water Services which is an IANZ accredited and approved laboratory for this analysis. This data was for the compliance quarters of Quarter 3, 2022 (1st July 2022 to 30th September 2022) to Quarter 4 (1st October 2022 to 13th November 2022).

Cyanotoxin Compliance

Does the distribution zone have P2 (Cyanotoxin) assigned?	None of ODC zones are assigned a cyanotoxin P2
Summary of monitoring results completed for report whether or not data was assessed for this. Justification either way	Not applicable
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Not applicable

Chemical Compliance

Does the distribution zone have any chemical P2's assigned? (list)	None of the ODC Distribution Zones have chemical P2's assigned.

Summary of monitoring results completed for report Whether or not data was assessed for this. Justification either way	Not applicable
Comment on compliance	Not applicable
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Not applicable

DATA AUDIT

Does the audited data align with data found in DWO?	I am confident that the audited data does align with both the continuous minute data and the monthly compliance reports.
If data doesn't align, what action is to be taken	N/A
Supplier informed of data audit result within 20 days?	Yes, the water supplier will be informed within 20 days.

Drinking Water Quality Assurance Rules 2022 Compliance Assessment of Ōtorohanga District Council Water Supplies for 14th November 2022 to June 2023.

3 Waters Consulting Limited have been asked to be the independent external expert in providing specialist drinking water expertise. An independent review of the Ōtorohanga District Council (ODC) water supplies compliance against sections of the Drinking Water Quality Assurance Rules 2022 has been completed. The reporting periods reviewed are those of the months of 14th November 2022 to June 2023.

The system that has been used for this assessment is the 3WC Audit Function: Assessing Drinking Water Supply Compliance which is predominately based upon the processes that were used by Drinking Water Assessors (DWA) prior to November 2021.

This assessment reviewed the overall compliance against the Drinking Water Quality Assurance Rules 2022, which meeting the Rules, indicates that a supplier is meeting the Water Services (Drinking Water Standards for New Zealand) Regulations 2022. The applicable sections of the Drinking Water Quality Assurance Rules 2022 assessed, include Section 1.5 (Categories of drinking water supply), Section 2 (Drinking water supply categories and Rule modules), Section 4.1 G (General Rules), Section 4.4 (T1-Treatment Rules), Section 4.5 (D1 – Distribution System Rules), Section 4.7 (T2 – Treatment Rules), Section 4.8 (D2 – Distribution System Rules), Section 4.10 (T3 Treatment Rules), and Section 4.11 (D3 Distribution System Rules). This assessment only used the applicable 1-month reporting 'Monitoring' Rules, with the exception being use of the Assurance Rules of G13 (for data separation), and G14 (data interruption).

It is to be noted that Taumata Arowai has not been forthcoming with guidance around interpretation of the Drinking Water Quality Assurance Rules 2022. Therefore, this assessment is based upon this Drinking Water Compliance Specialists interpretation of the Rules, using their experience as a past Drinking Water Assessor and their wealth of knowledge around water treatment.

The findings of this assessment and the method that was used are detailed in the below boxes.

Drinking Water Quality Assurance Rules 2022 Compliance Assessment Audit Information Recording Sheet

Date	October 2023
Person completing assessment & experience	Mark Palmer - Drinking Water Compliance Specialist Mark Palmer has a Bachelor of Applied Science (Honours) degree in Environmental Management (University of Otago), Postgraduate Diploma in Health Sciences (with Distinction) endorsed in Hazard Assessment and Management (University of Otago), Graduate Diploma (With Distinction) in Environmental Health (Massey University) and a Diploma in Drinking Water Assessment (Opus). Mark

	has approximately nine years' experience in drinking water assessment, having worked as part of the Waikato Drinking Water Assessment Service of the Waikato Public Health Unit – Health NZ. Until November 2021 Mark was the only Public Health full-time employed Drinking Water Assessor (with a consultant assisting) for the Waikato Region. Mark uses his previous experience and knowledge to undertake independent expert verification and compliance assessments.
Council audited or drinking-water supply name	Ōtorohanga District Council Water supplies of: Hurimu water supply Kahorekau water supply Kawhia water supply Otorohanga water supply Taupaki water supply Tihiroa water supply
Drinking water supply name, category and applicable Rule modules (as stated under Table 2, Section 2, DWQAR)	Water supplies: **Hurimu water supply** <u>Medium</u> Applicable Rule modules are G + S2 + T2 + D2 **Kahorekau water supply** <u>Medium</u> Applicable Rule modules are G + S2 + T2 + D2 **Kawhia water supply** <u>Medium</u> Applicable Rule modules are G + S2 + T2 + D2 **Otorohanga water supply** <u>Large</u> Applicable Rule modules are G + S3 + T3 + D3 **Taupaki water supply** <u>Small</u> Applicable Rule modules are G + S1 + T1 + D1

	Tihiroa water supply Medium Applicable Rule modules are G + S2 + T2 + D2
Information reviewed	ODC use the Water Outlook database for recording the overall compliance data of the water supplies. This includes all of the treatment plants' manual results, and continuous monitoring data particularly for the Otorohanga Treatment Plant, and Distribution Zone results. The bacterial (*E. coli,* total coliform), manual turbidity and chlorine results; sample data for the water leaving the treatment plants was contained in each respective treatment plants' Excel spreadsheets downloaded from Water Outlook. For Otorohanga Treatment Plant the continuous monitoring monthly results (showing the compliance monitoring period (CMP) 1-day) and turbidity results downloaded from SCADA and Water Outlook. ODC sent through the compliance monthly reports which gave a conclusive record of the monthly compliance for each plant along with the downloaded SCADA 'raw' continuous monitoring data for the Otorohanga Water Treatment Plant for all months assessed. Obtaining all compliance 'raw' data meant that the auditor did not need to randomly select the 5 days 'raw' data, rather the external expert was able to review all of the months of continuous monitoring data for the Otorohanga Treatment Plant. The information and data obtained for this assessment is detailed below for each respective Treatment Plant. **Treatment Plants** Huirimu (TP00689) Water Treatment Plant *- Huirimu WTP - T2 Quarterly Report - 2022-12* *- Huirimu WTP - T2 Quarterly Report - 2023-03* *- Huirimu WTP - T2 Quarterly Report - 2023-06* Kahorekau (TP00690) Water Treatment Plant *- Kahorekau WTP - T2 Quarterly Report - 2022-12* *- Kahorekau WTP - T2 Quarterly Report - 2023-03* *- Kahorekau WTP - T2 Quarterly Report - 2023-06* Kawhia (TP00169) Water Treatment Plant *- Kawhia WTP - T2 Quarterly Report - 2022-12* *- Kawhia WTP - T2 Quarterly Report - 2023-03* *- Kawhia WTP - T2 Quarterly Report - 2023-06*

	Otorohanga (TP00173) Water Treatment Plant *- Otorohanga WTP - 2022-11* *- Otorohanga WTP - 2022-12* *- Otorohanga WTP - 2023-01* *- Otorohanga WTP - 2023-02* *- Otorohanga WTP - 2023-03* *- Otorohanga WTP - 2023-04* *- Otorohanga WTP - 2023-05* *- Otorohanga WTP - 2023-06* *- Otorohanga DWQAR Continuous - 2022* *- Otorohanga DWQAR Continuous - 2023* Taupaki, Arohena (TP00691) Water Treatment Plant *- Taupaki WTP - T1 6-Monthly Report - 2022-12* *- Taupaki WTP - T1 6-Monthly Report - 2023-06* Tihiroa (TP00686) Water Treatment Plant *- Tihiroa WTP - T2 Quarterly Report - 2022-12* *- Tihiroa WTP - T2 Quarterly Report - 2023-03* *- Tihiroa WTP - T2 Quarterly Report - 2023-06* **Distribution Zones** The sample results that had been obtained by the water supplier were in the form of Water Outlook downloaded Excel spreadsheets. These samples were taken from the distribution zones and were analysed for parameters as *E. coli*, total coliforms and pH. Using the spreadsheet, the number of samples, maximum interval between samples, duration between samples, and days of the week were calculated and the information checked for consistency. It is noted that the sampling and analysis is undertaken by CoLab which is an IANZ accredited and approved laboratory for the analysis of all required determinands by ODC. The Excel spreadsheets submitted and reviewed are shown under each respective Distribution Zone and category of compliance below: Arohena (ARO001AR) Distribution Zone *- D1 Zones Report - 2022-12* *- D1 Zones Report - 2023-06* Aotearoa Road, Arohena (ARO001AO) Distribution Zone Kawhia Township (KAW001KA) Distribution Zone Mangare Road, Arohena (ARO001MA) Distribution Zone Tihiroa (TIH001TI) Distribution Zone *- D2 Zones Report - 2022-12* *- D2 Zones Report - 2023-03*

	- D2 Zones Report - 2023-06 <u>Otorohanga (OTO001OT) Distribution Zone</u> <u>Waipa (OTO001WA) Distribution Zone</u> *- D3 Zones Report - 2022-11* *- D3 Zones Report - 2022-12* *- D3 Zones Report - 2023-01* *- D3 Zones Report - 2023-02* *- D3 Zones Report - 2023-03* *- D3 Zones Report - 2023-04* *- D3 Zones Report - 2023-05* *- D3 Zones Report - 2023-06*

GENERAL COMPLIANCE

Compliance assessment period	From 14th November 2022 December 2022 January 2023 February 2023 March 2023 April 2023 May 2023 June 2023
What is risk category of supply audited eg high risk? – identifies priority for verification of data. Other comments on	The water supplies of Otorohanga, Tihiroa and Kawhia would not be deemed high risk due to appropriate bacterial (including chlorination) and protozoa treatment. However, the Huirimu, Kahorekau and Taupaki, Arohena water supplies would be considered medium to high risk due to inadequate protozoa removal which is rapid sand filtration without coagulation – if coagulation was in place, the risk would be reduced. This water supply is however chlorinated which does assist in decreasing the bacterial risk but not protozoan.
Method of data provision from water supplier to DWA (DWO/Alternative electronic/paper/in person during visit – detail dates and reason for visit)	Through electronic means of sample results, raw data and monthly compliance detail for the treatment plants downloaded from the monitoring database of Water Outlook and forwarded using Excel spreadsheets. Excel spreadsheets of bacterial (FAC, *E. coli* and total coliform) for the distribution zones.
What data is audited over compliance assessment period? – Overview of: • What selection of data was chosen and why? • What parameters are audited • What timeframes will be audited	All of the six water supplies compliance monitoring data was reviewed for the time period of 14th November 2022 to June 2023. For the treatment plants the audit reviewed for each individual plant:

• Which areas of compliance were chosen for audit and why? • Which supplies were chosen to select data from? Risk based approach used to determine this <u>Within each section below is details around selection of data</u>	For Otorohanga Treatment Plant the monthly compliance reports included the daily CMP filter results (for standard coagulation / sedimentation /filtration criteria) for all four filters, the minutes in service and whether the filter met the requirement. - the daily CMP filter results (for standard coagulation/flocculation/sedimentation /filtration for all filters with parameters as number of consecutive 15 min periods where turbidity was > 0.5 NTU, % of day where turbidity was <= 0.15 NTU, number of consecutive 15 min periods where turbidity was > 0.5 NTU, % of day where turbidity was <= 0.1 NTU, number of consecutive 15 min periods where turbidity was > 0.3 NTU. of day where turbidity was < 0.3 NTU The CMP daily FACE minutes, minimum FACE, minimum chlorine contact time and disinfection turbidity, - The CMP daily of chlorination, % of day C.t value is at least 15 min.mg/L, Minutes FACe is < 0.2mg/L, Minimum T_{10} contact time, % of day where the turbidity of water leaving WTP is < 1.0 NTU, and # consecutive 15 min periods where the turbidity of water leaving WTP is > 2.0 NTU. For the other Treatment Plants, the Water Outlook monthly compliance reports (which had parameters as turbidity results, pH, FAC, *E.* coli, total coliforms). Bacterial (*E. coli,* total coliform, FAC) sample results for the distribution zone were analysed, these downloaded from Water Outlook and forwarded from ODC.

Compliance assessment based on: a. Whole compliance data set. b. Audit of selection of data records (state %) Note: this may be determined by what criteria they are trying to comply with (e.g. secure groundwater and crypto monitoring requires whole compliance data set)	For the Otorohanga Treatment Plants the monthly compliance reports were viewed, with the raw SCADA minute by minute continuous monitoring data reviewed for all months. All manual bacterial, FACE and turbidity results for the T2 Treatment Plants' compliance were reviewed viewed. For the Distribution Zones, the bacterial results were viewed via an Excel spreadsheet downloaded from Water Outlook database.

TREATMENT PLANTS

Category T1 Rule modules for compliance

Record Applicable Section of the Rules used for compliance of each water supply.	<u>Taupaki, Arohena Treatment Plant</u> *Compliance Monitoring Period = 6 Month* Compliance Section 4.4 – T1 monitoring Rules *All applicable Rules under Section 4.4 – Rule: T1.8*
What parameters and timeframe were audited and from which supplies?	compliance reports, laboratory samples were forwarded and reviewed for the D1 compliance. The time frame for the compliance audit was from November 14th 2022 to June 2023. Parameters reviewed for the D1 compliance included: - Manual turbidity samples - Bacterial samples (*E. coli* / total coliforms)
	Comments on whether compliance Rules met / not met. **<u>Taupaki, Arohena Treatment Plant</u>** <u>Actual Obtained for water leaving the Treatment Plant</u> *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *<u>Actual Obtained for water leaving the Treatment Plant:</u>* *Samples obtained every 3 months (Note: as compliance began 14th November 2022, the two months of November and December 2022 were viewed)* *E. coli and Total coliform – 1 sample* *Turbidity samples – 1 sample* *Samples obtained every 3 months (January 2023 to March 2023)* *E. coli and Total coliform – 1 sample* *Turbidity samples – 1 sample*

	Samples obtained every 3 months (April to June 2023) *E. coli and Total coliform – 1 sample* *Turbidity samples – 1 sample* Compliance monitoring Period = 6 months Therefore, Taupaki, Arohena Treatment Plant is compliant
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Water Outlook Excel Treatment Plant bacterial / turbidity results supplied by ODC.

Category T2 Rule modules for compliance

Record Applicable Section of the Rules used for compliance of each water supply.	Huirimu Treatment Plant *Compliance Monitoring Period = 1 Month* Compliance Section 4.7.1 – T2 monitoring Rules *All applicable Rules under Section 4.7.1 – Rules: T2.1, T2.2* Compliance Section 4.7.2 – T2 Filtration Rules *Rule T2.9* Compliance Section 4.7.4 – T2 Chlorine Rules *All applicable Rules under Section 4.7.4 – Rules: T2.18, T2.19, T2.20, T2.21* *Compliance Monitoring Period = 1 Month* Kahorekau Treatment Plant *Compliance Monitoring Period = 1 Month* Compliance Section 4.7.1 – T2 monitoring Rules *All applicable Rules under Section 4.7.1 – Rules: T2.1, T2.2* Compliance Section 4.7.2 – T2 Filtration Rules *Rule T2.9*

	Compliance Section 4.7.4 – T2 Chlorine Rules *All applicable Rules under Section 4.7.4 – Rules: T2.18, T2.19, T2.20, T2.21* *Compliance Monitoring Period = 1 Month* <u>Kawhia Treatment Plant</u> *Compliance Monitoring Period = 1 Month* Compliance Section 4.7.1 – T2 monitoring Rules *All applicable Rules under Section 4.7.1 – Rules: T2.1, T2.2* Compliance Section 4.7.2 – T2 Filtration Rules *Rule T2.9* Compliance Section 4.7.4 – T2 Chlorine Rules *All applicable Rules under Section 4.7.4 – Rules: T2.18, T2.19, T2.20, T2.21* *Compliance Monitoring Period = 1 Month* *Note: Section 4.14 Varying Population Rules for increased monitoring required from 26th December 2022 to 8th January 2023.* <u>Tihiroa Treatment Plant</u> *Compliance Monitoring Period = 1 Month* Compliance Section 4.7.1 – T2 monitoring Rules *All applicable Rules under Section 4.7.1 – Rules: T2.1, T2.2* Compliance Section 4.7.2 – T2 Filtration Rules *Rule T2.9* Compliance Section 4.7.4 – T2 Chlorine Rules *All applicable Rules under Section 4.7.4 – Rules: T2.18, T2.19, T2.20, T2.21* *Compliance Monitoring Period = 1 Month*

What parameters and timeframe were audited and from which supplies?	Monthly compliance reports, operator readings and laboratory samples were forwarded and reviewed for the T2 compliance. The time frame for the compliance audit was from 14th November 2022 to June 2023. Parameters reviewed for the T2 compliance included: - Manual turbidity samples - Manual FAC samples - Manual pH samples - Bacterial samples (*E. coli* / total coliforms)
DWQAR compliance Rules monitoring requirements. **Huirimu Treatment Plant** DWQAR requirements **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements	**Comments on whether compliance Rules met / not met.** **Huirimu Treatment Plant** Actual Obtained for water leaving the Treatment Plant **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 3* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met*

Minimum samples per week = 2 *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, and Rule T2.20, from November 14th 2022.* *Treatment plant is non-compliant with Rule T2.21 from November 14th 2022.*
December 2022 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**December 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples outside of required = 4* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 1* *Treatment plant is compliant with Rule T2.2, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, and Rule T2.20, for December 2022.* *Treatment plant is non-compliant with Rule T2.1, Rule T2.9 and Rule T2.21 and for December 2022.*

January 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**January 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met** *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 1* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, and Rule T2.20, for January 2023.* *Treatment plant is non-compliant with Rule T2.21 for January 2023.* *Huirimu Treatment Plant is non-compliant with Section 4 of the Water Services (Drinking Water Standards for New Zealand) Regulations 2022. This was due to an E. coli positive result on 12th January 2023.*
February 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)*	**February 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)*

DWQAR requirements *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 4* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for February 2023.* *Treatment plant is non-compliant with Rule T2.21 for February 2023.*
March 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below*	**March 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH

pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 1* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, and Rule T2.20, for March 2023.* *Treatment plant is non-compliant with Rule T2.21 for March 2023.*
April 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**April 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met*

