Hastings District Council

Drinking Water Strategy

Date: 28 March 2018

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1 INTRODUCTION

In 2008 the Hastings District Council (HDC) embarked on the development of a Water Strategy. The catalyst for compiling a comprehensive water strategy was in response to resource consent conditions imposed as a result of an application seeking to continue to abstract water from the Brookvale Rd bores that primarily sourced water for the Havelock North community.

It was acknowledged at the time of the application that there was no robust document that brought together the future planning initiatives for the water supply and Council needed an overarching plan of how it would address a range of issues including demand management, growth, network management (including pressure and leakage) and environmental impacts through abstraction and stream depletion.

Growing concerns about the combined effects of abstraction of water from the Heretaunga Plains meant that a greater focus was being placed on all users including municipal water supplies to demonstrate that their use was sustainable and that the management of these supplies was in line with appropriate practices and under regular review. With the Hastings urban water supply consent up for renewal in 2012 all of these issues would need to be addressed in a comprehensive strategy that set out initiatives and commitments over time.

At the heart of the strategy was an assumption that the groundwater source supplying much of the entire urban area was of such a high quality that it was safe to deliver to consumers without treatment. This perception of groundwater being immune from contamination has been in existence since the 1880's when groundwater was first used to supply potable water to a developing community. Since then the communities of Napier and Hastings have relied entirely on pristine groundwater sources pumped directly from the source to the consumer without any treatment or chlorination whatsoever. It must also be noted that our primary horticultural, agricultural and food processing industries have a huge reliance on the Heretaunga Plains groundwater source for irrigation and bulk water supply.

Purpose of Document

This summary document brings together the genesis of the HDC water strategy from its conception in 2008 updated to the most recent strategy that has been substantially reviewed in light of the Havelock North contamination event in August 2016. The plethora of new information informing us about groundwater quality and its vulnerability to contamination has resulted in a substantial rethink about how safe water is to be provided across the Hastings District.

New information relating to sustainable groundwater abstraction rates and stream depletion effects from groundwater abstraction across the Heretaunga Plains means that Council also needs to ensure that it has adequate water to meet the current and future needs of the community, water is used efficiently while also ensuring that its abstractions are within sustainable allocation limits and are not having an adverse environmental effect.

This strategy presents a vision for the delivery of water services based on an agreed set of objectives that has water quality and safety as its prime objective. The strategy includes a combination of new and redefined initiatives based on investigations, modelling and science to inform how Council will progress in meeting the targets and timeframes it is proposing in the 2018 – 2028 LTP.

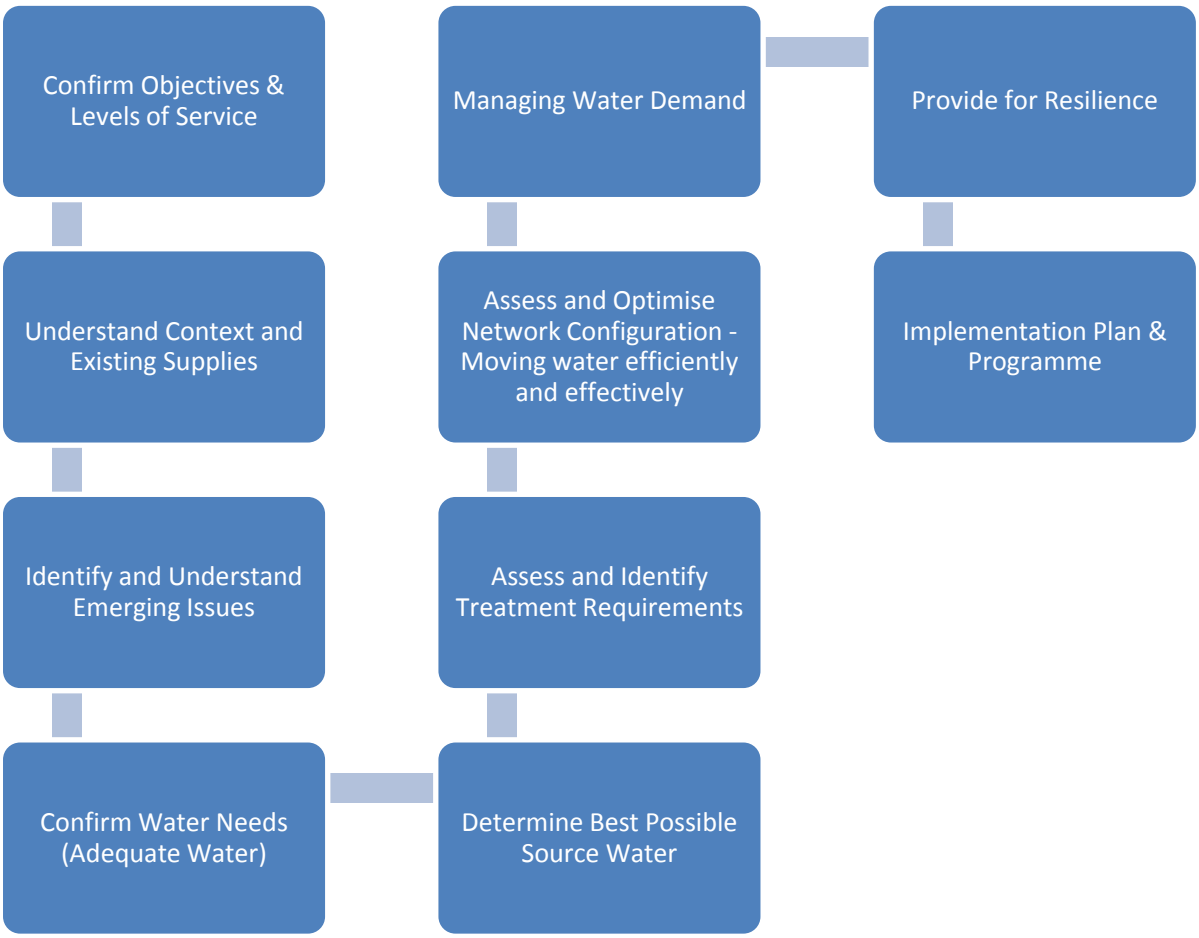

Figure 1 - Road Map to Review & Update Strategy

2 WATER SERVICES OBJECTIVES

The number one priority for Council is the provision of safe water.

Council's previous water strategy was premised on the assumption that groundwater was both pristine and plentiful and the key considerations were around accessing sufficient quantities of water while minimising potential stream depletion effects. This strategy recognises that the assumptions of plentiful and pristine water are no longer valid and a wider range of objectives have been established as a result of the extensive investigations and recommendations from the Board of Inquiry who have investigated and reported on the Havelock North contamination event. These are summarised below.

Figure 2 - Water Services Objectives

3 STRATEGY BACKGROUND

2008 The strategy development commenced with the **2008 Brookvale consenting process**. At that time, it was known that there were stream depletion effects arising from using the Brookvale bores and assessments determined that at the maximum consented rate of 200 L/s this would cause a depletion of up to 63 l/s from groundwater springs that feed into the Mangateretere Stream. These effects were considered to be unsustainable and both Ngati Kahungunu and a number of surrounding properties were objecting to the continued use of Brookvale. Of particular interest during the consent hearing was the lack of any historic demand management practices to control community use at times of peak summer demand. The consent was granted for a period of 10 years acknowledging that HDC would require time to determine and implement an augmentation strategy that supported a move away from Brookvale Rd as a primary source of supply. At this early stage both HDC and the HB Regional Council were in agreement that abstraction from groundwater sources that did not have stream depletion effects was a more appropriate measure.

Through the consent, Council committed to a **Water Conservation and Demand Management Strategy** across the network, and to working towards reducing the abstraction from the Brookvale bores by the end

of the 10 year consent term (ie, by 2018). Council recognised and acknowledged concerns from Ngati Kahungunu regarding stream depletion effects and committed by written agreement to withdraw from Brookvale as a primary supply source unless stream depletion effects could be mitigated.
In summary, the 2008 Brookvale consenting process represented the start of Council's programme on Water Conservation and Demand Management, as well as the start of a programme of investigations to confirm groundwater sources that could be used without significant adverse effects on surface water.

2011 - 2012

In **2011, HDC completed its investigations into what infrastructure investment would be required to supply Hastings and Havelock North, including providing for the projected Heretaunga Plains Urban Development Strategy (HPUDS) growth.** A range of scenarios were assessed including with and without Brookvale, as well as limiting the use of the Flaxmere bores due to potential stream depleting effects.

The outcome was a strategy to consolidate supply around the Frimley and Eastbourne borefields, both of which were understood to yield high quantities of secure, good quality groundwater that would not need treatment to meet Drinking Water Standards. These borefields were deemed to meet the requirements of the DWSNZ 2005 (2008) for secure supplies.

2012 -2014

In **2014, resource consent was secured for the required abstraction** to support the implementation of this strategy. The Hastings water supply consent was granted **to 2047** and provided a stepped annual allocation of groundwater that would meet growth needs. The focus at this stage remained on securing access to water with the assumption that groundwater was of high quality and did not need treatment to meet Drinking Water Standards

2014 - 2018

Since 2014 the strategy has been **progressively implemented** by HDC including moving Portsmouth Road bore to an augmentation role, construction of a new bore and upgrade of power supply at Frimley, pipework connecting through Irongate industrial area and new trunk mains in Heretaunga Street and Te Mata Road.

In response to the 2016 Contamination Event which was caused from contaminated stormwater entering the aquifer, Council commenced a programme of scientific investigations into its groundwater sources in order to understand the quality and potential contamination risks associated with each of the catchment areas up gradient of the abstraction bores. The outcome of this study was a series of **Source Protection Zones** which created a 3-D model incorporating groundwater and aquifer data with land use activities to provide a risk map and profile for each water source. This work, coupled with significantly increased groundwater monitoring and age testing has **informed the Council's current strategy and its choice of groundwater sources, founded on the principle of using the best possible source water.**

4 RECENT & EMERGING ISSUES INFLUENCING OUR STRATEGY

4.1 Havelock North Contamination Event

The Havelock North contamination event is a sobering reminder of the consequences of non-secure groundwater sources being supplied directly to consumers without having multiple barriers to contamination in place. The primary cause of the event was found to be contamination from land use activities entering the aquifer following a significant rainfall event. This, combined with an absence of treatment and no chlorine residual disinfection resulted in over 5,000 people being struck down with campylobacteriosis and was implicated in the deaths of four people.

Contributory factors included a reliance on the secure groundwater status and very little oversight of land use and catchment management in the vicinity of the bores or understanding of the potential risks within the wider catchment.

4.2 NZ Drinking Water Standards - Compliance and Groundwater Security

The Health Act 1956 requires drinking-water suppliers to take all practicable steps to meet the Drinking-Water Standards for New Zealand. These standards provide the yardstick against which water quality is measured. They provide detailed specifications for drinking-water suppliers, including maximum acceptable values for a range of contaminants and monitoring requirements.

Under the Drinking-Water Standards for New Zealand, suppliers are expected to test the water regularly to demonstrate that it is safe. The drinking-water standards were produced by the Ministry of Health, which has a national function to ensure appropriate regulations are in place.

The current DWSNZ approach using water dating or water quality variation criteria, along with consideration of bore head protection, is based on a reasonable assumption that groundwater isolated from surface contamination is unlikely to contain pathogenic micro-organisms. Advantages of the current approach include that it is pragmatic, being easily applied with minimal information and is empirically derived from local information.

The water supply bores serving the Hastings, Havelock North and Flaxmere urban network have for many years been deemed secure under the NZ Drinking Water Standards 2005 (Revised 2008). The information that supported this secure status is primarily based on hydrogeological information about the aquifer, bore depths and the lithology when they were drilled, microbiological testing and ground water age tracer analysis undertaken by the Institute of Geological and Nuclear Science at 5 yearly frequencies.

The following tables demonstrate the type of data used by HDC to assess the integrity and age of our groundwater sources. An important aspect of the more recent assessments is the determination of the **minimum residence time** in addition to reporting on the **mean residence time (MRT)**. Previous analysis submitted to support the secure status was based on MRT result alone and this has been the standard practice for many years.

Table 1: Well Details

(Table 1.1 of GNS Science Consultancy Report 2016/152 – Groundwater Residence Time Assessment of Hastings District Council Water Supply Wells in the Context of the Drinking Water Standards for New Zealand)

Well name	HBRC Well ID number	Easting [1]	Northing [2]	Total well depth [m below ground level]	Screen depth (m below ground level) [2]	Aquifer confinement condition [2]
Waipatiki	3516	1942704	5642678	37.5	23.7 - 28.0 31.3 - 34.3	confined
Whirinaki	5033	1933186	5632652	10.2	7.2 - 10.2	unconfined
Omahu	10334	1923223	5611906	12.2	Not specified	confined
Portsmouth Rd	3253	1924038	5606956	48	37.0 - 40.0 40.9 - 43.9 45.0 - 48.0	confined
Wilson Rd	897	1925802	5606559	46	38.5 - 46	confined
Pakipaki	1905	1925137	5599411	30	21.95 - 28.96	confined
Parkhill	5830	1938931	5606995	37	32.5 - 36.5	confined
Beach Rd, Haumoana	1187	1939107	5608137	51.3	22.0 - 28.1	confined
Tucker Lane, Clive	542	1936402	5610725	47.55	41.45 - 47.55	confined
Ferry Rd, Clive	1658	1936643	5611357	48.2	41.0 - 47.0	confined
Whakatu	473	1934545	5608832	38.4	32.3 - 38.4	confined
Waipatu	15415	1932395	5606254	36.57	Not specified	confined
Brookvale No.1	1329	1935195	5603353	22	11.4 - 17.4 19.0 - 22.0	confined
Lyndhurst No.5	130	1929225	5607179	63.4	51.7 - 54.1 56.0 - 58.4 60.3 - 62.7	confined
Eastbourne No.5	1302	1929853	5604651	85.5	69.4 - 76.4	confined

1. Coordinates are NZTM and were measured at the time of sampling by handheld GPS.
2. Screen depths and aquifer confinement condition provided by the Hastings District Council.

Table 2: Groundwater Mean Residence Time (MRT) and Young Fraction (i.e. water less than one year old)
(Table 4.1 of GNS Science Consultancy Report 2016/152 – Groundwater Residence Time Assessment of Hastings District Council Water Supply Wells in the Context of the Drinking Water Standards for New Zealand)

Well name	Exponential mixed flow %	MRT [years]	Minimum residence time [years] [2]	Young Fraction <0.005%
Waipatiki	50	115	58	Yes
Whirinaki	72	10	2.8	Yes
Omahu	50	0.2	0.1	No
Portsmouth Road	19	2.1	1.7	Yes
Wilson Road	56	2.1	0.9	No
Pakipaki	71	149	43	Yes
Parkhill	BMM [1]	20.8	3.3	Yes
Beach Rd, Haumoana	53	73	34	Yes
Tucker Lane, Clive	BMM [1]	26.6	5.4	Yes
Ferry Road, Clive	BMM [1]	34.1	5.0	Yes
Whakatu	BMM [1]	29.9	2.0	Yes
Waipatu	BMM [1]	29.9	2.0	Yes
Brookvale No.1	BMM [1]	4.3	0.1	No
Lyndhurst No.5	50 BMM [1]	5 9.0	2.5 1.0	Yes No
Eastbourne No.5	BMM [1]	25.0	2.4	Yes

1. BMM denotes a binary mixing model.
2. Minimum residence time is the age of the youngest water present in the well outflow. Values in red indicate non-compliance with the DWSNZ:2005 residence time criterion.

The relevance of achieving a secure status meant that water suppliers were deemed to be achieving protozoal compliance without treatment and the extent of ongoing microbiological testing for compliance was substantially relaxed.

