WATER WATCHERS - WATCHING TAURANGA'S WATER FOR GOOD

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ABSTRACT

Flows in the source water streams that have provided a reliable source of water to Tauranga City since the early 1990's began trending downward from late 2019 until this past summer (2022/23) due to historically low rainfall. These declining flows put significant pressure on Tauranga City Council's (TCC) ability to supply water to meet high summer water demand.

A new approach prior to the 21/22 summer was needed due to source water stream flows reaching record lows. Hence TCC and GHD developed a new water restriction approach, the Water Watchers Plan, as a means of providing continuity of water supply and mitigating impacts on source water streams.

Key aspects of the Water Watchers Plan that differentiate it from traditional restriction approaches are:

(1) It is proactive plan – restriction periods and types are set in advance.

(2) It is a year-round plan – to acknowledge that water conservation/management is not something that should occur only in summer and/or at times of drought.

(3) It is more detailed and wider reaching than past restrictions – with separate plans for at home, at work and in the community.

(4) It includes an exemption process, allowing residents to submit a "Smart Water Plan".

Many lessons were learnt in the development, communication and management of the Water Watchers Plan that will be of interest to other regions looking at their water restriction approaches.

Overall, the plan resulted in an estimated reduction in peak demand of approximately 19% compared to unrestricted; with an additional 5% of water savings (in spite of population growth of 3%) from the previous restricted summer. The plan has been approved by TCC's commission through to 2026.

KEYWORDS

Water Supply, Water Restrictions, Demand Management, Water Conservation, Community Engagement.

PRESENTER PROFILE

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Ryan Orr is a GHD Principal and has over 15 years' experience in project leadership and technical delivery roles, primarily on 3 waters projects. He is currently a Client Relationship Leader working with GHD's civil infrastructure clients on projects across Aotearoa.

INTRODUCTION

Tauranga City Council (TCC) currently operates three aquifer feed water supply schemes: the Oropi Scheme (fed by the Waiorohi Stream), the Joyce Scheme (fed by the Tautau Stream and the Waiāri Scheme (fed by the Waiāri Stream). The Waiāri Scheme was commissioned late December 2022 to respond to the ongoing growth of Tauranga. A diagram of Tauranga's water supply network is below.

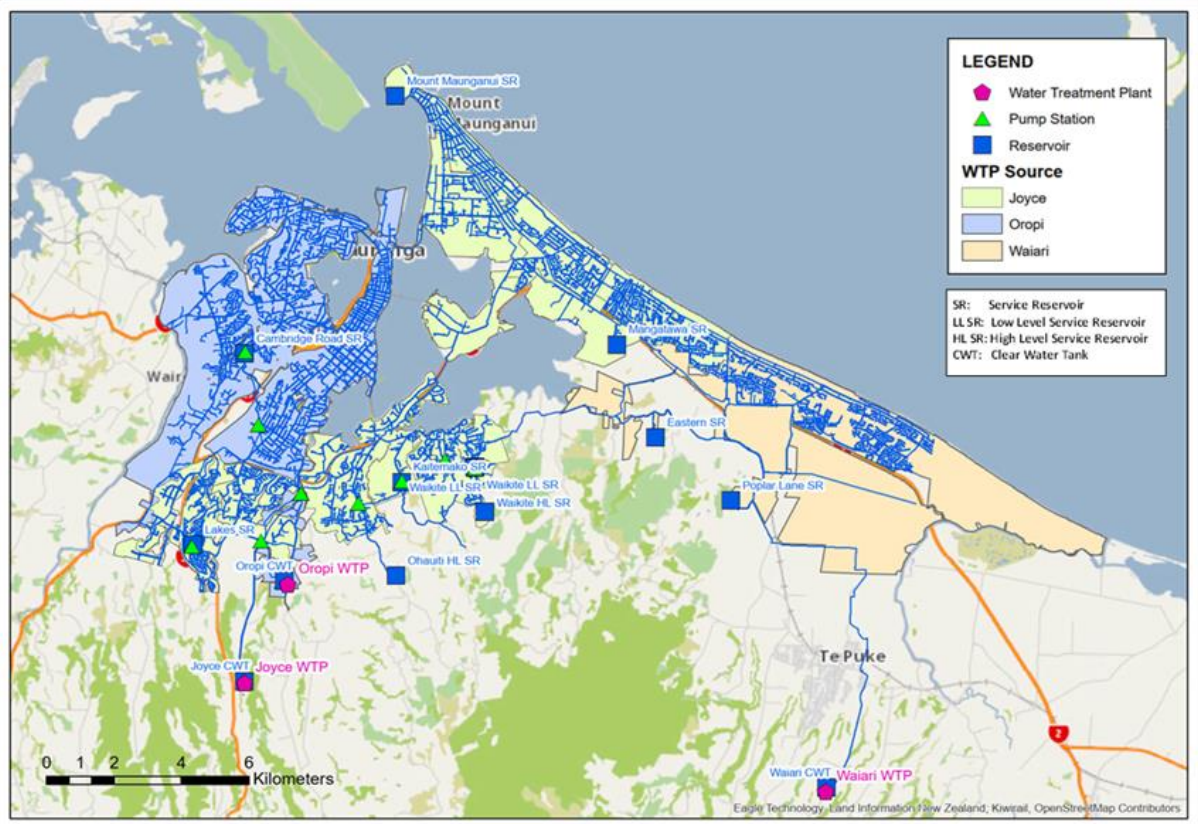

Figure 1 Tauranga's water supply network

As shown in Figure 2 below, the history of water demand in Tauranga is a tale of two halves; prior to the installation of water meters in 1999 - 2001, peak and average water demand was rising year on year. Water restrictions were used to manage demand for the nine years prior to the installation of water meters. Restrictions were then not required, post metering, up until 2017 due to consumption falling.

