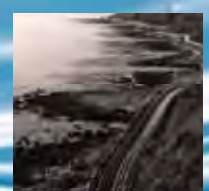
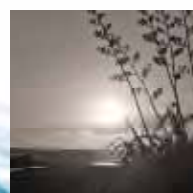
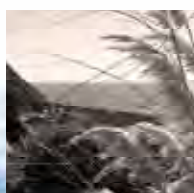
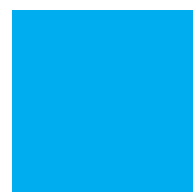
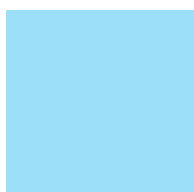
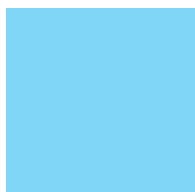
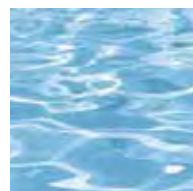
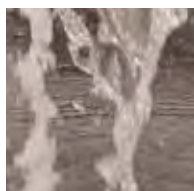
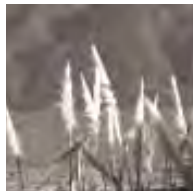
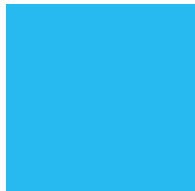




# Kapiti Coast

## Water Supply Capacity Review and Options for Supplementary Supply Preliminary Status Report



Prepared for Kapiti Coast District Council by CH2M Beca



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## Contents

### Executive Summary ..... 1

### 1 Introduction ..... 6

- 1.1 Background .....8
- 1.2 Process for the Project .....9
- 1.3 Partnership With Tangata Whenua .....9
- 1.4 Relationship With the Community .....11
- 1.5 Relationship With Landowners.....11

### 2 Kapiti Coast: Development Management..... 12

- 2.1 Overview of the District .....12
- 2.2 Wellington Regional Policy Statement and Wellington Regional Strategy.....14
- 2.3 Sustainable Development Principles from the Community Plan (LTCCP) .....14
- 2.4 Implications for Water Supply .....15

### 3 Sustainable Water Management..... 16

- 3.1 Sustainable Water Management Strategy .....16
- 3.2 Existing Water Supply System .....18
- 3.3 Implications for Water Supply .....19

### 4 Water Demand Forecasts..... 24

- 4.1 Inputs into Forecasting.....24
- 4.2 Historical Records .....25
- 4.3 Demand Growth.....26
- 4.4 Unaccounted for Water .....28
- 4.5 Peak Demand Projections.....29
- 4.6 Commercial/Industrial Growth .....30
- 4.7 Climate Change Effects .....30
- 4.8 Summary of Demands and Underlying Assumptions.....31

### 5 Kapiti Coast Water Supply Options ..... 32

- 5.1 Run-of-River .....36
- 5.2 Dams .....40
- 5.3 Storage Ponds .....48
- 5.4 Groundwater .....50
- 5.5 River Recharge.....54
- 5.6 Other.....58
- 5.7 District Wide Schemes with Staging.....64

### 6 Next Steps..... 66

- 6.1 Coarse Screening.....66
- 6.2 Actions .....70





### Executive Summary

The summer water demand has severely stretched the District's bulk water supply. In particular, the existing water supply at Waikanae is under pressure, both in terms of overall quantity and water taste and other quality issues from the supplementary bores. This water supply provides water to Kapiti Coast District Council's largest urban area – the Waikanae, Paraparaumu and Raumati (WPR) area. Council is addressing this by investigating additional sources for water supply.

The Kapiti Coast District Council has a philosophy of managing water demand and designing water supply solutions within water consumption targets. It also operates a Development Management Strategy which sets thresholds for staged development proposals, such that if water consumption targets have not been met and/or supply systems are at capacity, then identified development stages will not proceed.

The Waikanae River and Borefield supply up to 23,000 m<sup>3</sup>/day. Peak daily demand over the last few years has been approaching this limit, and therefore options for providing more water must be examined with relative urgency. The Council wishes to establish a new water source by 2016.

In consultation with the community, Council has developed a Sustainable Water Management Strategy. This Strategy sets out the vision for water management in the District over the next fifty years (i.e. out to 2060). The Strategy recognises that water is a finite resource, and one that is essential to people's health and well-being, and the well-being of the local economy. The Strategy has a major focus on water conservation, and commits Council and the community to reducing peak daily consumption to 400 litres of water per person per day by the year 2013. This daily volume, plus an allowance for unaccounted for water of 90 litres per person per day, allows an estimate of future water needs to be determined. Using medium population projections out to the year 2060, the WPR area requires a total of 26,000 m<sup>3</sup>/day for the WPR water supply area.

The nature of the existing water supply regime is such that when the flow in the Waikanae River drops below its minimum flow (set by resource consent conditions), the WPR system switches to the use of Waikanae Bore field water. However, it is well known that this water is not liked by some in the community because of taste and hardness issues. The borefield does provide a reliable water source during the summer dry period. It also represents a significant investment for the community.

## *Kapiti Coast: Executive Summary*

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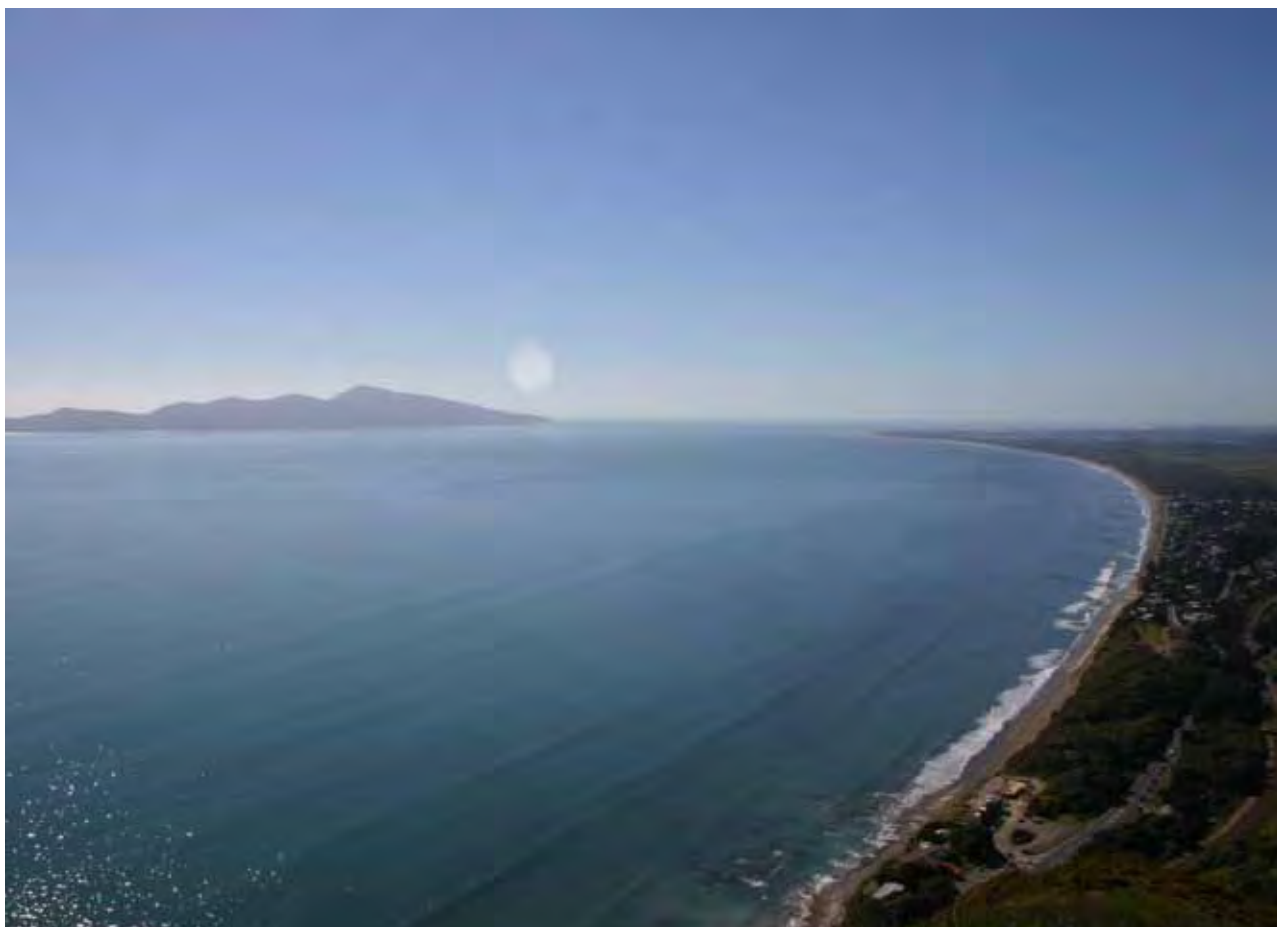
Water is an important resource for the whole community. In order to properly consider the future water source for the urban communities of the District, Council must engage with its community. Local iwi and hapu in particular have an important role to play working in partnership with Council to ensure the sustainable management of our water resources. Reaching an appropriate solution will involve consideration of a range of cultural, social, environmental and economic considerations.

It is important not to jump too quickly to a preferred solution. Rather, Council intends to understand what the community values most, and use these values to assist in evaluating options. Ultimately, the process of consulting the community on these values, working in partnership with iwi and undertaking technical evaluation of the options presented will allow decision-makers to identify a preferred option. Resource consents must then be secured for the preferred option to allow it to be constructed. Overall, an approach which ensures the sustainable management of water resources is required. This means a long term approach is essential.

Given the significance of this water supply challenge, and the need for Council to plan over a long time horizon (i.e. out to at least 2060) it is also important to consider what water supply challenges may occur in other parts of the District. Otaki, Te Horo and Paekakariki all have existing reticulated water systems with water supplied by Council. Overall, more than 95% of the District's population is connected to an urban water supply. When potential population growth is considered, as well as successful implementation of water conservation measures, the District as a whole will require up to 33,000 m<sup>3</sup>/day of water by 2060. This includes the 26,000 m<sup>3</sup> required for the WPR area.

Over the past twenty years, Council has investigated a wide range of options to provide sufficient water for the WPR water supply area. This report presents outcomes from the review of previous investigations and options for water supply solutions. In addition, two 'District Wide' options are presented, which would resolve the existing and most pressing water supply challenge for the WPR area, as well as provide a long term District-wide water supply solution.





Identifying an appropriate water supply solution for the Kapiti Coast is not an easy thing to do. There are many water supply options, all of which have pros and cons. In all, this report presents 40 options, the majority of which have been investigated to a greater or lesser degree at some point in the past 20 years. A number of new options are identified also.

Each of the options is described briefly in this report. There are six different option categories which describe the water source. That is, whether water is sourced from a run-of-river, dam, storage pond, groundwater, river recharge or another source. The following map provides an indication of the location of each of the options identified. The report then identifies the pros and cons of each option based on previous investigations. The information presented on each option has been extracted from the reports prepared by Council and various consultants over the last 20 years. It has not yet been technically reviewed. Therefore, this report identifies a number of areas where further technical investigations are required in order to inform the process, and ultimately to make robust decisions.

At this early stage, there are some high level criteria which each option should meet in order to be considered further. These criteria include the total cost (Council has allocated \$23 million (in 2009 dollars) through its LTCCP), total yield (as noted, up to 26,000 m<sup>3</sup>/day of water is required), and whether there are technical or resource consent fatal flaws. These criteria have been tested with the community through previous applicable consultation processes already, and so it seems sensible to test the long list of options against these criteria from the outset. Any option that does not meet these criteria should not be considered further, as to do so would waste Council resources on unnecessary investigations. On this basis, this report recommends taking 31 options forward for consideration and evaluation.

## *Kapiti Coast: Executive Summary*

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### These 31 options are:

#### Run of River

- Waitohu Stream
- Otaki River Gorge
- Otaki River Gorge Transfer
- Otaki Wellfield and Pipeline
- Mangaone Stream
- Akatarawa River Transfer
- Whakatikei River Transfer

#### Dams

- Waitohu Dam
- Mangaone Dam
- Combined Storage Dam in the Waikanae River
- Waikanae WTP Dam
- Kapakapanui Dam
- Ngatiawa Dam
- Upper Ngatiawa Dam
- Rangiora Dam
- Reikorangi Dam (Cambridge Farm)
- Lower Maungakotukutuku Dam
- Low-low Maungakotukutuku Dam
- GWRC Whakatikei Dam

#### Storage Ponds

- Storage Ponds - West
- Storage Ponds - East

#### Groundwater

- Extended Waikanae Borefield
- Eastern Waikanae Borefield
- Deep Groundwater
- Aquifer Storage & Recovery

#### River Recharge

- Groundwater River Recharge
- River Recycle

#### Other

- Non-potable reticulation network ("Dual" pipe system)
- Waikanae Borefield and storage