	Number of samples exceeding 5 NTU = 0 *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for April 2023.*
May 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**May 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 2* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 1* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, and Rule T2.20 for May 2023.* *Treatment plant is non-compliant with Rule T2.9 and Rule T2.21 for May 2023.*
June 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)*	**June 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)*

DWQAR requirements *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples outside of required = 1* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20 for June 2023.* *Treatment plant is non-compliant with Rule T2.1 and Rule T2.21 for June 2023.*
Kahorekau Treatment Plant DWQAR requirements **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC)	**Kahorekau Treatment Plant** Actual Obtained for water leaving the Treatment Plant **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant:

DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 from November 14th 2022.*
December 2022 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity	**December 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity

DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for December 2022.*
January 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**January 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for January 2023.*

February 2023	**February 2023**
Compliance Monitoring Period = 1 Month *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for February 2023.*
March 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements	**March 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant:

Minimum samples per week = 2 *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *<u>Treatment plant is compliant with Rule 2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for March 2023.</u>*
<u>April 2023</u> *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *<u>DWQAR requirements</u>* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity	**<u>April 2023</u>** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *<u>Actual Obtained for water leaving the Treatment Plant:</u>* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity

DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.1, Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.20, Rule T2.21 for April 2023.*
May 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**May 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for May 2023.* *Treatment plant is non-compliant with Rule T2.1 for May 2023.*

June 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**June 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = not met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for June 2023.* *Treatment plant is non-compliant with Rule T2.1 for June 2023.*
Kawhia Treatment Plant DWQAR requirements **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)*	**Kawhia Treatment Plant** Actual Obtained for water leaving the Treatment Plant **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:*

DWQAR requirements *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 4* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, and Rule T2.20 from November 14th 2022.* *Treatment plant is non-compliant with Rule T2.1 and Rule T2.21 from November 14th 2022.*
December 2022 1st December to 25th December 2022 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2*	**December 2023** 1st December to 25th December 2022 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met*

Duration between samples = at least 2 days *FAC > 0.50 mg/L = no samples below* pH <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU* <u>Varying population rules (VP.3) required from 26th December to 31st December 2023</u> *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *<u>DWQAR requirements</u>* *Minimum samples per month = weekly* *Duration between samples = at least 4 days* Free Available Chlorine (FAC) <u>DWQAR requirements</u> *Minimum samples to be obtained = daily* *Duration between samples = 12 hours* *FAC > 0.50 mg/L = no samples below* pH <u>DWQAR requirements</u> *Minimum samples to be obtained = daily* *Duration between samples = 12 hours* Turbidity <u>DWQAR requirements</u> *Minimum samples to be obtained = daily* *Duration between samples = 12 hours* *Turbidity no samples above 5 NTU*	*Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* <u>Varying population rules (VP.3) required from 26th December to 31st December 2023</u> *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *<u>Actual Obtained for water leaving the Treatment Plant:</u>* *Samples obtained (weekly) = not met* *Minimum duration between samples = met* Free Available Chlorine (FAC) <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples obtained = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (daily) = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (daily) = met* *Minimum duration between samples = not met*

January 2023 Varying population rules (VP.3) required from 1st January to 8th January 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = weekly* *Duration between samples = at least 4 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples to be obtained = daily* *Duration between samples = 12 hours* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples to be obtained = daily* *Duration between samples = 12 hours* Turbidity DWQAR requirements *Minimum samples to be obtained = daily* *Duration between samples = 12 hours* *Turbidity no samples above 5 NTU* From 9th January to 31st January 2023 *Compliance Monitoring Period = 1 Month*	*Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for December 2022.* *Treatment plant is non-compliant with Rule T2.1 and VP.3 for December 2022.* **January 2023** Varying population rules (VP.3) required from 1st January to 8th January 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for (weekly) = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples obtained = not met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (daily) = not met* *Minimum duration between samples = met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (daily) = not met* *Minimum duration between samples = met* *Number of samples exceeding 5 NTU = 0* From 9th January to 31st January 2023 *Compliance Monitoring Period = 1 Month*

E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number) *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = not met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for January 2023.* *Treatment plant is non-compliant with Rule T2.1 and VP.3 for January 2023.*
February 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements	**February 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met*

Minimum samples per week = 2 *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for February 2023.* *Treatment plant is non-compliant with Rule T2.1 for February 2023.*
March 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements	**March 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant:

Minimum samples per week = 2 *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for March 2023.* *Treatment plant is non-compliant with Rule T2.1 for March 2023.*
April 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**April 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = not met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples =* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.20, Rule T2.21 for April 2023.* *Treatment plant is non-compliant with Rule T2.1 for April 2023.*

May 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**May 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for May 2023.* *Treatment plant is non-compliant with Rule T2.1 for May 2023.*
June 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC)	**June 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC)

DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for June 2023.* *Treatment plant is non-compliant with Rule T2.1 for June 2023.*
Tihiroa Treatment Plant DWQAR requirements **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH	**Tihiroa Treatment Plant** Actual Obtained for water leaving the Treatment Plant **From 14th November 2022** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH

DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 from November 14th 2022.* *Treatment plant is non-compliant with Rule T2.1 from November 14th 2022.*
December 2022 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2*	**December 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant:

Duration between samples = at least 2 days *Turbidity no samples above 5 NTU*	*Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for December 2022.* *Treatment plant is non-compliant with Rule T2.1 for December 2022.*
January 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**January 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 1* *Treatment plant is compliant with Rule T2.2, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for January 2023.* *Treatment plant is non-compliant with Rule T2.1 and Rule T2.9 for January 2023.*

February 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**February 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 3* *Treatment plant is compliant with Rule T2.2, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for February 2023.* *Treatment plant is non-compliant with Rule T2.1 and Rule T2.9 for February 2023.*
March 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days*	**March 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met*

Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU* **April 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements	Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for March 2023.* *Treatment plant is non-compliant with Rule T2.1 for March 2023.* **April 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant:

Minimum samples per week = 2 *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *<u>Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.20, Rule T2.21 for April 2023.</u>* *<u>Treatment plant is non-compliant with Rule T2.1 for April 2023.</u>*
<u>May 2023</u> *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *<u>DWQAR requirements</u>* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity <u>DWQAR requirements</u> *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	**<u>May 2023</u>** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *<u>Actual Obtained for water leaving the Treatment Plant:</u>* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity <u>Actual Obtained for water leaving the Treatment Plant:</u> *Minimum samples (2) per week = met* *Minimum duration between samples = not met*

June 2023 *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies– therefore treated as same number)* *DWQAR requirements* *Minimum samples per month = 1* *Duration between samples = at least 12 days* Free Available Chlorine (FAC) DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *FAC > 0.50 mg/L = no samples below* pH DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *pH ≥ 6.5 and ≤ 8 = no samples outside* Turbidity DWQAR requirements *Minimum samples per week = 2* *Duration between samples = at least 2 days* *Turbidity no samples above 5 NTU*	*Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for May 2023.* *Treatment plant is non-compliant with Rule T2.1 for May 2023.* **June 2023** *Compliance Monitoring Period = 1 Month* *E. coli and total coliform samples (each to be obtained at same frequencies – therefore treated as same number)* *Actual Obtained for water leaving the Treatment Plant:* *Samples obtained for month = met* *Minimum duration between samples = met* Free Available Chlorine (FAC) Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples below 0.5 mg/L = 0* pH Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week =* *Minimum duration between samples = not met* *met* *Number of samples outside of required = 0* Turbidity Actual Obtained for water leaving the Treatment Plant: *Minimum samples (2) per week = met* *Minimum duration between samples = not met* *Number of samples exceeding 5 NTU = 0* *Treatment plant is compliant with Rule T2.2, Rule T2.9, Rule T2.12, Rule T2.13, Rule T2.14, Rule T2.18, Rule T2.19, Rule T2.20, Rule T2.21 for June 2023.* *Treatment plant is non-compliant with Rule T2.1 for June 2023.*

Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	WaterOutlook compliance Excel spreadsheets with the applicable Treatment Plant and bacterial results data supplied by ODC. This data was analysed for the overall compliance.

Bacterial Compliance for T3 Rules

Record Applicable Section of the Rules used for compliance of each water supply.	**Otorohanga Treatment Plant** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *All applicable Rules under Section 4.10.1.1 – Rules: T3.1, T3.2, T3.3, T3.4, T3.5, T3.6* The Compliance Monitoring Period (CMP) = 1 day for all of the above rules.
What parameters and timeframe were audited and from which supplies?	Monthly compliance reports were forwarded (see above). Continuous data was also received, this to ensure consistency with the monthly compliance reports. The time frame for the compliance audit was from 14th November 2022 to June 2023. Parameters reviewed for chlorination were: - Turbidity - Continuous FACE - Retention time - Minimum C.t value - pH
Comments on whether compliance Rules met / not met and reasons.	**Otorohanga Treatment Plant** **From November 14th 2022** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *Met all of the required monitoring Rules, for all 17 days compliance.* Bacterial compliance met for all 17 days of reporting period. **December 2022** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine

	Met all of the required monitoring Rules, for all 31 days compliance. Bacterial compliance met for all 31 days of reporting period. **January 2023** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *Met all of the required monitoring Rules, for all 31 days compliance.* Bacterial compliance met for all 31 days of reporting period. **February 2023** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *Met all of the required monitoring Rules, for all 28 days compliance.* Bacterial compliance met for all 28 days of reporting period. **March 2023** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *Met all of the required monitoring Rules, for all 31 days compliance.* Bacterial compliance met for all 31 days of reporting period. **April 2023** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *Met all of the required monitoring Rules, for all 30 days compliance.* Bacterial compliance met for all 30 days of reporting period.

	May 2023 Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *<u>Met</u> all of the required monitoring Rules, for all 31 days compliance.* Bacterial compliance <u>met</u> for all 31 days of reporting period. **June 2023** Compliance Section 4.10.1.1 – T3 Bacterial Rules for Water Disinfected with Chlorine *<u>Met</u> all of the required monitoring Rules, for all 30 days compliance.* Bacterial compliance <u>met</u> for all 30 days of reporting period.
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Monthly compliance reports, raw minute by minute data was reviewed (minute by minute – for various parameters, as stated above).

<u>Protozoa Compliance for T3 Rules</u>

Record Log Credit required	Source Water Risk Assessment – 3-log allocated to the Otorohanga Treatment Plant.
List treatment processes in place to meet the DWQAR Rules – including compliance monitoring periods for those treatment processes.	**Otorohanga Treatment Plant** <u>Section 4.10.2.5</u> Coagulation, flocculation, sedimentation & filtration (CMP – 1 day).
What parameters and timeframe were audited and from which supplies? –	The compliance assessment audited the months from November 14th 2022 to June 2023. Monthly Compliance reports summaries were reviewed for each of the months. Raw minute by minute SCADA data was sought for any unusual discrepancies and supplied as part of the monthly compliance summaries spreadsheet. This Drinking Water Compliance Specialist reviewed the minute-by-minute data for that particular day of compliance data for assessment

	to ensure consistency with each individual month compliance summary and reports. This Drinking Water Compliance Specialist reviewed the minute-by-minute data for all months of the compliance reporting months. The parameters assessed are detailed below for each respective Treatment Plant. **Otorohanga Treatment Plant** Parameters assessed: - Filtration turbidity - Flow data - Any missing data
What log credits are possible for each treatment process? – Which ones achieved those log credits and why? **Total log credits achieved:** all treatment processes combined	**Otorohanga Treatment Plant** **From November 14th 2022** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 17 days. *All parameters assessed met the requirements of the DWAQR for all 17 days from November 2022 – achieved 3-log removal.* **December 2022** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 31 days. *All parameters assessed met the requirements of the DWAQR for all 31 days for December 2022 – achieved 3-log removal.* **January 2023** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 31 days.

	All parameters assessed met the requirements of the DWAQR for all 31 days of January 2023 – achieved 3-log removal. **February 2023** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 28 days. *All parameters assessed met the requirements of the DWAQR for all 28 days of February 2023 – achieved 3-log removal.* **March 2023** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 31 days. *All parameters assessed met the requirements of the DWAQR for all 31 days of March 2023 – achieved 3-log removal.* **April 2023** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 30 days. *All parameters assessed met the requirements of the DWAQR for all 30 days of April 2023 – achieved 3-log removal.* **May 2023** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 31 days.

	All parameters assessed, met the requirements of the DWAQR for all 31 days of May 2023 – achieved 3-log removal. **June 2023** Coagulation, flocculation, sedimentation & filtration – maximum 3-Log. Log credit possible – 3-log Achieved - 3-log for 30 days. *All parameters assessed met the requirements of the DWAQR for all 30 days of June 2023 – achieved 3-log removal.*
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	Monthly compliance summaries and raw data (minute by minute – for all months from the Treatment Plant) was analysed. This raw data was forwarded in the form of Excel spreadsheets. The parameters of minute-by-minute data, turbidity from each of the plants' filters, all checked for consistency and reliability.

DISTRIBUTION ZONES

Bacterial Compliance – D1 Distribution Zone Rules

Record compliance Rules used. – and compliance periods for these criterion	DWQAR – Section 4.5 (D1 Distribution System Rules) Rule D1.1: Water in the distribution system must be monitored for the determinands and at the frequencies set out in Table 11 (Are stated below for each individual zone). **Distribution Zone** **January 2023 – March 2023** *E. coli* and total coliform samples (each to be obtained at same frequencies) DWQAR requirements Minimum samples per 3 month period = 1 Actual Obtained for Zone:

	Samples obtained for 3 month period (January to March) = 9 samples Both *E. coli* and total coliforms met the requirement for the January to March 2023 period. **April 2023 – June 2023 Microbiological monitoring** *E. coli* and total coliform samples (each to be obtained at same frequencies) DWQAR requirements Minimum samples per 3 month period = 1 Actual Obtained for Zone: Samples obtained for 3 month period (April to June 2023) = 14 samples Both *E. coli* and total coliforms met the requirement for the April to June 2023 period. **Distribution Zone** **January 2023 – March 2023** *E. coli* and total coliform samples (each to be obtained at same frequencies) DWQAR requirements Minimum samples per 3 month period = 1 Actual Obtained for Zone: Samples obtained for 3 month period (January to March) = 1 sample Both *E. coli* and total coliforms met the requirement for the January to March 2023 period. **April 2023 – June 2023 Microbiological monitoring** *E. coli* and total coliform samples (each to be obtained at same frequencies) DWQAR requirements Minimum samples per 3 month period = 1 Actual Obtained for Zone: Samples obtained for 3 month period (April to June 2023) = 1 sample

	Both *E. coli* and total coliforms met the requirement for the April to June 2023 period.
Summary of results completed for inclusion in report – What parameters and timeframe were audited?	The timeframe was from January through to June 2023 to be monitored at a three month compliance period. The rule assessed was: DWQAR – Section 4.5 (D1 Distribution System Rules) Rule D1.1: Water in the distribution system must be monitored for the determinands and at the frequencies set out in Table 11 (Are stated below for each individual zone).
Comments on whether compliance Rules met / not met and reasons.	For the period of January to June 2023, the Distribution Zone met Rule D1.1, therefore was compliant. Note: as the DWQAR began on November 14th 2022, the sample period from this time was viewed and met.
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	WaterOutlook Excel spreadsheet with bacterial results obtained from ODC which were from the IANZ accredited laboratory.

Bacterial Compliance – D2 Distribution Zone Rules

Record compliance Rules used. – and compliance periods for these criterion	DWQAR – Section 4.8 (D2 Distribution System Rules) Rule D2.1: Water in the distribution system must be monitored for the determinands and at the frequencies set out in Table 15 (Are stated below for each individual zone). Rule D2.5: A FAC of at least 0.2 mg/l must be maintained in the distribution system in at least 4 of every 5 samples. No sample should be less than 0.1 mg/L. DWQAR – Section 4.14 (VP Rules for Supplies with Varying Population) Rule VP 3: when population exceeds 500 people, monitoring must be undertaken at addition frequencies (these shown below). **Mangare Rd, Arohena Distribution Zone** **From November 14th 2022 – Residual Disinfection**

	DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **From November 14th 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement from 14th November 2022.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 from 14th November 2022. **December 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = not met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None

	December 2022 – Microbiological monitoring *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for December 2022.* Distribution Zone is compliant with Rule D2.5 for December 2022. Distribution Zone is non-compliant with Rule D2.1 for December 2022. **January 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **January 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met

	Both E. coli and total coliforms met the requirement for January. Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for January 2023. **February 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **February 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for February 2023.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for February 2023. **March 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month

	Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **March 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for March 2023.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for March 2023. **April 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **April 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone:

	Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms <u>met</u> the requirement for April 2023.* <u>Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for April 2023.</u> **<u>May 2023 – Residual Disinfection</u>** <u>DWQAR requirements</u> Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **<u>May 2023 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per month = 1 Duration between samples = at least 12 days <u>Actual Obtained for Zone:</u> Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms <u>met</u> the requirement for May 2023.* <u>Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for May 2023.</u> **<u>June 2023 – Residual Disinfection</u>** <u>DWQAR requirements</u> Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none

	Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = not met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **June 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for June 2023.* Distribution Zone is compliant with Rule D2.5 for June 2023. Distribution Zone is non-compliant with Rule D2.1 for June 2023. **Aotearoa Road, Arohena Distribution Zone** **From November 14th 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **From November 14th 2022 – Microbiological monitoring**

	E. coli and total coliform samples (each to be obtained at same frequencies) DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement from 14th November 2022.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 from 14th November 2022. **December 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **December 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for December 2022.*

	Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for December 2022. **January 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **January 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for January.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for January 2023. **February 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met

	FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **<u>February 2023 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per month = 1 Duration between samples = at least 12 days <u>Actual Obtained for Zone:</u> Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms <u>met</u> the requirement for February 2023.* <u>Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for February 2023.</u> **<u>March 2023 – Residual Disinfection</u>** <u>DWQAR requirements</u> Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **<u>March 2023 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per month = 1 Duration between samples = at least 12 days <u>Actual Obtained for Zone:</u> Samples obtained for month = met Duration between samples = met

	Both E. coli and total coliforms met the requirement for March 2023. Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for March 2023. **April 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **April 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for April 2023.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for April 2023. **May 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month

	Actual Obtained for Zone: Minimum samples (2) per week = not met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **May 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for May 2023.* Distribution Zone is compliant with Rule D2.5 for May 2023. Distribution Zone is non-compliant with Rule D2.1 for May 2023. **June 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = not met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **June 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days

	Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for June 2023.* Distribution Zone is compliant with Rule D2.5 for June 2023. Distribution Zone is non-compliant with Rule D2.1 for June 2023. **Kawhia Township Distribution Zone** **From November 14th 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **From November 14th 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement from 14th November 2022.* Distribution Zone is compliant with Rule D2.5 from 14th November 2022.