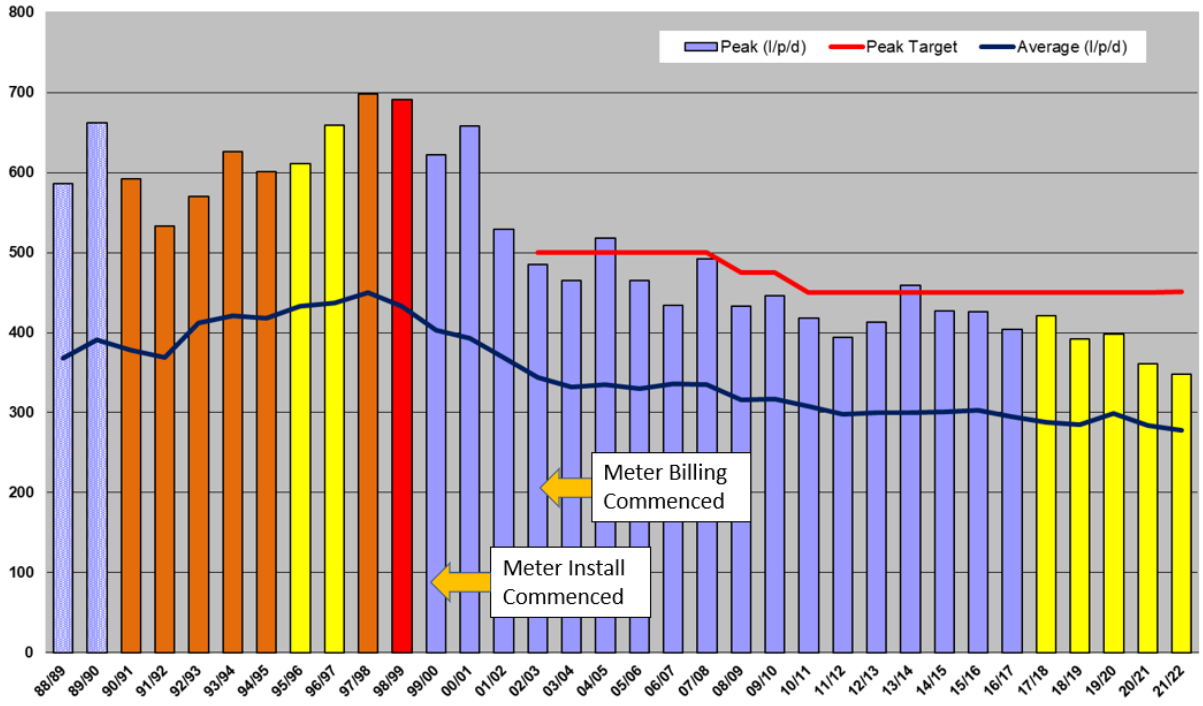

Figure 2 Tauranga Water Demand 1988/89 to 2021/22

Prior to 2021, restrictions were implemented when water demand was at a level that was putting the ability of the schemes infrastructure to continuously supply water to residents at risk. Once water demand exceeded a pre-set consumption (demand) the High-Water Demand - Drought Management - Water Restriction Procedure came into force. Traditional water restrictions in Tauranga involved a "Level" approach as shown in Table 1 below.

Table 1 - Water Restriction Summary (High Water Demand - Drought Management - Water Restriction Procedure Version 5, 2020)

Restriction Level	**Requirement**	**Water Consumption (7 day rolling average)**
0 - Normal to High	No restrictions but summer conservation advisory	Between 45 to 50 Ml/d
1 - Sprinkler Ban	No sprinkler use and only hand held hoses permitted	Greater than 50 Ml/d for 5 days or more with no prospect of rain
2 - Hose ban	No hose pipe use. Water with watering cans or containers only	As per (1) with sprinkler ban in place
3 - No Outdoor Drinking Water Use	No drinking water for garden / outside use	As per (1) with hose ban in place

The exact timing of stepping up/steeping down of levels was determined by the Water Supply Manager and approved by the CEO prior to communication to the public.

In addition to restrictions, TCC have had a water conservation program in place since 2000 to support the efficient use of water resources.

THE CHALLENGE CHANGED IN 2021

As noted above, traditional water restrictions were implemented over three summers between 2017 and 2020 with the primary aim of minimising the risk of Tauranga's water treatment capacity being exceeded.

In the 2021/22 summer, in addition to the treatment capacity constraints, the streams that supply raw water for treatment had declined significantly and now governed (due to consented residual flow limits) the maximum volume of water that could be supplied to residents.

The Tautau stream was the source water supply stream of most concern due to its record low flow. Up until 2021 the Tautau Stream had provided a reliable source of water to the city since the early 1990's. Figure 3 below shows that water flow in the stream has historically had peaks and troughs but has always shown recovery within a period of a year or two and has been relatively consistent through to late 2019, with flows declining markedly following.