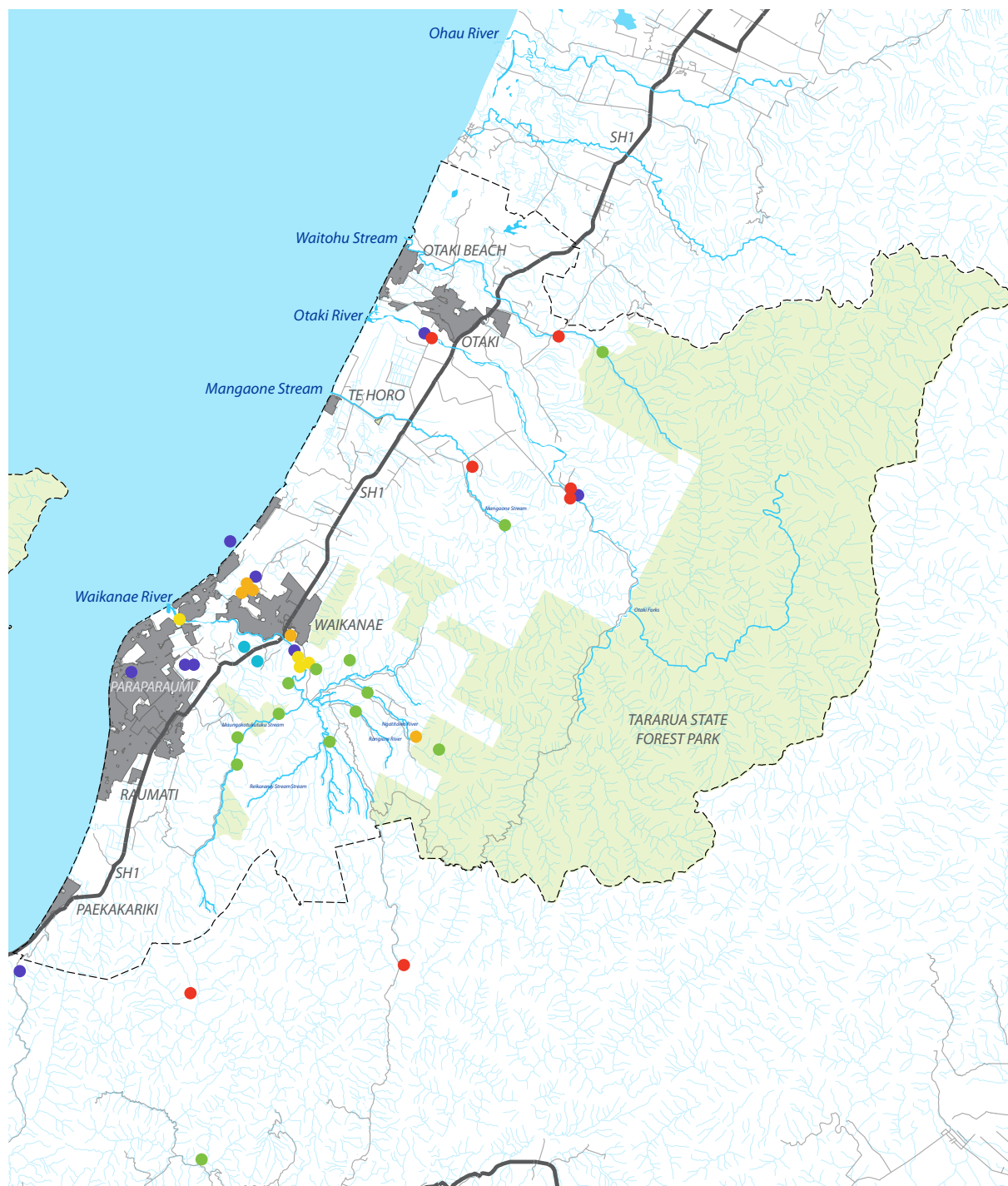
#### District Wide

- Kapiti District Integrated Water Supply
- Kapiti District Integrated Water Supply (Otaki Gorge)

This report presents a long list of options. However, one issue that will need to be resolved early in the process of engaging with the community is whether the water from the borefield can be further treated, so that it can be considered part of the longer term solution. If the bore field water can be treated so that the whole community accepts it, only a further 3,000 m<sup>3</sup>/day of water must be found. However, if the bore field water is unacceptable, a total of 26,000 m<sup>3</sup>/day of water is required from a different source.

The process for identifying a preferred solution from the long list of 31 options will involve consulting with the community, further technical investigations, and making decisions which are in the best long term interests of the community and the environment. Before further short-listing of options is considered however, Council will be seeking community input on the values that are important. These values will guide the evaluation and short-listing process. This also report sets out the next steps in that process.

Although the forecast peak daily demand in 2060 of 26,000 m<sup>3</sup>/day has been arrived at in accordance with Council's policies, there are significant risks in the short to medium term that in dry summers very severe water restrictions will need to be imposed (perhaps with heavy enforcement) to avoid the water supply running dry. This is because the underpinning design assumptions are based on the community achieving a relatively quick transition to a significantly reduced per capita peak demand before population growth starts to have an impact. For this reason we recommend that Council consider the use of a larger planning figure for forecast peak daily demand, at least for the short to medium term horizon.



## KEY:

- Roads
- State Highway 1
- Residential
- State Forest Park
- KCDC Boundary
- Waterways / Rivers / Streams

## Options

- Run-of-River
- Dams
- Storage Ponds
- Groundwater
- River Recharge
- Other

## Water Supply Options

# 1 Kapiti Coast: Introduction

---

## 1 Introduction

The per capita consumption of water, levels of water loss and population growth, combined with limited action to significantly reduce peak water demand, means that the summer water demand has severely stretched the District's bulk water supply. The existing supply at Waikanae is under pressure, both in terms of overall quantity and water taste and other quality issues from the supplementary bores. Council is therefore embarking on a process to identify the most suitable option for providing water to meet its communities' needs for the next 50 years.

This report presents outcomes from the review of previous investigations and options for water supply solutions. Much of this information is historical information, and so the report also identifies information gaps or the need to update specific data.

This report has been prepared for Councillors to make preliminary decisions on the range of options that should be considered. This report also provides background information to ensure the public is informed and able to fully participate in the option selection process that lies ahead. This report therefore seeks to:

- Provide a context for considering the future water supply needs of Kapiti Coast (refer Section 2 of this report).
- Provide an overview of the Water Management Strategy for Council and review the existing water supply network (refer Section 3 of this report). This strategy establishes a maximum level of water use

per person, which is 400 L per person per day at peak times. This target forms the basis of demand predictions, and given it has been adopted by Council, is not under review.

- Review the present and future water supply demands based on population projections and demand management work being carried out separately by Council (refer Section 4 of this report).
- Review and confirm design assumptions that apply to whatever final solution is identified (refer Section 4 of this report).
- Review previous ideas and options for capacity upgrades from previous investigations undertaken by Council, and identify any new options that should also be considered for evaluation. This will include identification of any detailed information gaps that should be filled in order to allow feasible options to be evaluated (refer Section 5 of this report).
- Provide an initial coarse screening of the long list of options, and eliminate options that have been previously conceived but which do not meet the high-level requirements of Council (refer Section 6 of this report).
- Identify the next steps for the project, including community engagement and filling information gaps (refer Section 6 of this report).

While the focus at present is on the Waikanae, Paraparaumu and Raumati area (referred to in this report as the WPR area), the report also considers water demand and supply across the whole district, which currently includes a number of smaller water supply schemes.





**KEY:**




- |   |                 |   |                              |
|---|-----------------|---|------------------------------|
|  | Roads           |  | State Forest Park            |
|  | State Highway 1 |  | KCDC Boundary                |
|  | Residential     |  | Waterways / Rivers / Streams |

Figure 1: Location Map

# 1 Kapiti Coast: Introduction

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## 1.1 Background

Council's normal water supply is based on a run-of-river system on the Waikanae River. For dry summer periods this supply is supplemented by a borefield in Waikanae. Water from the borefield whilst meeting the drinking water standards has been criticised by some consumers for its taste and hardness.

The capacity of the existing water supply system for the WPR area that is sourced from the Waikanae River and Borefield is nearing capacity for the demands placed on it by the existing population. The Development Management Strategy and recent Plan Changes have introduced significant thresholds for development to ensure staging is consistent with infrastructure provision. Overall per capita demand for existing and projected population continues to place pressure on the system. Options for a more extensive water conservation programme are being reviewed by Council officers in parallel with this new water supply source project.

Council has been actively considering additional water sources and options for improving the security of supply from existing sources since the early 1990s. A more detailed timeline of options considered is provided in Section 5. Following various unsuccessful attempts to resolve water supply concerns, the Council developed a Sustainable Water Management Strategy in 2003. In 2003 it proceeded with investment in the Waikanae Borefield within a very tight river consent timeline, alongside an intended aggressive water conservation programme.

The overall philosophy has been further reinforced by the adoption of the 2009 LTCCP, which states;

*"The district has historically been a heavy water consumer in comparison with other Councils. The Council's 2003 Sustainable Water Use Strategy has a 50 year focus and is concerned with reducing demand for water*

*and providing a supply within a 'reasonable water use' standard. Implementation of the strategy will assure the long term sustainability of our region's water resources and ensure adequate infrastructure capacity to fit new population demand – within reasonable water use targets."*

The level of service targets as defined in the 2009 LTCCP for water supply capacity and reliability are that;

Peak water consumption of no more than 400 litres per person per day (L/person/day) plus an allowance for leakage by 2012/13 at all times:

- 250 L/person/day for essential use
- 150 L/person/day for non-essential use
- Plus leakage or unaccounted for water

The standards are adopted as targets and will guide the amount of investment there will be in new supply and water storage in an area. For example, the recent water plans (each supply's management plan) take this standard into account. The standards will also guide the demand management programme.

## Project Objective

Council's overall objective in terms of water management is: to secure water supply for the whole district for the long term by both investing in additional supply and consumption conservation (demand management).

To meet the objective to provide a secure supply into the future for the district, options are to be developed, investigated and implemented for additional supply capacity in the Waikanae, Paraparaumu and Raumati area, and longer term for the wider district. All options are to be considered. All issues relating to public perception about aesthetic values are to be responded to.

### 1.2 Process for the Project

Overleaf is a brief summary of the project stages. The steps set out here involve a number of unknown elements at this early stage. In terms of timeframes, there are two key milestone dates. The first is that, provided the community engagement process is successful, it is anticipated that a preferred option will emerge from the option evaluation process by June 2010. The second is that by October 2010 resource consent documentation will be completed in draft form to enable consideration by Council for lodgment with Greater Wellington Regional Council and Council's planning team.

The following diagram provides a summary of the key steps and outcomes along the way. Working with key stakeholders, iwi and others in the community is a critical part of the process. The approach is therefore more focused on the "process" than what the outcome might be. This is because Council is taking the approach that the community, combined with technical input from specialists, will guide the process towards the best decision for this community.

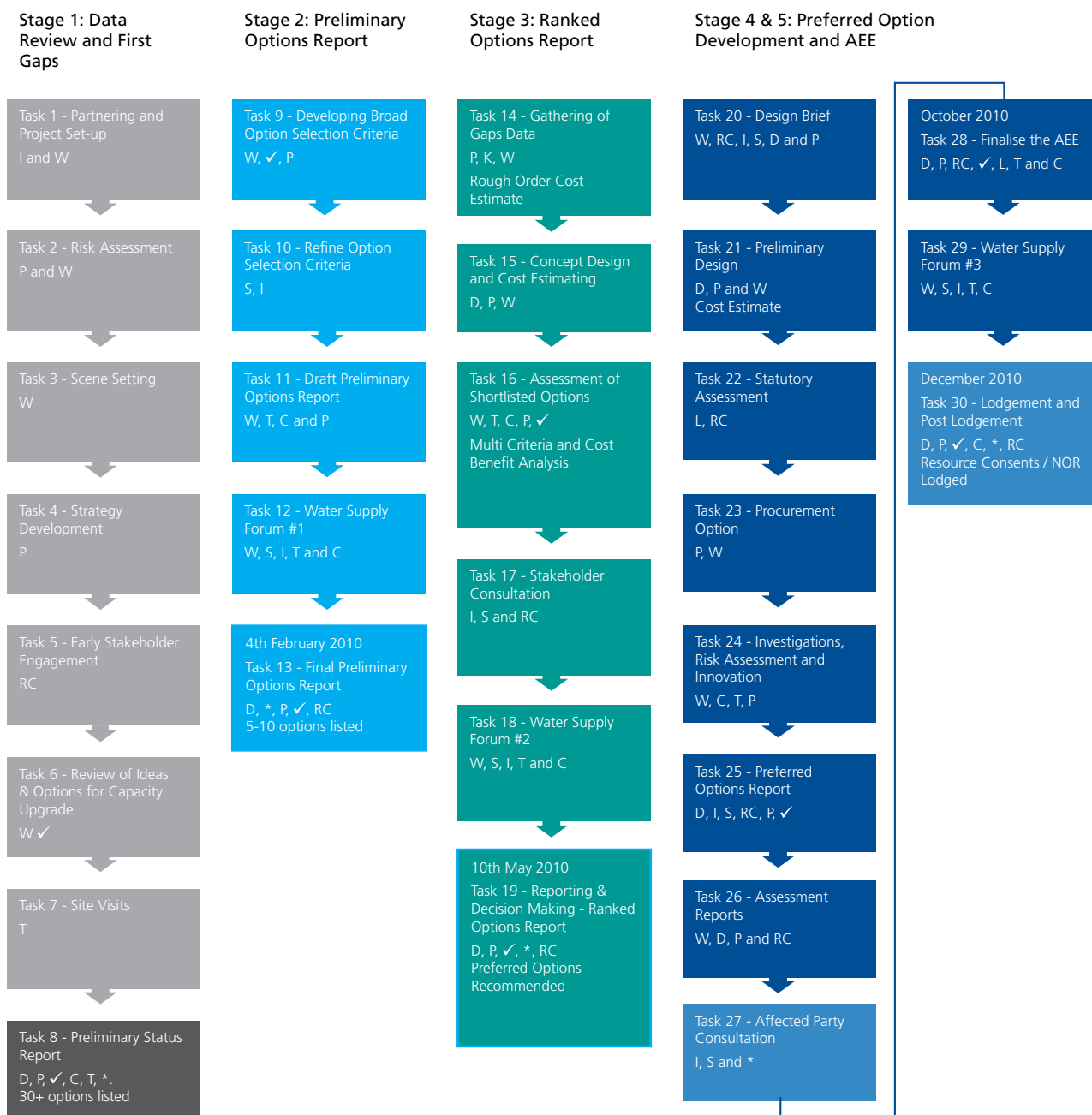
This report contributes to 'Stage 1' of the project, in particular Tasks 1, 3, 4 and 6. It provides a long list of options, as well as an overall update on the project context.

### 1.3 Partnership With Tangata Whenua

One of the key activities for Council in developing a future water supply source is to ensure that the partnership with tangata whenua enables robust input to decision making. In these early stages of this project, Council is actively seeking a partnership approach with iwi generally, and around water management issues in particular. There are certain statutory duties under the Resource Management Act (RMA) which need to be considered, including exploring how best to have regard to the concept of kaitiakitanga in relation to water and other matters. Council is exploring how best to consult with iwi and hapu. A key consideration will be the protection of the mauri of the waterways, including issues of ecosystem health and potential harm to spiritual kaitiaki that protect the waterways. While these are issues of concern to the whole community, iwi and hapu have a special place alongside Council in making decisions which are long term and sustainable.