Chlorination

The dosing of chlorine as a residual disinfection has never been utilised in any of the Hastings DC supplies. The reason for this has been based on the long held and imbedded perception that the quality of all groundwater across the Hawkes Bay was pristine and safe, and therefore did not require any treatment. The community and Council has held the belief that our supplies should remain pure and there has been a reluctance to tolerate chlorine even when it has been used as a response to transgressions. The Council, like many other suppliers across the country, has relied on the groundwater secure status and compliance testing as a means of demonstrating that supplies have been safe without treatment.

The events of August 2016 in Havelock North led HDC to implement chlorine disinfection across the entire urban network as an immediate step to improve the safety of groundwater sources that are no longer considered to be secure. The investigation by HDC and the Board of Inquiry outcomes have clearly indicated the need to consider all groundwater sources as non-secure requiring treatment and chlorination as part of a multi-barrier approach to water safety.

The Water Strategy is therefore heavily focused on setting out how Council will go about meeting this objective and the treatment train that will be required, while also incorporating a suite of other strategies that combine to address the overarching objectives of the plan.

Fluoridation

Prior to the 2016 contamination event, all of the urban water supplies were being dosed with HFA (hydro-fluosilicic acid) as a means of providing community fluoridation. This practice ceased when the dosing systems

were commandeered to dose chlorine into the water supplies in response to the event. Fluoridation will recommence as each of the source supplies and treatment plants is upgraded as part of the strategy; the timeline for full reinstatement of all supplies is within 3 to 5 years although it is expected that partial fluoridation will be in place within 2 years.

4.3 Fundamental Principles of Drinking Water Safety

The Board of Inquiry, in its Stage 2 report into the Havelock North Contamination Event, , identified six fundamental principles for drinking water safety for New Zealand. Hastings District Council has adopted these principles in preparing its water strategy. These principles, as defined by the Board of Inquiry are:

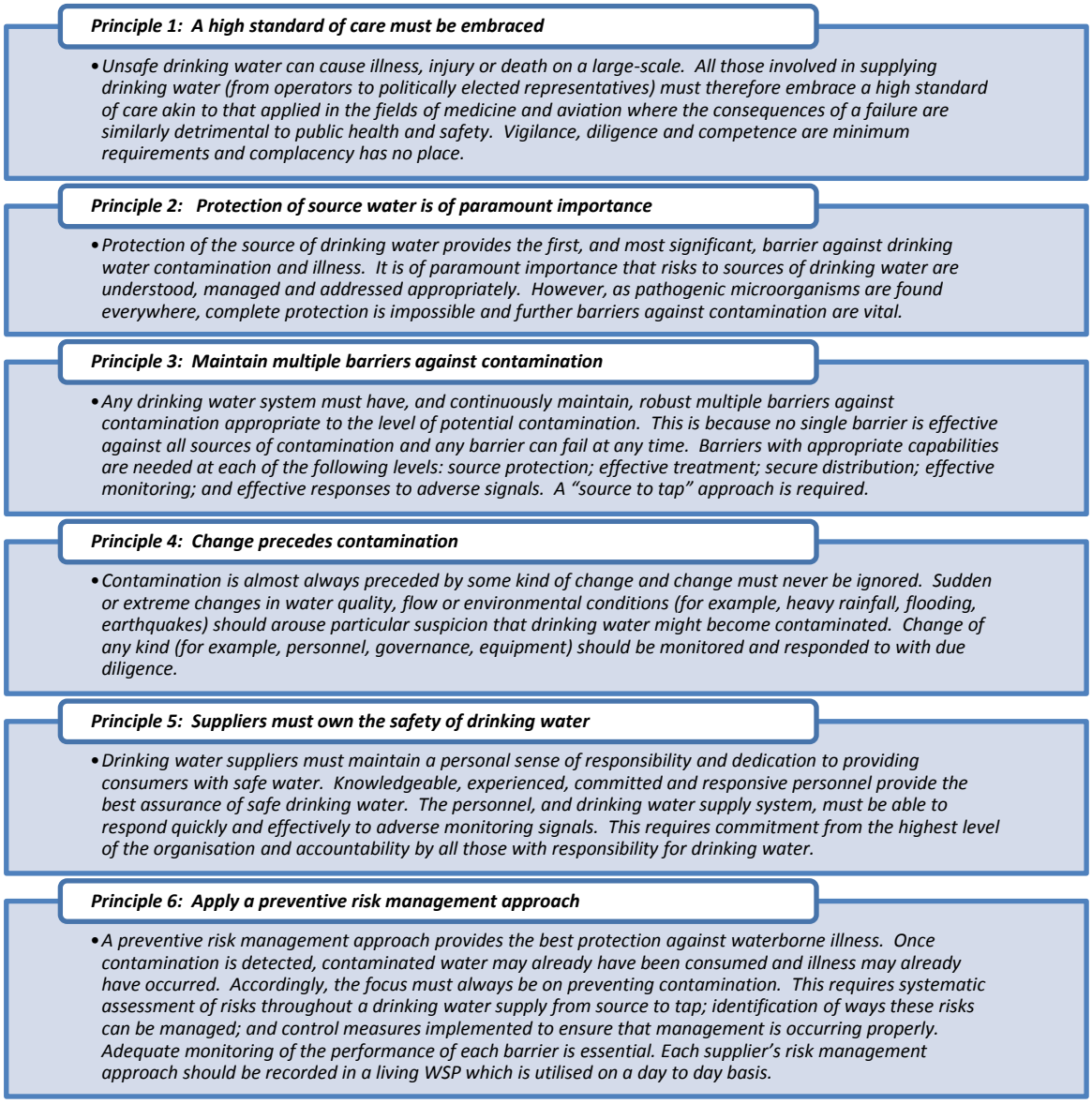

Figure 3 - Principles of Drinking Water Supply

4.4 Board of Inquiry, Stage 2 Recommendations

The Havelock North Drinking Water Inquiry Stage 2 process and report focused on matters relating to improvement of the safety of drinking water in New Zealand, lessons to be learned from the Havelock North outbreak, and changes which should be made to achieve those goals. In addition to the Fundamental Principles of Drinking Water Safety as noted above, the Board made several recommendations which have

been taken in to consideration by Council in developing this strategy. The relevant recommendations and how Council has incorporated these in to the Strategy are summarised below (Recommendation numbers are as per the Board of Inquiry Stage 2 Report):

Fundamental Principles of Drinking Water Safety

Urgent & Early Recommendation 1
"The six fundamental principles of drinking water safety should be ….used to inform … the operation of the entire drinking water system"

Council has adopted the six fundamental principles of drinking water safety in the development of this strategy and in all activities undertaken in providing drinking waters services.

Secure Groundwater

Urgent & Early Recommendation 2
"The secure classification system in section 4.5 of the DWSNZ should be abolished forthwith. The concept of a secure classification is fundamentally flawed as it does not provide a sound or safe basis for dispensing with treatment or reducing monitoring requirements and provides an erroneous and misleading message that the bore water is safe."

Since August 2016 Council has no longer relied on the secure groundwater status and has instigated chlorine treatment as an interim step in minimising risk. The development of this strategy has assumed that none of the Council's supplies will be considered secure in terms of the Drinking Water Standards. Decisions around selection of source water and treatment needs have not relied on achieving or maintaining secure groundwater status.

Mandating Universal Treatment

Urgent & Early Recommendation 6
"Because the risks to the public of untreated drinking water are simply too high to continue with such supplies until legislation mandating universal treatment has been considered and passed, the Director-General of Health can and should, in the interests of public safety and welfare, exercise effective and practical leadership to encourage water suppliers to use appropriate and effective treatment without delay."

Further Recommendation 20
"Appropriate and effective treatment of drinking water should be mandated by law or through the DWSNZ for all supplies (networked and specified self suppliers). This should include a residual disinfectant in the reticulation."

This strategy includes the provision of treatment on all water sources for drinking water purposes. This outcome has arisen from risk assessments on the source supplies and the fact that groundwater can no longer be considered secure. The outcome is consistent with the Board's recommendation for universal treatment.

The preferred treatment method (refer Section 7) includes UV and chlorine disinfection (including storage to achieve contact time) and to maintain a residual disinfectant in the reticulation.

Collaboration & Joint Working Groups (JWGs)

Urgent & Early Recommendation 18
DHBs (with PHUs) should establish as soon as practicable (with the assistance of the Ministry of Health), a JWG (or groups) responsible for oversight of drinking water safety in their respective regions. Such JWGs should operate along the lines of the Hawke's Bay JWG and the CDWRG described in this Stage 2 Report.

Further Recommendation 31
Collaboration groups (JWGs) should be mandated by law. How such JWGs are configured should depend on relevant local and regional circumstances.

This recommendation encourages Joint Working Groups be adopted throughout the country. The Hastings District Council is continuing to be an active participant in the Hawke's Bay Joint Working Group.

Water Safety Plans

Further Recommendation 37
Water suppliers should be required by the Director-General to review their WSPs to ensure that:

(a) leadership, governance and management understand the relevant drinking water risks and have appropriately addressed the management of those risks in their strategic decision making, long term planning, audit and resource allocation processes, and delegations;

(b) operational staff understand the critical control points and other processes they are required to follow, the matters they are required to monitor and escalate as appropriate, and that the critical control points and other processes are in place and are being implemented; and

(c) the WSP is being used as a living document and is updated as frequently as necessary.

Council has been reviewing, updating and implementing their WSPs in a manner which is consistent with the recommendation. This will be an ongoing process throughout the implementation of this strategy to ensure that WSPs remain up to date as improvements are made, and to maintain the WSPs as a living document.

The improvement plans of each WSP has been collated into a project delivery framework to ensure that proposed upgrades and enhancements are included within the LTP.

HDC is also proposing to formally adopt the WSP's.

Prohibit New Below-Ground Bore Heads

Further Recommendation 49
"No new below-ground bore heads should be permitted. Below-ground bore heads are undesirable and introduce additional (and unnecessary) risk."

Council has upgraded its existing infrastructure to remove any existing below ground bore heads. Council will ensure that any new sources developed are consistent with this recommendation.

4.5 Multiple Barrier Approach

A multiple barrier approach is recognised as a founding principle for delivering safe drinking water. The multiple barrier approach means that there are "barriers" or measures in place at several steps through the catchment-to-tap process which guard against contamination or the potential for contamination. Examples of multiple barriers include the confining layer of the aquifer, treating the source water, providing a residual disinfectant in the reticulation network and maintaining appropriate backflow devices. The New Zealand Drinking Water Guidelines identify four fundamental barriers as follows:

"Each barrier contributes to the safety of the supply, but it is generally recognised that the greatest protection to water quality and public health is achieved by ensuring that four fundamental barriers are in place. These four barriers must achieve the following:

1 prevention of contaminants entering the raw water of the supply

2 removal of particles from the water

3 inactivation of micro-organisms in the water

4 maintenance of the quality of the water during distribution.

4.6 Need to Ensure Adequate Water Supply

The Council is required to ensure an adequate supply of drinking water is provided to its customers[1]. Under the Health Act, adequate supply means "the minimum quantity of drinking water that is required by the occupants of that property, on an ongoing basis, for their ordinary domestic and food preparation use and sanitary needs". In addition, the Local Government Act (s130) requires that the Council "must continue to provide water services and maintain its capacity" to do so.

Hastings urban area is classified as a Medium-Growth Urban area under the New Zealand Policy Statement on Urban Development Capacity 2016. That Policy Statement requires Council to ensure that there is sufficient development capacity for housing and business which is both zoned and serviced with development infrastructure including, but not limited to, water supply.

All of the above requirements meant that Council must be able to provide sufficient water to meet the needs of the community both in terms of the current supply area and projected growth. How much water is required to meet these needs is discussed further in Section 5.

In addition to planned growth within the supply area, Council also needs to ensure that there is sufficient water to meet fire fighting requirements and to provide for extensions of the network where this is feasible and will provide improved public health outcomes. An example of such an extension is the connection of the Bridge Pa community to the supply area in 2009. Prior to connection, Bridge Pa residents were self-supplied via private bores. However, in 2008 a large portion of those bores were affected by falling low groundwater levels, such that individuals were unable to supply water to their households. In developing this strategy, Council acknowledges that it may need to expand its water supply network in future to service rural supply areas and / or self-supply areas either due to lack of access to water, and/or public health risks associated with poor water quality.

4.7 Avoiding Adverse Environmental Effects

While Council has an obligation under the Local Government and Health Acts to continue to provide adequate and safe drinking water supplies, this service needs to be provided in the context of the Resource Management Act. The purpose of the Act is to promote the sustainable management of natural and physical resources which means using those resources (ie water) in a way which (RMA, Section 5(2)):

> *"…enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while –*
>
> *(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
>
> *(b) Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and*
>
> *(c) Avoiding, remedying or mitigating any adverse effects of activities on the environment."*

Further, Section 17 of the Resource Management Act places a general obligation on all persons to avoid, remedy or mitigate any adverse effect on the environment arising from their activities, irrespective of whether or not it is carried out in accordance with permitted activity rules or approved resource consents.

Since the previous strategy was developed, our understanding as to the quality and quantity of the groundwater resource, and potential effects of the water supply abstraction has increased in two areas, namely Regional Council's understanding of the sustainable aquifer allocation limits and potential stream depletion effects of groundwater abstraction at specific bores.

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[1] *See s69S Health Act which states "every networked supplier … must take all practicable steps to ensure that an adequate supply of drinking water is provided to each point of supply to which the supplier supplies drinking water".*

Sustainable Aquifer Limits

In August 2017, Hawkes Bay Regional Council announced that "new scientific advice… indicates the effects of current groundwater takes from the Heretaunga Aquifer are at the limit of what is environmentally acceptable"[2]. The Regional Council also stated that the science advice indicates that all groundwater takes from the Heretaunga Plains Aquifer are ultimately connected to surface water flow, albeit that the effect of the takes vary with location. It noted that "at the current usage levels, the groundwater is not being used unsustainably as there is still considerably more water entering the aquifer every year providing spring flows and flowing out to sea than is taken for use. However, the current groundwater volumes abstracted over a year have a significant effect on the Ngaruroro River and spring-fed streams and a detrimental effect on in-stream ecology."

In the context of this information, the strategy is focused on ensuring that the Hastings water supply system draws water from sources that are considered to have the least potential effect on the groundwater and surface water resources; water is used efficiently and effectively; and that the water system is supplied within the current consented limit. That current consented limit is an annual volume available for abstraction for public water supply purposes. Council intends to provide for current and future growth, including the development of any new bore supplies, within the current consented limit for the system.

Stream Depletion Effects

Within the Hastings supply network, there are three bores which are known to have stream depleting effects. These are the Brookvale borefield along with the two Flaxmere bores (Wilson Road and Portsmouth Road).

The Brookvale borefield is partially decommissioned following the August 2016 contamination event, however, the remaining bore (Brookvale Bore 3) supplies water via the Brookvale Water Treatment Plant (installed in March 2017) and is therefore potentially the lowest risk supplied water within the network. The existing resource consent for the Brookvale Borefield expires in May 2018, and Council investigated whether or not maintaining the use of Bore 3 at lower than historic abstraction rates would appropriately address stream depletion effects. It was considered that a lower abstraction rate (80 L/s compared to the previous rate of 200 L/s) and use of Bore 3 only, being the furthest bore from the Mangateretere Stream, may significantly reduce potential stream depletion effects. However, recent investigations have determined that stream depletion effects from the use of Bore 3 only are greater than previously assessed, and still considered to be more than minor[3]. As a result of these findings and the known aquifer risks, the decision has been made to decommission the Brookvale bore field in the near future. The decommissioning of the Brookvale borefield requires significant new infrastructure to be constructed in order to augment supply to Havelock North and enable the strategic withdrawal from this supply by 2020.