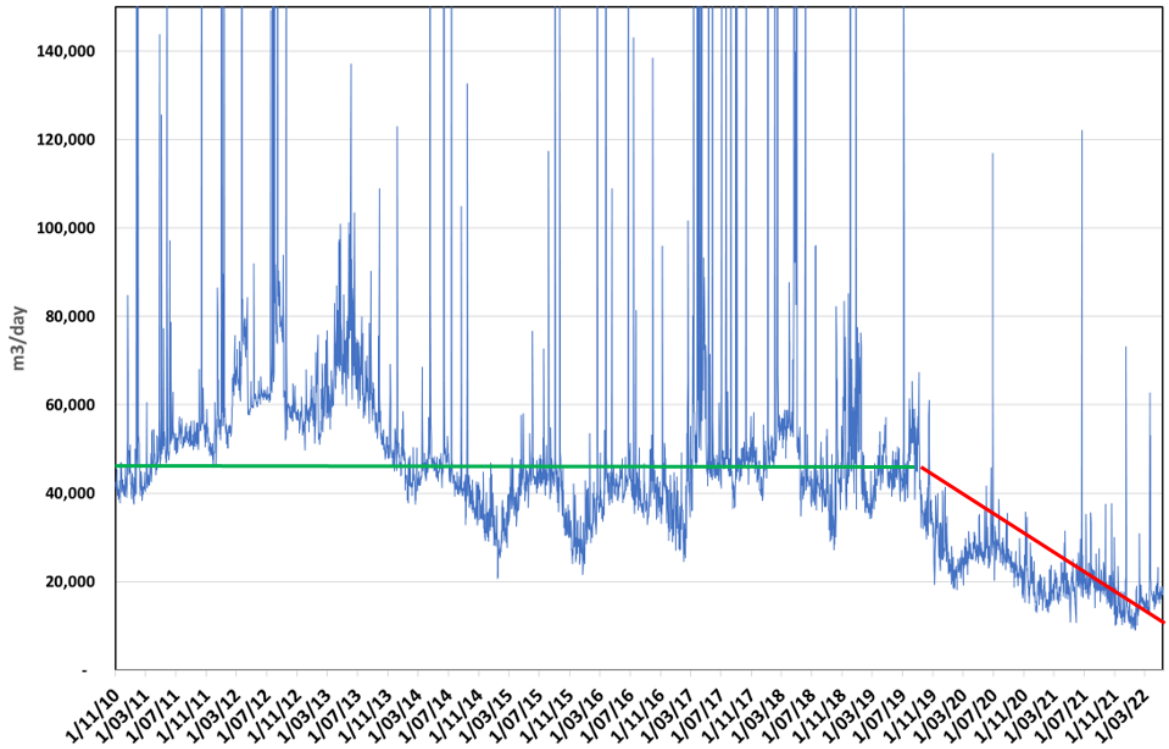

Figure 3 Tautau Stream Residual Flow (m3/day)

To overcome the risk of the water treatment capacity being exceeded, TCC had long been planning the Waiāri Scheme; and the construction of the new Waiāri Water Treatment Plant and associated pipelines was underway. However, the

Waiāri stream was also showing similar declining traits to that seen in the Tautau as shown in Figure 4 below.

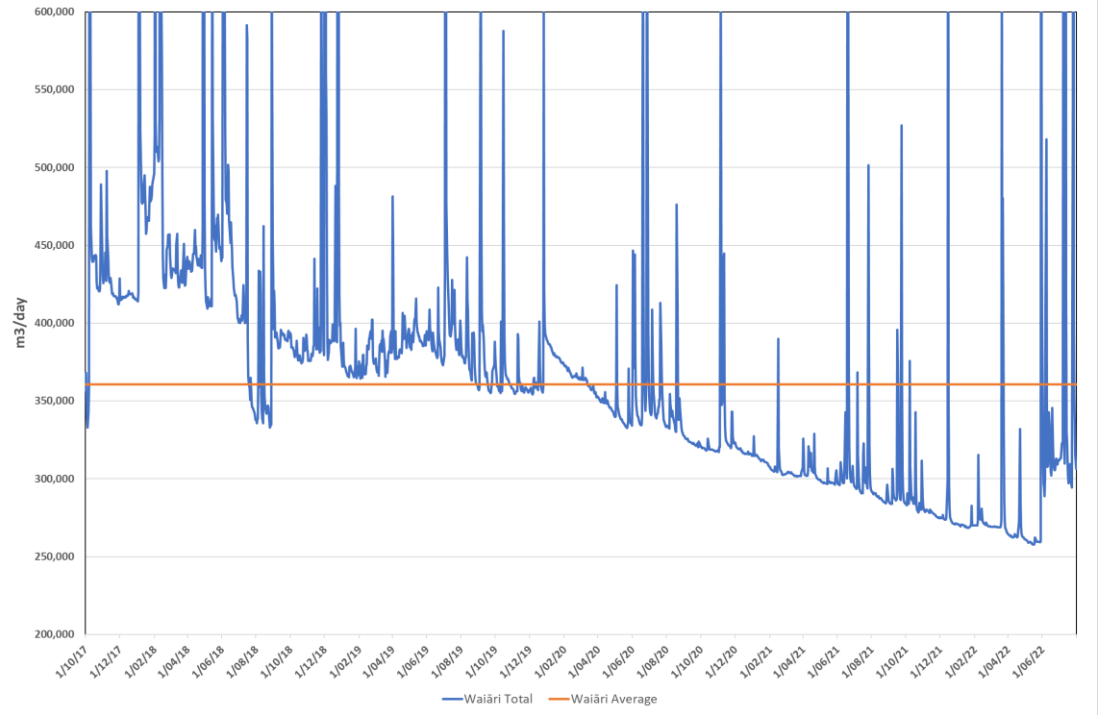

Figure 4 Waiāri Stream Flow Showing 20 Year Flow Average(m^3/day)

It therefore became evident that the Waiāri Water Treatment Plant was no longer the "silver bullet" to water resilience in Tauranga and that the primary challenge facing Tauranga's water supply had shifted from an infrastructure capacity issue to one of environmental capability.

This also highlighted the lack of resilience in TCC's source water supplies due to climatic effects, especially as all water sources are aquifer-fed streams.

WATER WATCHERS PLAN DEVELOPMENT

With the transition from an infrastructure capacity issue to one of environmental capability, TCC identified the need to review the approach to restrictions as demand needed to reduce further than what had been achieved in previous summers using a traditional approach.