# 1 Kapiti Coast: Introduction



## Legend

T - Technical Advisory Group  
C - Challenge Team  
P - PCG Meeting / Sign-off  
✓ - Formal Council / Committee Endorsement

L - Legal Input Recommended  
D - Deliverable/Milestone  
RC - GW / KCDC Resource Consent Staff Involvement  
W - Project Team Workshop

\* - Public Communication  
I - Iwi Consultation  
S - Stakeholder Consultation Required

Figure 2: Methodology flow chart

### 1.4 Relationship With the Community

Council is seeking active engagement with the wider Kapiti community in order to resolve the future water supply needs for the district. A program of active consultation is being implemented as part of the process to identify a preferred option. This will include engaging on the specific selection criteria, evaluating the list of options, and also providing input to evaluating the potential effects and benefits of different options.

The community has an active interest in the water management process. Through previous processes (e.g. LTCCP submissions) a number of people have focused particularly on having a reliable water source that meets the aesthetic requirements of consumers. The community is also keen to ensure that Kapiti is a sustainable user of water. These messages have been clearly articulated in the LTCCP, which is guiding the water supply project.

### 1.5 Relationship With Landowners

A number of the options identified previously will involve a level of impact on some landowners within the District. Whether this is as a result of infrastructure being located on or across private land, or land being taken for water storage (e.g. for dam options), there will be a number of landowners affected to some degree. Council has previously consulted with landowners affected by some of the options presented in this report. However, because a number of the options were first conceived 10 or 20 years ago, land ownership is likely to have changed. Therefore, in the early stages of consultation, landowners that are potentially affected by different options will need to be consulted.



## 2 Kapiti Coast: Growth Context

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### 2 Kapiti Coast: Development Management

Before identifying a preferred option to supply water to the future communities of Kapiti Coast, it is important to understand the context for future managing future development in the District. This is because the design life for significant infrastructure such as a water supply source is typically many decades. The Sustainable Water Management Strategy identifies the need for Council to plan over at least a 50 year period. That is, this project needs to consider water demand issues out to the year 2060. It also makes clear in the section on the WPR that supply systems will be designed and developed within the proposed per capita water consumption targets.

Council has developed a “*Development Management Strategy*” (2006) which identifies the concept of thresholds and requires development to be staged to be consistent with infrastructure capacity. It has also established an urban edge concept at Waikanae, moved to limit the location of medium density housing and retain lower density character where appropriate. While it cannot directly influence household size, the Strategy establishes a sustainable development approach which, as best it can, links growth pressures with environmental capacity.

Council has a number of important strategies to ensure future development in the district is sustainable. A number of strategies and other factors influence the way in which development is managed, as explored in this section. The degree and location of development has an important influence on the design capacity of the water supply option chosen. Therefore, this section provides important context to the nature of population growth, the likely shape of development, trends in dwelling numbers and so forth.

#### 2.1 Overview of the District

##### 2.1.1 Population

The 2006 Census of Population and Dwellings identifies that 46,458 people usually live in Kapiti Coast District. Nationally the Kapiti Coast is classified as having a medium to high population growth, with a population increase of 3,753 people, or 8.8%, since the 2001 Census. This is projected to slow in the medium term to come into line with the regional average. Most of the development in the District has occurred in Paraparaumu.

##### Age

The majority of the Kapiti Coast population is located in the main urban area consisting of Raumati, Paraparaumu and Waikanae. The population has a large proportion of people over 65 years of age, with the 2006 Census showing that 23.3% of people in Kapiti Coast District are aged 65 years and over, compared with 12.3% of the total New Zealand population. The population has a relatively small proportion of people of working-age. Otaki and Waikanae have the largest proportion of people over 65 years.

##### Dwellings

Increasing numbers of one-person households, declining family size, and fewer couple-with-children households, have all contributed to the decline in household size in New Zealand. Kapiti Coast is no exception; the average household size in Kapiti Coast District is 2.3 people, compared with an average of 2.7 people for all of New Zealand. Single person households comprised 27.4% of total households in Kapiti in 2001, and 29% in 2006. There were 19,368 occupied dwellings, and 168 dwellings under construction in Kapiti Coast District, as at the 2006 Census.

The District has also historically had a number of dwellings that are ‘weekenders’ or used irregularly by owners as baches or holiday houses. The degree to which these holiday houses influence water demand is not known.

##### Household Income

As outlined in the Kapiti Coast Development Management Strategy, household income is a significant factor shaping the community, and has an impact on private expenditure and also the capacity of the community to invest collectively. As discussed above, the Kapiti District has a large proportion of residents who are over 65 years of age and as such, the community is



characterised by a large number of households receiving their income from superannuation, or other benefits. Therefore, many households are on limited fixed income. The 2006 Census data reflects this, showing that the median income for Kapiti Coast is lower than the New Zealand average: the median income in Kapiti Coast District (for people aged 15 years and over) is \$23,000. This compares with a median of \$24,400 for all of New Zealand.

### 2.1.2 Settlements and District Form

Council has developed a clear strategy for urban form, which essentially reinforces the existing settlement pattern. From a water supply perspective, this provides a sound basis on which to plan for the future. It is important to consider where development may occur in future. Specifically, in considering the WPR water supply area, it is likely that most development in the District will continue to occur in this area, as set out in the Development Management Strategy. The other major centre of Otaki will also continue to grow within set limits identified in the Strategy. This has implications for considering district-wide water supply solutions, and district-wide demands for water use.

The Kapiti Coast is defined by very strong natural features, including the coastal edge, wetlands, the southern coastal escarpment and hills, rivers and streams, and the Tararua and associated ranges. These characteristics are highly valued by the community and are the framework around which urban form and development are built. Future development will be located away from sensitive features, or if appropriate, these areas should be restored and enhanced and actively designed into any future development.

Over time, there has been continued development in the District, largely within the urban area. This development has been accompanied by changes in subdivision and development standards and an acknowledgement of the need to modify infrastructure to take account of the area's environmental constraints, for example water supply issues.

Kapiti Coast District has a number of centres of varying scale, ranging from those with a district-wide influence to those with a neighbourhood function. Council supplies all of these urban centres with water in some form. Understanding the future form of settlements is likely to influence the water supply option that is required, and the timing of providing those options.

The key settlements, and the distinctive urban areas within the Kapiti Coast District, are: Otaki, Waikanae, Paraparaumu/Raumati, and Paekakariki. A significant area of Kapiti Coast is rural in nature, including Te Horo, Otaki and Hautere.

Council encourages efficient use of water across all different types of land use. In terms of the rural areas within the Kapiti Coast District, there is a significant resource of high quality soils and, therefore, the rural productive sector is an important component of the local and regional economy. The Council has a clear policy of protection of the productive potential of this land. Any water supply options which might have impacts such as land this would need to be carefully assessed. While Council does not manage water allocation (GWRC manage this under the Resource Management Act), the sustainable use of land is an important consideration for Council. In addition, it is not appropriate for potable water to be used for rural purposes.

## 2 Kapiti Coast: Growth Context

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### 2.2 Wellington Regional Policy Statement and Wellington Regional Strategy

The Wellington Regional Policy Statement identifies the regionally significant issues around the management of the region's natural and physical resources and sets out what needs to be achieved and how this will occur (objectives and policies). Therefore, the Wellington Regional Policy Statement has direct relevance in the management of Kapiti District's water supply issues.

The Wellington Regional Strategy is concerned with the sustainable economic growth of the region, and includes a vision for key aspects of regional form and urban structure, and a growth framework. The Strategy has identified both Paraparaumu Town Centre (in terms of the need for a functioning town centre) and Waikanae North (in terms of an urban edge), as regionally significant focus areas. This is also the area where there is greatest future risk to water supply, and as a result the preliminary focus of this investigation. A key aspect of the framework is to make sure land and infrastructure are used efficiently. This is particularly critical when considering the provision of water services, as inefficient land use (i.e. low density development) typically comes with much higher infrastructure servicing costs.

### 2.3 Sustainable Development Principles from the Community Plan (LTCCP)

Through the LTCCP process, Kapiti Coast District Council has adopted fourteen sustainable development principles to guide decision making for the District. The LTCCP explains that these principles are particularly important in guiding the quality of actions for current Council services, as well as guiding thinking and action for future Council services and activities. Water supply and issues around its demand and capacity can be addressed under a number of these principles, particularly in relation to partnerships with local community and tangata whenua.

It is anticipated that these principles will inform the development of selection criteria for analysing the long list of options presented in this report. This is further discussed in Section 6 of the report. The sustainable development principles are as follows:



### Kapiti Coast Development Principles

Principle 1: That there should be long term balance between social, economic, cultural and environmental wellbeing;

Principle 2: All residents and ratepayers should have the ability to participate in the community and community processes;

Principle 3: Positive partnerships should exist between community groups, tangata whenua, businesses, the voluntary sector and local and central government;

Principle 4: The interests of future as well as present generations are taken into account in decision making;

Principle 5: There is prudent stewardship of natural resources;

Principle 6: The people resource of knowledge, skills, wisdom, physical ability, health, creativity and flair of all generations is maintained, nurtured and increased

Principle 7: The interconnectedness of the natural environment and communities is recognised when taking action;

Principle 8: An action should increase the resilience and adaptability of the community to external 'shocks',

changes in fads and changing pressures over people's lifetimes;

Principle 9: The local economy and economic growth should as far as possible avoid environmental harm and develop within the basic capacity and thresholds of natural resources to support economic growth;

Principle 10: Decisions should take account of the impacts of social wellbeing of the community and impacts on the wellbeing of individuals;

Principle 11: A precautionary approach should be taken to decisions by assessing short, medium and long term financial and non-financial risk. Solutions should spread risk and actions should produce multiple benefits;

Principle 12: People should have easy access to tools, knowledge, systems and technologies that enable them to act sustainably, in an easy, self reliant, responsible and innovative way;

Principle 13: Account should be taken of the changing regional, national and global contexts when making local decisions;

Principle 14: The speed of change should recognise and work within the capacity of the community and individuals to respond (including issues of affordability).

### 2.4 Implications for Water Supply

Existing development management strategies provide some clear guidance for the water supply project, and have some important implications. These are:

- That development will be managed within the existing urban areas;
- That Paraparaumu and Waikanae are major focal points for town centre development;
- That in general terms, development will be staged to fit infrastructure capacity;
- That Council is seeking to encourage efficient and sustainable use of land, which promotes cost effective servicing including for water supply purposes;
- That the district will continue to manage development in accordance with its Development Management Strategy (population projections are provided in Section 4); and
- That the district will continue to seek to become more self sufficient for employment, meaning a level of increase in commercial and industrial activities is likely. This will have some implications for predicting future water use.



## *3 Kapiti Coast: Sustainable Water Management*

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### **3 Sustainable Water Management**

Kapiti Coast District Council has an extremely clear strategy as to how water will be managed now and into the future. It is important to understand that the search for a water supply solution, initially for the Waikanae, Paraparaumu and Raumati area, occurs in this context. Specifically, Council has set clear targets for water use and has a sound understanding of the capacity of its network. The key challenge is identifying a water source that provides sufficient capacity for future development that occurs under the Development Management Strategy. This section provides an overview of key aspects of the sustainable water management strategy and the existing water supply networks across the District. While the initial focus is on the Waikanae, Paraparaumu and Raumati (WPR) area, water in the district must be considered in an integrated manner over the long term. Therefore, an overview of the entire district is provided. This includes largely the urban areas, and the reticulated water

networks that service them. Urban areas require potable water for human consumption. Rural land uses do not require potable water, but may require some raw or untreated water for productive purposes (e.g. for stock).

#### **3.1 Sustainable Water Management Strategy**

The Kapiti Coast District Sustainable Water Management Strategy sets out the Council's vision for water management in the District over the next fifty years. The central core of that strategy was reaffirmed as part of the 2009 LTCCP review. The Strategy recognises that water is a finite resource, and one that is essential to people's health and well-being, and the well-being of the local economy.

The Strategy contains a list of principles that provide an overall framework for water management, for each local community.



### *3 Kapiti Coast: Sustainable Water Management*

The main conclusions that form the Sustainable Water Management Strategy that relate to the water supply solution are as follows:

- Water management is an issue for each of the Kapiti Coast communities to address, and particularly must be a partnership between Council and iwi, who have a kaitiaki (guardian) role with local communities.
- Water management must take into account the natural capacities of local environments. Understanding this natural capacity is essential to understand the development potential of each area within the District, and the degree to which each local catchment could provide water to the rest of the District. Cross catchment water supply will be considered but within a context of local responsibility for managing the supply.
- Development futures, of both residential growth and economic development, must be understood and then managed in relation to the natural capacity. Residential growth must take into account the impact of new lots on water supply and natural capacity, as well as supply constraints in specific areas. Economic development is important, as long as this development does not compromise the water capacity of the District. For example, new business activities that use large amounts of water will not be encouraged and every effort will be made to reduce any excessive consumption by existing businesses.
- The level of water consumption must be reduced overall, particularly potable water use. The Strategy advises that communities should work towards a standard of 400 L/person/day peak demand (plus an additional allowance for unaccounted for water or leakage). Council would work with each community to set local targets, as each community has unique water use scenarios, and some communities have a particular need to understand the implications of their future development potential. The Strategy included an action to investigate whether water metering was required. This investigation has occurred, and concluded that metering will not be considered on the Kapiti Coast. A range of other conservation measures will be implemented over time to reduce overall demand to 400 L/person/day.
- Planning for storage/supply to offset loss of supply from the river in periods of low flow (drought) is important.
- Recognition of water conservation as an essential water management tool. This Strategy is built on the principle that a key role for community investment in water management is to reduce demand levels in high consumption catchments. Demand management requires improved understanding of water consumption and water loss, an emphasis on water loss management and minimisation and long term monitoring from all communities.

## 3 Kapiti Coast: Sustainable Water Management



### 3.2 Existing Water Supply System

Kapiti Coast District effectively has four different water supply areas, with the balance of the district being the rural area which is not serviced with a reticulated potable water supply. The four water supply areas each have a number of different existing and potential water sources. The four water supply areas in the District are:

- Paraparaumu/Raumati and Waikanae/Peka Peka (this area is large, and has two distinct parts, but water is sourced from the same location).
  - Paekakariki
  - Otaki
  - Te Horo/Hautere

The Kapiti Coast in general terms has abundant water sources. There are a number of rivers, groundwater aquifers of varying depths, and a reasonably reliable level of rainfall (e.g. for rural dwellings that rely on roof water).

Further Work: Further investigation on the hydrology and climatic patterns of the area, including the potential impact of climate change is required in the next stage of this project. This work needs to be integrated with other investigations Council is undertaking including historical analysis and stormwater management.