For the Flaxmere bores (Wilson & Portsmouth), the issue of potential stream depletion effects was addressed in the 2012 Hastings consent process. It was found that the Portsmouth Road bore (which was the primary supply bore) had a significantly greater stream depleting effect on the Irongate Stream than occurred with the use of Wilson Road Bore. The result was that Council switched the functions of these two bores – such that Wilson Road bore is now the primary supply bore and Portsmouth Road is retained as a backup supply. The use of Portsmouth Road bore is restricted during times of low flow in the Irongate Stream and, from January 2020, the Portsmouth Road bore is to be used in emergency situations only.

Council acknowledges that the ongoing use of Wilson Road bore may have a minor stream depleting effect on the Irongate Stream. However, modelling and operational experience has shown that a supply bore in the Flaxmere area is required to maintain an adequate level of supply in this area, at least in the short-medium term. Decision making processes as to the ongoing role of the Wilson Road and Portsmouth Road bores will need to take in to account their potential effects on the Irongate Stream, particularly during times of low flow.

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2 *Hawkes Bay Regional Council, Press Release, 18 August 2017.*

3 *The revised assessment and updated understanding of stream depletion effects has been possible due to the decommissioning of bores 1 and 2 thereby allowing the effects of Bore 3 by itself to be measured for the first time, and due to improved understanding of the aquifer as a result of scientific investigations associated with the contamination event inquiry.*

Further, in the consideration of potential new sources, Council will need to ensure that stream depletion effects are adequately identified and assessed in order to avoid adverse stream depletion effects.

4.8 Providing Resilience

Water supply, in particular potable water for health and hygiene purposes, is a critical service for which there are significant public health and community disruption effects if the supply is interrupted. The resilience of the overall system is therefore an important consideration in the development of the water supply strategy. Council is still in the process of defining and developing criteria for assessing and building in resilience to the supply system. This notwithstanding, the following principles have been considered in developing this strategy:

- Ensuring redundancy at every step in the process, where practicable. This includes developing a supply system that is not reliant on a single source supply; providing redundancy within the treatment process; ensuring backup power generation is available; providing reservoir storage at the main Eastbourne and Frimley bore fields and ensuring that our critical network infrastructure is able to operate.
- Council's objective for achieving resilience in all but a major civil defence emergency is to not have outages that exceed eight hours in duration.
- Maintaining provision to use emergency / back up bores such as Portsmouth Road.
  This requires careful consideration as it will require treatment to be able to supply the water in to the reticulation network and therefore the benefit of being able to access the source water when needed versus the cost and operational considerations for maintaining a treatment plant need to be assessed. The degree to which such emergency supplies may be needed for resilience, and their intended purpose will influence the solution. For example, if needed for firefighting purposes, then treated water will need to be fed in to the reticulation. However, if it is only to be used as a potential supply in case of civil defence emergency, it may be appropriate to only provide chlorine treatment or utilise these sources as a tanker filling station with a requirement for boiling of water before consumption.

4.9 Small Community Supplies

The Hastings District Council provides reticulated water supplies to 10 small communities across the district. These supplies are sourced from a mix of surface and groundwater sources (refer to Table 1 and 2 above).

Treatment, including filtration and UV has been in place since the early 2000s in **Waimarama** and the **Whirinaki/Esk** schemes as they are reliant on surface water sources. The UV units no longer comply with the NZ Drinking Water Standards and are not able to be validated. The proposal is to rebuild these treatment plants to incorporate the latest technology available and ensure they will fully comply with the standards. Chlorination has also been in place since February 2017.

The townships of **Paki Paki** (2017) and **Bridge Pa** (2009) are serviced from the Hastings urban supply. The **Omahu** supply draws from shallow groundwater and this supply has been upgraded in 2017 to include UV disinfection and chlorination. The **Waipatu** supply draws from a deep groundwater bore and is having a UV unit installed in March 2018. The remaining supplies of **Whakatu**, **Clive**, **Haumoana/Te Awanga** and **Waipatiki** are untreated and will be upgraded to include UV disinfection and new chlorination systems over the next two years.

By April 2018, it is expected that all HDC water supplies will be chlorinated and a disinfection residual maintained. HDC has embarked on a community awareness campaign to inform our communities about why permanent chlorination is being implemented and to provide advice and assistance about how consumers can minimise any taste and odour issues that might arise from the introduction of chlorine.

5 HOW MUCH WATER DO WE NEED?

Understanding how much water the community needs is best considered by looking at recent history of water use and projecting that forward, taking in to account expected community growth and any efficiency improvements that can be reasonably relied upon. While efficiency improvements and water conservation can be useful to make some water available for other uses, it must be recognised that there is a limit to how much growth can be provided for through efficiency and conservation. As best practice efficiency and conservation are approached the ability to make further gains becomes significantly reduced.

How much water a community needs varies depending on the time of day and time of year. Water demand can be dramatically different from day to day, or week to week, depending on what is happening within the community and, in particular, what the weather is. The hotter and drier the weather, the more water is consumed. Hastings District typically has a higher than average water use as a result of our hot, dry summers and use of water to maintain the likes of gardens for both aesthetic and food growing purposes.

In order to plan for water supplies, water demand needs to be understood in the following ways:

Table 3 – Summary of Water Demand Requirement

Annual Demand	How much do we need over the entire year? This determines how much water we need to abstract from the aquifer each year. This is important to ensure that the amount we take from the aquifer is sustainable. Annual demand also impacts on our overall operating costs – for example, our power bills are influenced by how much water needs to be treated and pumped each year. Our annual water use is summarised in Figure 7.
Peak Day Demand	The maximum amount of water used on any one day. For Hastings, this invariably occurs during the summer months. Our Peak Day Demand at the moment is in the order of 50,000-55,000 m^3/day and this typically occurs for a handful of days during January-February. Our water conservation programme is focused on trying to keep peak day demand at or below this level. Our peak day demand is actually now lower than it has been historically. Prior to implementing our Water Conservation & Demand Management Strategy, peak summer day demand was routinely above 60,000 m^3/day and the highest peak day was in 1998 when it was 73,000 m^3/day. Peak day demand is a key factor for considering the environmental effects of our water abstraction. The amount we take out of the ground on the peak day – depending on where it is taken and how much is taken – has the potential to impact on surface water streams and rivers, or other groundwater users. All of our infrastructure (pumps, treatment plants, reticulation) need to be sized to ensure that our peak day demand can be delivered. This means peak day demand is a key factor affecting the cost of our water infrastructure.
Peak Hour Demand	Normal patterns show a morning peak (when the majority of people get up and start their day) and, particularly in summer time, a larger evening peak. The evening peak in summer reflects people using the water to enjoy the lifestyle of the District – including recreation (pools & sprinklers), garden irrigation and vehicle or boat washing. Peak hour demand is a key factor that determines the sizing of our pumps and pipes. That is, it is a key driver of the cost of our infrastructure.
Fire Fighting	When there is a fire, there is a need for a lot of water to be supplied, very quickly. This needs to be done in a way which doesn't result in other areas losing water. Firefighting demands are a key design criterion for any water supply network.

All of the above need to be understood for the current situation, as well as what is likely to occur in the future.

The demands for our current situation are well understood. We have meters on all of our bore pumps and throughout our reticulation network that allow us to monitor how much water is being used at any time. That data is collated and assessed to understand how much water we need to meet our current situation.

Reasonable Uses within A Municipal Water Supply

A municipal water supply is required to provide far more water than what is simply required for drinking water or public health reasons. The full range of water uses supplied by a municipal water system is summarised in Figure 4 below.

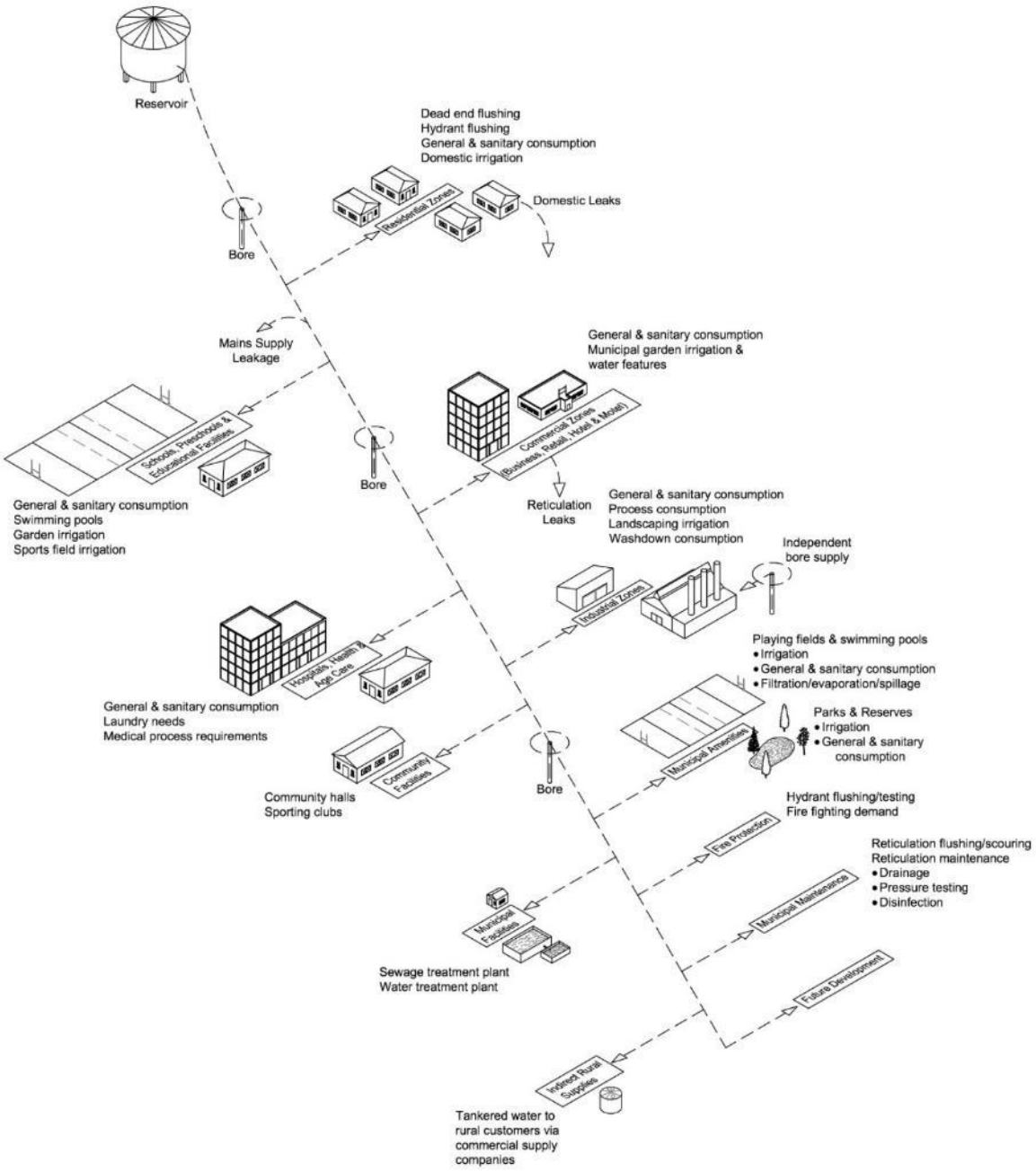

Figure 4 - Municipal Water System, Examples of Water Uses

Future Growth Projections

To determine our future needs, we need to understand how the community is likely to grow. For the purposes of this study, we have assumed the growth projections which have been established in the Heretaunga Plains Urban Development Strategy (HPUDS) study. This provides a growth projection for the Heretaunga Plains through to 2045. The growth areas identified in the HPUDS study are shown in Figure 5 below.

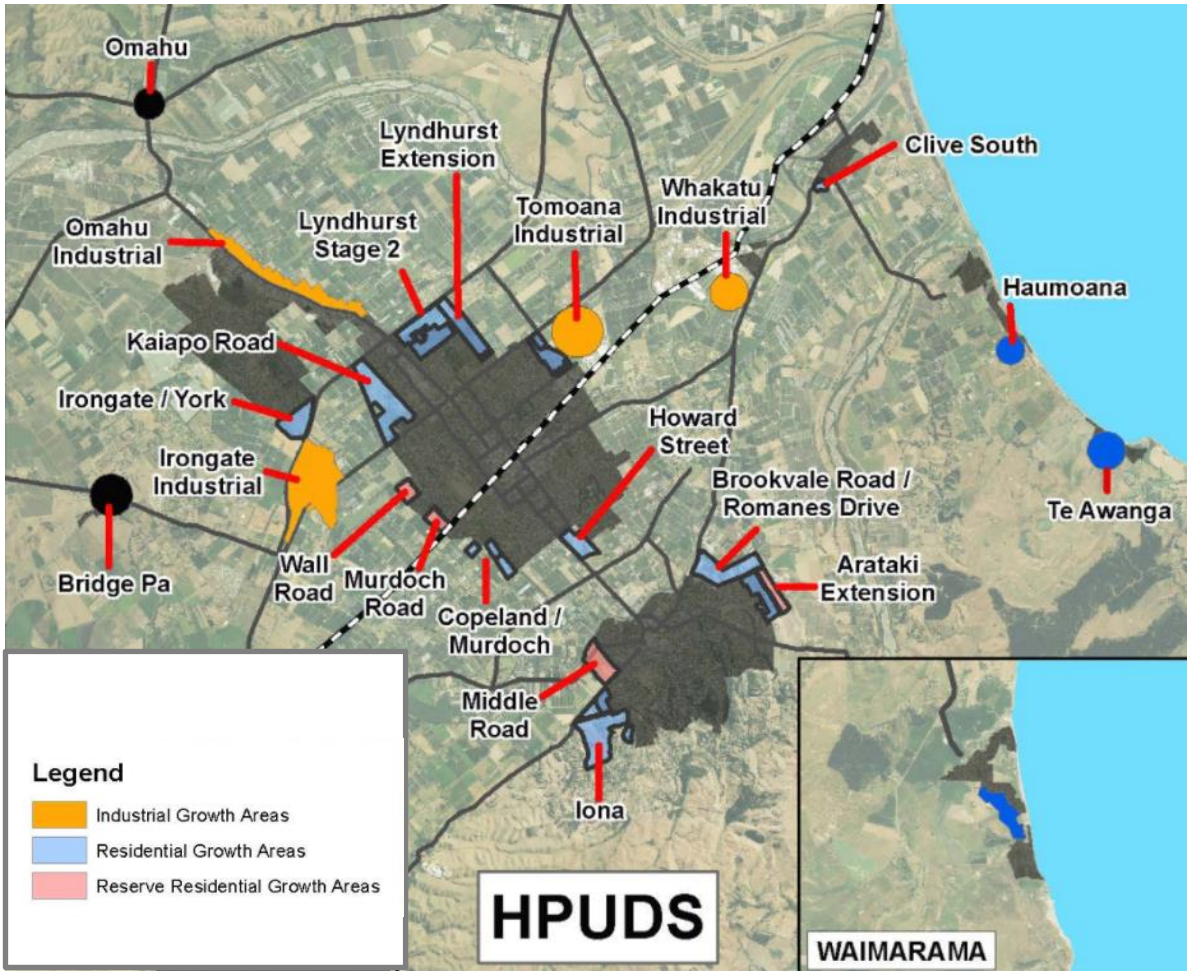

Figure 5 - Heretaunga Plains Urban Development Strategy Growth Areas

To project future water demand, we also need to consider whether per capita or per connection usage will decrease, remain the same, or increase.

Water use may increase if the network is not managed well (eg leakages, and burst pipes), or if people don't value the water and use it wastefully

Water use should decrease if we all value the water and use is wisely. This includes Council minimising leakages in the water network and adopting efficient practices for community recreation facilities such as parks and sportsgrounds.

HOWEVER, there is a limit to how much water use can decrease if the community is growing. Even with the best efficiency and conservation measures, usage will increase as the community and supply area grows.