TCC formed a "Water Restriction Task Team" that included input from TCC staff across Water Operations, Communications and Water Education as well as staff from GHD that provided technical expertise in stakeholder engagement, predictive analysis and water restriction/conservation plan development.

To develop the plan, two key tasks progressed in parallel:

1) Data analysis and predictive modeling to develop an understanding of how low stream flows may get during summer.
2) The updating of the High-Water Demand - Drought Management - Water Restriction Procedure.

ESTIMATING "HOW BAD IS IT GOING TO GET?"

As a traditional groundwater model was unable to be built and calibrated in the time available, stochastic models of the 3 streams that supply water to Tauranga were built by GHD. The purpose of this analysis was twofold to:

1) Determine whether a simplistic model approach could provide reasonable predictions of stream flow.
2) Forecast likely stream flow over the 2021-2022 summer period, to assist with water management.

A range of models were briefly tested in determining whether the historical stream flow, groundwater recharge and rainfall could be used to provide predictions of future stream flow. Testing included using two thirds of the available dataset period to train the models, and the remaining one third to test the models for goodness of fit. Consideration was given to the model's ability to predict general long term trends as well as annual variation in baseflow.

Within the timeframes available, multivariate linear and generalised linear machine learning models were tested. The models were applied to datasets for the three streams, however, greater focus was put on refining the model for the Tautau Stream as the water supply of greatest concern. The modelling approach was found to provide a reasonable level of fit for the Tautau Stream, with a mean percentage error in the order of 10% and an R2 of 0.64. Representation of annual variation for the test period was impaired to some degree, however, overall trend in predicted stream baseflow was considered adequate for broad predictions and hence the model was then run with the full data set with the aim of projecting future stream flow. As shown in Figure 5, the Tautau stream base flow for the summer months of 2021/222 was predicted to remain at very low levels which confirmed the need for restrictions to continue at or above their current level.

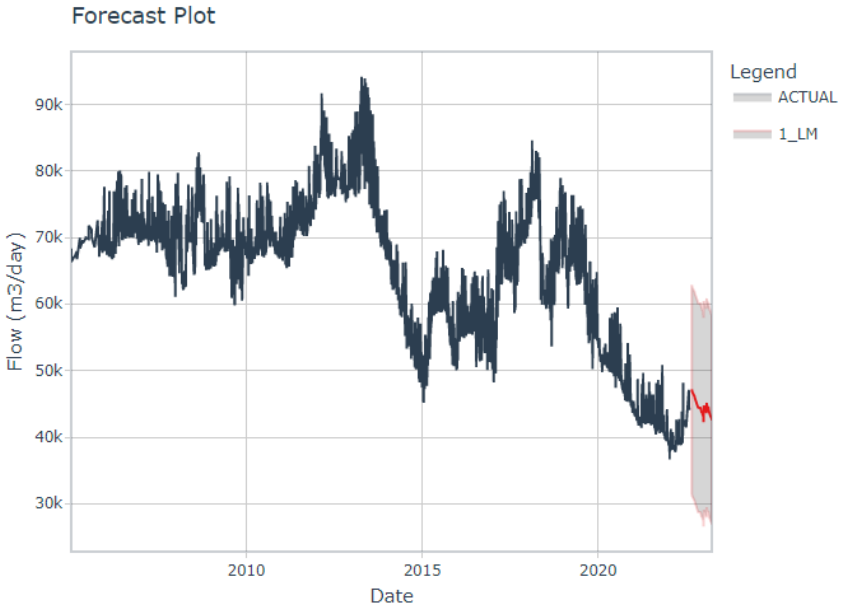

Figure 5 Tautau stochastic model prediction (m3/day)

PLAN DEVELOPMENT

The "High-Water Demand - Drought Management - Water Restriction Procedure" (later named Water Watchers Plan) was developed based on the following:

a) **Effectiveness of previous summers water restrictions** – We took components from the current restrictions forward that were delivering water savings, such as the outdoor water restrictions.
b) **Predicted source water conditions, especially in the Tautau Stream** – As noted above, the prediction was for source water flow to be at or below the prior summer's levels. With the potential for the flow to be less than the prior summer, and considering the high population growth occurring in Tauranga, it was determined that a higher level of savings was required.
c) **Lessons learnt by GHD in supporting Australian Water Utilities in managing water shortages in Australia over the past decade** – Key takeaways from the various Australian examples were the value of a planned approach with action taken at defined levels/times, the importance of understandable and digestible communication material, the importance of broadening the plan from a focus only on sprinkler/hose use to other water uses, the value of an exemption application process and the overarching water conservation approach taken.
d) **Lessons learnt by Watercare in managing water shortages recently in Auckland** – Key takeaways from Watercare were the impact that prohibiting specific business' use of water had (i.e house washing) and the importance of making accurate, real-time information on usage available.

The design expectation of the plan was to "flatten the curve" during summer months to proactively maintain the 7 day rolling average demand below 50,000 m^3/day to ensure community needs could be met without the source water stream consents being breached.

The final plan was developed collaboratively between GHD and TCC over a four-week period and on completion was named the Water Watchers Plan. The plan differed from prior restrictions in Tauranga in the flowing ways:

a) **It was a proactive plan** – restriction periods and types were set in advance.
b) **It was a year-round plan** – to acknowledge that water conservation is not something that should occur only in summer.
c) **It was more detailed and wider reaching than past restrictions** – with plans for at home, at work and in the community.
d) **In included an exemption process** - allowing residents to submit a "Smart Water Plan".