Council prepared a report in 2006 (*"An assessment of water and sanitary services in the Kapiti Coast District"*) that comprehensively describes each reticulated network, storage, water quality and security. In relation to the WPR area, which is the main focus of this report, important messages from this report include:

- 96% of the Kapiti population is provided with a reticulated water supply by the Council.
- That the Waikanae water treatment plant has a technical capacity to treat up to 34,000 m<sup>3</sup> of water per day. This plant provides water to the majority of the serviced population, including the Waikanae, Paraparaumu and Raumati (WPR) area.
- That the hydraulic capacity of the Waikanae treatment plant is up to 45,000 m<sup>3</sup>/day.
- That the existing resource consent to take water from all sources that serve the WPR area (i.e. the Waikanae River, emergency bores, supplementary bores) is 23,000 m<sup>3</sup>/day;
- The Waikanae River has a minimum flow requirement of 750 L/sec. Once the river flow becomes less than this, no water can be taken from the river and the borefield must be used. There is a 'step-down' arrangement embodied in the resource consent conditions.

Other specific points of interest in relation to each of the four water supply areas are described in the diagram on the following pages. These are included because one of the potential long term strategies for the District could be to consider water management and supply at a District wide level over the next fifty years out to 2060.

### **3.3 Implications for Water Supply**

The Sustainable Water Management Strategy provides an important framework for considering water supply sources. The principles of this Strategy were reconfirmed during the LTCCP process in 2009. When considered in the context of the existing water supply networks, a number of issues and opportunities arise. These include:

- That the total volume of water required for each person in the District from the year 2013 is 400 L/person/day at peak times. This figure excludes unaccounted for water.
- That the water supply project is being developed alongside a range of measures to conserve water, and therefore reduce overall water demand.
- That the significant majority (over 95%) of people living in the Kapiti District are serviced by Council water supply systems.
- There are very few large water users in the District, which reduces the range of potential water supply solutions (e.g. potable water substitution) that may be available.
- There are a number of different networks, each with different sources, treatment methods and water quality.



### *3 Kapiti Coast: Sustainable Water Management*

#### **Paraparaumu/Raumati**

- 97% of population serviced.
- Raw water is sourced from Waikanae River and supplementary bores. The bore supplies are at a typical depth of 80m. Maximum consented extraction of 23,000 m<sup>3</sup>/day.
- Bore water is 'hard' due to high mineral content.
- Two emergency bores at Otaihanga provide maximum extraction of 7,000 m<sup>3</sup>/day.
- Three storage reservoirs feed this network. Reservoirs provide not less than 90% of daytime demand over 24 hours.
- Reticulated network has an average age of 25 years
- River water is of a lower microbiological and organic quality than bore water. The bore water does not meet some of the community's 'taste' and hardness expectations.
- The fire fighting supply requirements in terms of pressure are met in all areas with the exception of a few low pressure water zones.
- In four residential areas there are various reasons for restrictions on water supply (being Waterstone, Nikau Valley, Waikanae Downs, Camelot).
- Commercial water users are metered and charged for water consumed. The largest users are:
  - Paraparaumu Wastewater Treatment Plant (60,000m<sup>3</sup>/year).
  - Kapiti Cheese Factory (32,000 m<sup>3</sup>/year).
  - Lindale Tourist Centre (7,000 m<sup>3</sup>/year).
- There are a number of dwellings in the area who provide their own water supply (e.g. roof water, bore water) or from local privately operated treatment plants.

#### **Waikanae/Peka Peka**

- 95% of population serviced.
- Raw water and water sources the same as for the Paraparaumu/Raumati area.
- An emergency bore at Waikanae Beach is available to provide supply to the Waikanae community, but this is untreated raw water and is not reticulated.
- Four storage reservoirs feed the Waikanae part of the network. Reservoirs provide not less than 90% of daytime demand over 24 hours.
- Part of Peka Peka has a restricted water supply, meaning future development in the area is limited.
- The fire fighting supply requirements in terms of pressure are met in all areas with the exception of a few low pressure water zones.
- There are a number of rural or lifestyle properties that service their own water supply requirements (in 2006, up to 500 people). These properties are in Upper Huia Street, Waikanae. Council offers a water quality testing service to unserviced properties.
- There are four known privately operated treatment plants.
- There are no heavy commercial water users.

#### **Paekakariki**

- 100% of the population serviced.
- Paekakariki Town and Queen Elizabeth Park camp are serviced.
- Wainui Stream and a shallow bore supply raw water
- Raw water is treated, but not fluoridated.
- One storage reservoir feeds the reticulated network. The reservoir has adequate storage capacity.
- The piped network is comprised of asbestos cement and uPVC pipe materials.
- Only two known private supplies (roof water) in the area. Privately operated treatment plants are also known.



Figure 3: KCDC Water Supplies

### 3 Kapiti Coast: Sustainable Water Management

#### Otaki

- 97% of population of Otaki (including the Waitohu Plateau) and Otaki Beach are serviced.
- Raw water was historically provided from the Waitohu Stream, Otaki groundwater zone and Waitohu groundwater zone.
- Bore water from Otaki Beach currently provides the current raw water source for the Otaki network.
- The water supply is treated with chlorination and for pH adjustment.
- A small balancing reservoir is located at the abandoned Waitohu treatment plant.
- KCDC have plans to procure a new bore supply in the Waitohu catchment and 6,000 m<sup>3</sup> storage reservoir to meet Drinking Water Standards and future storage requirements.
- Some risks to water supply not meeting Drinking Water Standards in future due to unconfined nature of the aquifer having been identified. This is being addressed through the addition of UV treatment to this supply.
- Total maximum allocation is 13,000 m<sup>3</sup>/day from all three water sources.
- Pumping and/or reservoir capacity are likely to be the main future constraints.
- Otaki is a high water user per head of population.
- The two largest non-domestic water users are:
  - Otaki Wastewater Treatment Plant (12,000 m<sup>3</sup>/year).
  - Tasman Road College (10,000 m<sup>3</sup>/year).
- Fire fighting pressure is not able to be met as a result of the 'on-demand' nature of the supply system.
- Approximately 10 properties are provided with restricted water supply.
- 3% of the Otaki community do not have access to Council reticulated water supply system. These properties are largely in the rural areas north of the township (Tasman, Mill and Rahui Roads) Most provide water from either roof or bore water sources).
- There are a number of commercial operations with private water supplies (e.g. Otaki Racecourse, Firth Industries, camp grounds).

#### Te Horo/Hautere (Rural Water Supply)

- Restricted flow supply.
- 70% of the population serviced by a reticulated water supply (700 people).
- Raw water is sourced from two groundwater zones (the coastal zone and Hautere Zone).
- Largest part of the system is the Hautere Plains area, which was originally established to service dairy farming, but now provides domestic drinking water. Currently no additional capacity in scheme as historically over allocated.
- Hautere Plains raw water is treated at the Hautere treatment plant with pH adjustment, chlorination and UV treatment.
- Reticulation is small diameter with majority of pipe material as uPVC and some PE. There is no fire fighting capacity.
- Water quality is variable.
- There are three other reticulated water supply schemes in the area, being at the Willow Park Development, Gary Road, and the Te Horo scheme.
- Approximately 200 homes at Te Horo rely on roof water or shallow bores from an unconfined aquifer. There is no wastewater reticulation in Te Horo, meaning septic tanks discharge to ground. Supply security risks are high, and water quality can be poor. Significant risk assessment and guiding policy to monitor impacts has been undertaken.
- Te Waka Road is another population area without a reticulated supply, and also relies on roof and bore water.
- There are three private water supplies in the Hautere/Te Horo area, being the Riverslea Lodge, cafes/restaurants and a catering company.

#### Rural Area

- No Council provided infrastructure or bulk supply.
- Majority of other rural users are in the Otaki catchment.
- No significant volume of water is taken directly from the Otaki River.



Figure 4: KCDC Water Supplies

## 4 Kapiti Coast: Water Demand Forecasts

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### 4 Water Demand Forecasts

To assess the feasibility of different water supply options, it is important to understand how much water is required at different times in the future to provide a secure supply to the community. This section provides an overview of water demand forecasting and the various factors that influence demand now and in future.

#### 4.1 Inputs into Forecasting

##### Variables

Forecasting water demand involves consideration of a complex interaction of a number of variables. For water supplies that are dominated by domestic use, the two key variables are the future population, and how much each person will use in the future.

Population is influenced by a host of factors; such as demographic changes in the resident population and immigration, economic growth of the district and the region, transportation links to employment areas, land availability for housing, and housing availability.

##### Individual Water Use

How much water each person uses is influenced by their personal habits, the habits and practices of the household, the price and the method of charging, external water conservation measures and incentives, the efficiency of water using appliances (e.g. the washing machine) and fixtures (e.g. the shower), and the kind of water-using activities that take place outdoors (e.g. gardening).

##### Peak Demand

Outdoor water use dominates peak demand. For water sources such as run-of river (like the present Waikanae River source), peak demand is what drives how much water a source must provide at the time it is actually needed. Water systems that rely on storing raw water in the wet months to provide water in the dry months, need to also take account of average demand.

Non-residential water use includes commercial properties (e.g. retail, warehousing), industry, wet industries, parks and gardens, playing fields, and large public facilities (e.g. swimming pools). For non-residential water use, forecasting relies on building up a picture of how each type of use will change in the future, and then either using historical figures of demand per type, or using demand figures that are generally accepted for that type of use. The latter method is usually used when there are insufficient historical records of water consumption for that type of use.

##### Forecasting Demand

Forecasting demand must also consider and allow for the losses from the system between the point the water is abstracted and where it is actually supplied to consumers.

The key inputs into demand forecasting are therefore:

- Historical water consumption data, and how this is broken down between the various uses;
- Losses from the system or unaccounted for water;
- Factors and trends that will influence and change historical water consumption figures;
- Population forecasts - Statistics New Zealand projections are commonly used as the basis for predicting growth in the population. Council has used the 'medium' growth scenario prepared by Statistics New Zealand (and ratified regionally through the Wellington Regional Strategy) for previous infrastructure planning work, and this approach will be adopted for this project also; and
- For non-residential demand – future changes in each type of use, and then forecasting consumption.

At this early stage of the project we only require a preliminary and high level assessment of future water demand out to 2060.

For present purposes, a simple "consumption per person" method has been selected as providing an appropriate figure to meet the needs of this project at the present time. The underlying assumption of 400 L/person/day is already clearly embodied in Council's Sustainable Water Management Strategy as a basis for making these future predictions.

## 4 Kapiti Coast: Water Demand Forecasts

Further work will be undertaken to provide greater certainty on these projections. Specifically, this will focus on:

- Consideration of detailed work on historical demands and water conservation, which is being undertaken by Council in parallel with the supplementary water source project;
- Whether the medium population growth scenario should be used as the basis for determining future water supply requirements. At this point, this is the approach Council is taking so that there is consistency with other strategies and other infrastructure planning work;
- Consideration of the potential impacts of higher rates of economic growth, in particular the potential for a number of "wet industries" to locate on the Kapiti Coast. The Water Matters strategy does not actively encourage new wet industry, but an approach which requires new industry to contribute to its own supply is likely along with significant water efficiency actions;
- Consideration of district-wide water requirements, and the need to ensure there is sufficient water available for a wide range of economic, cultural, social and environmental uses of water;
- Consideration of the future benefits of linking the four main urban water supplies together, including those benefits associated with reducing the vulnerability to drought and system failures, as well as operational efficiencies;
- Whether there is potential for rural land irrigation to occur at greater levels than occurs at present, and what impact this may have on water availability for urban supplies. This will involve working closely with the Greater Wellington Regional Council on water allocation issues in the District;
- Consideration of strategies to reduce unaccounted for water, which is being investigated at present.
- Consideration of the success of water conservation measures and the ability to remain flexible over time, so that water supply capacity does not either over or under deliver by a significant margin.
- Confirm the amount of water use for industrial and commercial users.
- The simple "consumption per person" method has made the following assumptions:
  - The population connected to the water supply increases at the same rate as the population within the relevant Statistics New Zealand census area unit.
  - Growth in industrial and commercial water use occurs at the same rate as domestic water use.
  - That water lost from the system increases at the same rate as population.

### 4.2 Historical Records

Historical records of peak consumption indicate that currently residents in the District consume in excess of 400 L/person/day (excluding unaccounted for water). Over a period of four to five years, Council and the community are committed to implementing a series of water conservation measures so that the target of 400 L/person/day (plus unaccounted for water) can be achieved.

Historical peak daily demand records are presented below on a per person basis for each of the four urban reticulated water supply networks on the Kapiti Coast that are managed by Council. Note these figures include unaccounted for water. The peak day figures vary depending on the weather over the summer period.

*Table 1 Peak Daily Demand Per Person (L/person/day) Including Losses 2001/01 - 2008/09*

Reticulated Supply System	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Otaki	1070	1478	1144	1106	1300	1012	1019	1075
Waikanae	808	803	736	762	745	811	767	757
Paraparaumu & Raumati	621	565	540	613	606	506	662	524
Total WPR	677	635	598	657	647	595	693	592
Paekakariki	603	580	564	593	640	643	669	606

## 4 Kapiti Coast: Water Demand Forecasts

Setting aside the volume of water used by individuals or households, a serious concern is that the increasing population is having an impact on peak demand to the point where the consented limit for the supply of 23,000 m<sup>3</sup>/day is close to being reached. The table below identifies the number of times when total daily consumption has entered what can be considered the 'risk zone' in terms of potential breach of resource consent requirements.

Until the water supply solution is in place, tighter water restrictions may be required in addition to the current water conservation measures to ensure that the community does not breach the consent limit.

*Table 2 Number of Days Total Daily Consumption Enters the Risk Zone for WPR*

	20,000 m <sup>3</sup> / day	21,000 m <sup>3</sup> / day	22,000 m <sup>3</sup> / day
2002/2003	4	0	0
2003/2004	0	0	0
2004/2005	3	0	0
2005/2006	3	0	0
2006/2007	4	0	0
2007/2008	20	6	2
2008/2009	17	7	2

### 4.3 Demand Growth

Deriving population based water demand projections requires a number of assumptions. These are outlined here to provide a context for the final total population figure.

#### 4.3.1 Planning Horizon

In its Sustainable Water Management Strategy, Council adopts a strategic intent to plan for the future urban water supply over at least a 50 year time horizon. Therefore, using the most recent census (2006) as a base, the population for the District and water supply areas has been projected out to 2060.