	Distribution Zone is non-compliant with Rule D2.1 from 14th November 2022. **December 2022 – Residual Disinfection** *(1st December 2022 to 25th December 2022)* DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **December 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for 1st December 2022 to the 26th December 2022.* **December 2022 – Residual Disinfection** *(26th December 2022 to 31st December 2022)* Varying population rules in place DWQAR requirements Minimum samples = daily Duration between samples = at least 12 hours FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Actual Obtained for Zone: Minimum sampling is daily = not met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L

	FAC < 0.1 = None **<u>December 2022 – Microbiological monitoring</u>** *(26th December 2022 to 31st December 2022)* <u>Varying population rules in place</u> *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples = weekly Duration between samples = at least 4 days <u>Actual Obtained for Zone:</u> Samples obtained for VP period = met Duration between samples = met *Both E. coli and total coliforms <u>met</u> the requirement for the 26th December 2022 to 31st December 2022 period.* <u>Distribution Zone is compliant with Rule D2.5 for December 2023.</u> <u>Distribution Zone is non-compliant with Rule D2.1, and VP.3 for December 2023.</u> **<u>January 2023 – Residual Disinfection</u>** *(1st January 2023 to 8th January 2023)* <u>Varying population rules in place</u> <u>DWQAR requirements</u> Minimum samples = daily Duration between samples = at least 12 hours FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Minimum sampling is daily = not met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **<u>January 2023 – Microbiological monitoring</u>** *(1st January 2023 to 8th January 2023)* <u>Varying population rules in place</u> *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u>

	Minimum samples = weekly Duration between samples = at least 4 days <u>Actual Obtained for Zone:</u> Samples obtained for VP period = met Duration between samples = met *Both E. coli and total coliforms <u>met</u> the requirement for 1st January 2023 to 8th January 2023).* **<u>January 2023 – Residual Disinfection</u>** *(9th January 2023 to 31st January 2023)* <u>DWQAR requirements</u> Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **<u>January 2023 – Microbiological monitoring</u>** *(9th January 2023 to 31st January 2023)* *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per month = 1 Duration between samples = at least 12 days <u>Actual Obtained for Zone:</u> Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms <u>met</u> the requirement for 9th January 2023 to 31st January 2023.* <u>Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for January 2023.</u> <u>Distribution Zone is non-compliant with VP.3 for January 2023.</u>

	February 2023 – Residual Disinfection DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **February 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for February 2023.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for February 2023. Distribution Zone is non-compliant with Rule D2.1 for February 2023. **March 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met

	FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **March 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for March 2023.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for March 2023. **April 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **April 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met

	Both E. coli and total coliforms met the requirement for April 2023. Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for April 2023. **May 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **May 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for May 2023.* Distribution Zone is compliant with Rule D2.5 for May 2023. Distribution Zone is non-compliant with Rule D2.1 for May 2023. **June 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none

	Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **June 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for June 2023.* Distribution Zone is compliant with Rule D2.5 for June 2023. Distribution Zone is non-compliant with Rule D2.1 for June 2023. **Tihiroa Distribution Zone** **From November 14th 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **From November 14th 2022 – Microbiological monitoring**

	E. coli and total coliform samples (each to be obtained at same frequencies) DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement from 14th November 2022.* Distribution Zone is compliant with Rule D2.5 from 14th November 2022. Distribution Zone is non-compliant with Rule D2.1 from 14th November 2022. **December 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **December 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for December 2022.*

	Distribution Zone is compliant Rule D2.5 for December 2022. Distribution Zone is non-compliant with Rule D2.1 for December 2022. **January 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **January 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for January.* Distribution Zone is compliant with Rule D2.5 for January 2023. Distribution Zone is non-compliant with Rule D2.1 for January 2023. **February 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less

	FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **February 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for February 2023.* Distribution Zone is compliant with Rule D2.5 for February 2023. Distribution Zone is non-compliant with Rule D2.1 for February 2023. **March 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None

	March 2023 – Microbiological monitoring *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for March 2023.* Distribution Zone is compliant with Rule D2.1 and Rule D2.5 for March 2023. Distribution Zone is non-compliant with Rule D2.1 for March 2023. **April 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **April 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met

	Both E. coli and total coliforms met the requirement for April 2023. Distribution Zone is compliant with Rule D2.5 for April 2023. Distribution Zone is non-compliant with Rule D2.1 for April 2023. **May 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **May 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for May 2023.* Distribution Zone is compliant with Rule D2.5 for May 2023. Distribution Zone is non-compliant with Rule D2.1 for May 2023. **June 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 2 Duration between samples = at least 2 days FAC > 0.20 = no more than 1 sample out of 5 less FAC <0.1 = none

	Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (2) per week = met Minimum duration between samples = not met FAC > 0.20 = Yes all above 0.2 mg/L FAC < 0.1 = None **June 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per month = 1 Duration between samples = at least 12 days Actual Obtained for Zone: Samples obtained for month = met Duration between samples = met *Both E. coli and total coliforms met the requirement for June 2023.* Distribution Zone is compliant with Rule D2.5 for June 2023. Distribution Zone is non-compliant with Rule D2.1 for June 2023.
Summary of results completed for inclusion in report – What parameters and timeframe were audited?	The timeframe was from November 14th 2022 through to June 2023 for monthly compliance of the Distribution Zones. The rules assessed were: DWQAR – Section 4.8 (D2 Distribution System Rules) – Rule D2.1: Water in the distribution system must be monitored for the determinands and at the frequencies set out in Table 15 (Are stated below for each individual zone). Rule D2.5: A FAC of at least 0.2 mg/l must be maintained in the distribution system in at least 4 of every 5 samples. No sample should be less than 0.1 mg/L. DWQAR – Section 4.14 (VP Rules for Supplies with Varying Population)

	(For Kawhia Distribution Zone – between 26th December 2022 and 8th January 2023). Rule VP 3: when population exceeds 500 people, monitoring must be undertaken at addition frequencies (these shown below).
Comments on whether compliance Rules met / not met and reasons.	For the period from 14th November 2022 to June 2023 Mangare Rd, Arohena (ARO001MA) Distribution met the D2.1 Residual disinfection monitoring for full Distribution Zone compliance in November 2022, January 2023, February 2023, March 2023, April 2023 and May 2023. Aotearoa Road, Arohena (ARO001AO) met the requirements from November 14th 2023, through to April 2023. Kawhia Township (KAW001KA) was complaint in March 2023 and April 2023, while Tihiroa (TIH001TI) was unable to achieve full compliance at all throughout the compliance periods. For the period from November 14th 2022 all of the four Distribution Zones met the D2.1 Microbiological Monitoring in all of the months. The Distribution Zones also met Rule D2.5 for all of the months from November 14th 2022 to June 2023.
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	WaterOutlook Excel spreadsheet with the raw results obtained from ODC. The results were then for each zone and month individually assessed for compliance.

<u>Bacterial Compliance – D3 Distribution Zone Rules</u>

Record compliance Rules used. – and compliance periods for these criterion	<u>DWQAR – Section 4.11.4 (D3 Residual Disinfection)</u> Rule D3.19: A FAC of at least 0.2 mg/L must be maintained in 85% of samples (or 85% of the time if continuously monitored). Up to 15% of samples (or 15% of the time if continuously monitored) may have a FAC of less than 0.2 mg/L but must be greater than 0.1 mg/L. Rule D3.20: Samples must be collected for FAC at the frequencies outlined in table 35 (Are stated below for each individual zone). <u>DWQAR – Section 4.11.5 (D3 Microbiological Monitoring Rules)</u>

	Rule D3.29: *E. coli* and total coliforms must be monitored in each zone of the distribution system according to the frequencies set out in Table 39. **Otorohanga Distribution Zone** **From November 14th 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **From November 14th 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement* from 14th November 2022. Distribution Zone is compliant with Rule D3.19, Rule D3.20 and Rule D3.29 from 14th November 2022. **December 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3

	Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **<u>December 2022 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 <u>Actual Obtained for Zone:</u> Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms <u>met</u> the requirement for December 2022.* <u>Distribution Zone is compliant with Rule D3.19, Rule D3.20 and Rule D3.29 for December 2022.</u> **<u>January 2023 – Residual Disinfection</u>** <u>DWQAR requirements</u> Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (3) per week = not met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L

	FAC <0.1 = None **<u>January 2023 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 <u>Actual Obtained for Zone:</u> Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms <u>met</u> the requirement for January.* <u>Distribution Zone is compliant with Rule D3.19, and Rule D3.29 for January 2023.</u> <u>Distribution Zone is non-compliant with Rule D3.20 for January 2023.</u> **<u>February 2023 – Residual Disinfection</u>** <u>DWQAR requirements</u> Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **<u>February 2023 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per week = 1 Maximum interval between samples = 9

	Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for February 2023.* Distribution Zone is compliant with Rules D3.19, Rule D3.20 and D3.29 for February 2023. **March 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = not met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **March 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for March 2023.* Distribution Zone is compliant with Rules D3.19, and D3.29 for March 2023.

	Distribution Zone is non-compliant with Rule D3.20 for March 2023. **April 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = not met Maximum interval between samples (4) per week = not met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **April 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for April 2023.* Distribution Zone is compliant with Rules D3.19, and D3.29 for April 2023. Distribution Zone is non-compliant with Rule D3.20 for April 2023. **May 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15%

	FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **<u>May 2023 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 <u>Actual Obtained for Zone:</u> Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for May 2023.* <u>Distribution Zone is compliant with Rules D3.19, Rule D3.20 and D3.29 for May 2023.</u> **<u>June 2023 – Residual Disinfection</u>** <u>DWQAR requirements</u> Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None

	June 2023 – Microbiological monitoring *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for June 2023.* Distribution Zone is compliant with Rules D3.19, Rule D3.20 and D3.29 for June 2023. **Waipa Distribution Zone** **From November 14th 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **From November 14th 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5

	Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement* from 14th November 2022. Distribution Zone is compliant with Rule D3.19, Rule D3.20 and Rule D3.29 from 14th November 2022. **December 2022 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = 1 sample **December 2022 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for December 2022.* Distribution Zone is compliant with Rule D3.20 and Rule D3.29 for December 2022.

	Distribution Zone is non-compliant with Rule D3.19 for December 2022. **January 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = not met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **January 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for January.* Distribution Zone is compliant with Rule D3.19, and Rule D3.29 for January 2023. Distribution Zone is non-compliant with Rule D3.20 for January 2023. **February 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15%

	FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **<u>February 2023 – Microbiological monitoring</u>** *E. coli and total coliform samples (each to be obtained at same frequencies)* <u>DWQAR requirements</u> Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 <u>Actual Obtained for Zone:</u> Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for February 2023.* <u>Distribution Zone is compliant with Rules D3.19, Rule D3.20 and D3.29 for February 2023.</u> **<u>March 2023 – Residual Disinfection</u>** <u>DWQAR requirements</u> Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month <u>Actual Obtained for Zone:</u> Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None

	March 2023 – Microbiological monitoring *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for March 2023.* Distribution Zone is compliant with Rules D3.19, Rule D3.20 and D3.29 for March 2023. **April 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = not met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **April 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met

	Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for April 2023.* Distribution Zone is compliant with Rules D3.19, and D3.29 for April 2023. Distribution Zone is non-compliant with Rule D3.20 for April 2023. **May 2023 – Residual Disinfection** DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **May 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for May 2023.* Distribution Zone is compliant with Rules D3.19, Rule D3.20 and D3.29 for May 2023.

	June 2023 – Residual Disinfection DWQAR requirements Minimum samples per week = 3 Maximum interval between samples = 4 Minimum days of week to be used = 5 FAC > 0.20 = no more than 15% FAC <0.1 = none Compliance Monitoring Period = 1 Month Actual Obtained for Zone: Minimum samples (3) per week = met Maximum interval between samples (4) per week = met Minimum days of week used (5) = met FAC > 0.20 = Yes all above 0.2 mg/L FAC <0.1 = None **June 2023 – Microbiological monitoring** *E. coli and total coliform samples (each to be obtained at same frequencies)* DWQAR requirements Minimum samples per week = 1 Maximum interval between samples = 9 Minimum days of week to be used = 5 Actual Obtained for Zone: Minimum samples (1) per week = met Maximum interval between samples (9) per week = met Minimum days of week used (5) = met *Both E. coli and total coliforms met the requirement for June 2023.* Distribution Zone is compliant with Rules D3.19, Rule D3.20 and D3.29 for June 2023.
Summary of results completed for inclusion in report – What parameters and timeframe were audited?	The timeframe was from November 14th 2022 through to June 2023 for monthly compliance of the two Distribution Zones of Otorohanga and Waipa. The rules assessed were: DWQAR – Section 4.11.4 (D3 Residual Disinfection) - Rule D3.19 (FAC concentration) and D3.20 (Residual Disinfection frequencies)

	DWQAR - Section 4.11.5 (D3 Microbiological Monitoring) - Rule D3.29 (*E. coli* and total coliform monitoring frequencies) for the months from November 14th 2022 to June 2023.
Comments on whether compliance Rules met / not met and reasons.	Overall summary of compliance findings shown below. Otorohanga Distribution Zone met the DWQAR – Section 4.11.4 (D3 Residual Disinfection) - Rule D3.19 (FAC concentration), D3.20 (Residual Disinfection frequencies) for the months from 14th November 2022, December 2022, February, May and June 2023. For January, March and April three samples were not obtained in the week throughout these months, meaning Otorohanga Distribution Zone did not meet Rule D3.20 throughout these months. Waipa Distribution Zone met the DWQAR – Section 4.11.4 (D3 Residual Disinfection) - Rule D3.19 (FAC concentration), D3.20 (Residual Disinfection frequencies) for the months from 14th November 2022, February, March, May and June 2023. In December 2022 a low FAC sample was obtained (0.05 mg/L) meaning the zone did not meet Rule D3.19. For January, and April three samples were not obtained in the week throughout these months, meaning Waipa Distribution Zone did not meet Rule D3.20 throughout these months. Both the Otorohanga and Waipa Distribution Zones met the DWQAR - Section 4.11.5 (D3 Microbiological Monitoring) - Rule D3.29 (*E. coli* and total coliform monitoring frequencies) from 14th November 2022 to June 2023.
Method of determining compliance eg checked all raw data, used excel to graph data, other method – where is this data recorded?	WaterOutlook Excel spreadsheet with raw results obtained from ODC and their IANZ accredited laboratory. The results were then for each zone and month individually assessed for compliance.

DATA AUDIT

Does the audited data align with monthly compliance?	Overall, I am confident that the data aligned and that there were no concerns.
If data doesn't align, what action is to be taken	N/A
Supplier informed of data audit result within 20 days?	Yes, the water supplier will be informed within 20 days.

Report

Arohena and Tihiroa Schemes Water Treatment Plants Protozoa Assessment

Prepared for Otorohanga District Council

By CH2M Beca Limited

29 June 2017

Revision History

Revision Nº	Prepared By	Description	Date
A	Dean Van Ingen	Draft	May 2017
B	Dean Van Ingen	Final	June 2017

Document Acceptance

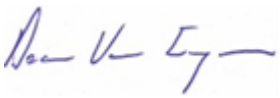
Action	Name	Signed	Date
Prepared by	Dean Van Ingen		29/6/2017
Reviewed by	Andrew Watson		29/6/2017
Approved by	Shaun Hodson		29/6/2017
on behalf of	CH2M Beca Limited		

Table of Contents

Appendices

1 Introduction

1.1 Background

Otorohanga District Council (ODC) has commissioned CH2M Beca Ltd (Beca) to undertake a Protozoa Assessment for the Kahorekau, Huirimu, Taupaki and Tihiroa water sources and treatment plants within the Arohena and Tihiroa water supply schemes.

The supply designations and populations served are as follows.

Table 1: Designations and Populations Served

Component	Code	Name	Population
Community	ARO001	Arohena	260
Supply Category		Networked Supply	
Zone	ARO001AO	Aotearoa Road, Arohena	120
Plant	TP00690	Kahorekau	
Source	S00411	Mangakomua Stream, Arohena	
Zone	ARO001AR	Arohena	20
Plant	TP00691	Taupaki, Arohena	
Source	S00412	Mangare Stream, Arohena	
Zone	ARO001MA	Mangare Road, Arohena	120
Plant	TP00689	Huirimu	
Source	S00410	Makomako Stream, Arohena	
Component	**Code**	**Name**	**Population**
Community	TIH001	Tihiroa	400
Supply Category		Networked Supply	
Zone	TIH001TI	Tihiroa	400
Plant	TP00686	Tihiroa	
Source	S00407	Waipa River at Tihiroa	

1.2 Purpose

The purpose of the assessment is to perform a high level review of source protozoa log credit levels, and to determine what log credit compliance the existing treatment processes are achieving in accordance with the Drinking Water Standards for New Zealand 2005 (Revised 2008) (DWSNZ) requirements.

The results of the assessment will confirm the log removal requirement for the source waters, and whether upgrades to existing treatment processes are required.

Where required, improvements to the treatment operation and processes will be proposed including high level cost estimates.