Figure 6 – Factors Influencing Future Water Demand

We have assumed that water use on a per capita, and per connection basis, will stay the same. Council intends to actively promote, encourage and manage water use to improve efficiency over time. The assumption that water use is likely to remain the same on a per capita and per connection basis, is therefore considered a conservative assumption for projecting future water demands.

Annual Water Demand

Figure 7 below shows the annual water demand for the Hastings and Havelock North network.

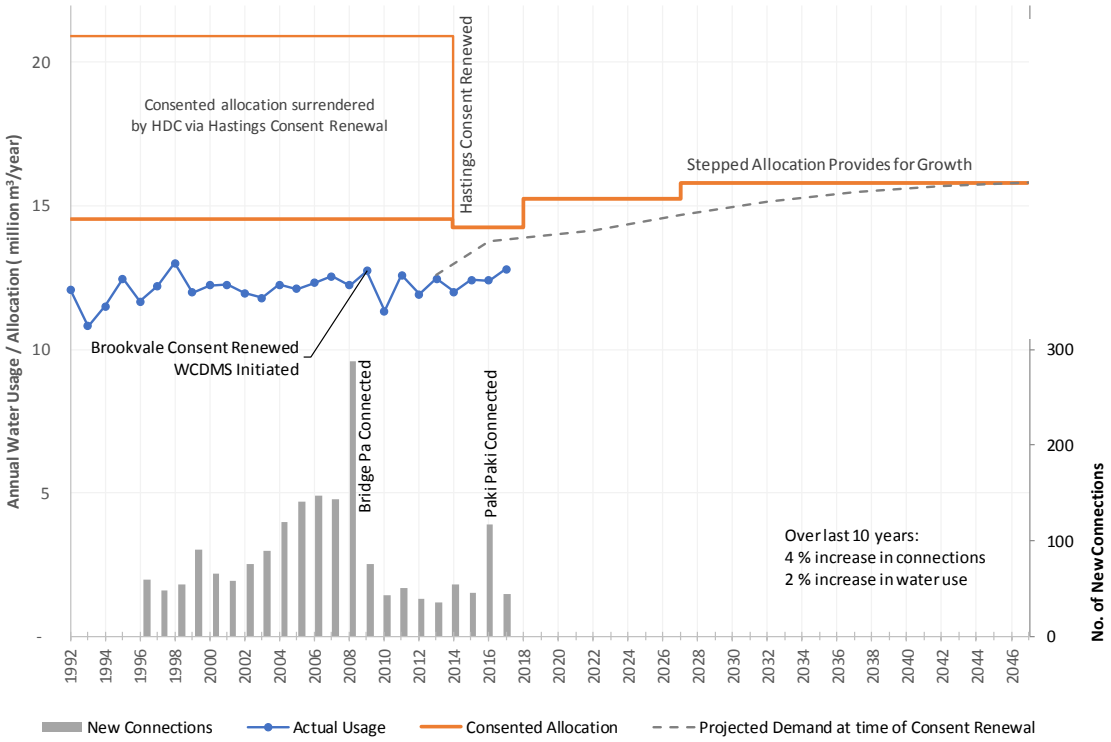

Figure 7 - Annual Abstraction for Hastings and Havelock North Network

Figure 7 shows that the annual abstraction (the blue line) has been consistently below the consented abstraction limit for the system (orange line). As noted earlier, the consented abstraction limit was reduced by about 6.4 million cubic metres per year in 2012 when the Hastings consent was renewed and Council acknowledged that they did not need all of the previously consented allocation. The Hastings consent does allow for increases in the annual allocation (orange line) in order to provide for growth. But, this is still less than the amount of water that was previously available to Council.

As indicated in Figure 7, there have been a significant number of new connections to the system from growth within the community as well as connection of the Bridge Pa and Paki Paki communities. While annual use does vary from year to year, looking at the last 10 years, there has been a 4% increase in the number of connections, but only a 2% increase in annual water consumption. This shows the efficiency gains which have been achieved to date.

Figure 7 shows that that the future (2047) annual abstraction required for the Hastings / Havelock North system is in the order of 15.8 million m³/year. Current usage is tracking below the projected demand line due to conservation and efficiency improvement. However, the growth projections in Figure 7 are based solely on growth as projected in Heretaunga Plains Urban Development Strategy. It does not allow for extensions to the supply area which may be needed in the future. For example, the supply area was extended to include Bridge Pa in 2009. This extension was to address issues of public health and lack of access to water from the previously self-supplied area. Council acknowledges that there may be future need to expand the supply area for similar reasons and is committed to providing for any such expansions within the current consented allocation limit.

Peak Day Demand

Current and future peak day demand has been established using network modelling. This process uses a computer network model, existing demand patterns (as measured by meters at our bore pumps and within our reticulation) and growth projections to identify current and future peak day patterns. This modelling has shown that the peak day demand in 2045 is likely to be in the order of 63,000 m^3/day. The way in which this demand is distributed throughout the day is shown in Figure 8. The key data are:

- Peak day demand = 63,100 m^3/day
- Peak hourly demand occurs around 8pm and is just under 1200 L/s
- The average demand across the day is approximately 730 L/s

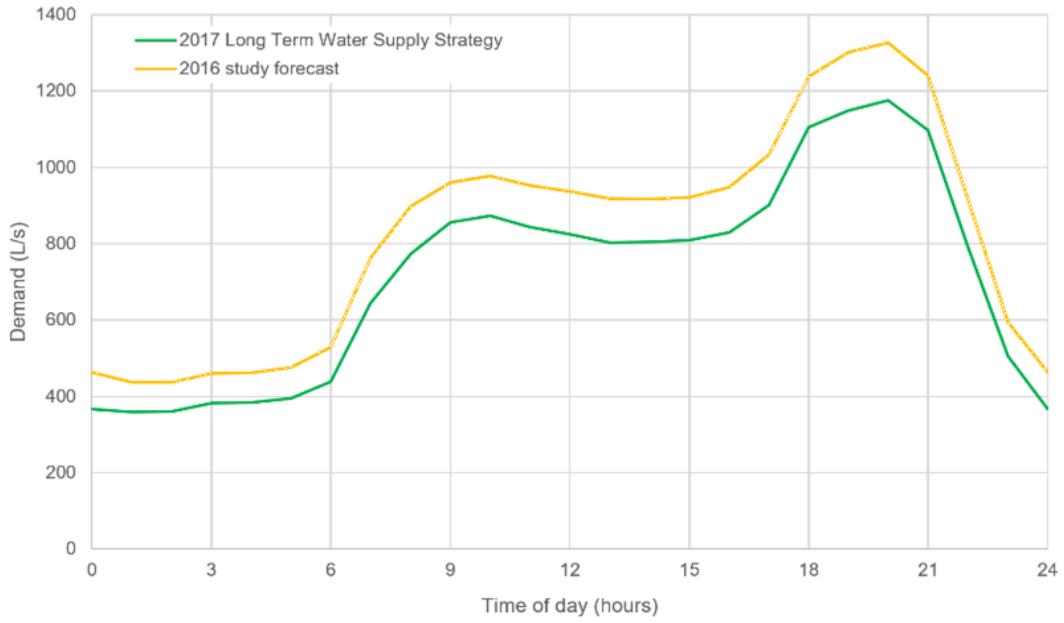

Figure 8 - Ultimate (2045) Peak Summer Day Demand
Source: Optimatics Presentation to HDC Water Strategy Team, October 2017

Smaller Community Supplies

The above discussion has focused on the Hastings / Havelock North area. Council also operates supplies in several smaller communities throughout the District. These are summarised in Table 4 below.

Table 4 - Summary of Current and Future Demand Projections for Smaller Community Supplies

Community	Consented Limit	Current Use (Peak week)	Future Demand
Clive	17,310 m^3/week Max take = 50 L/s	7,800 m^3/week (45% of consent limit)	Heretaunga Plains Urban Development Strategy growth area
Haumoana / Te Awanga	21,773 m^3/week Max take = 50 L/s	15,000 m^3/week (69% of consent limit)	Two Heretaunga Plains Urban Development Strategy growth areas
Waimarama	5,180 m^3/week May take 5 L/s from springs; 15 L/s from Stream	4,949 m^3/week (96% of consent limit)	Limited ability to grow within current consented or likely sustainable limits for water.

Community	Consented Limit	Current Use (Peak week)	Future Demand
Esk Valley / Whirinaki	23,794 m^3/week Max take 49 L/s	8,700 m^3/week (37% of consent limit)	Rural residential developments and supply to Napier residents (Kanuka Cliffs)
Whakatu	3,810 m^3/week Max take 50 L/s		Industrial growth area planned in Heretaunga Plains Urban Development Strategy
Omahu	1,000 m^3/week and not more than 25,000 m^3/year Max take 14 L/s		Potential to supply the entire residential area. Currently only half are on the HDC water supply.
Waipatiki	910 m^3/week Max take 2.5 L/s		Residential growth has been included.
Waipatu	176 m^3/week Max take 10 L/s		May be connected to Hastings supply.

Council is in the process of considering how best to provide adequate safe drinking water to the above smaller communities. Council will also be considering the need to expand supply networks to cover self-supply areas that may have difficulty accessing sufficient quantity of water for domestic needs and / or may be exposed to public health risks. These factors are considered further throughout this document.

6 WHERE SHOULD WE GET THE WATER FROM? ENSURING THE BEST POSSIBLE SOURCE WATER

The first stage in reviewing and developing our long term strategy has been to consider where water should be sourced from. Our objective has been to identify and find the best possible source water for our community. This means considering the quality of the water, risks associated with its use, whether sufficient water can be abstracted, and ensuring that our water abstraction does not have significant adverse environmental effects.

Key Assumption: Water Will Be Sourced from the Heretaunga Plains

The groundwater resource of the Heretaunga Plains is the main water resource in the area. While there are a number of rivers and streams, surface water has not been considered as a potential source for the community drinking water supply. This is because, the streams and rivers have their lowest flows in summer when we need the most water and the water quality is not as good as groundwater, meaning that a higher level of treatment would be required. **The Water Strategy has therefore assumed that the Heretaunga Plains Aquifer will continue to be the source of our public water supply.**

Until recently, water has been abstracted from the Heretaunga Plains Aquifer for a variety of uses on the assumption that the groundwater was both plentiful and pristine.

The August 2016 contamination event that resulted in a major public health crisis in Havelock North, along with Regional Council announcements in 2017 that the total abstractions being from the Aquifer is no longer sustainable, means that assumption is no longer valid. For District Council, this means we can no longer develop and manage our water system on the basis that the Heretaunga Plains Aquifer provides a plentiful and pristine source of water.

The District Council therefore needs to ensure that its abstraction of water from the Aquifer is undertaken in a way which ensures the ongoing sustainability, and protects and provides for Te Mana o te Wai, of the Heretaunga Plains Aquifer.

Objective: Seek the Best Possible Water with the Lowest Risk

There has been a large investment in scientific investigations and work to improve our understanding of the Heretaunga Plains Aquifer in recent years. This work has been undertaken by both the Regional and District Councils. This work has confirmed that the underground geology is complex, the Aquifer is not homogenous or uniform, and water does not necessarily flow evenly through the aquifer. Rather, the aquifer should be considered as a series of interconnected underground rivers and streams. The quality and quantity of water abstracted at any point will be influenced by its location in the aquifer, the area from which the water is drawn, land uses in the catchment area, and the amount of time the water is underground before it is abstracted.

The starting point for developing the Water Strategy has therefore been to determine where Council is able to get the best available water, with the lowest risk. This is the first step in the "multiple barrier" approach to providing a safe water supply.

6.1 Identification of Water Sources

The District Council has also gone through the process of assessing both the existing water sources, and potential new sources. The process has been to start with the existing sources and confirm their likely yield, effects on the aquifer and streams, and quality of, and risks associated with, the groundwater. The District Council has then looked for potential new sources as alternatives or to supplement the existing sources, where needed. Potential new sources for assessment have been identified taking in to account:

- Previous investigations that have been undertaken looking at potential water sources.
- What is known about the aquifer and where good quality water sources could be obtained. Preference has been given to sources within the confined areas of the aquifer. This is consistent with the multiple barrier approach to drinking water, with the confining layer providing a barrier to contamination.
- Council is also seeking new sources which, where possible, do not have potential hazardous land uses within their source influence area.
- Locations away from surface water streams and rivers, in order to avoid potential stream depletion effects.
- Areas of current and future water demand. Ideally, water sources will be located as close as possible to the demand areas, as this reduces the cost of infrastructure.

Based on above, the potential sources that have been assessed were existing sources, as well as an alternative Havelock North source, and new sources at both Tomoana/ Pakowhai and Whakatu. These are discussed further below.

6.2 Assessment Process

To assess the existing and potential water sources, the following steps have been taken.

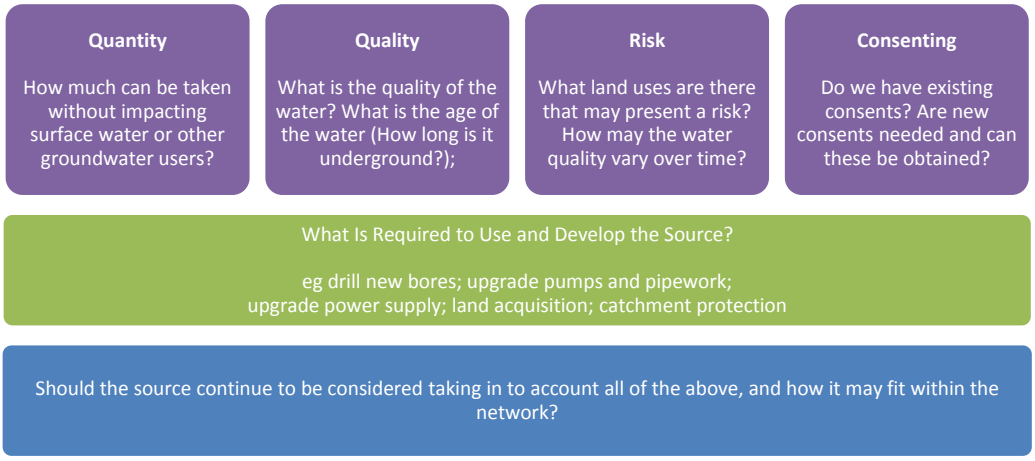

Figure 9 – Source Assessment Process

Quantity of Source Water

Assessments have been made for each of the source supplies as to how much water may be sustainably abstracted from the borefields. These assessments have been undertaken by Tonkin + Taylor Ltd and have involved the following steps[4]:

- Review of published geological and hydrogeological records for the area.
- Collation and review of published bore log information held by Hawkes Bay Regional Council and development of conceptual hydrogeological cross sections.
- Collation and review of existing permitted and consented groundwater take information for the area, including pumping test information where available.
- Determination of the likely aquifer parameters in the area, including aquifer transmissivities and potential aquifer yields and potential production zones.
- Assessment of potential drawdown based on the adopted transmissivity and storativity characteristics of the potential production zones
- Assessment of potential for saline intrusion.
- Assessment of potential effects on surface water courses from groundwater abstraction

Groundwater Quality & Risks

Tonkin + Taylor Ltd has undertaken groundwater quality and risk assessments of the existing sources. This work has focused on understanding the groundwater aquifer and area from which water is sourced including all available information on the aquifer properties and groundwater quality, and developed Source Protection Zones (SPZs) for the Eastbourne, Frimley, Wilson Road and Portsmouth borefields. The work has also included identifying existing land uses within each SPZ that may pose a risk to drinking water safety.

The source protection zones for each bore field comprise 3 individual zones, an immediate protection zone, a microbial protection zone, and a capture zone as follows:

- Immediate protection zone (SPZ1) – a 5m setback zone around each bore head to allow for specific control (by statue, regulation, planning rule) of activities within the immediate vicinity of the bore heads
- Microbial protection zone (SPZ2) - defined by analytic modelling that represents a 1 year groundwater travel time from the bore field
- Capture zone (SPZ3) – defined by a catchment or hydrogeological boundary, which in this case is based on a 10-year travel time.