#### 4.3.2 Growth Rate

Statistics New Zealand provides population projections for the District, which typically involve three different growth scenarios – being a high, medium and low rate of growth (in some districts the low scenario can be negative growth). The three growth scenarios incorporate different fertility, mortality and net migration assumptions. Kapiti Coast has experienced some of the most significant growth rates in the country in the past decade or more.

The LTCCP includes a Development Contributions policy based on the medium projections, and this will be applied in relation to 'sizing' water supply infrastructure in this instance. Clearly if growth rates are either higher or lower than this medium projection, then the water supply infrastructure developed as a result of this project will either last for a greater or lesser period of time in the future. Council's strategic planning documents (including the Sustainable Water Management Strategy) clearly require a 50 year perspective to be taken. This may not mean capacity is provided now to accommodate the population in 50 years time, but consideration of the future population will be required.

#### 4.3.3 Location

It is assumed that the present ratios of population distribution remain constant. That is, that over the 50 year period, one settlement does not acquire a greater proportion of growth than another.

Should options that involve examining water supply at a district-wide level be pursued, then further detailed analysis of land availability, population growth rates, and commercial/industrial growth locations will be required.

## 4 Kapiti Coast: Water Demand Forecasts

### 4.3.4 Population Projections

Statistics New Zealand's population projections for the Kapiti Coast District from 2006 through to 2031 were extended through to 2060 by Monitoring and Evaluation Research Associates Ltd (MERA). The population projections for the district based on the medium growth scenario are given in Table 3 and the following graph. The table shows that the Kapiti Coast District population is projected to increase by approximately 20,000 people by 2060.

MERA also provided population projections for each of the Kapiti Coast Census Area Units through to 2031 with the medium growth scenario. This data was extrapolated through to 2060 assuming that the percentage of total population for each census area unit remains constant from 2031 onwards. The populations projections for the census area units was assembled based on water supply service areas defined in the LTCCP 2009 and this data is given in the table below. While the census area units do not match exactly with the water supply service areas, they provide a close enough match for these purposes.

Table 3 Population Projections (Medium Growth) by Water Supply Service Area

Water Supply Service Area	2006	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2060
Otaki	5,466	5,563	6,162	6,263	6,479	6,658	6,896	7,077	7,211	7,308	7,382	7,443
Rural North*	2,559	2,698	2,809	2,936	3,042	3,134	3,246	3,332	3,393	3,441	3,475	3,504
Waikanae, Paraparaumu & Raumati	35,727	38,627	40,642	42,963	45,136	47,249	48,939	50,220	51,170	51,858	52,389	52,818
Paekakariki	1,599	1,624	1,604	1,605	1,600	1,593	1,650	1,693	1,725	1,748	1,766	1,781
Rural South*	837	882	923	964	1,006	1,035	1,072	1,100	1,121	1,136	1,148	1,157
Kapiti Coast District Total	46,197	49,394	52,140	54,731	57,263	59,669	61,805	63,424	64,622	65,491	66,161	66,702

\* Note that the Rural North area includes the Te Horo/Hautere rural water supply, where only approximately 70% of the population are not connected to a Council water supply.

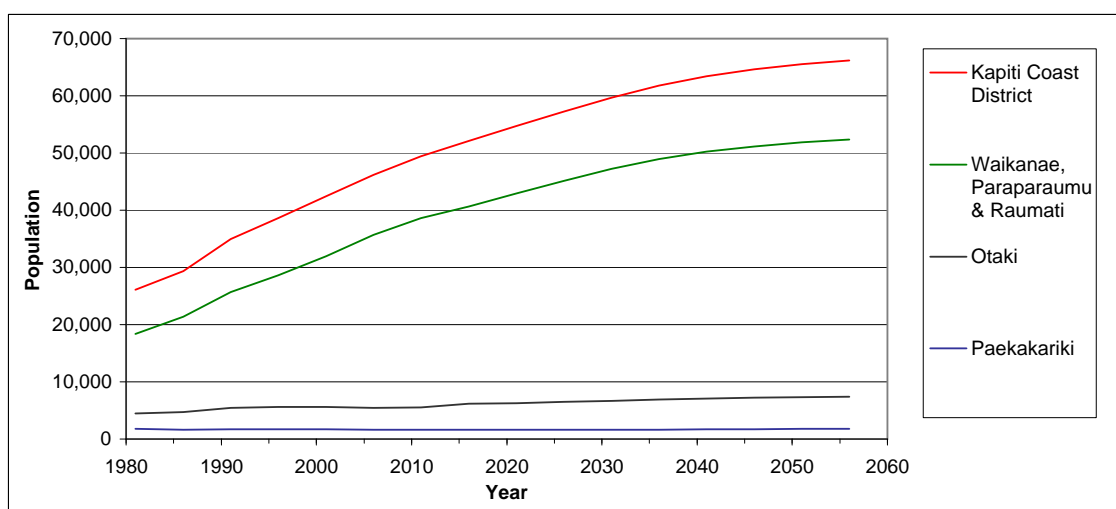


Figure 5: Population Projections (Medium Growth) for Kapiti Coast District

## 4 Kapiti Coast: Water Demand Forecasts

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### 4.3.5 Water Use Per Person

Water use is assumed to be 400 litres per person per day (400 L/person/day). This is a key design assumption which links the water supply project with the Sustainable Water Management Strategy (Water Matters) from 2003.

### 4.3.6 Drought Reliability

The normal design standard of reliability for urban water supplies in New Zealand is a 1 in 50 year (2% Annual Recurrence Interval) drought. Typically, to deliver on this standard some kind of demand management measure is necessary, such as a ban on using garden hoses. In Kapiti's case water conservation measures are likely to be in place for all summers, and hence if there are drought events with a return period of greater than 1 in 50 year, more severe measures will need to be imposed.



### 4.4 Unaccounted for Water

Because the amount of water that is actually supplied to each consumer is not measured, losses from the system are not known with any certainty. Around New Zealand losses are typically estimated as most communities do not universally meter consumers. Published losses in recent years have been in the range of 12-15%, however many (including Wellington City) are currently greater than 20%. Losses are usually expressed as a percentage of average demand.

Council is developing an Unaccounted for Water (UFW) Strategy to understand and manage water loss in the water supply networks. The UFW Strategy is relevant to the water supply project as it will assist in determining how much water is required on a peak daily basis, but it will also form a key link with the water conservation stream of the work that the Council is undertaking.

The principle of UFW is to measure or estimate the quantity of water legitimately used by end consumers. The idea is to establish the difference between the water that is legitimately used and compare with flows supplied from the water sources. The value difference provides an indication of water leakage in a supply system. The difference is commonly referred to as UFW.

Until further work is completed a provisional loss value of approximately 20% is proposed. Current average demand for WPR is 428 L/person/day including losses (i.e. 340 L/person/day excluding 20% losses). When the target peak day water use of 400 L/person/day is achieved, the average demand will be reduced accordingly, but at this point in time it is conservative to ignore this. Therefore a provisional figure for losses of 90 L/person/day has been allowed.

### 4.5 Peak Demand Projections

Including an allowance of 90 L/person/day for losses, the peak demand projections for the Waikanae, Paraparaumu and Raumati supply area are presented below.

The following graph (Figure 7) shows the peak demand projection for the Kapiti District as a whole, and the urban water supply areas, based on 490 L/person/day.

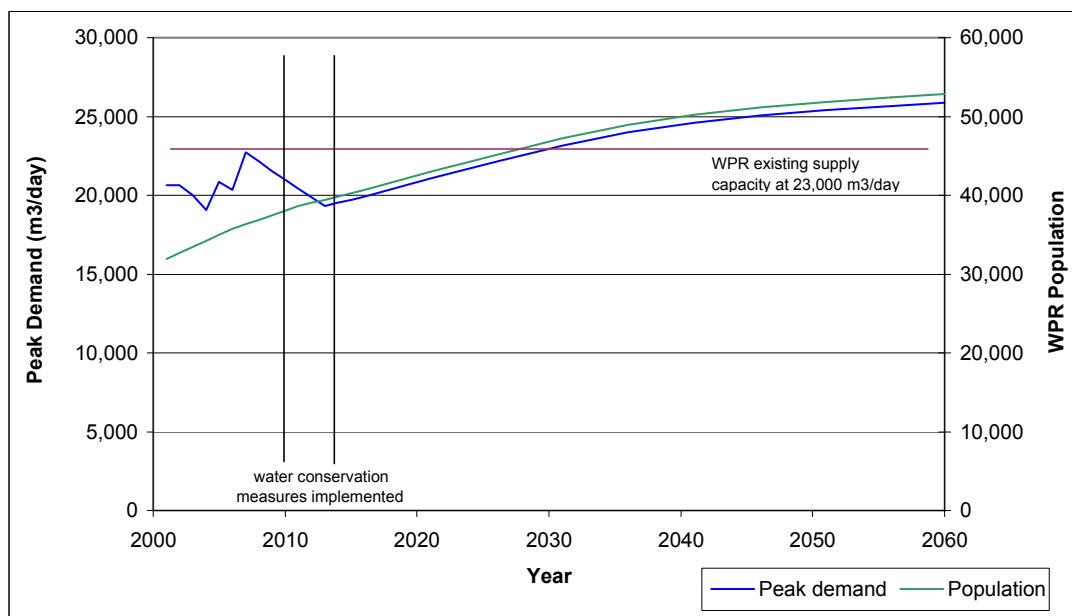


Figure 6: Population and Demand Projections (Medium Growth) for WPR

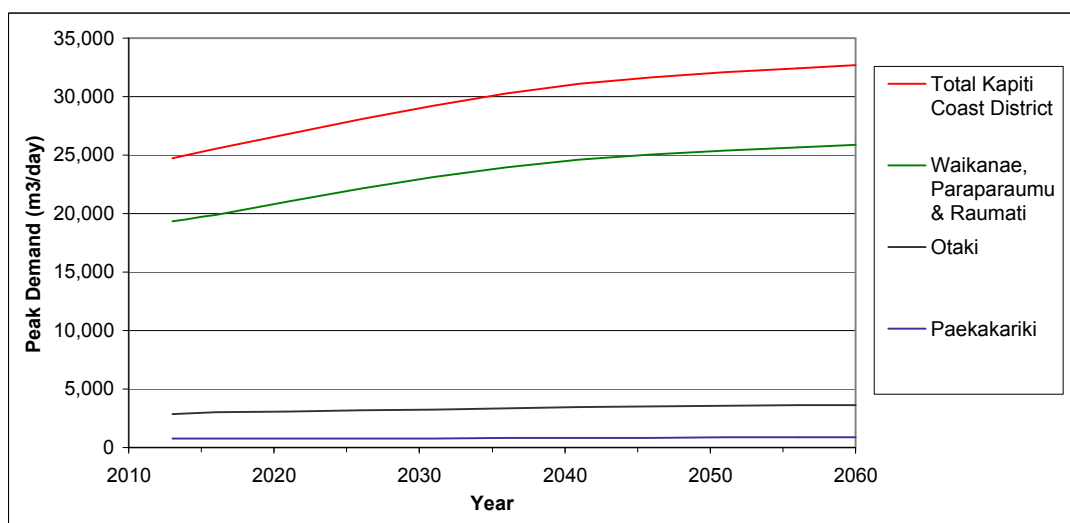


Figure 7: Kapiti Coast District Peak Demand Projections

## 4 Kapiti Coast: Water Demand Forecasts

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### 4.6 Commercial/Industrial Growth

#### 4.6.1 Large Water Users

Commercial and industrial growth, or large water users in general, have potential to further increase the amount of potable water required in future. Presently, Kapiti Coast has very few large water users. This is further assisted by the use of shallow bores at a number of Councils parks for irrigation purposes, plus many hundreds of local bores used by property owners for watering gardens.

Some of the largest users include the Paraparaumu Wastewater Treatment plant (60,000 m<sup>3</sup>/year) and Kapiti Cheese (32,000 m<sup>3</sup>/year), and Lindale Tourist Centre (7,000 m<sup>3</sup>/year). However, while in some areas such large users offer real potential to supplement potable water or make other savings, in this instance, the top 3 large water users effectively make only a 1% contribution to demand. In cost-benefit terms it is likely to be more sensible to provide water to these users directly from the water supply (as currently), rather than providing recycled water to free up potable water.

#### 4.6.2 Commercial Users

Kapiti District also includes a range of commercial properties that use water also. These uses are expected to increase at the same rate as the population growth, and are unlikely to make a significant difference to demand.

#### 4.6.3 Wet Industries

Commercial and industrial water usage is not expected to increase substantially in existing commercial and industrial areas. The greatest potential challenge in estimating future commercial water use arises from new "wet" industry. This could quite conceivably be associated with a growing horticultural or agricultural sector, particularly where value-added manufacturing or food processing may choose to locate on Kapiti Coast. New industry would likely be expected to make a specific development contribution to reflect its high water use, or identify its own source of water independently and institute water efficiency measures.

### 4.7 Climate Change Effects

#### 4.7.1 Incorporation into Planning

Climate change effects have the potential to affect both the water demand and the availability of water from the environment for supply.

The Ministry for the Environment (MfE) has produced a guide for local councils to incorporate climate change effects into their planning. Projections for 2040 and 2090 are provided.

This report discusses climate change resulting from human activity, and notes that these changes should be *"considered within the context of the natural variability of the climate system."* In this sense, although future years may, on average, be warmer than what we experience now, there will still be years that are colder or hotter than the underlying trend.

The report also explains that although the changes in average temperature, for example, are fairly small, this small shift can increase the likelihood of extreme temperature events and their associated weather patterns. It is primarily through the increased occurrence of extreme events that the effects of climate change on water supplies are observed.

#### 4.7.2 Water Demand Impact

The demand for water in Kapiti is most likely to be influenced by the temperature and antecedent rainfall, as it is during prolonged hot, dry periods that peak or increased demand occurs. It is likely that Kapiti will experience slightly elevated temperatures over the next 50 - 100 years. This of itself will not have a dramatic impact on water demand, but the likelihood and duration of extreme weather conditions such as high temperatures or dry spells will do. The occurrence of near peak demands and the magnitude of peak demands can be expected to increase due to the increased occurrence and duration of extreme climatic events.