1.3 Information Evaluated

In conducting the assessment, the following information was evaluated:

- Nature of source
- Land use in the catchment area
- Sources of contaminants and discharges within the catchment
- Historic monitoring data
- Treatment plant infrastructure
- Operational practices

2 Information Sources

Information was obtained from the following:

- Otorohanga District Council (ODC) staff
- Site visits
- Catchment maps
- Water supply area maps
- Treatment plant process diagrams, SCADA screen grabs, and pictures
- Water quality and quantity records held by Otorohanga District Council
- Water take consents
- District Health Board log credit requirement reports
- Identified improvements list
- Drinking Water for New Zealand website

3 Water Supply Scheme Overviews

3.1 Arohena

Kahorekau, Huirimu and Taupaki treatment plants contribute to serve the Arohena water supply scheme. The treatment plants and their respective distribution networks do not have interconnectivity.

Kahorekau plant, situated off Kahorekau Road - Wharepapa South, draws from the Mangakomua Stream. The gravity fed plant uses two stage treatment including rapid granular media filtration and residual disinfection using chlorine gas. The treated water is gravity fed to the network, and pumped to the treated water reservoirs.

Huirimu plant, situated off Huirimu Road - Wharepapa South, draws from the Makomako Stream. The plant uses two stage treatment including rapid granular media filtration and residual disinfection using chlorine gas. The raw water is pumped from the intake through the filter up to the treatment plant contact tank, where it is disinfected. The treated water is pumped from the contact tank to the reservoir from where it gravitates to the supply area.

Taupaki plant, situated off Waipapa Road – Wharepapa South, draws from the Mangare Stream. The gravity fed plant uses two stage treatment including rapid granular media filtration and soon to be commissioned residual disinfection using chlorine gas. The treated water is pumped to the treated water reservoirs.

3.2 Tihiroa

The Tihiroa water treatment plant is the sole supply for the Tihiroa water supply scheme.

Tihiroa plant, situated off Te Kawa Road – Tihiroa, draws from the Waipa River. The plant provides multi-stage treatment consisting of coagulation, sedimentation, rapid granular media filtration, and disinfection using chlorine gas. Treated water is pumped from the treatment site clear water tank to the network and Tihiroa Reservoir, from where it gravitates to the scheme.

4 Treatment Plants Final Water Quality

In the absence of protozoa monitoring and continuous online monitoring, results of grab sample tests for turbidity undertaken at the supplies during 2014 to 2017 were used to determine the protozoa treatment performance characteristics of the plants. Treated water turbidity, leaving the treatment plants, recorded during the monitoring period is summarised in Table 2.

Table 2: Treated Water Turbidity (NTU) Monitoring Data 2014 to 2017

Plant	Number of Samples	Minimum NTU	Average NTU	Maximum NTU
Kahorekau	252	0.6	2.2	10.8
Huirimu	230	0.7	3.2	38.5
Taupaki	128	0.25	2.0	7.2
Tihiroa	210	0.1	1.4	88.2

Table 5.2 of the DWSNZ provides the range of treatment technologies that can be used to achieve protozoal compliance, and the combinations of treatment processes for which log credits can be added. This table and the supporting document have been used to determine the protozoa treatment capabilities of the above treatment plants.

Kahorekau, Huirimu and Taupaki plants use rapid granular media filtration without coagulation for protozoa removal, which is a process that does not achieve any log credits.

The Tihiroa plant uses coagulation, sedimentation and filtration processes for protozoa removal, which theoretically can achieve 3.0 log credits (+1.0 log credit for enhanced individual filter performance). Proof of process effectiveness is required to achieve the potential log credits through continuous treated water turbidity monitoring. For 3.0 log credits each filter, while online, turbidity criteria cannot exceed:

1. 0.3 NTU for more than 5 % of monitoring period “Month” (DWSNZ 5.4.1.1d.i.A)
2. 0.5 NTU for more than 1 % of monitoring period “Month” (DWSNZ 5.4.1.1d.i.B)
3. 1.0 NTU for any 3 minute period (DWSNZ 5.4.1.1d.i.C)

For an additional 1.0 log credits for enhanced individual filter performance each filter, while online, turbidity criteria cannot exceed:

A. 0.1 NTU for more than 5 % of monitoring period “Month” (DWSNZ 5.8.1.2.a)

B. 0.3 NTU for more than 1 % of monitoring period “Month” (DWSNZ 5.8.1.2.b)

C. 0.5 NTU for any 3 minute period (DWSNZ 5.8.1.2.c)

Tihiroa does not have continuous final water turbidity monitoring, which means that it cannot prove the effectiveness of its protozoa treatment processes. To determine an understanding of how effective the treatment processes are at each of the sites, an evaluation of the final water turbidity results in Table 2 were compared against Criteria 1 to 3 above. The results are provided in Table 3 below.

Table 3: Treated Water Turbidity Compliance Results

Plant	Number of Samples	Samples >0.3 NTU	Samples >0.5 NTU	Samples >1.0 NTU
Kahorekau	252	100%	100%	96%
Huirimu	230	100%	100%	93%
Taupaki	128	99%	95%	80%
Tihiroa	210	96%	87%	41%

The sample test results show that the treatment plants are ineffective at achieving protozoa compliance.

5 Treatment Plant Observations

ODC operators generally visit each plant 1 to 2 times per week to undertake basic operations and maintenance functions.

ODC treatment plants are generally run irrespective of raw water conditions in order to meet supply demand.

No online turbidity monitoring is fitted with the exception of Tihiroa which monitors raw water turbidity.

Filter condition and performance characteristics at the ODC sites are difficult to ascertain due to their enclosed pressure vessel design, and the absence of continuous turbidity monitoring instrumentation.

Site visits were undertaken by Beca, in attendance with ODC operations and management staff in order to understand how the processes are currently performing and how they are run. A summary of observations is detailed below.

5.1 Kahorekau

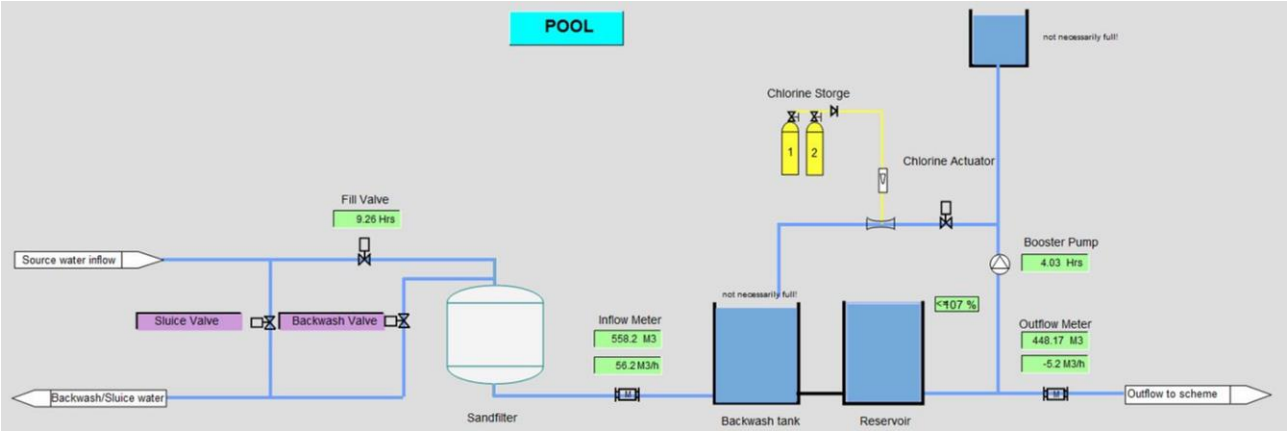


Figure 1: Kahorekau Process Diagram

The plant starts and stops based upon the backwash tank control set points. Raw water gravitates through the steel pressure filter until such time that the tank calls the filter to stop or a filter backwash is required.

Filter backwashes (no air scour facility) are triggered based on operator setpoints for frequency and duration, and backwash water is supplied from the backwash tank. The backwash control setpoints are set based on the operators' evaluation of the raw water condition, plant throughput, reservoir level, and filter performance. The water used for backwashing is chlorinated.

Figure 2: Kahorekau Filter

During periods when the raw water quality is poor, the operators can remotely trigger a raw water main (Bush Line) flush. This flush is used to remove settled debris or replace poor quality water in the raw water main prior to the filter with better quality water. During this flush, the filter does not run. A significant volume of pumice type material was noted beside the filter (not shown in above figure). This material was present in the raw water, during the last heavy rain event, and had been

removed from the filter by the operators. Since the removal of the pumice, the operator commented that the quality of the filtered water had diminished.

Filter maintenance is not known to have occurred in the last seven years, and the type of filter media is not known.

Telemetry is fitted to this site.

Table 4: Kahorekau Water Take Figures

Resource Consent Conditions			Actual Take	
Maximum	**Maximum**	**Maximum during low flow conditions**	**Minimum**	**Average**
985 m^3/24hrs	11.4 l/s	1,674.5 m^3/48hrs	300 m^3/day	832 m^3/day*

*Maximum demand could exceed maximum water take if not monitored and managed accordingly.

5.2 Huirimu

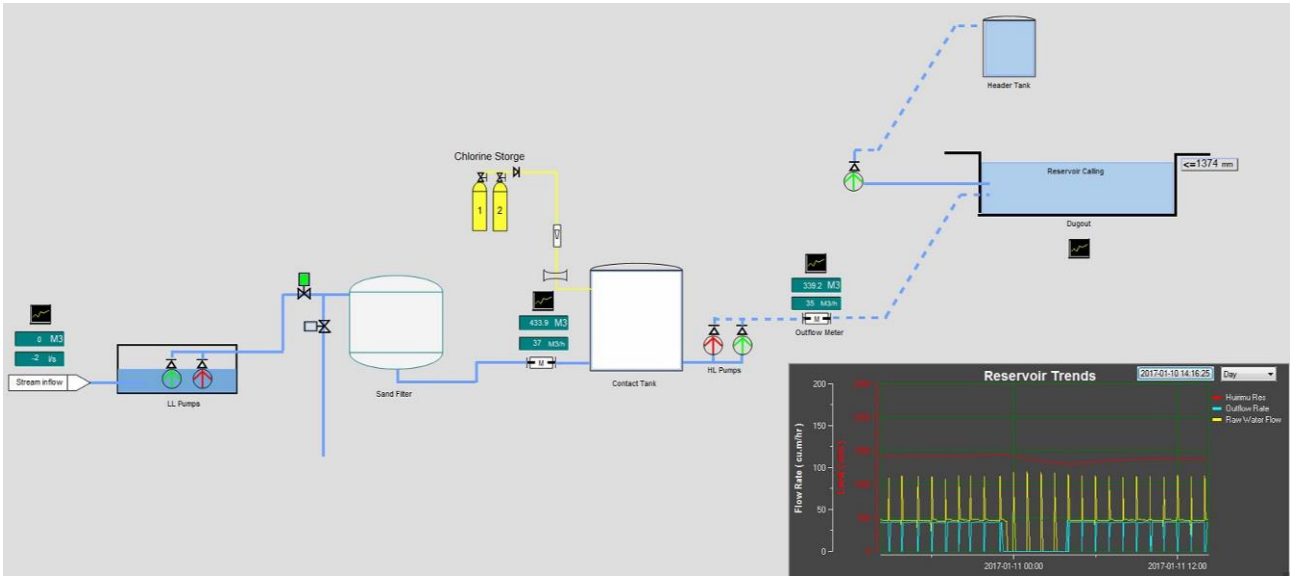


Figure 3: Huirimu Process Diagram

The plant starts and stops based upon the contact tank control set points. Raw water is pumped through the steel pressure filter until such time that the tank calls the filter to stop or a filter backwash is required.

Filter backwashes (no air scour facility) are triggered based on operator setpoints for frequency and duration, and backwash water is supplied from the contact tank. The backwash control setpoints are set based on the operators' evaluation of the raw water condition, plant throughput, reservoir level, and filter performance. The water used for backwashing is chlorinated.

Figure 4: Huirimu Filter

Filter media was replaced 6 to 7 months ago. The size and quantity of media used could not be verified. No work was undertaken on the filter floor, underdrains or nozzles at that time.

The ODC operator commented that the filter backwash rate was believed to be too low, and that an option to use treated water from the Dugout Reservoir was being considered because of the additional head it would provide.

Telemetry is fitted to this site.

Table 5: Huirimu Water Take Figures

Resource Consent Conditions			Actual Take	
Maximum	**Maximum**	**Maximum during low flow conditions**	**Minimum**	**Average**
925 m^3/24hrs	10.7 l/s	1,572.5 m^3/48hrs	300 m^3/day	705 m^3/day*

*Maximum demand could exceed maximum water take if not monitored and managed accordingly.

5.3 Taupaki

The plant starts and stops based upon the treated water reservoir control set points. Raw water gravitates through the fibreglass pressure filter until such time that the reservoir calls the filter to stop or a filter backwash is required.

Filter backwashes (no air scour facility) are triggered based on operator setpoints for frequency and duration, and backwash water is supplied from the treated water reservoir. The backwash control setpoints are set based on the operators' evaluation of the raw water condition, plant throughput, reservoir level, and filter performance. The water used for backwashing at the time of site visit was not chlorinated but a chlorine gas installation was in progress.

Figure 5: Taupaki Filter

The pressure filter was replaced approximately two years ago. The size and quantity of media used could not be verified.

If the plant is running when a power failure occurs, the plant will continue to filter water but it is unlikely that disinfection will continue due to the absence of power to the control solenoid. The plant will not start during the absence of power.

A private farm supply pump is fitted within the treatment plant shed. The pump draws water from the stream, and supplies the farm without any form of treatment. The private supply has been used to supplement the Council provided supply in emergency situations, although a permanent connection is not fitted.

Telemetry was not present at the time of site visit but installation was in progress.

It should be noted that until recently Council was of the understanding that this was purely for stock supply, but since learning that some water is being used for human consumption Council has initiated improvements.

Table 6: Taupaki Water Take Figures

Resource Consent Conditions			Actual Take	
Maximum	**Maximum**	**Maximum during low flow conditions**	**Minimum**	**Average**
150 m^3/24hrs	1.7 l/s	255 m^3/48hrs	30 m^3/day	131 m^3/day*

*Maximum demand could exceed maximum water take if not monitored and managed accordingly.

5.4 Tihiroa

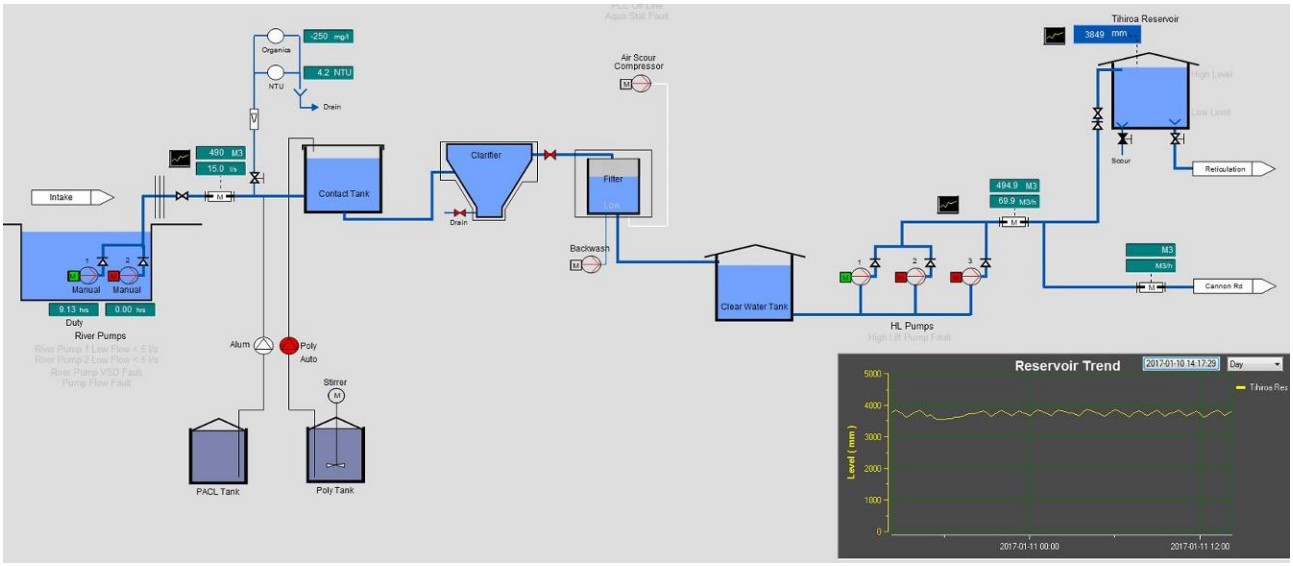


Figure 6: Tihiroa Process Diagram

The plant starts and stops based upon the clear water tank control set points. Raw water is pumped to the contact tank.

Alum is dosed neat into the raw water main prior to the contact tank, with dose being automatically adjusted flow proportional. No form of mechanical or static mixing is fitted.

Poly is dosed into the top of the contact tank as the water spills into the clarifier. The poly solution is mixed on site, with dose being automatically adjusted flow proportional. The poly solution strength can vary due to: the absence Standard Operating Procedures for mixing; mixing only occurring while the operator is on site to turn the mixer on / off; and new batches being made up in the day tank from which the poly is being drawn by the dose pump.

Refinement of alum and poly doses is based upon operator experience and understanding of the plant processes, rather than testing. The TOC (organics) control function shown in the process diagram above is not working, and is reported to have caused issues when it was running.

The plant was not running during the visit so assessment of the floc blanket was not possible. Clarifier sludge is drawn via a pipe which sits near the bottom of the clarifier. The frequency and duration of sludge removal is based upon the operator's visual clarifier performance assessment. The clarifier is not fitted with a sludge cone.

Leakage from the clarifier liner was noted but is not a contributing factor to the clarifier performance. Launder maintenance, to ensure launders are level and clear of vegetation, is difficult due to the fitted roof only having two access points.

Clarified water is filtered through an Automatic Valveless Gravity (AVG) filter. Filter backwashes (no air scour facility as shown in the above process diagram) are triggered based on filter headloss, and gravity fed backwash water (no backwash pump present as shown in the above process diagram) is supplied from the tank above the filter containing clarified water. The backwash control setpoints are not adjustable. The water used for backwashing is not chlorinated.