The SPZs have been developed based on published hydrogeological information. Potential contaminant sources within each SPZ have been identified - through catchment investigations and GIS mapping, incorporating land use and discharge consenting information; sites listed on the HBRC land use register of sites in Hawke's Bay (which reflects the New Zealand Standard Industrial Classification 1987 (NZSIC)), wastewater and water supply infrastructure. Once identified, each potential contaminant source has been semi-quantitatively ranked, considering aquifer vulnerability mapping, proximity to the water supply bore and individual factors relating to the source (for example the age, type and material of wastewater infrastructure).

The approach to defining SPZs for each of the bore fields was to not only consider them independently of each other but also to consider the combined effects on groundwater travel times and flow direction for the following reasons:

- The relatively close proximity of the four bore fields to one another.
- The terms of the combined groundwater take consent. The SPZ for each bore field is based on the maximum capacity of the bore up to the consented take volume.

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4 *Refer eg Tonkin + Taylor Groundwater Feasibility Assessment, Tomoana*

- The observed seasonal variation in groundwater flow directions.
- The slope of the groundwater surface (i.e. hydraulic gradient).
- The recharge from the Ngaruroro River.
- The location and magnitude of the large Heinz Wattie's Foods Ltd take.
- The relatively consistent geological/hydrogeological conditions.

Groundwater age testing undertaken by GNS has also been used to inform the understanding of groundwater quality and associated risks. Prior to 2016, Council was commissioning age testing on a 5 yearly basis in accordance with the Drinking Water Standards. Since the 2016 Havelock North contamination event, HDC has implemented a programme of quarterly age testing. The recent testing has indicated a minimum and mean residence time for groundwater that is significantly lower than previous results. Groundwater age is more variable than previously thought and there is a greater portion of younger water in the groundwater. Chemical water quality data has also suggested a significant influence of surface water in the aquifer.

Figures 10 and 11 show the SPZs developed and the overall risk profile for the various sources.

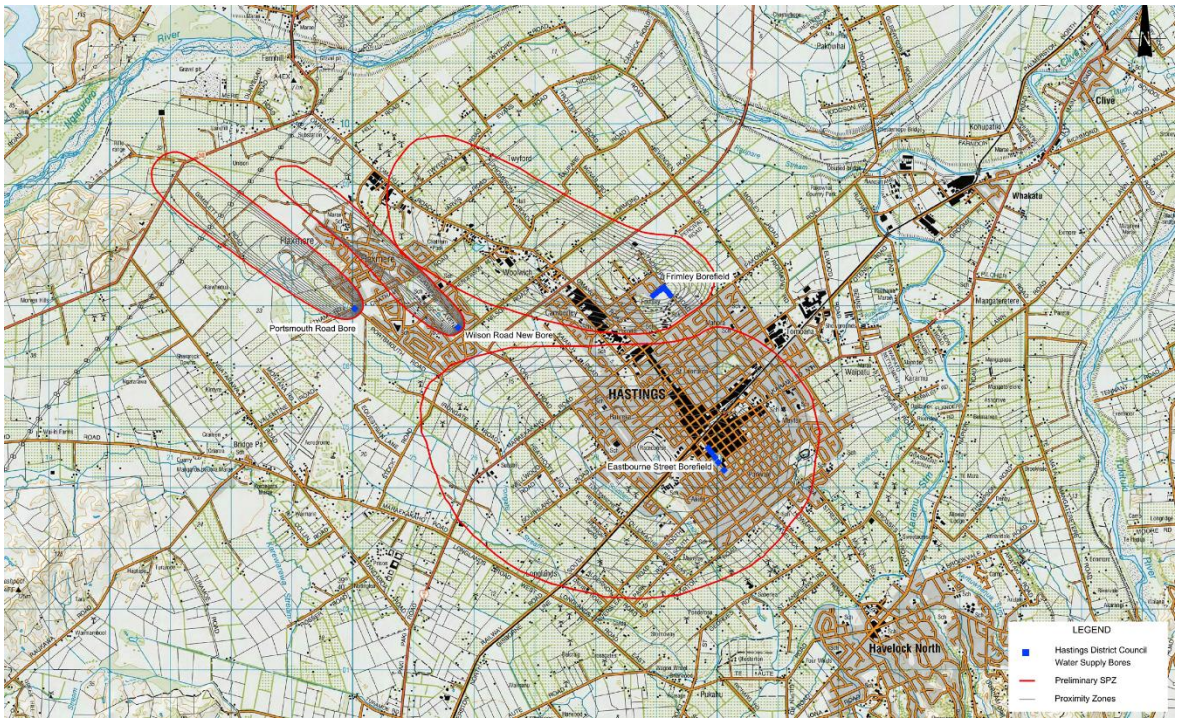

Figure 10 - Preliminary Source Protection Zones (SPZs)

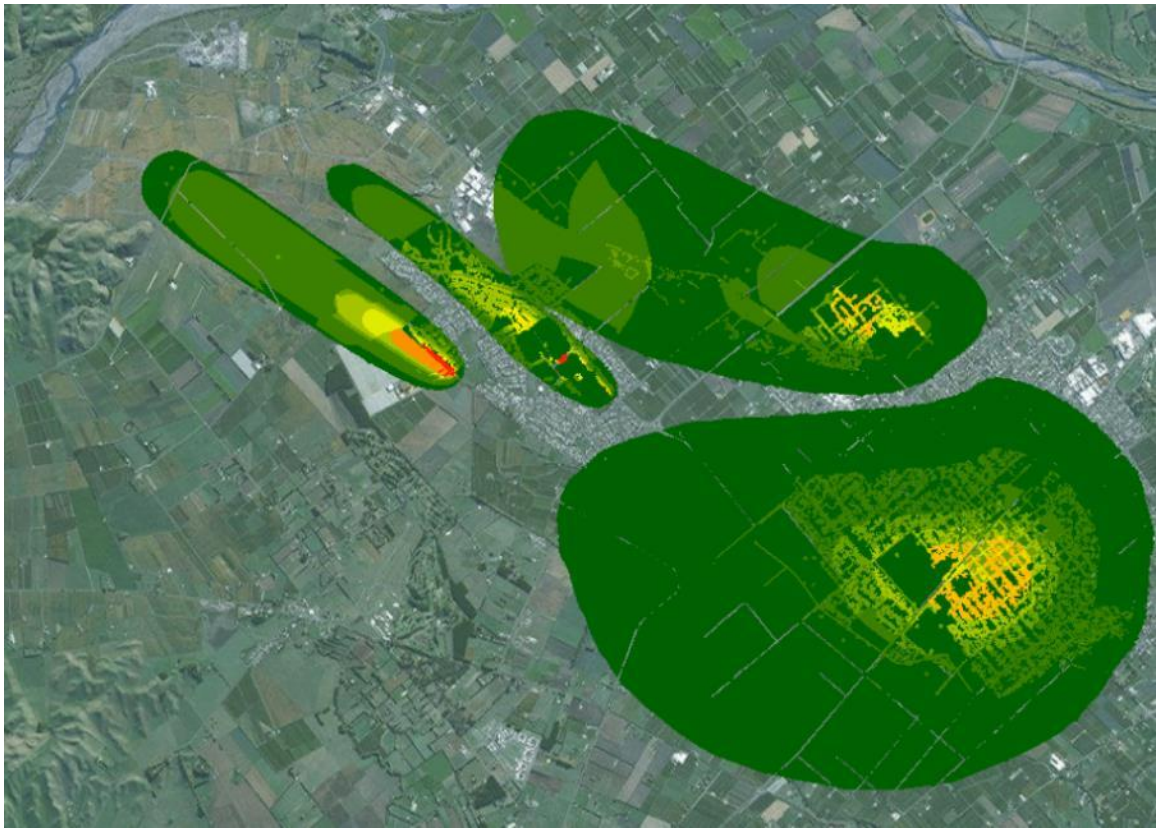

Figure 11 – Example of Preliminary Risk Map for Source Protection Zones

Figure 12 shows an example of the level of detail and resolution within the SPZ assessments. It shows a close up around the Wilson Road bore which shows a high risk (features highlighted red) associated with the reticulated wastewater network.

Figure 12 - Close Up on Wilson Road Source Protection Zone

The groundwater scientific investigation work has been used to develop a detailed understanding of the risks associated with each drinking water source, and to inform the management of those risks. The SPZs are being developed as a "live" GIS based tool which will inform ongoing management and protection of the groundwater resource, as far as practicable. Because the tool uses live information sources, such as HBRC's

consents database, new risks to the water supply can be managed proactively as they emerge (for example the granting of new discharge consents). This tool will be a key factor in giving effect to the multiple barrier approach to drinking water and the fundamental principle that "*protection of source water is paramount*".

Consenting

Any abstraction and use of water for the public water supply requires a resource consent from the Hawkes Bay Regional Council under the Resource Management Act. The following table summarises the existing consented takes from each bore.

Table 5 - Summary of Consent Details

Borefield	Max. Rate of Take	Annual Abstraction	Expires
Eastbourne	560 L/s	15.25 million m^3/year until June 2027 15.8 million m^3/year from July 2027	31 May 2047
Frimley	480 L/s		
Wilson Road	80 L/s		
Portsmouth Road	120 L/s Cannot be used when Irongate Stream is in low flow conditions (expect in the case of an emergency). Only able to be used until 1 January 2020. Beyond this date, can only be used for emergency purposes.		
Brookvale	200 L/s across the entire borefield. This is across three bores, two of which have already been decommissioned. The current consent only allows up to 100 L/s from any one bore. An application has been lodged for a short term renewal of consent. The application is for a maximum take of 80 L/s to match the capacity of the Brookvale Water Treatment Plant		31 May 2018 Short term consent renewal has been sought to allow infrastructure to be constructed prior to decommissioning Brookvale borefield

Any new sources will require a resource consent to be obtained. This would require consent for a Discretionary Activity under the Regional Plan and would more than likely be publicly notified. The District Council acknowledges notification from the Regional Council to all water users that "*any new consents for groundwater takes from the Heretaunga Plains Aquifer be declined unless applicants can demonstrate that there will be no adverse effects on surface water bodies, particularly the Ngaruroro River, spring-fed streams on the Heretaunga Plains, and on neighbouring bores.*"

If Council is to develop any new water sources within the Hastings / Havelock North area, it acknowledges that this will be subject to a consent process.

Council will not seek any additional allocation from the Heretaunga Plains Aquifer and any new water source application would be based on the total allocation being included in the amount provided for under the existing Hastings consent.

6.3 Discussion of Existing and Potential Sources

In undertaking the assessment, Council's approach has been to first understand the quality, quantity and risks associated with each existing source, and then to look for new sources where required. It has been recognised that, where possible, preferred source locations are within the confined area of the Heretaunga Plains Aquifer. It is also recognised that drawing from deeper sources in existing locations is not a preferred option. This has previously been investigated and it was found that quality groundwater and sustainable yield did not improve. Our current understanding of the aquifer supports that there is no better water to be found by going deeper in existing locations.

A further consideration has been to ensure that, where possible, positive artesian pressure can be maintained under abstraction conditions. This is considered a key risk management approach to minimise the potential for near-source surface activities to influence groundwater quality.

Table 6 - Summary of Source Assessments

	Borefield	Summary of Assessment	Outcome
Existing Sources	Eastbourne	This is the main borefield located in the centre of Hastings. It comprises 5 existing bores distributed along Eastbourne Street, although typically only three of the existing bores are currently used. The borefield is currently consented through to 2047 at a maximum abstraction rate of 560 L/s, compared to the current peak use of 400-440 L/s. Eastbourne borefield is located within the confined aquifer. SPZ risk mapping shows that the majority of the source area has relatively low risks (green areas in figure 11), with some higher risks within the CBD largely due to commercial and industrial activities and the presence of the reticulated wastewater network. Ensuring the borefield operates at a positive artesian pressure as much as possible, and addressing key risk areas (eg historic bores, minimising wastewater leakage) will be required to appropriately manage risks in this area.	Eastbourne is a primary borefield that provides both good quality and high yield. It is critical to the water supply network and will form a key component of the network in to the future.
	Frimley	The 2011 water supply strategy identified the need to expand Frimley borefield as a primary means of meeting future growth and minimising stream depletion effects associated with the Flaxmere bores. The borefield is consented for maximum abstraction of 480 L/s, but its current capacity is in the order of 200 L/s. Although the borefield is located within the confined aquifer, age testing indicates a relatively high portion of young water. The SPZ mapping and risk assessment is similar to Eastbourne with a large portion of the SPZ being considered low risk, with higher risks closer to the borefield largely due to the reticulated wastewater network. As with Eastbourne, ensuring the borefield operates at a positive artesian pressure as much as possible, and addressing key risk areas (eg historic bores, minimising wastewater leakage) will be required to appropriately manage risks in this area. The Omahu Industrial area is also within the SPZ and appropriate management of land uses in that area will be required to ensure groundwater risks are acceptable.	Frimley is a primary borefield that provides both good quality and high yield, albeit with a younger water proportion. It is critical to the water supply network and will form a key component of the network into the future. Network and abstraction optimisation is required to determine the degree to which the borefield is to be expanded to meet future needs.
	Wilson Road	Wilson Road bore is located in Flaxmere and is currently the main supply bore for that area. Prior to 2014, it was a secondary supply, but was switched to a primary supply bore as it had less effect on the Irongate Stream than Portsmouth Road bore. The Wilson Road SPZ is elongated, demonstrating a relatively fast travel time in this part of the aquifer. Some key risks exist in the SPZ including some aging wastewater pipework and the close proximity of the bore to the wastewater pump station. The bore is being relocated to provide sufficient separation from the wastewater pump station. Groundwater in this area is relatively young and treatment is currently being installed to maintain compliance with the Drinking Water Standards.	The network requires a source supply in Flaxmere to maintain acceptable levels of service. Wilson Road is the existing bore with the least stream depleting effects. The SPZ identified some key risks which are currently being addressed.
	Portsmouth Road	Portsmouth Road bore is located in Flaxmere and is currently a back up supply for that area. As noted above, it was previously the primary supply bore but was switched to a back-up mode in order to minimise stream depletion effects on the Irongate Stream. Resource consent requires this bore to be moved to an emergency use only from January 2020. As with Wilson Road, the SPZ is elongated, demonstrating the relatively fast travel time in this part of the aquifer.	Portsmouth Road bore is expected to move to an emergency supply bore in 2020.

	Borefield	Summary of Assessment	Outcome
	Brookvale	Brookvale bores 1 and 2 have been decommissioned. Bore 3 remains in use at present, and water abstracted is treated via the Brookvale Water Treatment Plant. Assessment of stream depletion effects identified that, even at the lower rate of 80 L/s, the abstraction has a significant stream depleting effect. The investigations also found significant sources of faecal contamination associated with land uses in the source zone, along with relatively direct and quick pathways between surface and groundwater, particularly following rainfall.	Stream depletion effects and catchment risks informed Council decision to decommission Brookvale borefield. Capital works are currently underway to allow this to occur.
Potential New Sources	Tomoana / Pakowhai	A potential new source was identified in the Tomoana area as it was likely to be within the confined portion of the aquifer; could be located close to where growth was expected to occur; and would provide an alternative to expansion of the Frimley borefield. The study identified catchment factors that constrained the location of a new borefield (including Ngarururo River and Karamu Stream, NZSIC listed sites, flood zones and vulnerable aquifer areas). However, it did find that a public water supply source would be feasible in this area, and that the most favourable location for a new water supply is likely to be in the western area of Tomoana near Evenden Road. Preliminary assessment indicated a combined sustainable take from Frimley and any new source in this area would be no more than 600 L/s.	There is potential for a viable groundwater source to be located in the Tomoana/ Pakowhai area.
	New Havelock North Source	A feasibility assessment for a new Havelock North source was conducted prior to committing to new pipework between Hastings and Havelock North. The Thompsons Road area was seen as a potential site as it would most likely provide good source of water but was further removed from catchment activities which presented a high risk for the Brookvale bore. However, the assessment identified that stream depletion effects on the Mangateretere Stream would likely be similar to the continued use of Brookvale borefield.	This option was not pursued as it was assessed to have significant stream depleting effects on the Mangateretere Stream.
	Whakatu	A potential source was assessed in the Whakatu area. It was identified that quality and quantity yields would be similar to a new source at Tomoana / Pakowhai, although located at a further distance to Hastings / Havelock North network. A source in this area would provide opportunity for increased linkage with smaller communities of Whakatu, Clive and Haumoana. However, any development of a source in this area would need to carefully consider, assess and manage local high risks likely due to industrial area and historic land uses.	A new source in this area may be feasible subject to being able to manage local risks associated with current and historic land uses. The Tomoana / Pakowhai source provides a better potential source in closer proximity to the network and is preferred ahead of a new source at Whakatu.