The Strategy at various stages was:

a) **Late Spring** (November) – Minor restrictions put in place to reduce water usage in specific areas where demand may spike should dry weather occur. This included reducing the hours during the day that water is used outdoors.
b) **Summer** (December to March) –introducing a significantly stronger set of restrictions aimed at suppressing water use over the period where the city

has historically seen highest demand. This was aimed at enabling TCC to maintain source water stream levels whilst balancing community needs.

c) **Autumn** (April) – A return to minor restrictions, following the stronger set of restrictions throughout the summer; continuing to encourage the wise use of water.

d) **Remainder of the year** (May through October) – An ongoing conservation / "restriction" that recognizes the importance and value of water and keeps water use front of mind in the community.

A copy of the at home plan is shown below.

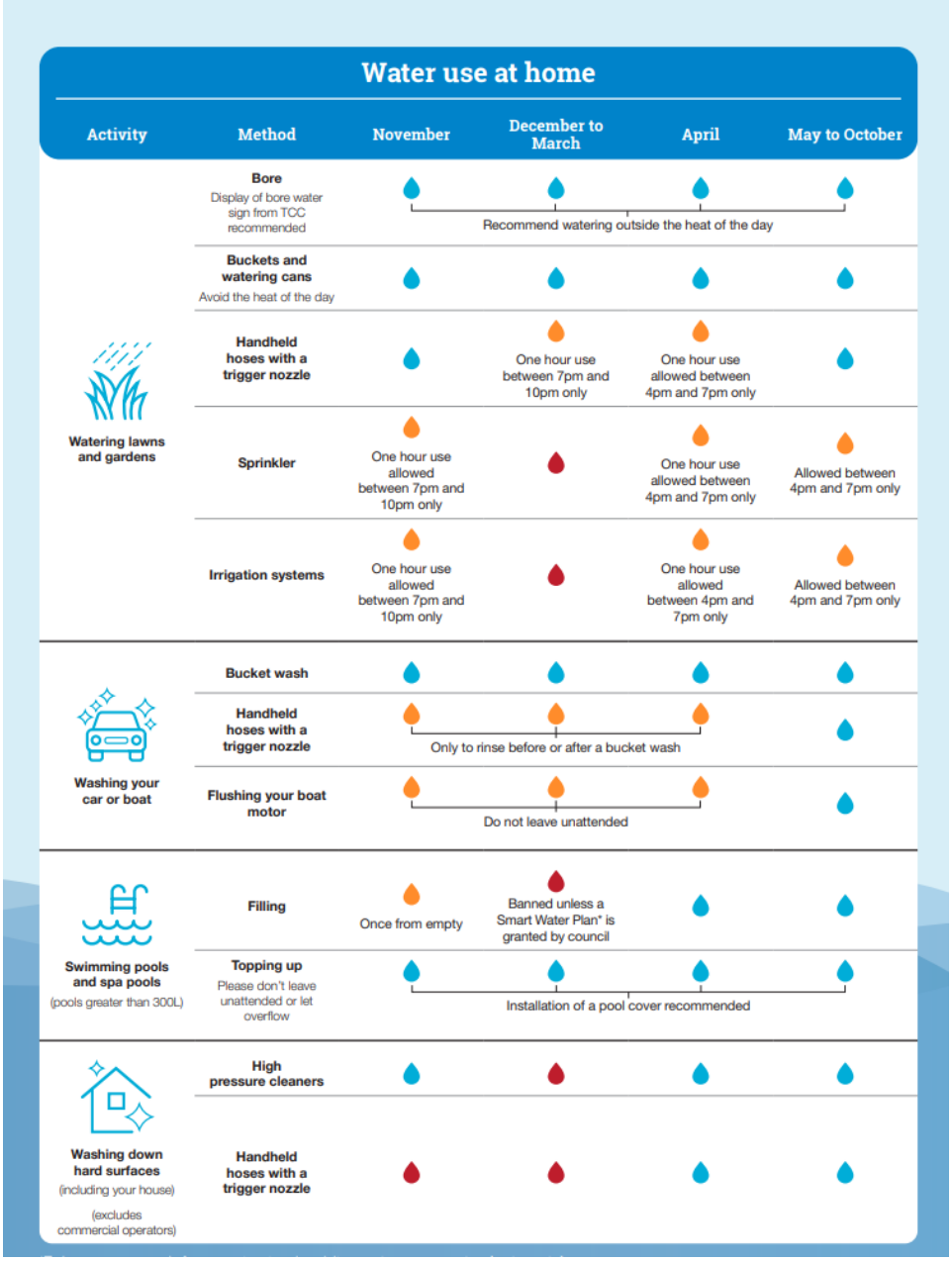

Figure 6 Water Watchers "At Home" plan, 2021/2022 Summer. Key – Blue = allowed, Orange = restricted, Red=banned.

The plan also included an emergency phase, being a total hose ban, that was pre-approved for implementation should the restrictions not sufficiently reduce demand. Finally, due to the restrictions being wider reaching and now involving

businesses, an exemption process, called a "Smart Water Plan" was implemented to achieve a balance between saving water without materially affecting people and their livelihoods.

2021 / 2022 IMPLEMENTATION

IMPLEMENTATION MANAGEMENT

Whilst the Water Watchers Plan restriction periods were set in advance, there was a need to actively manage the effectiveness of the plan, general communications, specific engagement with customers and compliance/enforcement over the summer.

The Water Restriction Task Team remined in place with the addition of a member of Council's compliance/enforcement team. At a minimum, weekly meetings were convened where peak and 7 day rolling average demand were monitored and, in the context of current demand, decisions were made on targeted communication and engagement activities, Smart Water Plan applications and compliance/ enforcement requirements.

A key difference from prior years was that the staff responsible for implementing the restrictions didn't include Council's water treatment or network team leads – this was to allow these teams to focus on the efficient running of treatment and network assets.

COMMUNICATIONS

The move away from traditional water restrictions, and the launch of the Water Watchers Plan, meant a significant change for the Tauranga community and a comprehensive communications campaign was required.