It is not known when the filter media was last changed or what type of media was installed. The filter has historically experienced mud balling and binding problems, but this is reported to have been largely addressed. The filter is reported to experience faults during the backwash process which leaves the filter in a permanent state of backwash or overflow. There is no remote monitoring of the filter.

Figure 7: Tihiroa Contact Tank, Clarifier and Filter

Table 7: Tihiroa Water Take Figures

Resource Consent Conditions			Actual Take	
Maximum	**Maximum**	**Maximum during low flow conditions**	**Minimum**	**Average**
1,500 m^3/24hrs	24 l/s	2,750 m^3/48hrs	400 m^3/day	793 m^3/day*

*Maximum demand could exceed maximum water take if not monitored and managed accordingly.

6 Treatment Plant Performance Summary and Requirements

The information observed and collated so far presents an overview of the current plants protozoa treatment capabilities, performance and requirements as tabled below.

Table 8: Log-Credit Removal for Treatment Plants

Plant	Credits Potentially Achievable Using Existing Fitted Processes	Credits Reliably Achieved	Credits Required by DHB
Kahorekau	0-log	0-log	Unknown*
Huirimu	0-log	0-log	4-log
Taupaki	0-log	0-log	3-log
Tihiroa	3-log	0-log	Unknown*

*The District Health Board (DHB) have not allocated log credits to the sources for Kahorekau and Tihiroa as ODC have not submitted catchment assessments from which to base this.

The catchments assessments used by the DHB to determine source log credit treatment requirements for Huirimu and Taupaki were undertaken in 2012, and are due for review in 2017. For the purpose of this report a high level review of all the catchments was undertaken to provide a basis from which to determine the log credits required, and any treatment plant improvements.

6.1 Huirimu and Taupaki Catchment Assessments

The Huirimu (Arohena) Water Supply Catchment Survey 2012 report, identifies that the source surface water is derived from largely pastoral catchment that always has low concentrations of cattle, sheep, horses or humans in immediate vicinity or upstream of the intake which aligns with the DWSNZ catchment risk categorisation description for 4 log credits. There have been no notable changes (land practices or development) to the Huirimu catchment characteristics identified by Council, and the assessment of 4 log treatment requirement (as defined in DWSNZ, Table 5.a) is appropriate.

An alternative to this assessment is to undertake Cryptosporidium monitoring, consisting of at least 26 samples over a 12 month period and costing in the order of $20,000. The results of which may determine the source water to be 3 log credits. The benefit of this approach, if successful, is reduced capital outlay for treatment plant upgrades. Verification of this designation can be achieved every 5 years thereafter through a comprehensive catchment risk assessment, for which Beca has recently completed for Waipa District Council.

The Taupaki (Arohena) Water Supply Catchment Survey 2012 report, identifies that the source surface water is derived from largely forest, bush, or scrub catchment in immediate vicinity or upstream of the intake which aligns with the DWSNZ catchment risk categorisation description for 3 log credits. There have been no notable changes (land practices or development) to the Taupaki catchment characteristics identified by Council, and the assessment of 3 log treatment requirement (as defined in DWSNZ, Table 5.a) is appropriate.

6.2 Kahorekau Catchment Assessment

The land use topographic map below shows the area of the catchment and the land use within that area.

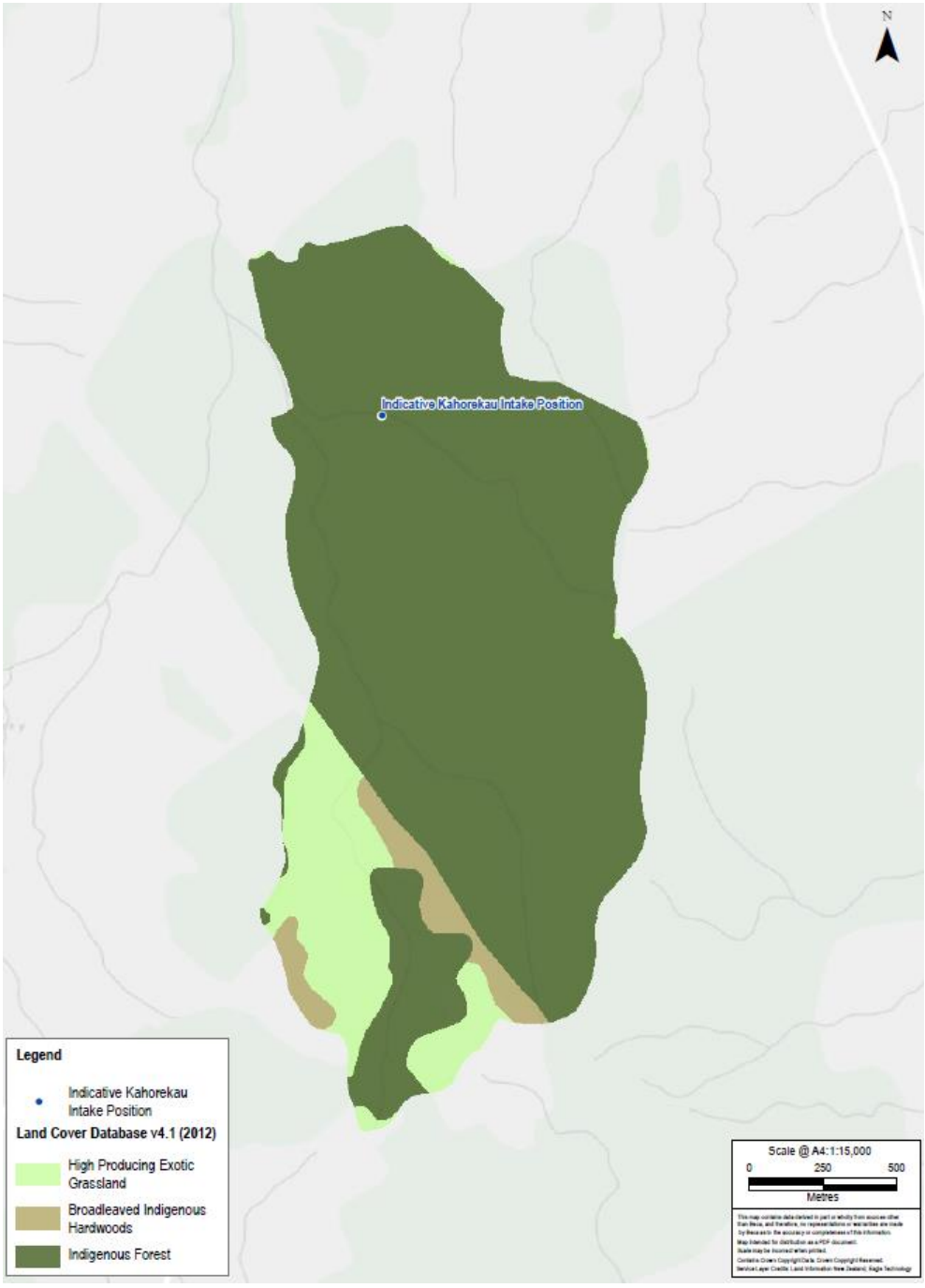


Figure 8: Kahorekau Catchment Use Topographical Map

The land use map above indicates that the catchment area is approximately 297 ha, consisting predominantly of native bush (88%), and a small proportion of upland pasture (12%).

There are no wastewater discharges, septic tanks, dairy effluent ponds or any other facilities or discharges associated with farming within the catchment. There may be feral animals such as goats, possums and possibly pigs within the catchment although the latter may be unlikely due to the relatively small area of the native bush. It is likely that feral animals would be reduced through local hunting in this relatively small native bush area.

The indications from the topographic and land use maps indicates that the catchment is native bush without an influence of agricultural activity and that the risk of microbial contamination is low.

Based on the above analysis the most appropriate protozoal risk category for the Kahorekau source water is:

- Water from forests, bush, scrub or tussock catchments with no agricultural activity

This category requires a log credit of 3 to reduce the risk of microbial contamination.

6.3 Tihiroa Catchment Assessment

The land use topographic map below shows the area of the catchment and the land use within that area.

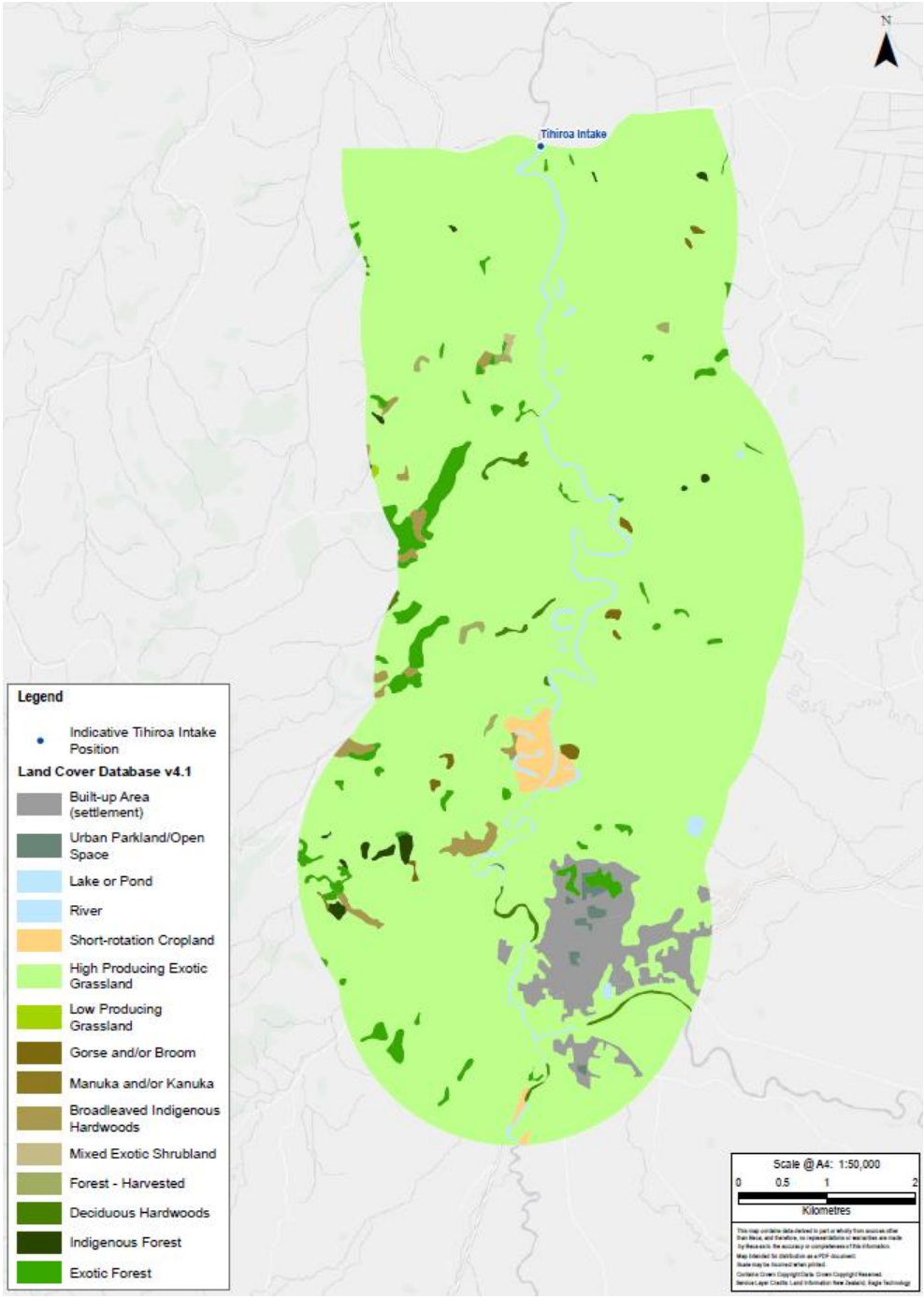


Figure 9: Tihiroa Catchment Use Topographical Map

For the purpose of this report the catchment survey area has been defined as 2km either side of the Waipa River, upstream of the intake, and 2km upstream of the nearest significant community which

in this case is Otorohanga. This approach was taken as it is believed that this area is most likely to influence the Waipa River water characteristics at the Tihiroa water treatment plant intake.

The catchment has been assessed to cover an area of 4,880 hectares.

All parts of this reach of the Waipa River flow though farm pasture with the exception of relatively small bush and protected areas distributed throughout the catchment.

Riparian management is carried out by landowners and stock is excluded in this way from the waterways for approximately 50% of the waterways within this catchment area.

The land use is 89% upland pasture, 5% is native bush and protected catchment, 1% arable (cropping) land, and 4% urban.

The pasture land provides grazing for 1,300 beef cattle, 4,900 dairy cows, 200 deer/goats and 4,800 sheep over the whole of the pasture area which extends across 4,343 hectares.

The indications from the topographic and land use maps indicates that the catchment is a well-managed dry stock pasture and that the risk of microbial contamination is low to moderate.

Based on the above analysis the most appropriate protozoal risk category for the Tihiroa source water is a mixture of:

- Water from a pastoral catchment that has relatively low concentrations of cattle and sheep

This category requires a log credit of 4 to reduce the risk of microbial contamination.

An alternative to this assessment is to undertake Cryptosporidium monitoring, consisting of at least 26 samples over a 12 month period and costing in the order of $20,000. The results of which may determine the source water to be 3 log credits. The benefit of this approach, if successful, is reduced capital outlay for treatment plant upgrades. Verification of this designation can be achieved every 5 years thereafter through a comprehensive catchment risk assessment, for which Beca has recently completed for Waipa District Council.

7 Treatment Plant Operational and Capital Improvement Options

The options in this section are presented in the order in which they should be actioned.

7.1 Alternate Source Evaluation

Protozoa occurs in many New Zealand surface waters and non-secure bore waters. The risk associated with non-secure bore waters can be lower than that of surface waters. The risk associated with secure bore water is much lower than that of surface waters and non-secure bore waters. Consequently the capital outlay for non-secure and secure bore waters treatment equipment can be significantly less than surface water sources.

Bore water characteristics are also far less likely to be influenced by weather, which means the quality is consistent and requires less operational input.

The log credit requirements for groundwater categories are shown in Table 9.

Taking into consideration the above, and seasonal challenges for the schemes to meet the supply demands, we recommend that ODC undertake a desktop evaluation to determine whether groundwater sources are a viable option to replace the existing surface water sources.

The costs and treatment options for groundwater sources have not been considered in this report.

Table 9: Log Credit Requirements for Groundwater Categories

Groundwater Protozoal Risk Category	Log Credits
Springs and non-secure bore water 0 to 10 m deep are treated as requiring the same log credit as the surface water in the overlying catchment.	3 - 5
Bore water drawn from an unconfined aquifer 10 to 30 m deep, and satisfies groundwater security criteria 2.	3
Bore water drawn from deeper than 30 m, and satisfies bore water security criteria 2.	2
Secure, interim secure, and provisionally secure bore water.	0

7.2 Quick Improvements

Good operational practices are based upon good information from which to make decisions, and consistency in execution. This information comes in various forms, including online instrumentation and Standard Operating Procedures (SOPs). Appropriate instrumentation will provide the operators with information to make proactive operational adjustments to optimise water quality, and downstream instrumentation will provide verification of those decisions. Instrumentation also provides valuable data to aid in the selection of appropriate treatment upgrades or improvements. Instrument purchases will be recommended based upon this, and where equipment may be retrofitted into upgraded plants.

The following table details quick improvement options.

Table 10: Plant Operational and Minor Capital Improvement Measures and Actions to Address Protozoa Removal

Cause	Preventative Measures	What to Check	Signs that Action is Needed*	Corrective Action	Estimated Budget Cost
Inappropriate filter operation for source water characteristics	Determine and document acceptable flow rates, and check regularly. Determine and implement effective backwash cycle procedure. Consider: – Timing of water wash (duration and frequency). – A log to record identified problems, and what was done to rectify them. Ensure operators are trained in correct operational procedures for the specific filters in use.	Raw water turbidity meter.	Frequent backwashes. Mud balls and / or cracks in the filter media. Boil up and / or dead spots during backwashing. Loss of media.	Change trigger parameters for backwash. Change procedure for backwash cycles.	(Excl. Tihiroa) Purchase raw water turbidity meter and connect to SCADA system $10,000 per site. Staff time.
Media deficiencies	Ensure depth and type of media is suitable for the quality of water being filtered and flow rate.	Visual inspection of filter.		Change type, number and / or depth of filter media.	Staff time. Do not change type, number and / or depth of filter media until a plant improvement plan has been agreed.
Inappropriate flow rates	Determine and document acceptable flow rates, and check regularly. Include winter versus summer flows and ensure both can be matched to media specifications. Avoid sudden changes in flow rates in dirty filters. Ensure operators are trained in correct operational procedures for the specific filters in use.			Restrict maximum flow rate when possible. Modify operational practices. Identify staff training needs and provide training.	Staff time only.
Incorrect filter backwash procedure	Determine which parameter(s) will be used to start the backwash cycle, and implement these controls. Determine and implement effective backwash cycle procedure. Consider: – Timing of water wash (duration and frequency). – A log to record identified problems, and what was done to rectify them. – Implementation of a filter ripening operation. Make sure the operators are trained in correct maintenance and operation procedures for the specific filters in use.	Headloss. Time. Filter log.	Frequent backwashes. Mud balls and / or cracks in the filter media. Boil up and / or dead spots during backwashing. Loss of media.	Change trigger parameters for backwash. Change procedure for backwash cycles.	Staff time only.
Inadequate filter maintenance	Inspect media at least annually. Ensure operators are trained in correct maintenance procedures for the specific filters in use.	Maintenance log book. Headloss. Time.	Frequent backwashes. Mud balls and / or cracks in the filter media. Boil up and / or dead spots during backwashing. Loss of media.	Increase frequency of media and filter inspection if required. Identify staff training needs and provide training.	Staff time only.