7 ENSURE WATER IS SAFE FOR USE

There is a need to provide treatment on all of our supplies as a consequence of the loss of secure groundwater status. The current understanding of groundwater risks and percentage of young water in the aquifer. The Drinking Water Standards assume that treatment for protozoa is not required if the groundwater is secure. As our groundwater sources can no longer be considered secure, treatment is required to manage protozoa risks.

The following table provides a summary of the status of our existing sources.

Table 7 – Summary of Status of Existing Sources

Bore		HBRC Well ID	WINZ Code	Operational Status	Raised or Below Ground Borehead	Is Borehead considered secure?	Status (DWS)	Bore Diameter (mm)	Bore Depth (m BGL)	Screen Interval(s) (m BGL)	Consented Abstraction Rate
Brookvale	**3**	4151	G02201	Operational	Raised	Yes	Non-secure	400	35.0	15.5 – 20.0 22.0 – 26.5	200L/s across all bores. 100 L/s max. from single bore
Eastbourne	**1**	469	G02194	Operational	Below	Yes – casing raised above GL. Borehead raising to be completed September 2017.	Provisionally secure	250	72.1	64.9 – 72.1	560 L/s
	2	15588	G02195		Raised	Yes	Secure	250	114.3	58.8 – 61.9 67.4 – 70.4	
	3	766	G02196			Yes		250	76.0	60.0 – 62.5 67.5 – 72.5	
	4	1171	G02197			Yes		250	81.0	59.4 – 72.3	
	5	1302	G02198			Yes		250	85.5	69.4 – 76.4	
Frimley Park	**1**	130	G00076	Operational	Raised	Yes	Provisionally secure	250	63.4	51.7 – 54.1 56.0 – 58.4 60.3 – 62.7	480 L/s
	2	16167	G02199			Yes	Interim secure	400	67.0	51.9 – 57.9 58.1 – 67.0	
Portsmouth		3253	G00782	Operational	Below	No – 2 x sump pumps in place, monitored via SCADA and alarmed with auto shutdown. Borehead programmed to be raised October 2017	Secure	250	75.0	37.0 – 40.0 40.9 – 43.9 45.0 – 48.0	120 L/s
Wilson Road		897	G00077	Operational	Raised	Yes	Non-secure	250	46.0	38.5 – 46.0	80 L/s
Napier Road		439	G00079	Redundant	Below	No – Abandoned and to be decommissioned.	n/a	200	36.5	30.5 – 36.5	n/a
Waimarama		15419	G01153				Non-secure	150	10	4 to 6	For springs- 5 L/s collectively. For bore- 15 L/s.
Clive: Tuckers Lane		542	G00664	Operational	Raised	Yes	Secure	150	47.55	41.5 – 47.6	50 L/s
Clive: Ferry Road		1658	G00663	Operational	Raised	Yes	Secure	150	48.17	41.0 – 47.0	50L/s combined
Whakatu		473	G00801	Operational	Raised	Yes	Secure	150	38.4	32.3 – 38.4	
Waipatu		15713	G02159	Operational	Raised	Yes	Secure	200	41.3	36.8 – 41.3	10 L/s
Shrimpton Road	**2**	15176	GO0072	Non-operational	Raised	Yes – Borehead works in progress. To be completed September 2017.	Secure	100	23.93		50 L/s
	3	1187		Operational	Raised	Yes	Secure	200	51.30		
Omahu	**#1 west**	8531	GO0799	Operational	Raised	Yes	Non-secure	100	14.02	12.2	14L/s
	#2 east	10334	GO0799	Operational	Raised	Yes	Non-secure	100	14.02	12.19	
Parkhill Farm Well		5830	GO1907	Operational	Raised	Yes	Non-secure	150	36.5	32.6-36.5	8L/s
Whirinaki		5033	GO1098	Operational	Raised	Yes	Non-secure	250	10.4	7.4-10.4	49L/s combined
Esk		4015	GO1952	Operational	Raised	Yes	Non-secure	200	9.79	6.79-9.79	
Whirinaki 600mm		15707	n/a	Non-operational	Raised	Yes – blanked off above ground	Non-secure	600	9.3	6.3-9.3	n/a
Waipatiki		3516	G00798	Operational	Raised	Yes	Non-secure	100	37.4	23.7-28	2.5L/s

The above bore data, groundwater quality and risk assessments have been taken in to account in considering the level of treatment required. This work indicates that the quality of groundwater is suitable for treatment without filtration.

The Drinking Water Guidelines provide guidance on the type of treatment processes suitable for various source water. For the Council's supplies, the treatment processes for consideration, as per the Drinking Water Guidelines are summarised below.

Table 8 – Options for Waters that Only Require Disinfection

Source: Table 4.9 of Guidelines for Drinking-water Quality Management for New Zealand, Ministry of Health, 2016

Disinfectant	Bacterial compliance	Protozoal compliance	Residual in the distribution system
Chlorine	Yes		Yes
Chloramine	Yes		Yes
Chlorine dioxide	Yes	Yes	Yes
Ozone	Yes	Yes	
UV light	Yes	Yes	

The outcome of the above considerations is that Council has adopted a preferred treatment process of UV disinfection followed by chlorine dosing to provide residual disinfection within the reticulation system. This, combined with an active programme of backflow prevention, is consistent with the catchment to tap approach for delivery of safe drinking water.

In designing its treatment facilities, Council will also design the ability to provide filtration at a later stage should this be considered necessary in the future.

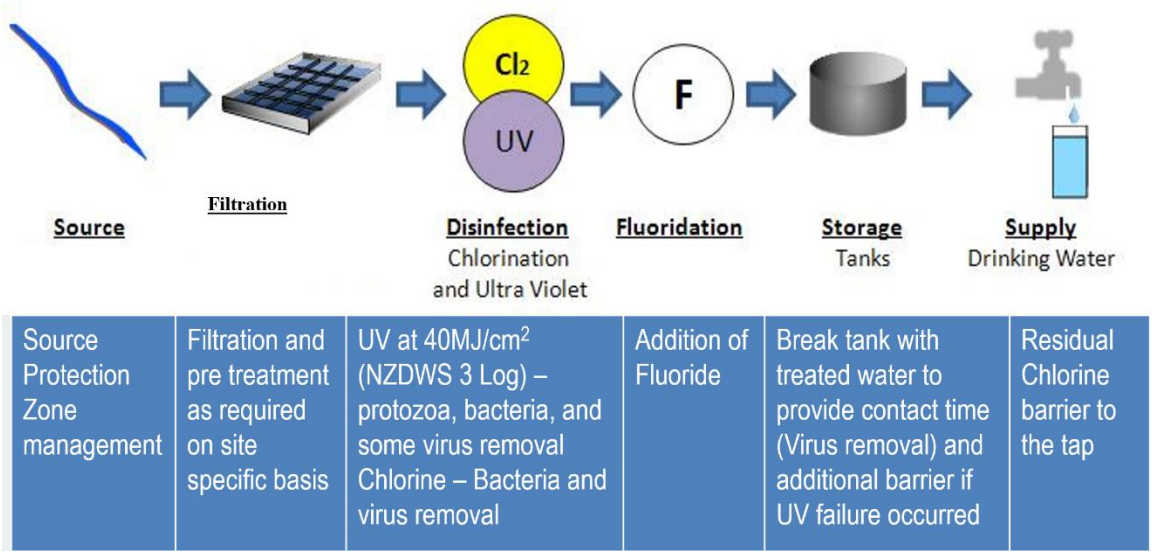

Figure 13 - Proposed Treatment Process

8 SAFE AND EFFICIENT WATER DISTRIBUTION

Once water is abstracted from the ground and treated, it needs to be conveyed and distributed in an efficient and cost-effective manner throughout our water supply network. Council has used its water network model to work through an optimisation process to identify the most cost effective and efficient means of distributing water. This includes identification of new infrastructure requirements, particularly where water sources will differ from our current configuration (eg with the removal of the Brookvale borefield from the system).

8.1 Hastings-Havelock North Connection

With the decision to decommission the Brookvale borefield and confirmation that there are no viable alternative sources within the Havelock North community, Council needed to consider the infrastructure required to provide sufficient water to Havelock North from the Hastings supply.

At present, there is a single 375mm diameter water main along Havelock Road which supplies water into the Havelock North reticulation and also directly into the Hastings and Havelock North reservoirs located in Tauroa Rd and Hikanui Drive. The reservoirs, in turn, provide a water source for feeding into the Havelock North reticulation. Prior to 2010, the Hastings and Havelock North supplies were run separately (the reservoirs were isolated from each other) and it was only at times of need that Hastings was opened to the Havelock North reticulation.

As a starting point for modelling, the existing network was assessed to confirm if the Havelock Road water main and combined reservoirs provided sufficient capacity to meet Havelock North's demand. Council already knew that the existing infrastructure was unable to fully meet Havelock North needs as significant supply issues were experienced and areas had very little, to no, water during the 2016-2017 summer when the Brookvale Borefield was not in operation (ie, when the bores were turned off following the August 2016 contamination event but prior to the Brookvale Bore 3 treatment plant being commissioned in March 2017). Nonetheless, network modelling was undertaken to identify if any operational changes (eg with valve or pump settings) or minor network improvements could enable supply to be achieved with the existing network[5]. It was identified that adequate supply could not be achieved without a new water source into the Havelock North network. The source water assessment confirmed that there were no feasible sources within the Havelock North area, and therefore, conveyance of water from the Hastings network (Eastbourne bores) to Havelock North was required.

The alternative was for a second supply trunk main to be installed between the Eastbourne borefield and the Havelock North reticulation to improve connectivity and capacity. Earlier work with the 2011 strategy had considered this scenario and identified potential alignments along Havelock Road and Crosses Road. The Crosses Road alignment was considered to have benefits in terms of ease of construction, less disruption to traffic and residents, as well as providing resilience benefits through having both the existing Havelock Road trunk main and a new Crosses Road trunk main across the Karamu Stream. The Havelock Rd pipeline is installed under the Karamu Stream and it is accepted that this limits access to and monitoring of assets but affords better protection in a major flood event. However, neither solution can be guaranteed against failure therefore it was decided that a new crossing at a different location provides less potential for both pipes to be affected in a flood event.

Options as to the new trunk main alignment where relatively limited as it was desired to use existing road corridors and bridge crossings. Network configuration and operational options were assessed as to where the source water could come from and where the new trunk main would connect at both the Hastings and Havelock North ends. One of the principal concerns was the extent of network pressurisation required to deliver water to the high level reservoirs and options to reduce or limit future pressures. Options considered are detailed in Stantec's October 2017 report and include:

1. A dedicated high pressure line feeding in to the Havelock North reticulation, direct from Eastbourne borefield (using two of the Eastbourne bores) in the short term and then from a new source in Tomoana/ Frimley when that was developed.

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[5] *This modelling was undertaken jointly by Jeff Booth Consulting Ltd and Stantec and is detailed in Stantec Ltd's report "Stage 1A Trunk Water Main and Havelock North Reconfiguration Options Modelling", October 2017*

2. A dedicated high pressure line as per above, but feeding directly in to the Havelock North Hills Reservoirs rather than the Havelock North reticulation. This would allow the reservoirs to fill and then feed into the reticulation.
3. Dedicated supply directly from a new source in the Frimley / Tomoana area.
4. A new trunk main from the Hastings reticulation to Havelock North, and feeding into a new booster pump station at the foot of the Havelock North Hills. This would enable the trunk main to operate at a lower pressure than with the other options, while the booster pump station would provide additional pressure to service the higher part of the Havelock North network and also feed the reservoirs.

Option 4 was identified as the preferred option and was found to have the following benefits:

- The trunk main was not required to extend all of the way to the existing bores (Eastbourne) and therefore disruption to the CBD area could be reduced.
- The booster pump station would provide more control over levels in the reservoirs.
- Power consumption via pumping effort could be reduced. The Council has pressure managed areas within Havelock North whereby pressure is reduced as a demand management tool. Options which involved a high pressure trunk main would require additional pumping effort, just to have the pressure reduced again.
- As it was not required to be a dedicated pipeline, running at high pressure, direct from the Eastbourne bores, it could also improve connections in to supply areas in the Hastings network to improve the overall reticulation system.
- This does not require reconfiguration of the Eastbourne borefield to provide dedicated pumping in to Havelock North. The borefield can continue to operate "as-is".
- This is able to be staged and implemented more easily than other options.

The preferred option of a new water main from Hastings to Havelock North along the Crosses Road alignment, with a booster pump station in Havelock North is currently being implemented. The trunk main works are underway and Council is progressing the location and design of the booster pump station.

8.2 New Infrastructure Needs for Preferred Source Water Configuration

Having identified the preferred groundwater sources, a network configuration optimisation process was undertaken to identify the infrastructure needs to provide adequate water to consumers for the current and future demands. This process adopted the Council's network hydraulic model and applied an optimisation model which considered various scenarios for new infrastructure and optimised the network taking in to account pumping and energy costs, project demand increases based on HPUDS, and pipeline construction and operation costs. This process built on the 2011 water strategy work which used a similar optimisation process.

The optimisation process took the outcomes of the source assessment, being that the Eastbourne and combined Frimley / Tomoana / Pakowhai sources met the Council's criteria of being the best possible source water. It considered the network implications for various abstraction rates from each of these sources. As Wilson Road bore was also seen as a key component of the network for meeting levels of service in the Flaxmere area, optimisation considerations with and without Wilson Road bore were also assessed.

As the Council had already identified there were no long term sources of water in the Havelock North area and had committed to the construction of the new pipeline between Hastings and Havelock North, this pipeline and the booster pump station were considered as "built" infrastructure in the optimisation model. This meant that the optimisation modelling was looking at the work required following the construction of the new pipeline and booster pump station to identify the next stages of improvement. The model process also assumed reservoir storage would be provided at each of the borefields in order to meet chlorine contact time requirements and to provide some buffering of peak hour flows and a more consistent abstraction regime.

The pipework options which were considered in the optimisation model are summarised in the diagram below.