With the Water Watchers Plan development finishing in November 2021, a Water Watchers communications campaign was designed and launched within a short time frame due to the need for rapid uptake by the community.

The campaign was designed to support the launch, embedding in, and ongoing awareness of the Plan. The campaign was focused on three themes and broken into three stages:

Stage one – launch the plan (November 2021)
The plan was launched via a letter drop to all households in Tauranga. The letter drop contained an A5 copy of the "At home" plan intended as a reference guide for residents to refer to over summer to guide water use. Static billboards were also installed during this phase focused on the key area of unattended outdoor water use. Media also picked up the plan and ran a significant number of stories on the restrictions and, critically, why they were required.

Stage two – create awareness (December 2021 – March 2022)
This stage focused on create awareness of the Water Watchers Plan and key water restrictions from December to March for those who might not have taken note of the letter drop. Messaging was kept simple and focused on the key parts of the plan, directing people to the website for more information. A large breadth of communication channels was used at this phase to reach the wider Tauranga

community. This included prominent billboards on main highways/roads, targeted Facebook posts, quizzes to learn more about the plan, radio, direct engagement with large customers and the wider the community as part of the Smart Water Plan process as well as variable messaging signs at key residential entry points targeting holiday makers.

Figure 7 Examples of communication used in Summer 2021/22

Stage three – Consolidating understanding and behavior change (April 2022 – onwards)

This stage focused on consolidating the plan and creating long term behavior change. The Tauranga Water Conservation Project (Te hinonga tiaki wai Tauranga) was launched as part of this stage to empower the community to think differently about water use and be more mindful around how they use their share of the city's water supply. It is an overarching programme that includes Water Watchers along with other resources and advice on action residents can take to make every drop of water used count.

SMART WATER PLANS AND WORKING WITH CUSTOMERS

As introduced above, the Water Watchers plan introduced a process where customers could apply for an exemption from having to comply with the Water Watchers Plan.

The process involved customers submitting an online form with information on the following to allow the proposed water use to be assessed by the Task Team:

a) The type and quantity of water use requiring an exemption.
b) When water was needed, where and how often.
c) How the volume of water had been calculated.
d) What initiatives were proposed to keep this volume to a minimum.
e) Why non-potable sources of water couldn't be used.
f) The impact of the plan not being granted.

Each application was individually assessed taking into consideration:

a) The current source water and treatment capacity
b) Prevailing weather conditions
c) Current and predicted water demand
d) Public health, safety or wellbeing
e) Impact upon the livelihood of the customer if not approved
f) The realistic needs of the customer applying for the exemption
g) Any special requirements of the customer applying for the exemption
h) Supporting evidence tendered in justification of the application
i) If the exemption is in the public interest

In addition to the Smart Water Plan process, targeted engagement was undertaken with Councils Top 25 water users as well as industry groups representing pool installers, civil contractors, the landscaping industry and house washing operators for example. Through this engagement we were able to understand specific water use required by particular users and work collaboratively to identify savings of scale – at a particular location or on an industry wide basis.

OUTCOMES DURING THE 2021 / 2022 SUMMER

WATER CONSUMPTION WAS REDUCED

Overall, the Water Watchers Plan was successful in curbing water demands and together with rainfall in early February 2022 water demand fell below the annual average water usage and remained (on average) below the prior year's usage into winter as shown in the 7-day rolling average demand graph in Figure 8.

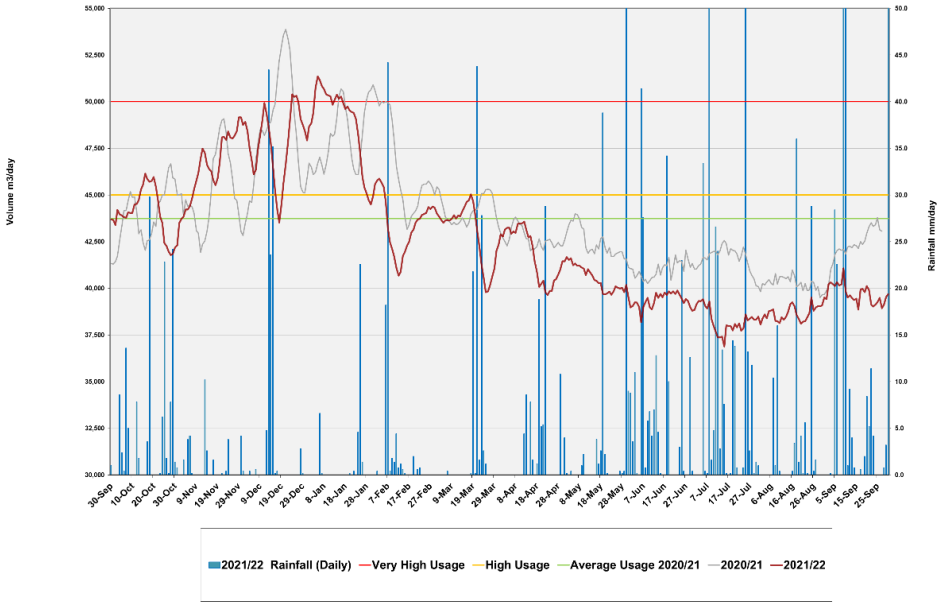

Figure 8 Tauranga City Peak Water Use (7 Day rolling average)

The following table provides a comparison of key water data over the 2020/21 and 2021/22 summers:

Item	**2020/2021**	**2021/2022**	**Change**
Highest Peak Day Usage (m3/day)	55,487	54,358	1,129 (2%)
Highest 7-Day rolling average (m3/day)	53,622	51,367	2,255 (4%)
Total Usage Dec-Mar (m3)	5,661,803	5,531,584	130,219 (2%)

While the changes may not appear to be significant from a percentage reduction, this reduction is over and above "traditional" water restriction reductions (estimated at 14% reduction on unrestricted). This reduction must also be considered in the light of ongoing population growth of 3% P/A over the period and the impact that small reductions in water take can have on the source water streams.