Cause	Preventative Measures	What to Check	Signs that Action is Needed*	Corrective Action	Estimated Budget Cost
Inconsistent poly solution strength	Determine and implement effective poly make-up procedure. Consider: – Poly to water ratio. – How poly and water will be measured. – When poly is added to water. – Duration of mixing. Create a SOP for poly mixing. Make sure the operators are trained in correct procedure for mixing poly.	Visual inspection of clarifier to determine floc blanket performance.	Clarifier floc blanket too: – Low – High – Unstable Frequent backwashes. Mud balls and / or cracks in the filter media. Boil up and / or dead spots during backwashing. Loss of media.	Identify staff training needs and provide training.	(Tihiroa) Staff time only.
Inappropriate clarifier operation for source water characteristics	Determine and document acceptable flow rates, and check regularly. Determine and implement effective alum and poly dose rates. Create a SOP for determination of effective alum and poly dose rates. Consider: – Timing of desludging (duration and frequency). – A log to record identified problems, and what was done to rectify them. Ensure operators are trained in correct operational procedures for the specific clarifier in use.	Raw water turbidity meter. Clarified water turbidity meter.	Unstable clarifier floc blanket. Poor clarified water quality. Frequent backwashes. Mud balls and / or cracks in the filter media. Boil up and / or dead spots during backwashing. Loss of media.	Change alum and / or poly dose rates. Change procedure for clarifier desludging.	(Tihiroa) Purchase clarified water turbidity meter and connect to SCADA system $10,000. (Tihiroa) Purchase jar stirrer to enable operators to undertake tests to determine optimum chemical dose rates $5,000. Staff time.
Supply of untreated water	Discontinue use of the untreated farm supply.	Farm supply is not connected to scheme supply.			(Taupaki) Staff time.

*Signs that action is needed in respect to filter performance typically reference turbidity >0.5 NTU. Because filtered water turbidity is generally going to be >0.5 NTU, levels are not stated and should be taken as greater than what would be expected for the source characteristics and filter operating parameters at the time.

7.3 Foundations for Treatment Plant Upgrade Decisions

Treatment plant investment or significant change needs to be based on sound information to ensure that Council and its customers end up with robust processes that achieve the desired outcomes. The risk of not doing this is investment that may not achieve the desired outcomes, and for which the suppliers will have little liability.

A significant portion of the improvement options are reliant upon the above, which is why we recommend that upgrades are based upon DHB approved catchment assessments, and the results of a comprehensive source water analysis programme.

7.3.1 Catchment Assessments

Huirimu and Taupaki catchment assessments are nearing their due date for review in 2017. Kahorekau and Tihiroa catchment assessments need undertaking.

7.3.2 Source Water Analysis

There is no raw water analysis from which to base treatment plant design on. We suggest source water sampling and testing should be undertaken for all four sources.

We have broken down the suggested raw water analysis into a basic analysis, which we would suggest is undertaken monthly for a year from each source, plus a more extensive analysis, which we would suggest should be a one off initially, but could consider some additional samples – say two more over the next year.

Basic Analysis - Monthly

- Alkalinity
- pH
- Calcium
- Magnesium
- Turbidity
- Suspended solids
- Total dissolved solids
- UV absorbance (254 nm, filtered)
- Dissolved Organic Carbon
- Iron – dissolved
- Iron - total
- Manganese - dissolved
- Manganese – total
- E.coli and coliforms

The cost for sample testing (laboratory cost only) is likely to be in the order of $250 per sample per source.

Full Analysis

- Aluminium
- Antimony
- Arsenic
- Barium
- Beryllium
- Boron

- Bromine
- Cadmium
- Chromium
- Copper
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Nickel
- Potassium
- Dissolved Reactive Phosphorous
- Ammonia
- Nitrate
- Nitrite
- Selenium
- Silver
- Reactive Silica
- Sodium
- Tin
- Uranium
- Zinc

The cost for sample testing (laboratory cost only) is likely to be in the order of $650 per sample per source.

For Tihiroa we recommend a one-off pesticides screen. The results of this should be assessed against the Waikato Regional Council's environmental programme for the Waipa River, and decision made as to whether further sampling is warranted.

Tihiroa Only – One Off:

- Acid herbicides
- PCP
- Organo -nitrogen and Organo phosphorous pesticide
- Organo- chlorine pesticides

The cost for sample testing (laboratory cost only) is likely to be in the order of $750.

7.4 Treatment Plant Upgrade Options

Surface water treatment options that could be considered for treating the Arohena and Tihiroa Water Schemes are described below and then compared in Table 11.

7.4.1 Direct Filtration

Figure 10 shows a simplified flow schematic of a direct filtration process.

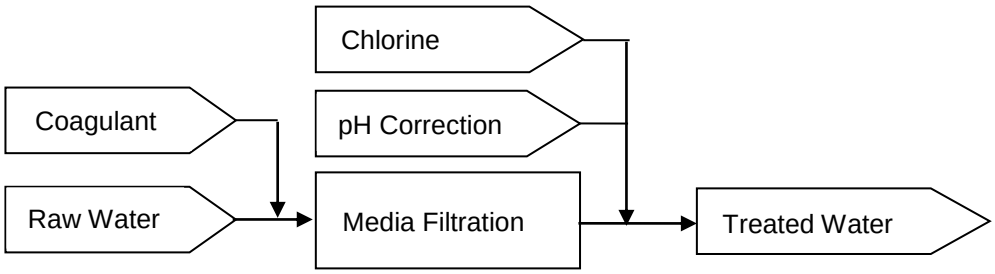


Figure 10: Direct Filtration Water Treatment Process

The following is a description of the conventional process:

- Raw water is dosed with a coagulant chemical (typically aluminium based), that causes the solids and organic matter in the water to clump together into larger particles.
- The majority of these particles are removed through a media filter – typically two layers – the upper layer being lighter anthracite or pumice, and the lower layer being sand.
- After filtration the filtered water is dosed with chlorine which kills any remaining pathogens in the filtered water and protects the water from any re-contamination when it is in the reticulation network.
- pH correction is typically applied following filtration to reduce the corrosivity of the treated water. Caustic soda or soda ash would be used.

For direct filtration to meet the treated water requirements of the DWSNZ, the raw water turbidity must not exceed 10 NTU.

7.4.2 Membrane

Figure 11 shows a simplified flow schematic of a membrane process.

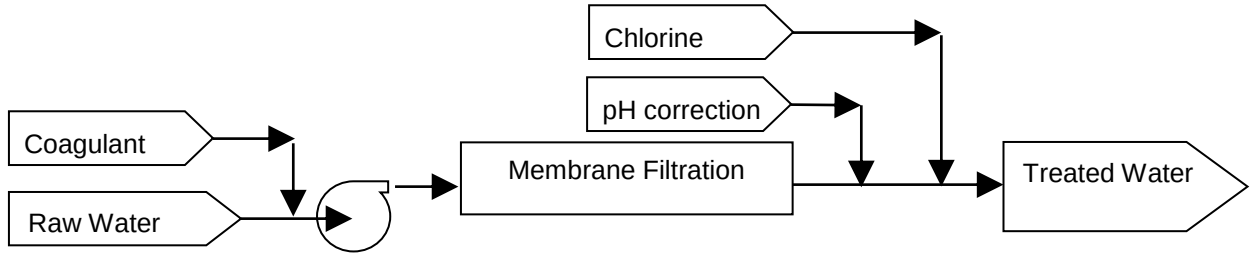


Figure 11: Membrane Water Treatment Process

The following is a description of the membrane process:

- Raw water may be dosed with a coagulant chemical (typically aluminium based). This is not necessary for particle removal (unlike conventional treatment), but would be recommended to remove organic matter if the water is to be chlorinated, minimising the formation of disinfection by products.
- The raw or coagulated water then flows through a membrane filter which has a pore size small enough to remove most particulate and some pathogenic matter.

- After filtration the filtered water is typically dosed with chlorine which kills any remaining pathogens in the filtered water and protects the water from contamination when it is in the reticulation network.
- pH correction is typically applied following filtration to reduce the corrosivity of the treated water. Caustic soda or soda ash would be used.
- Although the treatment process is less reliant on chemicals to perform, the membrane requires regular chemical cleaning to maintain the membrane.

7.4.3 Conventional

Figure 12 shows a simplified flow schematic of a conventional process.

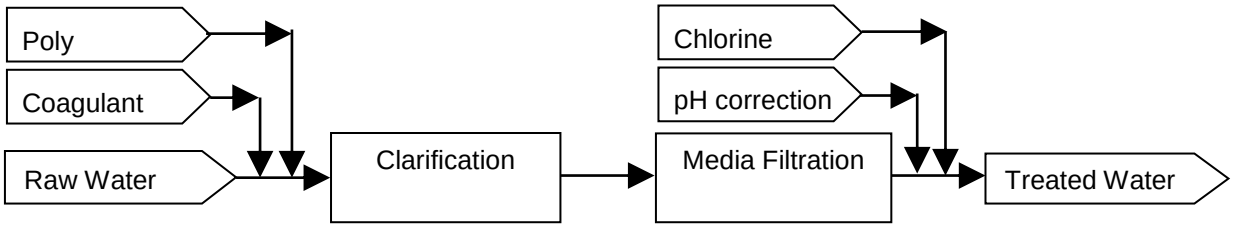


Figure 12: Conventional Water Treatment Process

The following is a description of the conventional process:

- Raw water is dosed with a coagulant chemical (typically aluminium based), that causes the solids and organic matter in the water to clump together into larger particles. Small doses of a flocculant polyelectrolyte are typically also dosed to aid the coagulation process.
- The majority of these particles settle in the clarification process and are discharged as a sludge waste stream.
- The clarified water then flows through a media filter – typically two layers – the upper layer being lighter anthracite or pumice, and the lower layer being sand.
- After filtration the filtered water is dosed with chlorine which kills any remaining pathogens in the filtered water and protects the water from any re-contamination when it is in the reticulation network.
- pH correction is typically applied following filtration to reduce the corrosivity of the treated water. Caustic soda or soda ash would be used.

7.4.4 Optimisation

As previously mentioned, the treatment processes used at Tihiroa achieve 3 and 4 logs at other plants in New Zealand. The most likely factors for Tihiroa not achieving this are:

- Limited monitoring and control equipment
- Inefficient chemical injection and mixing systems
- Chemical dose rates
- Filter condition
- Filter surface loading rate >10m/hr
- Clarifier loading rate >2-3 m/hr
- Inconsistency in plant operating practices

- Limited treated water storage to enable plant shutdown
- Limited maintenance
- Limited operator input

Addressing the above factors may enable the plant to achieve 3 log, but further investigation is required to determine whether the clarifier is fit for application. The reported filter condition, and its configuration are likely to be significant contributing factors in its replacement. The addition of UV treatment would enable the plant to achieve the estimated 4 log requirement, providing the preceding treatment systems are operating correctly. Operation of the plant most cost-effectively will require greater operational input than present.

For the direct filtration plants within the Arohena Scheme, compliance may be able to be met with the addition of coagulation, low cost upgrading of the filters (dependent on condition), installation of monitoring and control equipment, and addition of UV. Compliance would largely be dependent on the UV preceding treatment processes achieving <1 NTU. Operation of these plants is likely to be onerous due to the infrastructure, source water characteristics and limited operator resourcing.

7.4.5 Treatment Options Comparison

Detailed in Table 11.

Table 11: Options Comparison

Criteria	Existing Treatment Plant Optimisation (Coagulation, Direct Filtration) - Arohena Plants	Existing Treatment Plant Optimisation (Coagulation, Sedimentation, Rapid Gravity Filtration) - Tihiroa Plant	New Containerised Treatment Plant (Coagulation, Direct Filtration, UV – Taupaki Plant Only*	New Membrane Treatment Plant (Coagulation, Membrane Filtration) – All Plants	New Conventional Treatment Plant (Coagulation, Sedimentation, Rapid Gravity Filtration) – All Plants	New UV Treatment – All Plants
Operating Cost	Chemicals – Coagulant. – pH correction. Energy – The energy costs are relatively low compared with other options as the plant flow could continue to be driven by gravity; i.e. pumping not required. – Further investigation would be required to determine if the existing backwash system is suitable. An upgrade may be required including air scour and backwash pumps which would consume energy. Maintenance – Long asset life, if appropriate refurbishment of existing equipment is undertaken, reducing on-going maintenance costs. – Sand filter media replaced every 10 years.	Chemicals – Coagulant. – pH correction. – Poly. Energy – Raw water pump re-use, then energy consumption as per current situation. – Likely that the replacement filter will require air scour and backwash pumps, which will use more energy. Maintenance – New filter will be long asset life, if appropriate construction and materials are used, reducing on-going maintenance costs. – Existing clarifier re-use, will require immediate expenditure for leaking liner, and ongoing regular costs to maintain the timber tank and associated roof. – Condition of existing pipework, structures, dosing and control equipment may require expenditure depending on condition and performance. Sand filter media replaced every 10 years.	Chemicals – Coagulant. – pH correction. Energy – The energy costs are relatively low compared with other options as it is likely that the plant flow could be driven by gravity; i.e. pumping not required. – Backwash pumps are likely to be required, which will require further energy. Maintenance – Long asset life, if appropriate construction and materials are used, reducing on-going maintenance costs. – Sand filter media replaced every 10 years.	Chemicals – Coagulant. – Clean In Place (CIP) chemicals. Energy – Membrane plants are likely to require more energy than a conventional plant, as they normally require pumps to push the water through the microscopic pores of the membranes. Maintenance – The membrane fibres will have to be replaced, typically after 5-10 years, which is a significant cost.	Chemicals – Coagulant. – pH correction. – Poly. Energy – The energy costs for a conventional plant are relatively low compared with other options as it is likely that the plant flow could be driven by gravity; i.e. pumping not required, with the exception of Tihiroa. Maintenance – Long asset life, if appropriate construction and materials are used, reducing on-going maintenance costs. – Sand filter media replaced every 10 years.	Chemicals – N/A Energy – UV systems will require energy to power the lamps, but it is likely that they can be gravity fed water from the preceding process. Maintenance – The UV lamps will have to be replaced, frequency is dependent on frequency of use and equipment sizing, which is a significant cost. – Calibration of UV intensity sensor annually.
Removal of pathogens	Reasonable treated water quality, however will require operator intervention during storm events. This process may achieve 2.5 log, and will require support from a downstream process such as UV.	Reasonable treated water quality, however likely to require operator intervention during storm events.	Reasonable treated water quality, however likely to require operator intervention during storm events.	Reliable treated water quality, even during storm events.	Reasonable treated water quality, however likely to require operator intervention during storm events.	Reliable treatment process providing the preceding processes maintain turbidity <1.0 NTU.

Criteria	Existing Treatment Plant Optimisation (Coagulation, Direct Filtration) - Arohena Plants	Existing Treatment Plant Optimisation (Coagulation, Sedimentation, Rapid Gravity Filtration) - Tihiroa Plant	New Containerised Treatment Plant (Coagulation, Direct Filtration, UV – Taupaki Plant Only*	New Membrane Treatment Plant (Coagulation, Membrane Filtration) – All Plants	New Conventional Treatment Plant (Coagulation, Sedimentation, Rapid Gravity Filtration) – All Plants	New UV Treatment – All Plants
Chemical use	Coagulant would be dosed to remove natural organic matter in order to reduce the formation of DBPs. Chlorine would be dosed for treated water disinfection. Caustic soda or soda ash for pH correction.	Coagulant would be dosed to remove natural organic matter in order to reduce the formation of DBPs. Chlorine would be dosed for treated water disinfection. Caustic soda or soda ash for pH correction. Poly.	Coagulant would be dosed to remove natural organic matter in order to reduce the formation of DBPs. Chlorine would be dosed for treated water disinfection. Caustic soda or soda ash for pH correction.	Coagulant would be dosed to remove natural organic matter in order to reduce the formation of disinfection by-products. In addition to a coagulant, the membranes need to be washed with chemicals to remove the build-up of material from the raw water. This process is called Clean In Place (CIP) and the CIP system would also require additional pipework and potentially a storage tank where the CIP waste stream could neutralised before being discharged back to the environment.	Coagulant would be dosed to remove natural organic matter in order to reduce the formation of DBPs. Chlorine would be dosed for treated water disinfection. Caustic soda or soda ash for pH correction. Poly.	N/A
Operability	Operator will need to be on top of chemical dosing under typical conditions. Will require more operator invention during storm events.	Simple plant to operate under typical conditions. May require more operator invention during storm events.	Simple plant to operate under typical conditions. May require more operator invention during storm events.	High degree of automation, which may require more skilled operational and maintenance staff than a conventional plant.	Simple plant to operate under typical conditions. May require more operator invention during storm events.	Simple plant to operate, but will require more skilled operational and maintenance staff.
Waste stream	Liquid waste stream with a volume of about 10% of the plant output. Need to consider that a filter to waste function will be required to enable the filter to ripen, prior to bringing back online following backwash. This may impact on the overall daily production capability of the site.	Liquid waste stream with a volume of about 5% of the plant output.	Liquid waste stream with a volume of about 5-10% of the plant output.	Liquid waste stream with a volume of about 5 - 10% of the plant output.	Liquid waste stream with a volume of about 5% of the plant output.	N/A
Design capacity m^3 / day	Kahorekau – 1,000 Huirimu - 925 Taupaki - 150 Tihiroa – 1,500					
Budget costs	Kahorekau - $350,000 Excl. UV Huirimu - $350,000 Excl. UV Taupaki - $350,000 Excl. UV Tihiroa – N/A	N/A N/A N/A $600,000 Excl. UV	N/A N/A $250,000 Incl. UV N/A	$2.2M Excl. UV $2.1M Excl. UV $1.5M Excl. UV $2.4M Excl. UV	$2.1M Excl. UV $2.0M Excl. UV $1.5M Excl. UV $2.2M Excl. UV	$150,000 $120,000 $20,000 $180,000

*Containerised plant application cost prohibitive for sites other than Taupaki, due to the daily production requirements.

Overall a significant operational input will be required for any of the above surface water treatment options.

Membrane filtration is likely to be the most robust treatment process, possibly requiring no operator intervention during a storm event. It is comparable to conventional plants regarding capital but would have a slightly higher operating cost. The biggest risk of the membrane option is that it is a highly automated process and if something was to go wrong, it could require more specialised skills to fix in comparison to other options. The chemical use in the main process train is slightly less than for conventional treatment, but additional chemicals are used in the chemical cleaning process for the membrane.