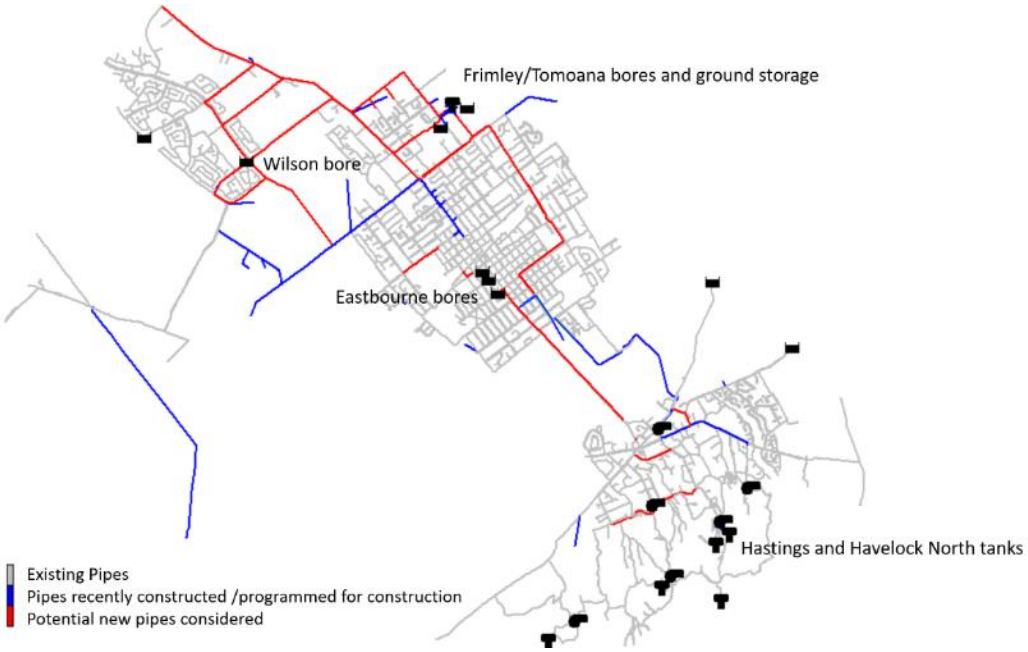

Figure 14 – Pipework Options Considered in Optimisation Model

The range of scenarios assessed, and the economic optimisation results are summarised in the Table below. This assessment identified the level of investment required depending on relative contribution to the supply from the Eastbourne borefield or from borefields in the Frimley / Tomoana /Pakowhai area.

Table 9 – Summary of Optimisation Scenario Results

Supply scenario			Estimated costs 25 year Net Present Value		
Frimley/Tomoana	Eastbourne	Wilson	New pipe	Power	Sum
~ 480 L/s (current consent)	~ 170 L/s	80 L/s	$ 6.73 m	$ 13.93 m	$ 20.66 m
	~ 250 L/s	-	$ 6.09 m	$ 13.40 m	$ 19.49 m
~ 600 L/s (likely sustainable abstraction)	~ 50 L/s	80 L/s	$ 11.10 m	$ 13.66 m	$ 24.75 m
	~ 130 L/s	-	$ 8.89 m	$ 14.17 m	$ 23.06 m
~ 250 L/s	400 L/s (current capacity)	80 L/s	$ 4.00 m	$ 13.03 m	$ 17.03 m
~ 330 L/s		-	$ 6.76 m	$ 12.50 m	$ 19.26 m

The optimisation modelling identified that a supply scenario with Eastbourne operating at its current capacity and the balance coming from the Frimley / Tomoana areas presented the most cost-effective network configuration. The modelling also identified that, in this configuration, there are significant economic benefits in retaining Wilson Road bore as a supply borefield, at least in the medium term.

The pipework infrastructure required to meet future demand in this scenario is summarised in the following diagram.

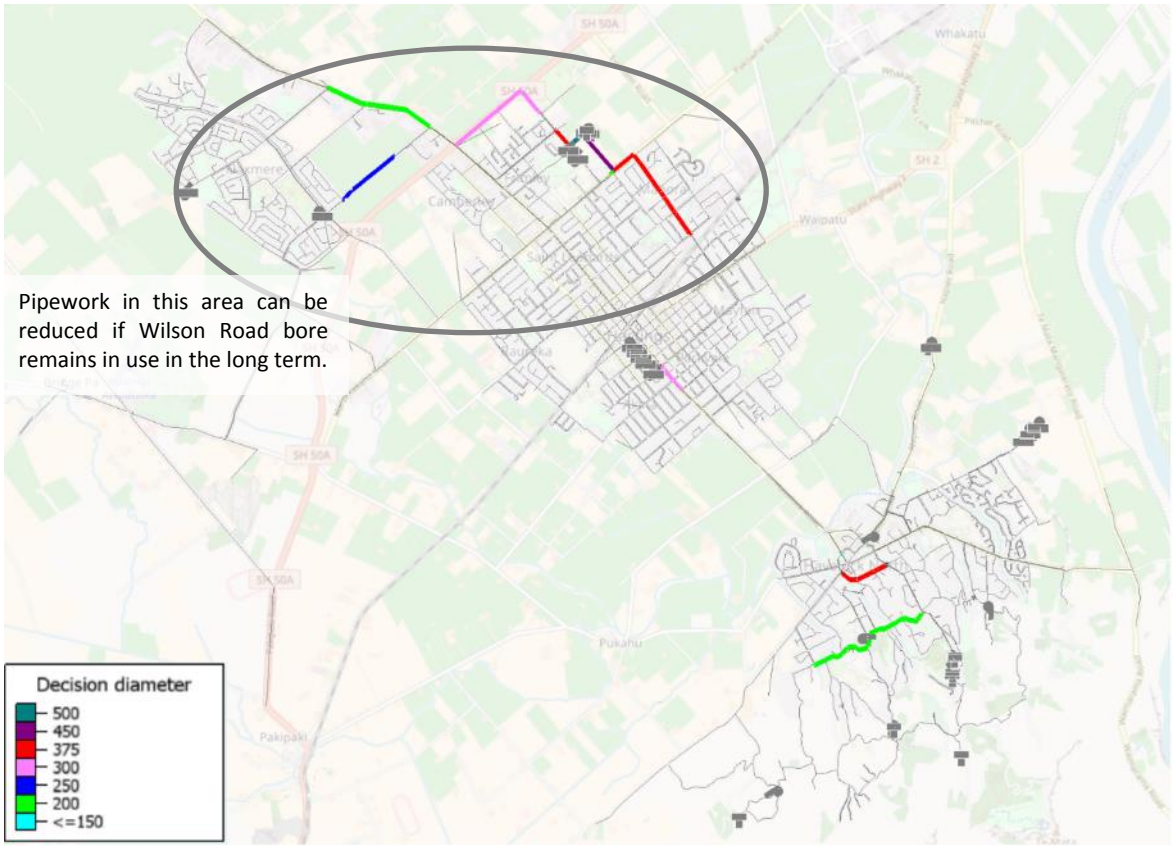

Figure 15 - Network Optimisation Outcomes for Lowest NPV Supply Scenario
Eastbourne at Current Capacity and Frimley / Tomoana sources providing balance (330 L/s)

8.3 Pressure Management

When Council commenced its Water Conservation & Demand Management Strategy in 2008, it was identified that the network operates at a relatively high pressure (as a consequence of the on-demand supply system and needing to feed water into the Havelock Hills reservoirs). Council's approach since 2008 has been to progressively implement Pressure Management Areas (PMAs) throughout the network. To date, five PMAs have been implemented and a further 2 PMAs are planned.

PMAs are created by creating subnetworks within the existing network. Within the PMAs, water pressure can be reduced without affecting the remainder of the network, where pressure may be required to be higher. This is usually achieved by closing line valves to create a new boundary within the network, and by supplying water across the boundary only through Pressure Reducing Valves (PRVs), which can control the pressure immediately downstream of the PRV. In some cases this reduces network connectivity and upgrades are required, but often the reconfiguration can be done through operational changes to existing network assets, with the PRVs themselves being the only upgrades required.

When pressure is reduced, water loss is reduced by a comparable fraction, e.g. if pressure is reduced by 30% then water loss can also be reduced by 30%. This is often the main driver for pressure management. Water mains burst frequency will also be reduced, and although the relationship is not as clear as for water loss, there are predictive equations to estimate likely savings. Reduced customer use and increased infrastructure life are also accepted benefits, but these are harder to measure.

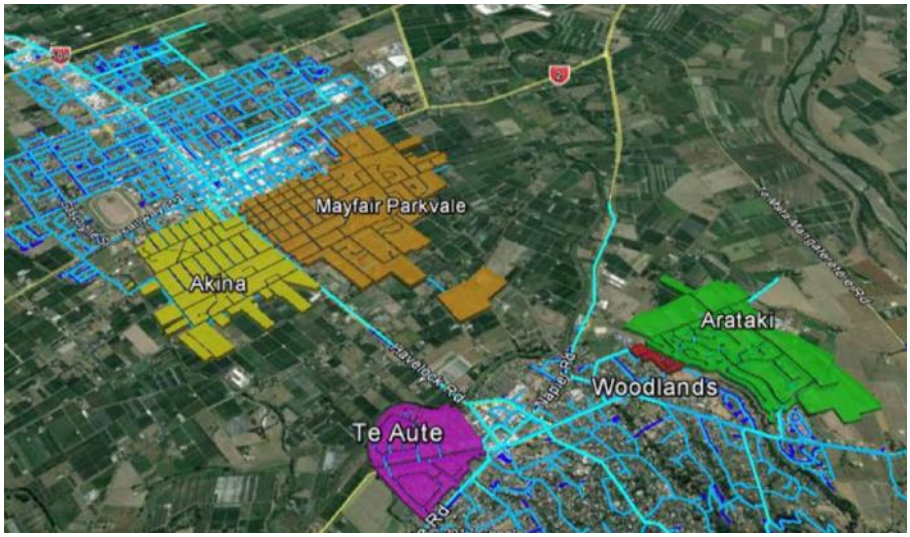

Figure 16 - Pressure Management Areas Implemented to Date – 18% of Network covered

Council has assessed the effectiveness of the Pressure Management Areas in reducing network leakage and consumer use. It was found that across the five Pressure Management Areas which have been implemented, the following benefits have been achieved:

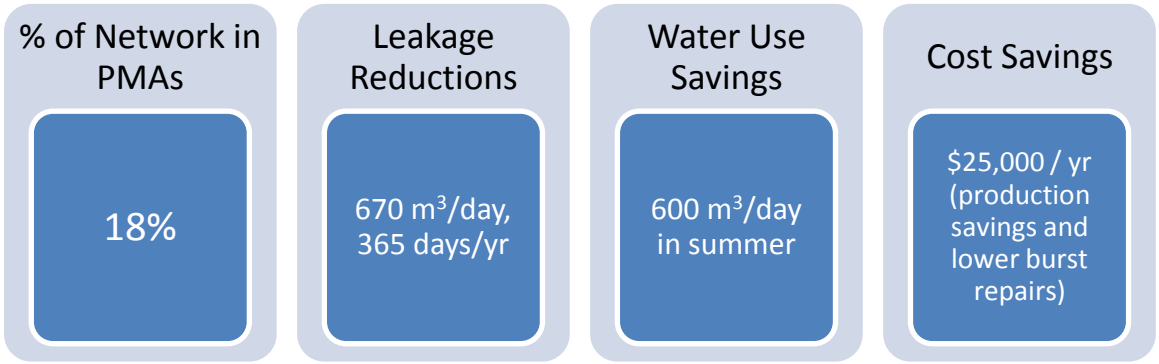

Figure 17 – Outcomes Achieved to Date via Pressure Management Areas

The preferred option for supplying Havelock North – new trunk main and booster pump station – means that the Eastbourne borefield will no longer need to pump at high pressure to get water up to the Havelock North Hills Reservoirs. This role will instead be delivered by the Booster Pump Station. This presents an opportunity to lower the network pressure throughout the entire network and therefore accelerate the pressure management programme. The benefits of this have been assessed based on the results which have been achieved in the PMAs and extending these to the entire network. Achieving pressure reduction throughout the network will result in over 3,500 m^3/day reduction in leakage on a day-to-day basis, and an estimated 3,300 m^3/day reduction in peak summer usage. These are summarised in the diagram below.

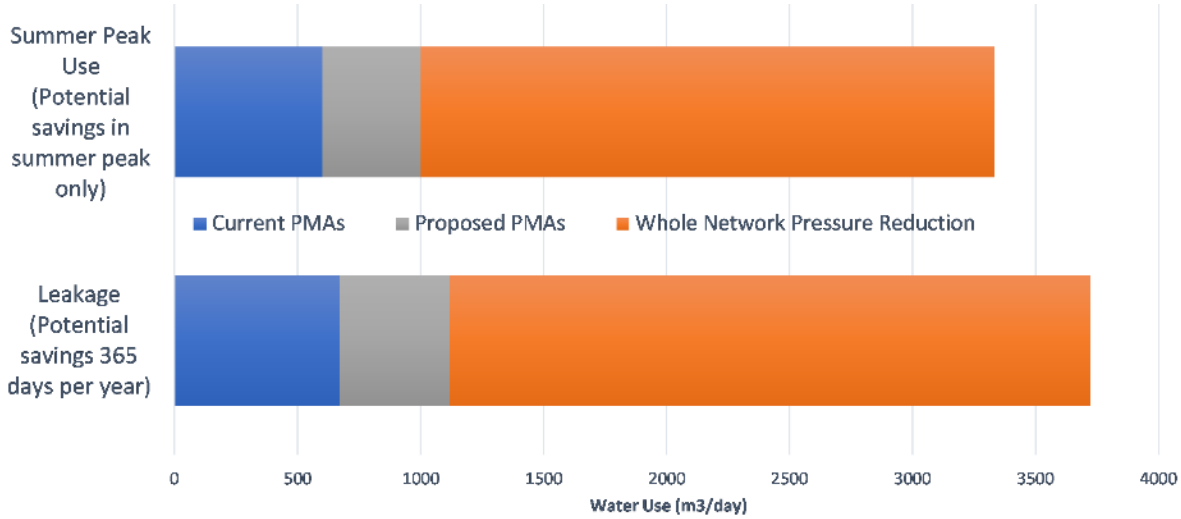

Figure 18 - Potential Water Savings with Extension of Pressure Management Areas

In addition to the potential water savings, extending the Pressure Management Areas to the entire network is estimated to achieve the following cost savings:

- Up to $60,000 per annum in reduced water production costs
- Up to $50,000 per annum in reduced costs associated with pipe bursts and repairs
- Up to $140,000 per annum in reduced power (pumping) costs.

The proposed strategy therefore includes pressure reduction across the entire network in order to capitalise on the opportunity to achieve this via the new Havelock North Booster Pump Station and to achieve the estimated benefits in terms of water use reduction and cost savings.

9 USING WATER WISELY – WATER CONSERVATION & DEMAND MANAGEMENT

To ensure that Hastings water supplies are managed efficiently and sustainably, thereby minimising environmental effects on water resources, Hastings District Council utilises a Water Conservation and Demand Management Strategy. This WCDMS has been in place since 2008, and was further reviewed and agreed upon in December 2017.

Figure 19 – Key Components of Water Conservation and Demand Management Strategy

Council will continue to implement this strategy, with a focus on the actions listed in the WCDMS and summarised in Table 10.

A key part of the WDCMS has been to progressively implement Pressure Management Areas throughout the network. To date, approximately 18% of the network is subject to pressure management. The infrastructure currently being constructed to enable the decommissioning of Brookvale bores presents an opportunity to accelerate this programme and implement pressure management across the entire network.

This WCDMS is scheduled for next review in 3 years' time, in December 2020. By this time, HDC will have implemented a withdrawal from the Brookvale Bores. Upon withdrawal from Brookvale, the present decision framework based upon Mangateretere Stream shall be reviewed with HBRC to identify appropriate triggers for the Hastings/ Havelock North scheme into the future.