#### 4.7.3 Water Supply Impact

Overall, Kapiti is likely to experience a very slight increase in rainfall on average over the next 80 years. However, uncertainty in these predictions means that there is a chance that there could be significantly more or less rainfall than the predicted change. The following graph provides a representation of these predictions.

The predicted changes in seasonal rainfall for Kapiti have been compared to historical rainfall records for the Paraparaumu Aerodrome to determine the extent of the changes to the rainfall pattern and the comparison is shown in Figure 8. Figure 8 shows that the changes in rainfall pattern attributable to climate change are fairly minor, and largely within the natural variation of rainfall from year to year. The error bars for the projections are the upper and lower limits of change predicted by MfE. The error bars for the current monthly rainfall are +/- 30% of the average and are indicative of the typical range of values that might occur from year to year.

The projected increased variability in spring rainfall could reduce the reliability of supply for Kapiti in dry years with increasing effect into the future.

## 4 Kapiti Coast: Water Demand Forecasts

In summary, climate change effects are expected to increase the frequency and duration of the extreme climatic events that most stretch the present supply by increasing demand (i.e. hot dry spells), and may reduce water availability. Nevertheless there is much uncertainty in the predictions and it is not realistic to make specific provision for climate change at this point in time. Instead it is proposed to favour supply options that provide flexibility to cope with these climate uncertainties.

### 4.8 Summary of Demands and Underlying Assumptions

For the purposes of determining whether or not the various source options are able to meet demand in the long term, or contribute to a solution involving multiple sources, a 50-year peak daily design demand of 26,000 m<sup>3</sup>/day is proposed for the Waikanae, Paraparaumu and Raumati supply. This demand is based on the following assumptions:

- 400 L/person/day peak day consumption (incorporating commercial/industrial demands)
- estimated losses of 90 L/person/day
- population growth at the Statistics New Zealand medium-growth scenario
- population growth in each constituent water supply area matches the overall District growth
- no new wet industries
- 50 year drought reliability standard
- no allowance for climate change

While the focus of this report is on the WPR area, there are likely to be strategic benefits to the various communities that make up the Kapiti District of a district-wide approach. The next stage of work will involve exploring these benefits relative to costs and other issues.

For a district-wide scheme the 50-year design demand of 33,000 m<sup>3</sup>/day would be required, based on the same assumptions as above with no allowance for rural demand.

Given the long term nature of the predictions that are used as a basis to identify the total volume of water required over a 50 year period, there are a number of uncertainties associated with the prediction. These include: population growth, climate change and water consumption per person. On the basis of these uncertainties, water supply options which provide for expandability should be favored.

**Further Work:** The design assumptions need to be further refined in the next stage of work. While a number of the design assumptions are fixed by previous Strategies adopted by Council (e.g. 400 L/person/day), a number require further work. This includes confirming the drought reliability standard to remove existing confusion on how many days supply the 50 year drought relates to, and considering climate change in a manner that is consistent with predictions and other Council asset management planning already underway.

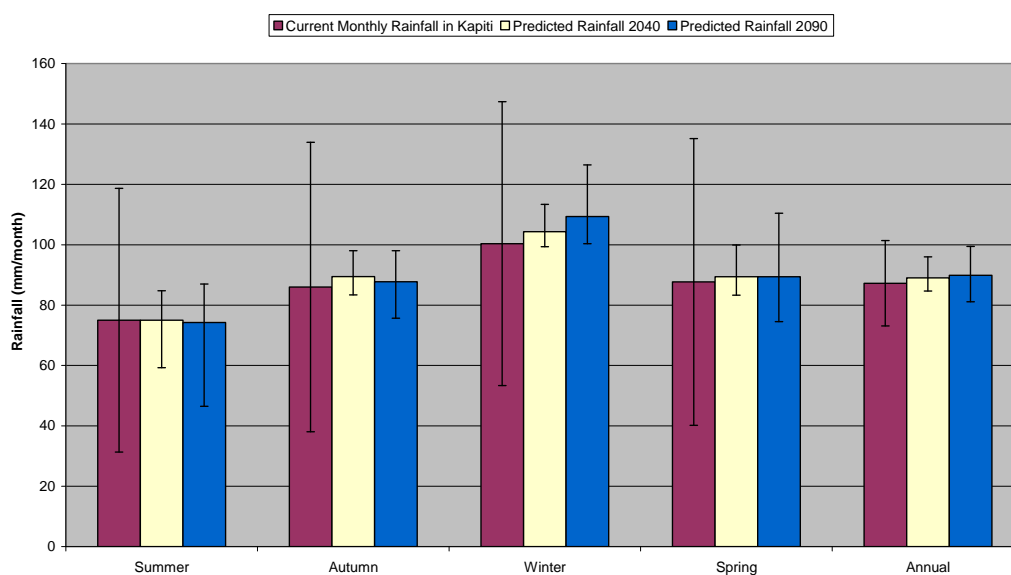


Figure 8: Rainfall Changes in Kapiti due to Climate Change

## 4 Kapiti Coast: Water Demand Forecasts

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### 5 Kapiti Coast Water Supply Options

Identifying an appropriate water supply solution for the Kapiti Coast is not an easy thing to do. There are many water supply options, all of which have pros and cons. The design assumptions will, to a large extent, determine which options are most suitable. The community will also provide input to selection criteria, which will ultimately be used to assist decision makers in evaluating the options for investigation, and finally a preferred option.

Kapiti Coast District Council began investigations into supplementary water supply options for Paraparaumu and Waikanae in 1990. These investigations were in response to concerns that increasing future demand would exceed the maximum allowable abstraction of 23,000 m<sup>3</sup>/day. A number of options were investigated including various groundwater, dams, storage ponds and run-of-river solutions. The earliest review concluded that a reduction in water demand would enable capital expenditure to be deferred for 20 years, and Council began a programme of water conservation measures. Over this time however, Council was prudent and continued to investigate various options for water supply sources.

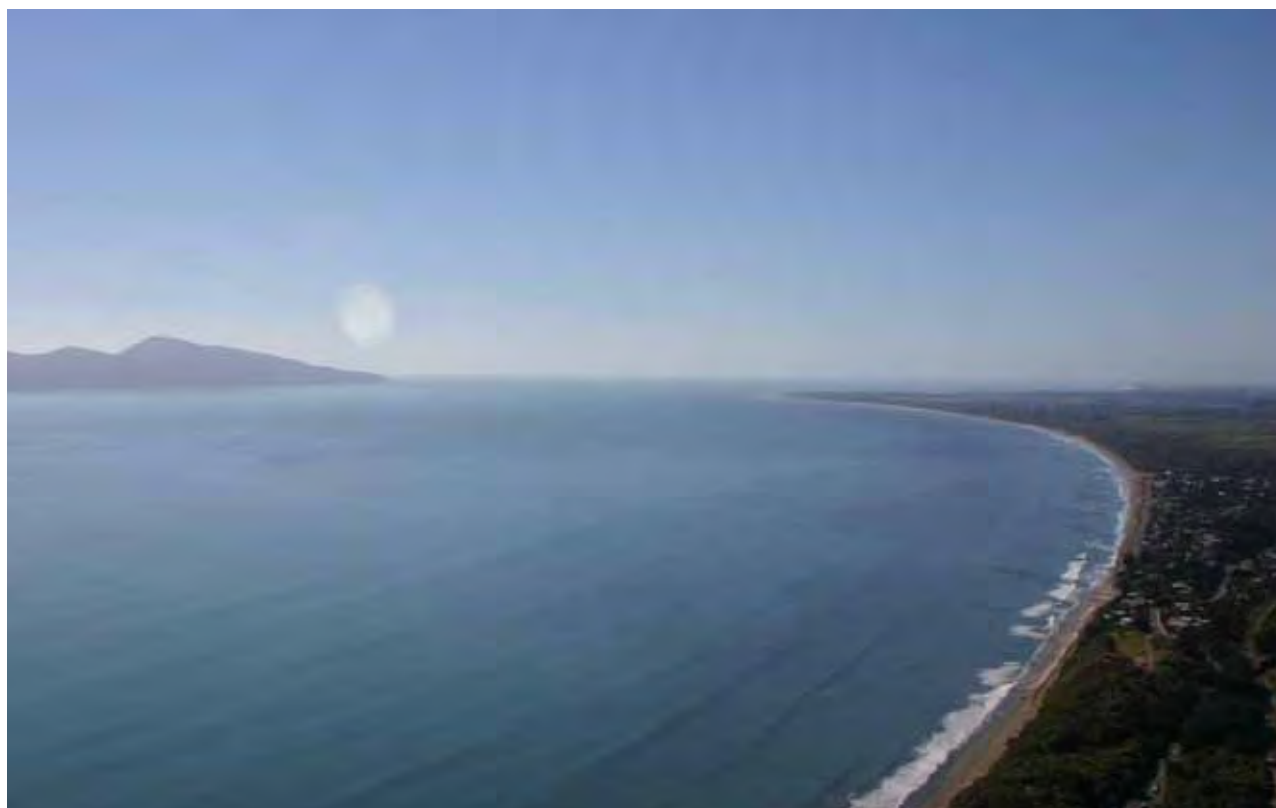
In 1996 when the resource consent to take water from the Waikanae River for water supply was issued, the consent included a requirement effective from January 2003 for the water take to cease when the river flow was

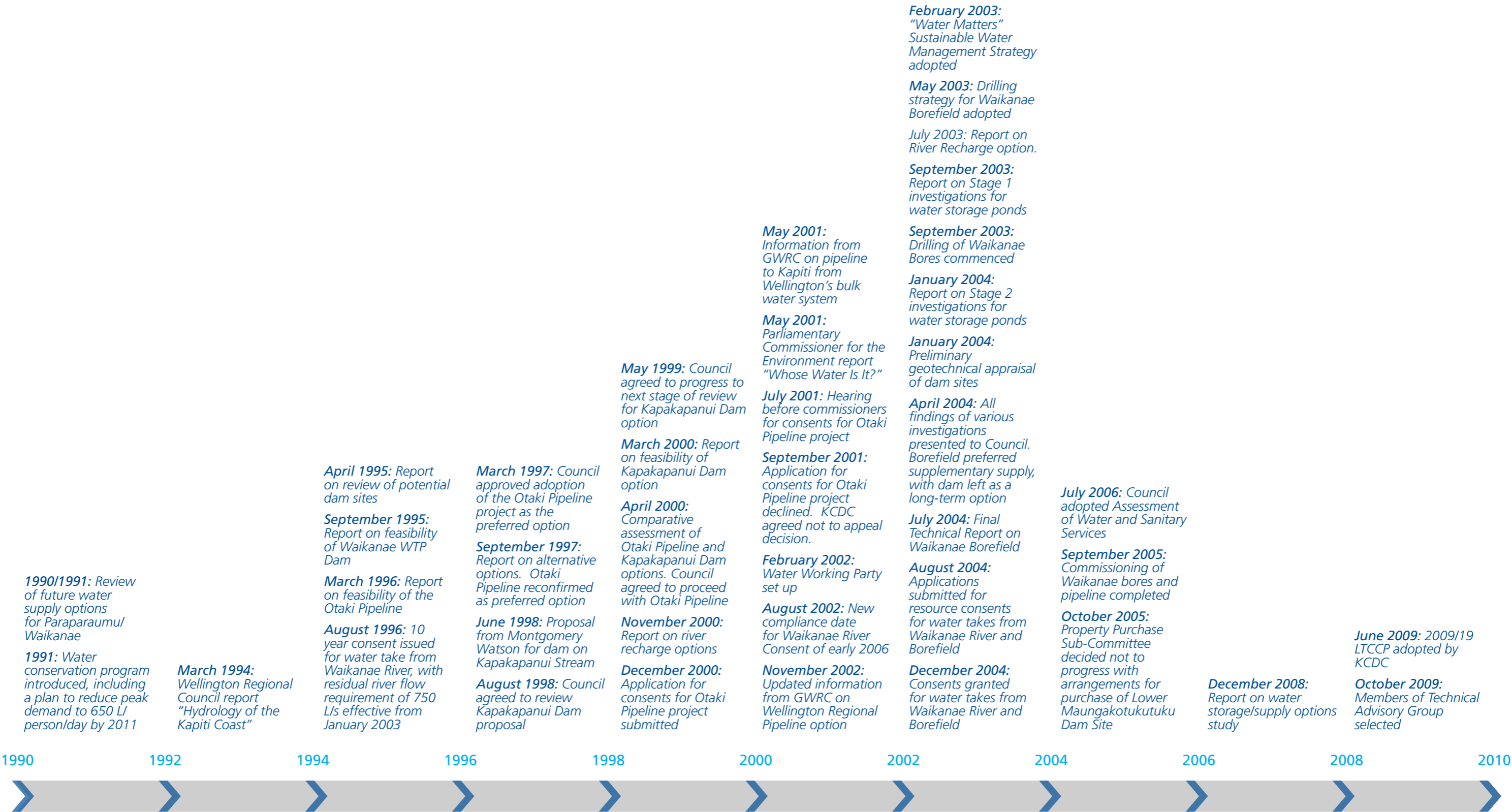
less than 750 L/s at the Water Treatment Plant intake. The previous water right (which had expired in 1992) required a minimum residual flow of 250 L/s in the Waikanae River at the State Highway 1 Bridge.

Subsequent to this, a pipeline from the Otaki River became the preferred option. Investigations were undertaken and resource consent lodged. Following the decision by the commissioners in September 2001 not to grant resource consents for the Otaki Pipeline and the subsequent decision of the Kapiti Coast District Council not to appeal, the Council commenced a broad review of its options for water supply. This review included public consultation and submissions and culminated in February 2003 with the Council's adoption of a strategy, which was set out in the document entitled *"Water Matters: Kapiti Coast District Sustainable Water Management Strategy"*.

The Council subsequently invested in a supplementary borefield supply with timelines dictated by the need to have a viable system in place prior to GWRC introducing an absolute consent limit on the Waikanae River abstraction.

Throughout this period, there have been a range of investigations into different options. The timeline on the following page provides an indication of when various options were first identified.