Conventional clarification and filtration provides a robust treatment process; although during rainfall events operator intervention is likely to be required to keep the plant producing good quality water; or if the source water characteristics are typically very clear then coagulation/flocculation may be challenging. Conventional treatment has the lowest operating cost. The expected asset life of a conventional plant would be expected to exceed that of a membrane plant.

With improved treatment processes, it is likely that there will be increased contaminants within the waste stream, and possibly an increase in waste stream volume requiring improved management processes and operator input. A change to the waste stream may require discussion with the Regional Council Authority who may require changes to the current disposal methods. This has not been accounted for in this report.

8 Long Term Plan Proposed Budget Adjustments

Council's Long Term Plan budgets for the Arohena and Tihiroa water schemes are as follows:

Table 12: Arohena LTP Budgeting

	Yr1 17/18	Yr 2 18/19	Yr 3 19/20	Yr 4 20/21	Yr 5 21/22	Yr 6 22/23	Yr 7 23/24	Yr 8 24/25	Totals
Renewals									
Pumps	4,147	18,211	33,300		12,328				67,986
Electrical								2,372	2,372
Sundry	12,969	13,008	14,315	13,632	13,956	14,280	14,616	45,653	142,429
Sand filter		976			5,466			19,413	25,855
Building								26,161	26,161
Subtotal									**264,803**
DWS log credit upgrades									140,130
Total									**404,933**

Table 13: Tihiroa LTP Budgeting

	Yr1 17/18	Yr 2 18/19	Yr 3 19/20	Yr 4 20/21	Yr 5 21/22	Yr 6 22/23	Yr 7 23/24	Yr 8 24/25	Totals
Renewals									
Pumps		6,070				6,664			19,712
Meter	5,290								5,290
Reservoir			44,755						44,755
Filter refurbishment	55,016								55,016
Sundry	34,914	5,420		5,680		5,950	3,683	6,230	61,877
Pipeline	41,082								41,082
Intake		29,138							29,138
Subtotal									**256,870**
DWS log credit upgrades									118,332
Total									**375,202**

To recognise the work required to bring the Arohena and Tihiroa scheme treatment plants up to Drinking Water Standards New Zealand compliance, we suggest the following long term budget planning. The budget assumes that ODC has the resources to undertake the catchment assessments and ground water investigation in-house.

Table 14: Proposed LTP Budgeting for Treatment Plant Upgrades

Site		Yr1 17/18	Yr 2 18/19	Yr 3 19/20	Yr 4 20/21	Yr 5 21/22	Yr 6 22/23	Totals
Tihiroa	CapEx	$4,400 site assessment	$100,000 options study and design	$2.38m plant construction and commissioning				**$2.48m**
Kahorekau	CapEx	$3,650 site assessment		$100,000 options study and design	$2.25m plant construction and commissioning			**$2.35m**
Taupaki	CapEx	$3,650 site assessment			$100,000 options study and design	$1.52m plant construction and commissioning		**$1.62m**
Huirimu	CapEx	$3,650 site assessment				$100,000 options study and design	$2.12m plant construction and commissioning	**$2.22m**
	Totals	**$15,350**	**$100,000**	**$2.48m**	**$2.35m**	**$1.62m**	**$2.12**	**$8.69m**

9 Conclusion

The treatment plants surveyed within the Arohena and Tihiroa water supply schemes, in their current infrastructural and operational configuration, cannot achieve the protozoa treatment targets required by the Drinking Water Standards New Zealand. The options in this report will have significant financial impact, and will require considerably more operational input than what is currently assigned to the plants.

Council's best approach to addressing this is:

- evaluation of alternate water sources,
- comprehensive analysis of the selected source characteristics; and
- selection of robust treatment processes to meet design parameters

to ensure Council and its customers end up with infrastructure that will reliably achieve compliance over a long period.

Appendix A

Kahorekau and Tihiroa Catchment Survey Forms

Kahorekau Catchment Risk Categorisation Survey Result Form

WATER SUPPLY

	Kahorekau
WINZ SOURCE CODE	
Abstraction point	easting northing
Catchment area	297 ha

LAND USE

(estimate % of catchment area)

Protected catchment	-
Bush/forest	88
Arable (cropping) land	-
Upland pasture	12
Lowland pasture	-
Urban	-
River	-

LIVESTOCK

(estimate numbers in catchment) Source: Statistics NZ Census June 2012, Waikato Regional Council

Beef cattle	10
Dairy cows	40
Sheep	-
Deer/goats	-
Pigs	-

HUMAN WASTES

(estimate population served)

Primary-treated sewage	(river/land discharge)
Secondary-treated sewage	(river/land discharge)
Septic tanks	

ANIMAL WASTES

(number in catchment)

Meatworks	
Cattle feedlot	
Piggeries	
Dairy effluent ponds	

MANAGEMENT PRACTICES

	(yes/no)	Estimate of coverage/comment
Riparian management	N	
Tile drains	N	
Livestock access to waterway	N	
Animal bridge/ford crossings	N	

MANAGEMENT PRACTICES

	(yes/no)	Data held by:
Faecal coliforms/*E. coli*		
Crytosporidium		
Giardia		

Provider's contact details

Tihiroa Catchment Risk Categorisation Survey Result Form

WATER SUPPLY

WINZ SOURCE CODE	Tihiroa
Abstraction point	easting northing
Catchment area	4,880 ha

LAND USE

	(estimate % of catchment area)
Protected catchment	-
Bush/forest	5
Arable (cropping) land	1
Upland pasture	89
Lowland pasture	-
Urban	4
River	1

LIVESTOCK

	(estimate numbers in catchment) Source: Statistics NZ Census June 2012, Waikato Regional Council
Beef cattle	1,300
Dairy cows	4,900
Sheep	4,800
Deer/goats	200
Pigs	-

HUMAN WASTES

(estimate population served)

Primary-treated sewage		(river/land discharge)
Secondary-treated sewage		(river/land discharge)
Septic tanks		

ANIMAL WASTES

(number in catchment)

Meatworks	
Cattle feedlot	
Piggeries	
Dairy effluent ponds	

MANAGEMENT PRACTICES

	(yes/no)	Estimate of coverage/comment
Riparian management	Y	
Tile drains	N	
Livestock access to waterway	N	
Animal bridge/ford crossings	N	

MANAGEMENT PRACTICES

	(yes/no)	Data held by:
Faecal coliforms/*E. coli*		
Crytosporidium		
Giardia		

Provider's contact details

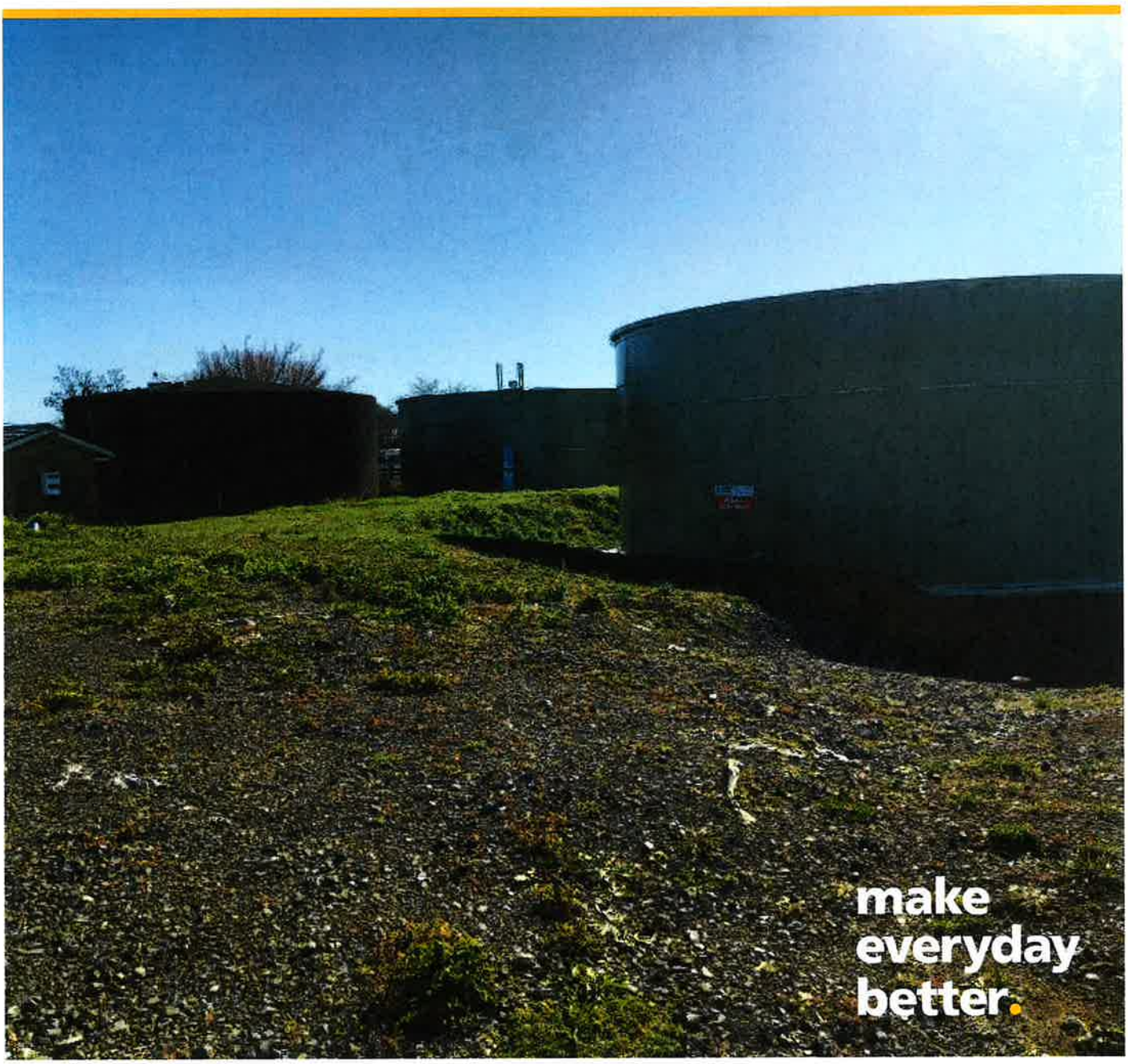
Sensitivity: General

Peer Review of Otorohanga District Council Three Waters Infrastructure Valuation

Report

Prepared for Otorohanga District Council
Prepared by Beca Projects NZ Limited

5 October 2023



Revision History

Revision N°	Prepared By	Description	Date
1	Ryan Wong	Peer Review Report	05/10/2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Ryan Wong		05/10/2023
Reviewed by	Robert Berghuis		05/10/2023
Approved by	Marvin Clough		05/10/2023
on behalf of	Beca Projects NZ Ltd		

Contents

Appendices

1 Introduction

Beca Projects NZ Limited (Beca) was commissioned by Otorohanga District Council (ODC) to complete a Peer Review of their 2023 Three Waters Infrastructure Valuation for financial reporting purposes.

Three water asset information is recorded in the Univerus Asset Management System (Univerus) that holds asset information, records condition assessments, and produces detailed and summary valuations in spreadsheet formats. This information and ODC's financial reports were provided for this peer review.

Recognising that escalating construction costs since the 2022 valuation will influence fair value, ODC decided to complete a 2023 revaluation using the Univerus system. An escalation movement of 6.56% from 30 June 2022 to 30 June 2023 was determined using Stats NZ CGPI CEPQ indices code for systems for water and sewerage, and this movement was applied across all existing assets for assessment as at 30 June 2022.

Three waters valuation summaries reported are effective as at 30 June 2023.

2 Scope

The scope of work was to complete the peer review as three distinct activities:

1. Review ODC's unit rates CGPI escalation 2022-2023 for assets for the following asset groups and classes:

- Water Supply (WS) infrastructure line (ws_line), plant ws_plant), and point (ws_point) assets.
- Wastewater (WW) infrastructure line (ww_line), plant (ww_line), and point (ww_point) assets.
- Stormwater (SW) infrastructure line (sw_line), plant (sw_plant), and point sw_point) assets.

2. Complete peer reviews of ODC 2023 valuation to provide an assessment of the infrastructure revaluation processes and the degree of compliance against current valuations standards and industry guidelines.

3. Provide support for ODC's inputs and outputs including validations of the base data, formulae, valuation processes, and valuation draft and final reports

ODC supplied a valuation report detailing purpose, scope, movements, basis of valuation, valuation process, methodologies, data confidence, optimisation and residual values including assumptions for this peer review.

The valuation excludes roading, amenities, and property assets owned by Council. Some of these assets exist in the Univerus database as connections to the three waters systems are identified but are not valued.

3 Values Reported

The asset group values reported by ODC for financial reporting purposes as at 30 June 2023 are:

Asset Group	Replacement Cost	Fair Value (DRC)	Annual Depreciation
Water Supply	40,630,477	23,848,218	751,879
Wastewater	21,130,274	10,036,277	328,136
Stormwater	18,649,542	11,560,051	213,880
TOTALS	**80,410,293**	**45,444,546**	**1,293,895**

The values are in New Zealand dollars and exclude GST.

4 Basis of Peer Review

This peer review was completed in accordance with the PBE IPSAS17, an accounting standard published by External Reporting Board (XRB), and with references to the current industry guidelines as described below.

PBE IPSAS 17

PBE IPSAS17 Public Benefit Entity International Public Sector Accounting Standard 17 - Property Plant and Equipment, applies to public sector entities other than Government Business Enterprises that prepares and financial statements under the accrual basis of accounting in accounting for property, plant, and equipment. These assets include infrastructure. Infrastructure assets are described in PBE IPSAS 17 Section 21 as:

"Infrastructure Assets:

Some assets are commonly described as "infrastructure assets." While there is no universally accepted definition of infrastructure assets, these assets usually display some or all of the following characteristics:

a) *They are part of a system or network;*

b) *They are specialized in nature and do not have alternative uses;*

c) *They are immovable; and*

d) *They may be subjected to constraints on disposal.*

Although ownership of infrastructure assets is not confined to entities in the public sector, significant infrastructure assets are frequently found in the public sector Infrastructure assets meet the definition of property, plant and equipment and should be accounted for in accordance with this standard.

A different approach is used to value specialised and non-specialised assets for their existing use. Non-specialised assets are valued on a market basis, usually by way of sales comparison or income approaches. Specialised assets are seldom traded on an open market, so they are valued on a depreciated replacement cost (DRC) basis to account for age and deterioration and optimised depreciation replacement cost (ODRC) was calculated from the DRC valuation by allowing for asset obsolescence, over-capacity, or redundancy.

Industry Guidelines

The New Zealand Infrastructure Asset Valuation and Depreciation Guidelines 2006 (NZIAVD) published by the National Asset Management Support (NAMS) Group sets out the general principles of valuation of public entity infrastructure and provides guidance on acceptable methods and legislative requirements surrounding valuations and guidance on the assessment of useful lives and depreciation methods used to value assets.

The International Infrastructure Management Manual 2020 (IIMM) published by the Institute of Public Works Engineering Australasia (IPWEA) describes asset life cycle management principles including the monitoring of performance and condition and predictive modelling on such parameters for determining remaining useful lives and identifying optimised obsolescent assets.

The Inland Revenue IRD265 2020 (IRD265) General depreciation rates guidance document provides advice on calculating asset depreciation rates using diminishing value (DV) and straight line (SL) methods based on estimated useful life. The document includes different industry sector asset types estimated useful life tables.

5 Valuation Processes

The valuation reports were peer reviewed for content, and completeness with both the spreadsheet and report peer reviews completed independently and interactively with ODC to facilitate amendments.

NZIAVD defines valuation processes for performing depreciated replacement cost (DRC) methodologies used to determine infrastructure fair values at a set point in time. The following processes were peer reviewed with any inconsistencies found reported to ODC to review.

Define the Component Level

Componentisations of assets are typically at a level that an entity replaces them at differing times. Asset items may be treated individually or combined into a global process. Appropriate componentisations of assets having differing useful lives were checked.

Establish the Valuation Database

The valuation database should contain asset register data with dimensional and descriptive attributes and the various valuation factors including optimisation, condition, modern equivalent asset (MEA) and impairment for completing the DRC calculations. Asset database register attributes and valuation factors were checked.

Optimise Replacement Costs

Assets are generally normalised to a global unit to assess a representative unit rate for valuation purposes. Costing factors are then applied to the unit rate to be assets to assess and assets optimised replacement cost. Project overheads, MEA considerations, optimisation, availability of supply and demand factors that may affect an asset's replacement cost were checked.

Assess Useful and Remaining Useful Lives

Useful life represents the period an entity expects the asset to be available for use. It is generally taken as the lesser of physical life where an asset deteriorates to a point where it cannot be used or its economic life where an asset has been installed and used for a particular purpose with a definite timeframe.

Infrastructure assets are generally those with useful lives usually ranging between ten and one hundred years with varying asset types having their own useful life ranges, which may be extended outside the usual range. Useful lives were checked for consistency against applicable ranges in NZIAVD, IIMM and IRD265 guidelines.

Remaining useful life is generally assessed from useful life less asset age unless there are conditional or other remaining life limiting factors such as deterioration modelling, process changes or obsolescence to consider. Remaining useful lives were checked for consistency considering the varying remaining life limiting factors.

Calculate DRC and Annual Depreciation

Depreciated Replacement Cost assess the consumption of an asset at a set point in time using diminishing value (DV) or straight line (SL) depreciation methods considering current replacement cost, residual value, useful life, and remaining useful life. Residual value for infrastructure assets is usually set to zero as they are generally part of a network, specialised for their purpose and are generally not traded.

The DV method assumes initial rapid consumption that slows down to a plateau at end of life while SL assumes constant rate of consumption. As infrastructure assets have long useful lives compared to consumable assets, they are generally depreciated using the SL method. Aside from non-depreciating assets, annual depreciation is the rate applied using the SL method considering the current DRC and remaining useful life.

Both DRC and annual depreciation calculations were checked for consistency.