Table 10 - Sustainable Water Management Actions Adopted via the Water Conservation & Demand Management Strategy

	Area of Work	Actions	Measures
Network Management and HDC Use	Integrated Planning	Ensure HDC plans and policies promote and encourage water conservation.	Alignment of District Plan, Water Services Bylaw and Engineering Code of Practice.
		Implement Regional Land and Water Management Strategy.	Agreed actions are undertaken.
	Asset Management	Maintain network model.	Network model is up to date.
		Repair of network faults.	Agreed response times are met.
		Zone management.	DMA zones are maintained. New DMA zones are added where potential for reduction benefits are identified.
		Leak detection.	Leakage surveys on 3 yearly rolling basis.
		Leakage Assessment of NRW and ILI.	NRW <20% ILI is between 4 and 8.
		Network operations at low flows.	Compliance with consent restrictions for Portsmouth Road bore (Hastings) and Waingongoro Stream (Waimarama).
	Demand Management - HDC Internal	Sports ground irrigation.	Irrigation demand is reduced by installation of efficient irrigation systems.
			Irrigation reduced or ceased if extreme dry periods encountered and it is considered safe to do so.
Demand Management - Efficient Use by End Users	Water Metering	Ordinary users.	Total annual usage per capita Daily Peak Demand.
		Metering of extra-ordinary users.	Percentage of extra-ordinary users metered.
		Hydrant usage.	Bulk filling station demand.
			Use of water due to hydrant testing.
	Education	Community Wide Information and Targeted Education.	Dates and duration of advertising.
			Information provided.
			Data provided on website.
	Water Restrictions	Restriction Status Signs.	Signs installed over summer period.
			Signs reflect restriction status accurately.
		Restrictions	Restrictions imposed as per decision framework.
			Change in demand patterns following imposition of restrictions.

10 RESILIENCE

As noted in Section 4.8 earlier, Council has identified that the delivery of this strategy provides an opportunity to improve the resilience of the overall supply. Identifying opportunities for improved resilience is an ongoing work package, with resilience improvements to be assessed and confirmed as the strategy is implemented. Key elements of the strategy which contribute to the overall resilience are:

- New pipeline between Hastings and Havelock North. The pipeline route has been selected to cross the Karamu Stream at a different location to the existing supply line. This provides increased resilience against loss of supply due to flooding or river bed scour. The existing pipeline along Havelock Road is a below riverbed pipeline whereas the new pipeline will be above ground on the existing road bridge.
- Provision of treatment at each supply source and the ability to convey water throughout the network means that water supply can continue, albeit potentially at reduced levels of supply, in the event of an outage or problem with one of the bores or treatment plants.
- Provision of storage at each of the source supplies will provide for ongoing supply in the event of any short-term outages of the bores or treatment plant.
- Ensuring adequate consented allocation is available, and ongoing water conservation and demand management measures ensures there is sufficient water available to be able to extend the supply network to address public health issues if necessary.

11 SMALL COMMUNITY SUPPLIES

Options considered for small community supplies have been to:

a. Maintain the status quo; or

b. Connect via reticulation to the Hastings supply; or

c. Maintain separate supplies and provide treatment.

Option c – maintain separate supplies and provide treatment – is the preferred option for all supplies, with the exception of Waipatu which is in close proximity to the Hastings network such that connection to the Hastings supply is able to be achieved cost effectively. For all other community supplies, the preferred option is to maintain these as separate supplies and provide treatment for the reasons outlined within this strategy.

Table 11 – Summary of Proposed Improvements for Small Community Supplies

Community Supply	Current Status	Proposed Improvements
Paki Paki & Bridge Pa	Connected to Hastings / Havelock North Supply	As per Hastings / Havelock North supply
Omahu	Upgrade in 2017 to include UV disinfection and chlorination	Was upgraded in 2017.
Waipatu	Source supply only from groundwater bore. No treatment in place	UV system to be installed in March 2018. Connect to Hastings network.
Whakatu	Source supply only from groundwater bore. No treatment in place	Treatment (UV and chlorine) and storage
Clive	Source supply only from two bores. No treatment in place	Treatment (UV and chlorine) and storage
Te Awanga / Haumoana	Water sourced from three bores. Treatment system (MIOX) currently in place to treat for iron and manganese only.	Investigate a new water source. Treatment (UV and chlorine) and storage.

Community Supply	Current Status	Proposed Improvements
Waimarama	Treatment in place via filtration and UV (non-validated system). Chlorination has been in place since February 2017.	Maintain treatment and upgrade to validated UV system.
Whirinaki / Esk	Filtration and UV treatment has been in place since early 2000s. Chlorination has been in place since February 2017	Maintain treatment and upgrade to validated UV system.
Waipatiki	Source supply only from two bores. No treatment in place	Treatment (UV and chlorine) and storage

12 SUMMARY OF STRATEGY APPROACH

This water strategy has resulted in a programme of works to achieve the primary objective of delivery of safe drinking water and meeting the water services objectives identified in Section 2.

The strategy is summarised in Figures 20 and 21, with the implementation programme summarised in Figure 22.

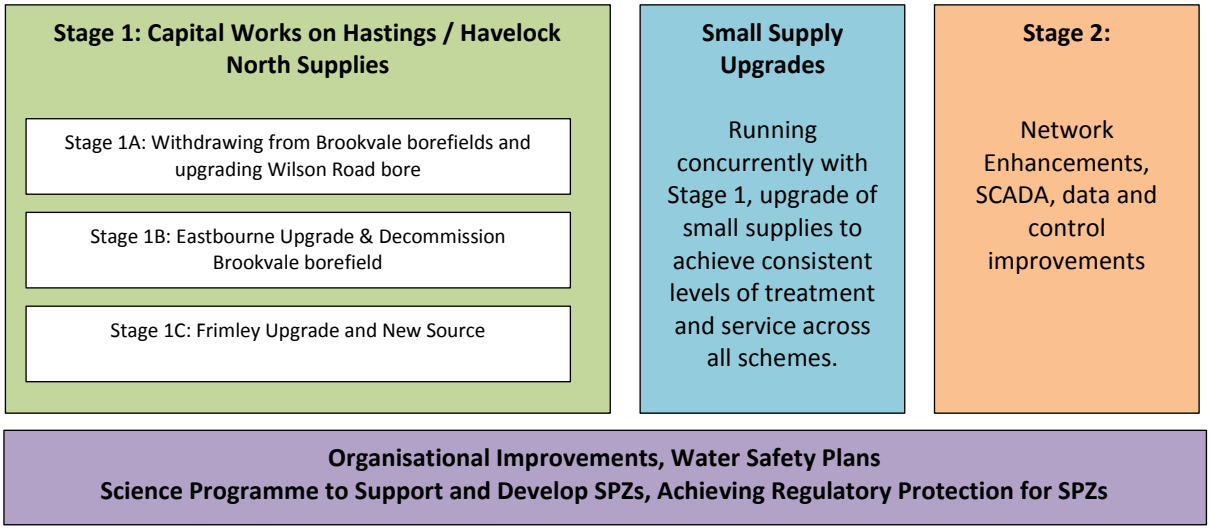

Figure 20 – Overview of Strategy Implementation Plan

Stage 1: Capital Works on Hastings / Havelock North Supplies

Stage 1 is summarised spatially in Figure 21 below and includes the following:

- **Stage 1A:** The objective of Stage 1A is to enable Brookvale borefield to be moved from a primary supply source to a back-up or augmentation source and to provide treatment to the Wilson Road bore supply. In order to move Brookvale borefield to an augmentation role, a new trunk main is being constructed from the Hastings system through to the Havelock North reticulation and a booster pump station (BPS) is to be installed in Havelock North. The booster pump station also provides the opportunity to implement pressure reduction across the entire network (Stage 2). This work is currently underway. A short-term resource consent has also been sought in order to enable continued use of the Brookvale Bore 3 source.

  The second element of Stage 1A is the upgrade of Wilson Road to full treatment. This involves the drilling of a new supply bore to achieve appropriate separation distance from the existing wastewater pump station along with the installation and commissioning of a UV treatment plant. This work is currently underway.

- **Stage 1B:** The objective of Stage 1B is to upgrade the Eastbourne borefield to provide treatment, storage and a booster pump station. This will include consideration of the optimum future configuration of the Eastbourne borefield, provision of treatment to meet drinking water standards and storage to meet chlorine contact time and provide for resilience and peak hour demand buffering. Consideration as to appropriate mitigation measures for risks identified through the SPZ process (eg historic bores in close vicinity to the supply bores) will also form part of the Stage 1B work programme.

  The outcome of Stage 1B will be the ability to be able to fully decommission the Brookvale borefield. Council is not seeking to fully decommission Brookvale borefield until such time as the treatment upgrade is completed at Eastbourne, given that the Brookvale water treatment plant is in place, it provides a high degree of treatment and can be used to supplement the water supply if needed. Once Eastbourne upgrade is complete, the intention is to relocate the Brookvale water treatment plant, most likely to Portsmouth Road to enable the ongoing use of that bore for emergency use.

- **Stage 1C:** The objective of this stage is to upgrade the Frimley borefield to provide treatment, storage and a booster pump station as well as to develop a new source within the Tomoana / Pakowhai area. This will require securing resource consent for a new source which will essentially relocate some of the existing allocation for the Hastings scheme to the new source.

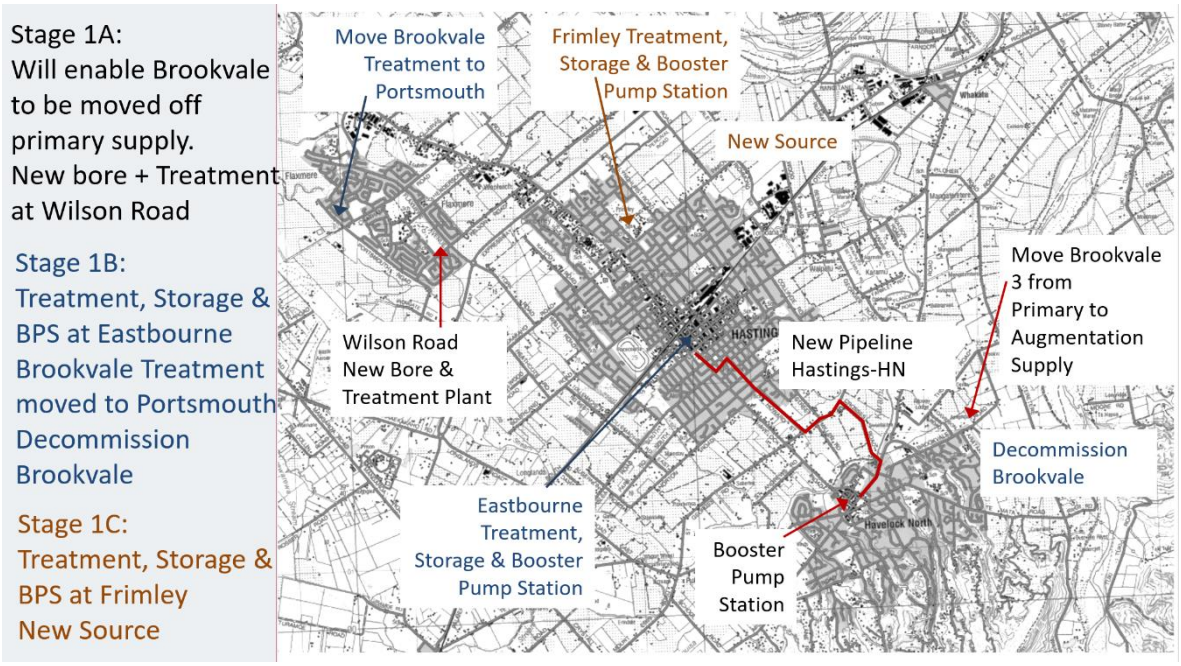

Figure 21 – Overview of Stage 1 of the Strategy Implementation Plan

Small Supplies

Concurrent with the work on the Hastings / Havelock North supply, Council will implement upgrades on the small community supplies, as identified in Section 11 of this report.

Stage 2: Network Enhancements

Stage 2 involves a series of network enhancement and improvements to enable the efficient distribution of water throughout the network. In the medium-long term, it involves a series of pipework improvements generally as set out in Figure 15 of this report. In the short term (next three years), it involves pipework upgrades in the high level of the Havelock North reticulation. Stage 2 also includes implementing the pressure reduction programme across the entire network.

Network model improvements to enable the model to be used as a "live" operational tool, and control (SCADA) and data management improvements will also be implemented to ensure that the network is operated in an efficient and cost-effective manner.

Supporting Work Programmes

In addition to the above work which involves capital and operational improvements, there are a number of supporting work programmes which will continue to be implemented. These include ongoing development and updating of the Water Safety Plans, operational and compliance monitoring to confirm and demonstrate compliance with Drinking Water Standards; ongoing development of the SPZs into a live tool for catchment risk management; and seeking recognition of the SPZs within the Resource Management Act regulatory framework for the Region.

Implementation Timeframe

Figure 22 summarises the implementation timeframe for the water strategy.

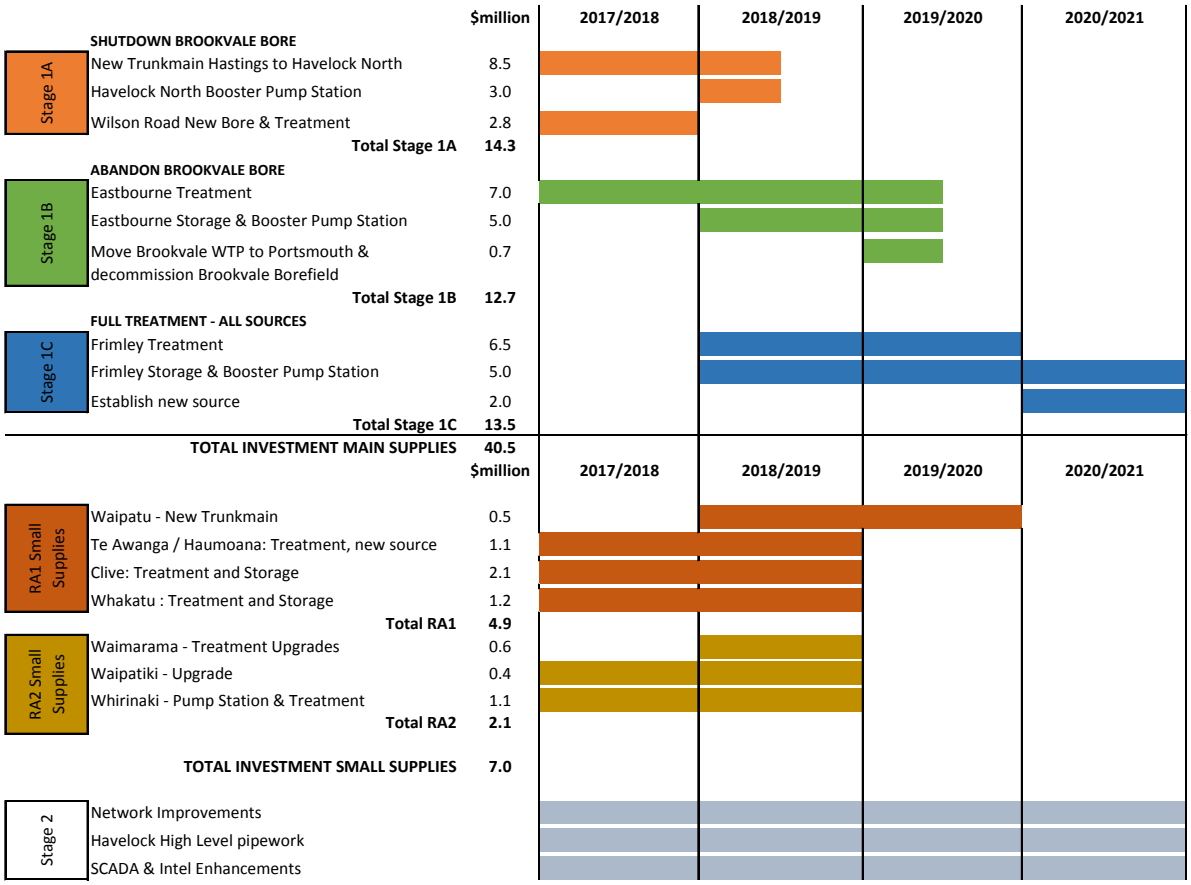

Figure 22 – Implementation Timeframe