## 5 Kapiti Coast: Water Supply Options

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### Existing Supply Source

The existing water supply for the WPR area comes from the Waikanae River, via a run of river system, which is supplemented during low flow periods with the Waikanae Borefield. The completion of the Waikanae Borefield in 2005 represented a major capital investment by the community in its water supply infrastructure, in particular to provide increased supply reliability and flexibility. Although there are many concerns over the impact of the quality of the water from the borefield on the water supply, these could be addressed through improvements to the level of treatment that the bore water receives. If treating the borefield water is accepted by the community as a potential option, the essential question then becomes whether there are more economic alternatives to the costs of such treatment improvements. If the existing borefield does not form part of the final water supply solution, then only options that can provide the full design demand (i.e. 26,000m<sup>3</sup>/day) will be viable. The decision over whether or not to include the existing borefield therefore makes a major difference to what options are viable. If the existing borefield is included, then an additional 3,000m<sup>3</sup> /day per day of water are required. However, the borefield does have a 90 day limit as part of the resource consent, which also needs to be considered as part of the assessment of options.

### Long List of Options

The process for preparing the long list of options has been carried out in October and November 2009. This has involved reviewing the previous reports prepared by Council, which provided a valuable resource for this process. These reports ultimately describe approximately 30 different options. The project team (comprising the CH2M Beca and Council engineers, and the Technical Advisory Group) then reviewed this long list of options and sought to add new options or obvious amalgamations of options that could work well together. This has led to a further ten options being added to the long list.

The information available on each option varies considerably. Some options have been investigated in detail, while others are only cursory. It is noted that the inclusion of an option in this long list is not an endorsement of its suitability. It simply notes that some previous investigation has occurred in relation to that option.

In this section of the report, each option of the 40 options is described briefly including identifying its location. Any pros and cons that have been identified previously are noted. In some cases, options have been abandoned previously because of the downsides identified. Given that time has moved on, these same downsides may or may not exist anymore, so a fresh review is required. Gaps in information relating to each option are also identified.

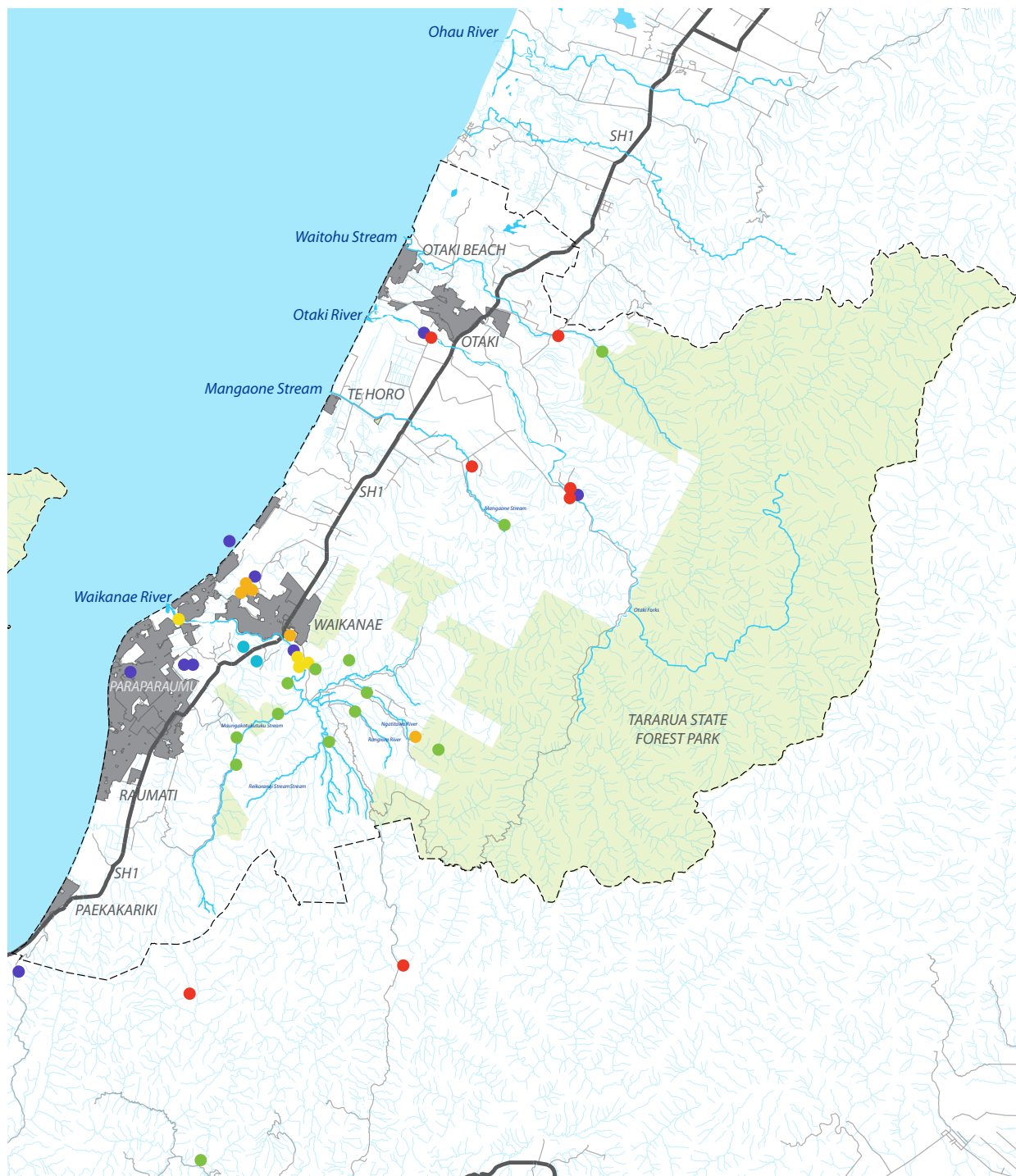
The information presented on each option has simply been extracted the reports prepared by Council and various consultants over the last 20 years. It has not yet been technically reviewed. Where capital cost estimates have been provided in the past, these simply have been escalated to 2009 figures<sup>1</sup>. However, the same assumptions exist as were made by the previous reports. No property purchase costs have been included in the capital cost estimates provided for many of the options to date.

The following map identifies the location of each option based on the type of option. There are six groups of options identified:

- Run-of-River (see Page 36)
- Dam (see Page 40)
- Storage Ponds (see Page 48)
- Groundwater (see Page 50)
- River Recharge (see Page 54)
- Other (see Page 58)

<sup>1</sup> Using the Capital Goods Price Index for non-residential buildings

## 5 Kapiti Coast: Water Supply Options



### KEY:

- Roads
- State Highway 1
- Residential
- State Forest Park
- - - KDC Boundary
- Waterways / Rivers / Streams

### Options

- Run-of-River
- Dams
- Storage Ponds
- Groundwater
- River Recharge
- Other

Figure 9: Water Supply Options

## 5 Kapiti Coast: Water Supply Options

### 5.1 Run-of-River

Run-of-river options involve extraction of water directly from a river, by such means as a river intake or shallow bores adjacent to the river. The water is then conveyed to the Waikanae Water Treatment Plant (WTP) for treatment before distribution via the reticulation system.

The following schematics illustrate the two ways that the run of river options could convey the Waikanae WTP, either by a pipeline for the full length or by a combination of pipeline and transfer to the headwaters of the Waikanae River, or a tributary of the Waikanae River, which then conveys the water to the WTP intake.

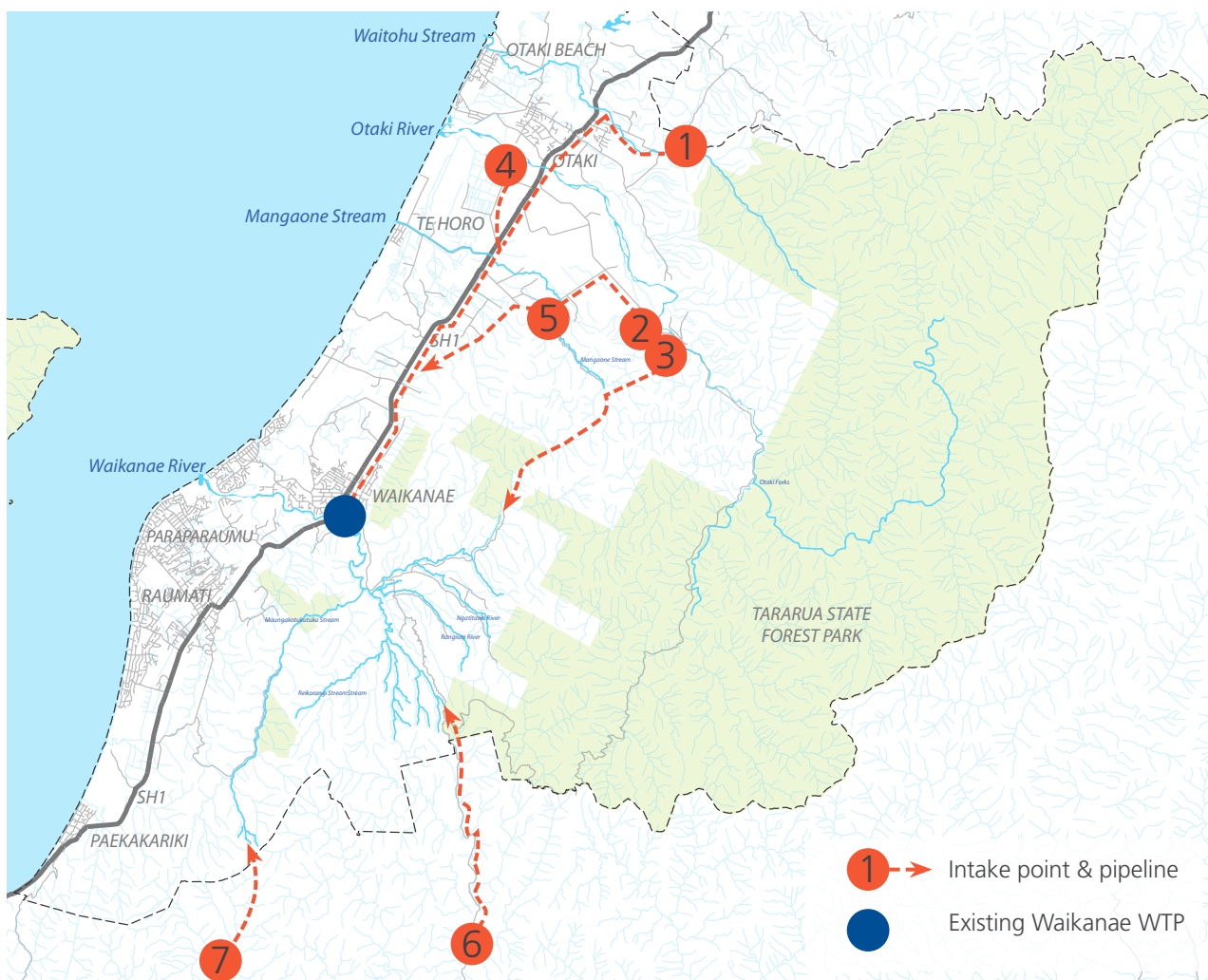
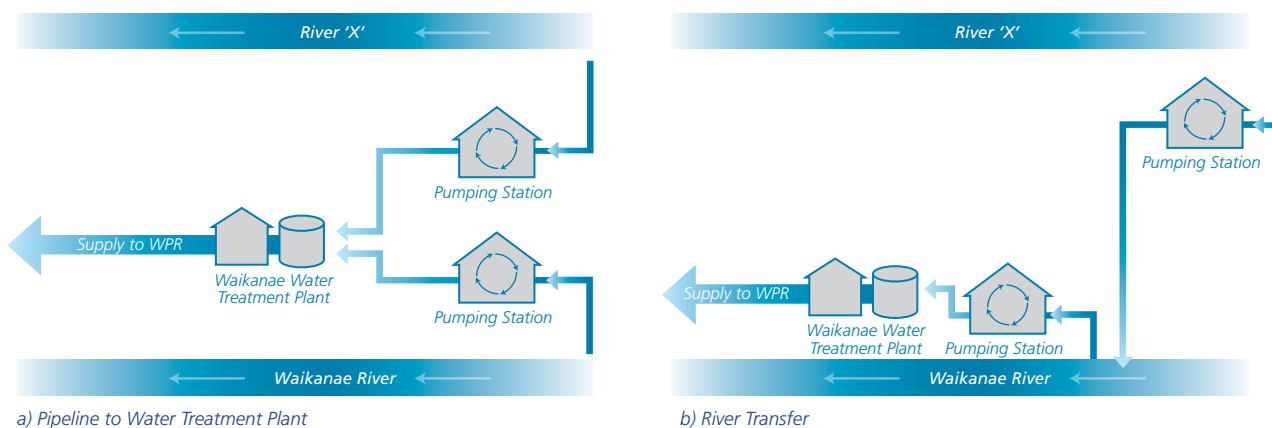


Figure 10: Water Supply Options - Run of River

## 5 Kapiti Coast: Water Supply Options

OPTION 1	<b>Name</b>	Waitohu Stream
	<b>Description</b>	Abstraction of water from the Waitohu Stream with a 20 km long pipeline transferring water to the Waikanae WTP for treatment and distribution
	<b>Pros</b>	Council hold an existing consent for 3,500 m <sup>3</sup> /day for water supply
	<b>Cons</b>	Stream is 20 km to Waikanae WTP Yield is likely to be low
	<b>Gaps</b>	Not previously considered for Waikanae, Paraparaumu and Raumati water supply
	<b>Yield</b>	Unknown (≥3500 m <sup>3</sup> /day)
	<b>Capital Cost</b>	Unknown

OPTION 2	<b>Name</b>	Otaki River Gorge
	<b>Description</b>	An intake on the Otaki River near the gorge with an 18 km long pipeline transferring water to the Waikanae WTP for treatment and distribution
	<b>Pros</b>	Similar to the Otaki Wellfield and Pipeline option and therefore likely to be feasible Limited human and animal activity in catchment Lower pumping head than the Otaki Wellfield Potential to also supply the Hautere/Te Horo area
	<b>Cons</b>	May affect the Otaki Groundwater Zone
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	31,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	\$4.8 - \$5.0 million (1991) Escalated to 2009: \$8 million

OPTION 3	<b>Name</b>	Otaki River Gorge Transfer
	<b>Description</b>	An intake on the Otaki River near the gorge with a 7-10 km long pipeline transferring water to the headwaters of Waikanae River. The water would then flow down the Waikanae River and be abstracted at the existing intake adjacent to the Waikanae WTP for treatment and distribution
	<b>Pros</b>	Limited human and animal activity in the catchment 7-10 km pipeline
	<b>Cons</b>	Potential loss of water to groundwater May affect the Otaki Groundwater Zone Need to lift the water 230m to get over the catchment boundary Legal position of transferred water is uncertain
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	31,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	\$3.6 million (1991) Escalated to 2009: \$6 million