Whist the plan was deemed successful when assessed across the full summer period, there was a two-week period early in January where water demand was consistently above 50,000 m^3/day which, put TCC's ability to supply sufficient water to meet demand under growing pressure. This was signaled to the community via a "Warning Phase" through various media channels which assisted to reduce the demand without needing to escalate the restriction requirements.

The demand profile, when compared to rainfall, reinforces that the majority of increased summer water demand is outdoor water use and supports the need for ongoing water conservation education and messaging to drive the sustainable use of drinking water in the city.

ENGAGEMENT & VISIBILITY WITH THE COMMUNITY SIGNIFICANTLY INCREASED

The communications campaign delivered was significantly more comprehensive than previous summers and resulted in an almost 300% increase in traffic to TCC's water restriction page (over 23,000 views) compared to the previous summer. The page was the sixth most viewed web page (out of over 1000 pages) on the TCC website over summer. The community was also actively engaged in supporting the implementation of the plan with the community logging 119 breach reports via TCC's call center.

Over 100 Smart Water Plans were received from December until March with 84 approved and the remainder either declined or withdrawn. The Smart Water Plan Process was more than a "tick box" exercise with every applicant spoken with to understand the importance/reason for the exemption to test whether options to reduce use or utilise other sources had been fully explored.

As a result of the Smart Water Plan process and direct engagement with customers, the following actions were taken by commercial and industrial customers to save water:

a) Mitre 10 Mega Tauranga installed rainwater tanks and a new irrigation system so that their nursery was solely watered by rainwater (Figure 9). They also used this in their own marketing over summer to promote themselves as a sustainable retailer and as an avenue for customers looking for advice and equipment to follow their lead.

Figure 9 Photo of Mitre 10 Mega Tauranga newly installed rainwater system.

b) Several retirement village complexes initially applied for exemptions, but following conversations agreed to change their property cleaning schedules ongoing so properties were not cleaned during the summer months (saving on washing of over 50 houses in peak demand times).

c) A number of car yards applied for an exemption and through collaboration a cleaning approach was developed that kept the impact to their businesses low whist saving almost 40% of the water used washing cars.
d) Several civil contractors applied for exemptions for water use during construction – in most cases savings over the applied for volume were able to be identified with applicants, with a couple of applications being withdrawn altogether due alternative sources of non-potable water being identified.
e) The Port of Tauranga (PoT), one of Councils largest customers, actioned their own campaign to minimise water use including:
    (i) Communicating with staff and contractors and placing signs at high water use locations.
    (ii) Limiting plant washing to essential hand washing only.
    (iii) Limiting the supply water for ships to when absolutely necessary.
    (iv) Transitioning to uses that don't require potable water to a bore source, such as water is used for bladders which hold tarpaulins down and water used for sweeping.

LESSONS WERE LEARNT

At the conclusion of the 21/22 high-water demand period the Water Restriction Task Team captured lessons learnt, and the key items were:

a) Communications

(i) The proactive plan was easier to communicate and was generally well received by the community by providing clarity as to what was expected.
(ii) The use of a range of digital media types (billboards, VMS boards and social media) provided the ability to target communications to the changing supply situation.
(iii) Even with a significantly larger communications effort, some sectors of the community (especially business) did not fully understand the broadened restrictions; therefore, more targeted engagement approaches should be considered for businesses.
(iv) That there is a lack of community understanding of where water comes from and infrastructure constraints. A wider community understanding would assist with future water restrictions/conservation programs.
(v) There is a growing understanding by the community that water is a precious, finite resource, which is supported by ongoing communication and restrictions.

b) Water Watchers Plan Restrictions

(i) The restricted activities resulted in significant water savings.
(ii) There are some specific areas where the plan could be clearer, to facilitate increased savings or provide for longer term behaviour change.
(iii) The Smart Water Plan process (exemption applications) worked well and delivered valuable insights but required more resource than anticipated.
(iv) Business restriction (included in the "At Work plan") compliance was highly varied, and there are areas of the plan that need further

consultation with specific sectors to better understand what is achievable.

(v) Providing certainty around timing allowed the community to plan activates in advance around restrictions – such as house washing before or after summer.

(vi) The Emergency Phase (hose ban) needed to be better integrated into the plan.

c) Compliance

(i) Site based compliance involvement/activity was targeted to multiple plan breaches. Consistent feedback was received from the community that individual plan breaches need to be addressed more proactively (on the day the non-compliant water usage occurs).

PREPARATION FOR THE FUTURE

DROUGHT PLANNING

Due to the impact of three dry summers on Tauranga's water supply network, and in recognition of the changing rainfall over time (Figure 10), TCC commissioned GHD to develop a plan focusing on managing drought over the near term (up to 2026).