6 Council Documents

ODC documents provided for the purpose of this peer review included:

- business-price-indexes-march-2023-quarter-capital-goods-price-index
- 2023 ODC 3 Waters Valuation V1 Draft Spreadsheet
- 2023 ODC 3 Waters Valuation V2 Draft Spreadsheet
- 2023 ODC 3 Waters Valuation V3 Draft Spreadsheet
- 2023 ODC 3 Waters Valuation V4 Final Spreadsheet
- Otorohanga District Council 2023 Three Waters Revaluation Report Draft
- Otorohanga District Council 2023 Three Waters Revaluation Report Final

The Univerus data includes selected purchase costs from contracts across all asset classes since 2016.

7 Univerus Base Data

Univerus hierarchies are owner, status, community, category, class, map group, system, type, and sub-type.

Attributes and inputs used for this revaluation include material, diameter, quantity/length, width, area, install date, year (of valuation), purchase cost, base life, unit cost, residual value, depth, unit rate factor, minimum remaining life percentage, dep asset (Y/N), make, model, and size.

Univerus calculations and outputs include age, non-depreciated value, depreciated value, annual depreciation, remaining life adjusted, and age remaining life. Condition remaining life was not used.

The detailed Univerus report included 15,636-line items map grouped by Water, Wastewater, and Stormwater. Each group was subdivided into lines, points, and plant, with meters being included into the water map group. This included 664-line items that were zero-rated due to owner, status, or type (primarily nodes or map points).

The summary Univerus report included 68-line items that are selectable by community, asset class and status.

The following filters were applied to the following separable assets in this revaluation:

Owner - Local Authority assets separated from Crown, Private, Roading, and Waipa District Council.

Status - Existing assets separated from abandoned, private, removed, replaced, and Roading Asset.

It was noted that most filterable assets had zero values due to a zero-unit rate factor being correctly applied, however, the reviewer used spreadsheet-based owner and status filters to exclude all separable assets.

8 Financial Groups

The following financial groups were incorporated manually into the Univerus valuation using spreadsheets:

- Community Water – Otorohanga water assets.
- Rural Water Supplies - Huirimu, Kahorekau, Kawhia, Ranginui, Taupaki, Tihiroa, Waipa water assets.
- Sewerage - Otorohanga wastewater assets
- Drainage Network – Kawhia and Otorohanga stormwater assets.

Refer to Appendix A for the Univerus Outputs by Financial Group.

9 Observations

9.1 General

This review was completed independently, although interactively with ODC, as ODC wished to use the peer review process to provide timely feedback in order to complete the valuations.

9.2 Compliance

Compliance aspects relating to the basis of valuation, processes, and methodologies in terms of evidence, as determined by review, were considered in terms of PBE IPSAS 17 and industry guidelines as shown below.

High compliance scores have been attributed to criteria that have statements support with evidence, medium scores where evidence has not been provided to support statements and low scores to aspects expected to be included in the valuation but were not included.

Criteria / Compliance	Evidence
Valuation shall be conducted by an independent valuer, or the Entity employs a person sufficiently experienced to conduct a valuation, subject to review by an independent valuer. **Compliance:** High	The three waters infrastructure valuations were led by ODC Brendan O'Callaghan, Finance Manager, and his team are sufficiently experienced to conduct a valuation subject to review by an independent valuer. A desktop peer review of the valuation was carried by Beca as the independent valuer using the approaches described above.
DRC basis to be used for assets where reliable market evidence is not available. **Compliance:** High	As infrastructure assets are specialised and rarely sell, there is no reliable market evidence on which to base fair value. DRC was carried out within Univerus from asset data and the system to produce detailed valuation outputs. The report details the cost and lives inputs used for DRC calculations.
Asset Register should provide general data on assets. **Compliance:** High	Asset registers were compiled for this peer review from the Univerus Detailed Valuation output spreadsheets that holds general data for Infrastructure assets in the various tables. Assets in the Univerus inventory are entered at levels that allows for differing types and lives e.g., pump, valve, and tank. General data included asset type and general attributes e.g., install date, dimensions, and materials.
Valuation Database should provide specific data on assets. **Compliance**: Medium	Although ODC have populated condition grades for assets, condition indices were not used for adjusting remaining lives. This is accepted as condition remaining life adjustments are lesser defined compared with age based remaining lives.
Documented data quality processes **Compliance:** High	The valuation refers to data quality assurance processes to eliminate blank values and correct totalling inconsistencies. As the Univerus attribute data aligns with GIS, ODC can run mapping quality checks on captured assets to check for any inconsistencies. Data quality is an ongoing data activity.
Establishing Useful Lives **Compliance:** High	Useful lives are featured in Univerus as base lives as given to an asset to represent the period of time Council expects the asset to perform at defined levels of service. These base lives generally compare with this ranges in the NZIAVD guidelines.

Establishing Standard Replacement Costs **Compliance**: High	Standard Replacement Costs are represented in Univerus as Unit Costs. The costs are typically sourced from the market, local contracts, cost estimations, and inflationary sources. For the 2023 fair value assessment, the unit costs that were established for the 2022 valuation were escalated from June 2022 to June 2023 as described in Section 9 at 6.56%. A Unit Rate Factor of 0.5 has been consistently applied for rural pipes as compared to urban pipes for this assessment instead of the complicated unit rate factors approach applied to various Communities for the 2022 valuation having noted that resulting differences to fair value was not material.
Estimate of residual values **Compliance:** High	The valuation states that, assets are depreciated to a residual value of 2.5% of the replacement cost. This residual value is not comparable to a saleable or recoverable residual value as offered by the market. Accordingly, the residual value used by Univerus for recoverable purposes has been set at zero.
Assessing asset age **Compliance**: High	Installation dates were provided for all asset records for the purpose of assessing asset ages.
Estimating remaining lives **Compliance**: Medium	Univerus calculates age RUL from the useful life less age and condition RUL from condition index applied to base life. For the reasons explained above condition RUL is not used. Where age RUL calculates to zero or a negative amount due the asset exceeding its base life, an adjusted remaining life of 2.5% of base life is applied, however, for assets with base lives less than 40 years, this results in decimal RULs that could inflate annual depreciation higher than its fair value.
Optimisation Compliance: High	There has been no optimisation applied for over design or redundancy. However, lowest replacement cost optimisation has been applied by considering an assets replacement with a modern equivalent asset (MEA) that may be procured and installed at a lower cost.
Annual Financial Depreciation (AFD) Compliance: Medium	Using the above inputs Univerus calculates AFD using the financial formula AFD = DRC / RUL to calculate depreciation on any asset in service to its base life. As described above, the application of RULs less than one year generates AFDs exceeding the DRC. For assets exceeding its base life, AFD = 0 . Beca has observed an immaterial variance when comparing Beca's depreciation calculation against the Univerus AFD.
Optimised Depreciated Replacement Cost (ODRC) Compliance: Medium	Refer sub-section 10.3 Optimised Depreciated Replacement Cost (ODRC) below.

9.3 Optimised Depreciated Replacement Cost (ODRC)

As stated above, fair value for infrastructure assets is equivalent to its depreciated replacement cost (DRC). Using the above inputs Univerus calculates DRC using the financial formula as:

DRC = (RC-RV) * RUL / (RUL + Age) + RV, and, for assets exceeding their base life, DRC = 2.5% x RC.

In line with Audit recommendations, ODC has adopted a "residual" depreciated value of 2.5% of replacement cost to recognise asset in service after the asset has exceeded its useful life. The DRC residual of 2.5% ORC and zero depreciation is applied when assets surpass useful life was checked and were consistently applied. Beca has observed an immaterial variance when comparing Beca's depreciation calculation with Univerus.

The reviewer noted that there were limited instances applied where assets that were not owned by Council or had a status other existing were had values applied. However, by using pivot queries, these assets were excluded from the valuation. The final fair value assessment result for the total three waters is $45,444,546.

The valuation summary as shown in Section 3 Valuation Summary and comparisons with the 2022 valuation movement summaries by group and asset type are shown in ODC's 2023 Three Waters Revaluation Report.

Final 2022-2023 ODRC (Fair Value) Summaries by Asset Group are:

Group	2022	2023	Difference	% Change
Water	20,525,575	23,848,218	3,302,643	16.1%
Wastewater	9,549,410	10,036,277	486,867	5.1%
Stormwater	10,733,379	11,560,051	826,672	7.7%
Three Waters	40,828,364	45,444,569	4,635,183	11.3%

10 Validated Values

Beca consulted with site staff to review the asset register, age, condition, utilisation and remaining useful economic life of the assets. Beca considers the asset register to be reliable and suitable for the valuation.

11 Conclusions

The infrastructure datasets used for the valuation are considered to be substantially complete and accurate.

The total fair value of the three waters assets calculated using Univerus as at 30 June 2023 is $45,445,589. This is an increase of 11.4% on the previous valuation undertaken in 2022.

The ODRC movements explained for the assets in the report are considered reliable considering changes to the network, vested asset additions, asset deletions, data improvements, and found assets.

As replacement cost, ODRC and annual depreciation calculations were based on derived asset replacement costs and the useful lives are consistent with the industry guidelines or were appropriately modified to meet certain conditions, Beca considers these values to be reliable and suitable for financial reporting purposes.

The reviewer observed a 7% variance when comparing peer review depreciation calculation with the ODRC produced by Univerus. This has primarily occurred on assets that have exceeded their base lives and, given that these assets will likely be replaced in the foreseeable future, the variance may be considered immaterial. Supporting spreadsheet *ODC 3 Waters Valuation 2023 RW Review Updated RB with ODC Input* has details.

12 Recommendations

The following recommendations are provided for ODC to consider. These include asset data validations and process improvements and are listed are in no particular order.

It is recommended that ODC:

Data Attributes

- Continue to develop and improve the data capture and verification processes to minimise unknowns.
- Continue to populate the size and notes fields to capture specific asset attributes and relevant information.
- Continue to develop record for retired assets and demolished assets.

Valuation Inputs

- Request Univerus check algorithms used to calculate age, and adjusted remaining lives are consistent.
- Investigate asset type condition grade index development for calculating condition remaining useful lives.

Valuation Outputs

- Run only Local Authority owned assets in Univerus to ensure Local Authority quantities are recorded.
- Request Univerus to check that their calculations for replacement cost, depreciated replacement cost, and annual depreciation are consistent with ODC's financial policies and valuation methodology.

13 Limitations

The following limitations apply to this valuation peer review:

- Reliance has been placed on the accuracy and completeness of information supplied by ODC.
- It has been assumed that assets are in proper working order and functioning for the purposes for which they were designed, and conform to current building, fire, health & safety regulations & codes.
- The report is on the basis that ODC owns the assets reviewed.
- This report has been prepared for the specific purpose stated herein. Any party that relies upon it for another purpose without reference to the writer does so at their own risk.
- Beca's responsibility in connection with this report is limited to the ODC to whom it is addressed. Beca disclaim all responsibility and accept no liability to any other party.
- Not the entire report nor any part of it may be referred to or included in any published document, circular or statement without our written approval of the form and context in which it may appear.
- Beca reserve the right but not the obligation to revise this report in the light of any information existing or additional information that comes to our attention after this report has been issued.

14 Declaration

Beca is aware that the auditors will be relying on Beca's knowledge of infrastructure valuations of this type.

Beca is not aware of any reason why ODC's auditors should not place reliance on the information provided by ODC and values in the valuation report, as provided by ODC, based on the above data.

This review was completed by Robert Berghuis and approved by Marvin Clough. Both Robert and Marvin are registered plant and machinery valuers experienced in the completion of public benefit entity valuations and peer reviews.

Please contact the undersigned if you have any questions regarding this peer review.

Robert Berghuis

Registered Plant and Machinery Valuer

Senior Valuer

Marvin Clough

Technical Director - Valuations

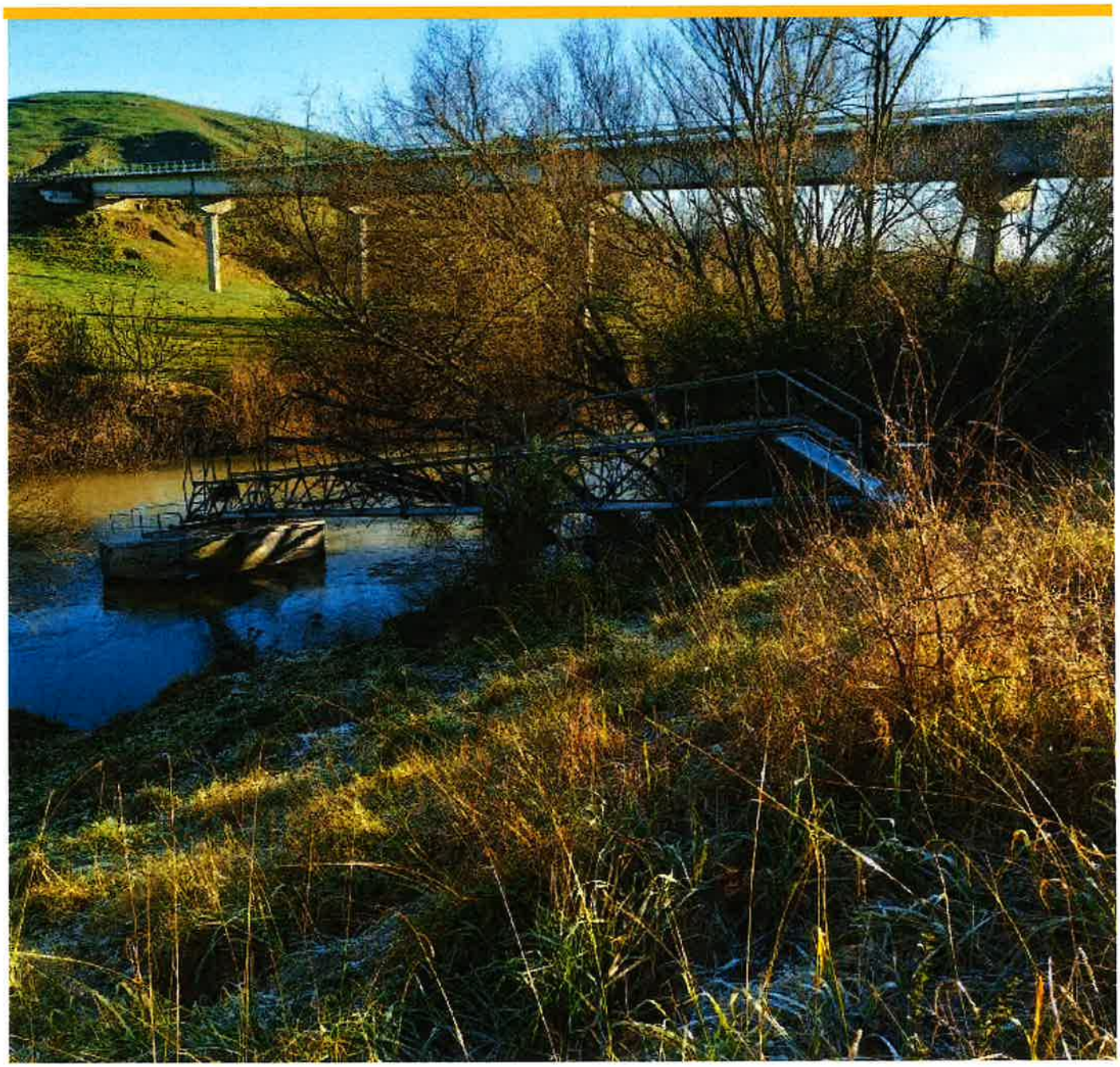
on behalf of

Beca Project NZ Ltd

Email: Robert.Berghuis@beca.com

A

Appendix A – Univerus Outputs by Financial Group



Community	Count	ORC	DRC	AFD
Community Water	**9090**	**18,816,050**	**10,263,527**	**391,842**
Otorohanga	9090	18,816,050	10,263,527	391,842
Drainage Network	**1184**	**18,649,542**	**11,560,051**	**213,880**
Kawhia	197	3,097,986	2,305,537	35,984
Otorohanga	987	15,551,556	9,254,514	177,896
Rural water Supplies	**2411**	**21,814,427**	**13,584,691**	**360,037**
Huirimu	191	2,363,139	1,405,962	39,822
Kahorekau	171	2,540,167	1,677,544	37,339
Kawhia	1200	4,958,695	2,201,045	108,771
Ranginui	73	1,945,350	1,093,031	27,897
Taupaki	95	771,800	434,409	11,473
Tihiroa	269	5,352,170	4,199,779	78,452
Waipa	412	3,883,106	2,572,921	56,284
Sewerage	**2303**	**21,130,274**	**10,036,277**	**328,136**
Otorohanga	2303	21,130,274	10,036,277	328,136
Grand Total	**14988**	**80,410,294**	**45,444,545**	**1,293,894**

Table Source: V4 Detailed Pivot excluding EXCLUSIONS.

2023 Activity	Replacement Cost	ODRC	Annual Depreciation
Water	40,630,477	23,848,218	751,879
Wastewater	21,130,274	10,036,277	328,136
Stormwater	18,649,542	11,560,051	213,880
Total Three Waters	80,410,293	45,444,546	1,293,895
V4 Detailed Pivot	**80,410,294**	**45,444,545**	**1,293,894**

2022 Activity	Replacement Cost	ODRC	Annual Depreciation
Water	36,057,534	20,545,575	671,244
Wastewater	19,687,229	9,549,410	304,816
Stormwater	17,179,246	10,733,379	202,235
Total Three Waters	72,924,008	40,828,364	1,178,294

Source: Copy of 2021-22 ODC 3 Water Valuation V12 Beca Review (3)

Difference	Replacement Cost	ODRC	Annual Depreciation
Water	4,572,943	3,302,643	80,635
Wastewater	1,443,045	486,867	23,320
Stormwater	1,470,296	826,672	11,645
Total Three Waters	7,486,285	4,616,182	115,601

Percentages	Replacement Cost	ODRC	Annual Depreciation
Water	12.7%	16.1%	12.0%
Wastewater	7.3%	5.1%	7.7%
Stormwater	8.6%	7.7%	5.8%
Total Three Waters	10.3%	11.3%	9.8%