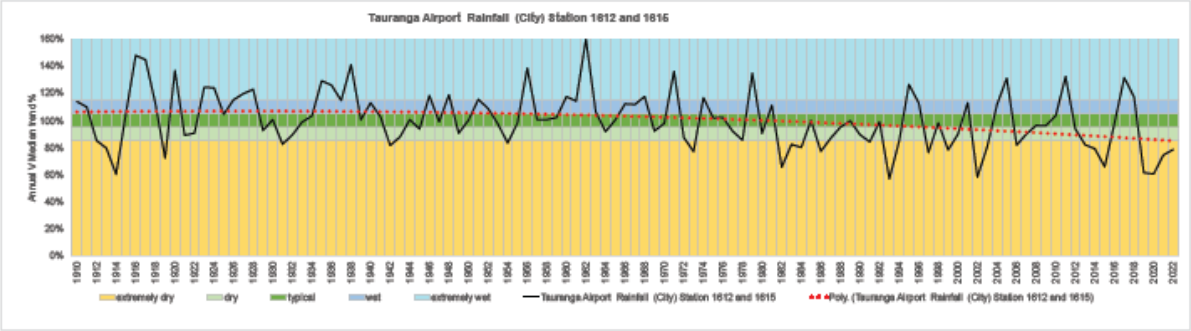

Figure 10 Rainfall at Tauranga Airport 1910 to 2022

The plan was developed using a climate dependent water balance tool to forecast future demand and test the impact of potential supply and demand side interventions. Amongst several recommended interventions, the plan confirmed that it was prudent to maintain the Water Watchers plan on an ongoing basis given the need for TCC to be good stewards of water and the growing climatic uncertainty.

EVOLUTION OF THE PLAN FOLLOWING THE SUMMER OF 2021/22

Following the successful implementation of the Water Watchers Plan in the 2021/22 Summer, a paper was presented to Tauranga City Council on 7 November 2022 in preparation for the 22/23 Summer with proposed changes to the plan in response to lessons learnt during the prior summer's implementation. Proposed changes to the plan included:

a) All plans:

(i) Peak demand month restrictions amended to December - February (From December - March), following analysis of the prior year's water demand and availability.

(ii) An advisory was added that more stringent water saving measures (full hose ban) will be implemented if water use goes beyond sustainable levels.

b) At Home plan:

(i) An allowance was made for watering vegetables with low volume/ micro irrigation systems, following community feedback. We considered it was important to acknowledge the value of vegetable gardens with the current high inflation and cost of living demands on the community.

c) At Work plan:

(i) The plan was reorganised into three activity themes to make it clearer:

i. Landscaping, gardens and pools
ii. Garden Centres and retailers
iii. Vehicle and building washing.

(ii) A new section for water uses in construction was added.

(iii) For clarity, the ability to apply for a Smart Water Plan to use water for dust suppression was removed. The use of drinking water for dust suppression has been long prohibited in Tauranga and alternative water sources are required.

(iv) A cap on the quantity of water supplied to cruise ships was included as a result of resident concern (directly communicated with the PoT)

d) In the Community plan:

(i) An allowance was made for watering community vegetable gardens with low volume/ micro irrigation systems in line with the at home plan.

The paper also included a recommendation to continue with the Water Watchers Plan, to mitigate supply risk and as an ongoing water efficiency/conservation measure, through to 2026.This was endorsed by the Commissioners.

REFLECTIONS FROM THE 22/23 "WET" SUMMER

Tauranga experienced an incredibly wet period including the summer of 2022/23. The rainfall for the past financial year was more than double the annual average (2,558 mm compared to 1,244 mm). The flow in the city's source water streams started to improve from about November / December 2022 and are currently showing above normal flows, however the city is yet to have a period of drier weather needed to ascertain how much of the flow is from surface runoff versus true aquifer recovery.

With all of this rainfall, the community have understandably questioned why the Water Watchers Plan / water restrictions are still in force given they have historically been used when water was in short supply/high demand. The sudden transition from very dry to very wet and the associated community response has highlighted the challenges associated with delivering a consistent, proactive approach to restrictions like the Water Watchers Plan aims to do.

Our experience suggests that there are the two key advantages with a consistent approach to restrictions, firstly it allows the community to plan their outdoor water use on the timings in the plan (e.g. home water blasting by the end of November and not during the December to February period). The implementation of the plan on a multiyear basis also starts to drive long term change such as investment in rain tanks, bores and the transition of landscaping to drought tolerant species being a few examples. Secondly, using the traditional approach one of the biggest challenges was how to get the message of water restrictions out to the whole community in a matter of days, this was largely overcome with keeping the Water Watchers Plan in play in the medium term and the community understanding is building year on year.

There are also a number of other reasons to keep the proactive approach in place including:

(a) Positioning Tauranga to be a "Water Efficient City". This will stand the city in good stead in preparing for the reconsenting of two of the water takes which expire in October 2026.

(b) To give effect to Te Mana o te Wai, which is required under the Water Services Act 2021. Water suppliers are required to be good stewards of the water that is used to supply. Efficient water use contributes to the impact on the environment and stream flow and health.

(c) Better use of existing water supply infrastructure through reducing both the average and peak water use per capita. Peak water demand drives the timing of infrastructure requirements which drives capital investment and associated carbon emissions.

(d) During periods of hot, dry weather the aquifers that supply our streams do not recharge at the same rate that we are taking water. During heavy rain events demand for water eases, however it brings challenges in our ability to treat water due to the extra sediment stirred up. Further re-enforcing that, whatever the weather, good water conservation practices are needed.

From a community perspective however, water restrictions can have a negative connotation in relation to a service the community are paying for yet are subject to restricted use of and, in some instances, enforcement action. Furthermore, community buy-in to water restrictions in the past has been in response to a clear and current need (e.g. low stream flows / the drought situation), but isn't seen in the same light when there is a perception that that need for restrictions is no longer there.

CONCLUSIONS

There are clear and compelling reasons to maintain the Water Watchers Plan in place moving forward, however this will require us to take the Tauranga community on our journey to move from water restrictions to water conservation and good water use practices- not always in response to a current shortage but in response to the value of water. The future focus will be on developing this transition.

ACKNOWLEDGEMENTS

The authors would like to acknowledge:

(a) The Tauranga community for their efforts over the past summers to "watch our water for good"

(b) Chris Donnelly (Technical Director - Engagement, Communication and Communities at GHD) for providing insights from restriction approaches in Australia.

(c) TCC's Communications Team, particularly Paula Trubshaw.