## 5 Kapiti Coast: Water Supply Options

OPTION 4	<b>Name</b>	Otaki Wellfield and Pipeline
	<b>Description</b>	Shallow bores adjacent to Otaki River would draw water from a shallow aquifer that has a good hydraulic connection with the Otaki River, making the abstraction from the wellfield effectively a run of river water take. A 17 km long pipeline would convey the abstracted water to the Waikanae WTP. There are a variety of potential pipeline routes
	<b>Pros</b>	Feasible option and already considered in some detail Potential to also supply water to Otaki and the Hautere/Te Horo area No major environmental impacts previously identified Some flexibility from having two water sources
	<b>Cons</b>	Iwi concerns about transfer of water between catchments Historical Otaki community opposition
	<b>Gaps</b>	Recent consultation Need to update preliminary design, cost estimates and assessment of environmental effects
	<b>Yield</b>	35,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	\$10.2 million (2000) Escalated to 2009: \$14 million

OPTION 5	<b>Name</b>	Mangaone Stream
	<b>Description</b>	Abstraction of water from the Mangaone Stream with a 12 km long pipeline transferring water to the Waikanae WTP for treatment and distribution.
	<b>Pros</b>	Mangaone Stream is 3 km closer to Waikanae than the Otaki River.
	<b>Cons</b>	Low yield. The water in the Mangaone Stream may be already allocated.
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	2,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	Unknown, but based on other options likely <\$23 million

## 5 Kapiti Coast: Water Supply Options

OPTION 6	<b>Name</b>	Akatarawa River Transfer
	<b>Description</b>	Abstraction of water from the Akatarawa River and a 10 km long pipeline transferring water to the Reikorangi Stream, which is a tributary of the Waikanae River. The water would flow down the Reikorangi Stream into the Waikanae River and be abstracted from the river at the existing intake adjacent to the Waikanae WTP
	<b>Pros</b>	The Akatarawa River is as close to the Waikanae WTP as the Otaki River
	<b>Cons</b>	Need to lift the water 240m to get over the catchment boundary Potential adverse effects on Greater Wellington's water supply
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown, but given a 10 km pipeline, likely to be <\$23 million

OPTION 7	<b>Name</b>	Whakatikei River Transfer
	<b>Description</b>	Abstraction of water from the Whakatikei River and a 6km long pipeline for transferring the water to the upper Maungakotukutuku Stream, which is a tributary of the Waikanae River. The water would flow down the Maungakotukutuku Stream into the Waikanae River and be abstracted from the river at the existing intake adjacent to the Waikanae WTP.
	<b>Pros</b>	Limited human and animal activity in the catchment.
	<b>Cons</b>	Need to lift the water 200m to get over the catchment boundary. No formed road or other obvious pipeline route. Potential adverse effects on Greater Wellington's water supply.
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown, unformed country means price difficult to estimate, but likely to be <\$23 million

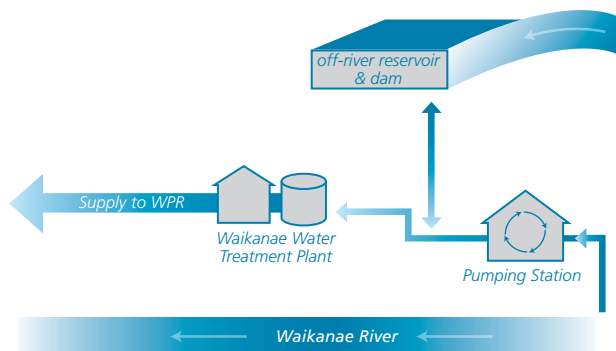
## 5 Kapiti Coast: Water Supply Options

### 5.2 Dams

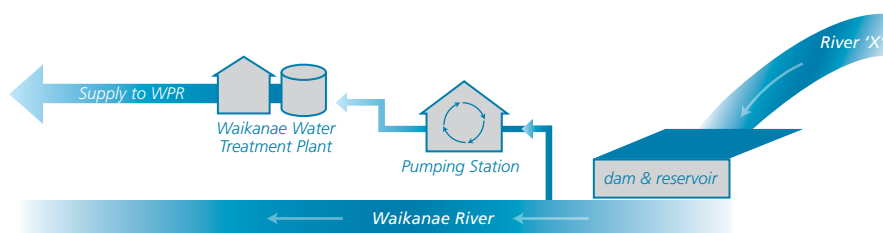
Dam options involve raw water storage formed by constructing a dam to provide supplemental supply to the Waikanae WTP during times of low flow in the Waikanae River. The water can be conveyed to the WTP either by pipeline or by river flow.

Generally the dam options are in-river dams. One option has been identified which is off river storage, with water pumped to the storage reservoir from the Waikanae River and returned along the same pipeline when required to be used. The following schematics illustrate the dam options' methods of operation.

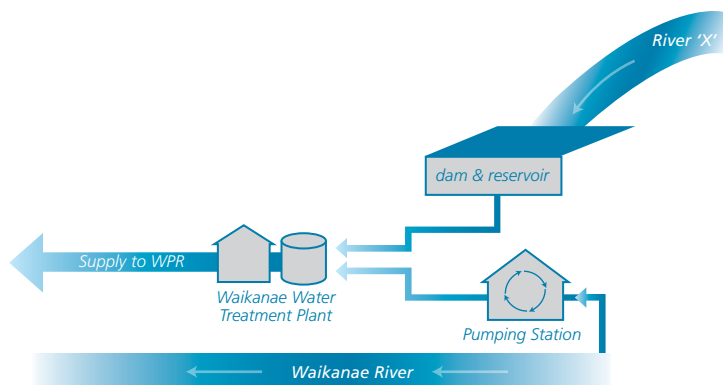
The locations of the dam options are identified on the map in Figure 11.



a) Waikanae WTP Dam



b) River conveys water to WTP



c) Pipeline to WTP

## 5 Kapiti Coast: Water Supply Options

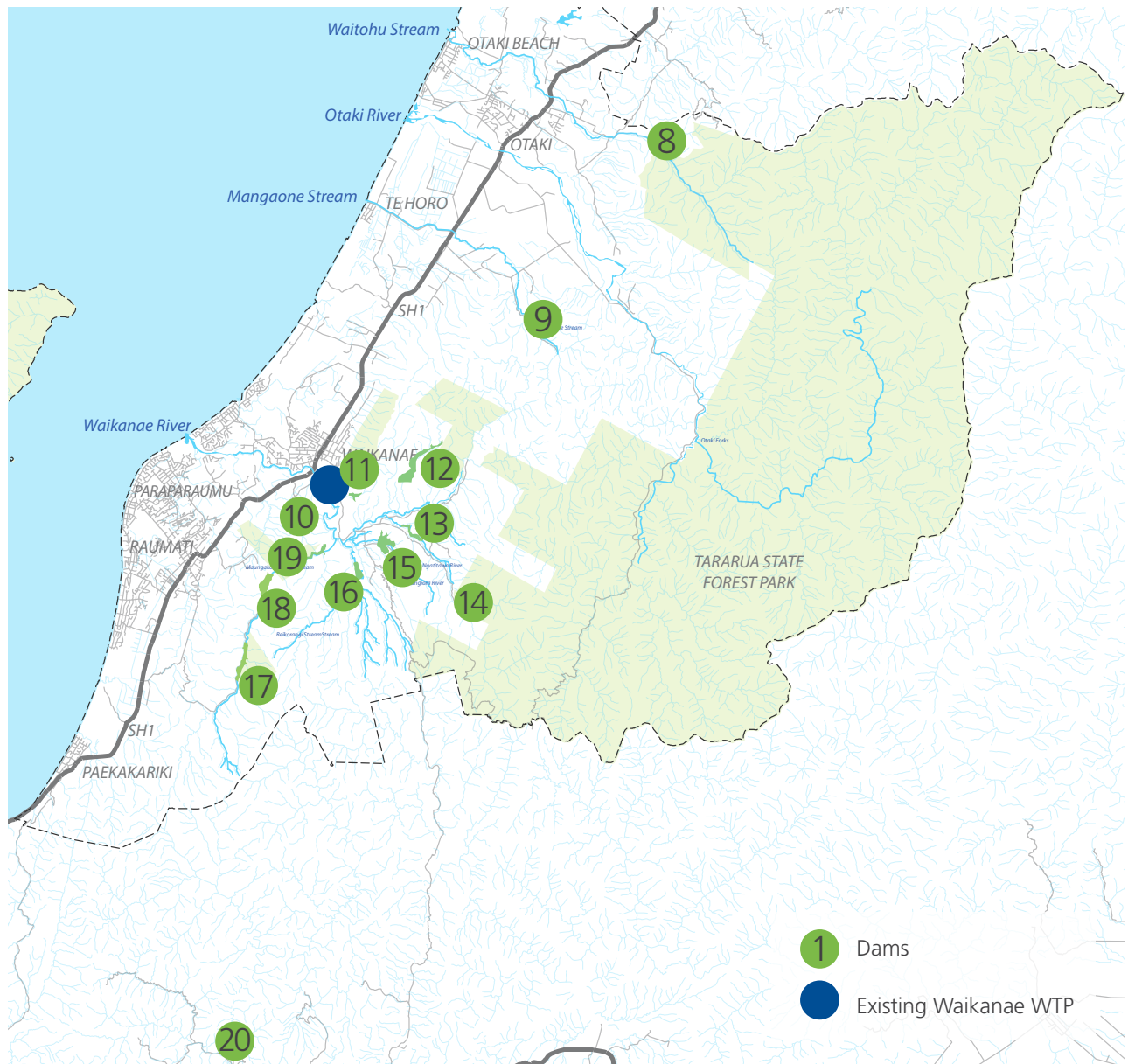


Figure 11: Water Supply Options - Dams

## 5 Kapiti Coast: Water Supply Options

OPTION 8	<b>Name</b>	Waitohu Dam
	<b>Description</b>	Dam and storage reservoir in the Waitohu River with a pipeline transferring water to the Waikanae WTP. New option
	<b>Pros</b>	Council hold existing consent for 3,500 m <sup>3</sup> /day for water supply.
	<b>Cons</b>	The Waitohu Stream is further away from the Waikanae WTP than other sources (eg Otaki River) Yield is likely to be low
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown (≥3,500 m <sup>3</sup> /day)
	<b>Capital Cost</b>	Unknown

OPTION 9	<b>Name</b>	Mangaone Dam
	<b>Description</b>	Dam and storage reservoir in the Mangaone Stream with a pipeline transferring water to the Waikanae WTP. New option
	<b>Pros</b>	3 km closer to Waikanae than the Otaki River
	<b>Cons</b>	Low yield The water in the Mangaone Stream may be already allocated
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown

OPTION 10	<b>Name</b>	Combined Storage Dam in the Waikanae River
	<b>Description</b>	22m high dam located in the Waikanae River, 1 km upstream of the Waikanae WTP. The storage reservoir created by the dam provides storage for bulk water supply purposes (1M m <sup>3</sup> ) and additional capacity for the detention of flood water (2M m <sup>3</sup> ). A diversion provides for continuous run of river flows
	<b>Pros</b>	Flood detention as well as water supply storage No pumping
	<b>Cons</b>	Large land area (60ha of submerged land) Large cost compared to other dam options considered at the time it was investigated Legal position of released water uncertain
	<b>Gaps</b>	Feasibility investigations
	<b>Yield</b>	18,100 m <sup>3</sup> /day for 56 day drought (1 in 50 years). 25,100 m <sup>3</sup> /day for 1 day duration.
	<b>Capital Cost</b>	\$13.6 million (1995) Escalated to 2009: \$19 million

## 5 Kapiti Coast: Water Supply Options

OPTION 11	<b>Name</b>	Waikanae WTP Dam
	<b>Description</b>	40m high dam and storage reservoir (1M m <sup>3</sup> ) in an unnamed tributary of the Waikanae River near the Waikanae WTP. Water would be pumped from Waikanae River up to the reservoir and transferred back to the WTP by pipeline when needed
	<b>Pros</b>	Previous work indicates the scheme is viable and the geotechnical risks can be managed Uses existing WTP intake (new pumps) to supply water to storage dam, and may provide additional pumping back up for the WTP Small land area (5.75 ha of submerged land)
	<b>Cons</b>	Pumping to reservoir required Near urban area Risk of insufficient water for dam filling long-term (dependent on consented take and actual take)
	<b>Gaps</b>	Availability of water for dam reservoir filling/ drought reliability analysis. Concept design & costs (update 1995 feasibility study). Updated consultation, planning requirements and environmental impacts assessments.
	<b>Yield</b>	18,100 m <sup>3</sup> /day for 56 day drought (1 in 50 years). 25,100 m <sup>3</sup> /day for 1 day duration.
	<b>Capital Cost</b>	\$10.6 million (1997) Escalated to 2009: \$15 million

OPTION 12	<b>Name</b>	Kapakapanui Dam
	<b>Description</b>	This option is for a 34.5m high dam with storage reservoir (1.6M m <sup>3</sup> ) located in the Kapakapanui Stream, 100m upstream from its confluence with the Waikanae River, approximately 6 km from Waikanae. The dam captures winter rainfall in the Kapakapanui catchment, for controlled release during low flows in the Waikanae River. The water flows to the Waikanae WTP using rivers. The submerged land area is approximately 15ha
	<b>Pros</b>	Previous work indicates it is feasible No significant impact on ecology/fisheries identified by previous work Good source of fill Low seepage losses No pumping
	<b>Cons</b>	Local opposition and concern about safety issues Compensation issues Possible seismic risks Legal position of released water uncertain
	<b>Gaps</b>	Concept design & costs (update 1999 feasibility study) Hydrology Updated consultation, planning requirements and environmental impacts assessments
	<b>Yield</b>	34,500m <sup>3</sup> /day, 104 days (1 in 50 year drought)
	<b>Capital Cost</b>	\$9.5 million (2000) Escalated to 2009: \$13 million

## 5 Kapiti Coast: Water Supply Options

OPTION 13	<b>Name</b>	Ngatiawa Dam
	<b>Description</b>	25m high dam structure with submerged land area of 9.75 ha, located in the Ngatiawa River valley. The dam captures winter rainfall in the Ngatiawa Valley for controlled release during low flows in the Waikanae River. Water may be conveyed to the Waikanae WTP by pipeline or river
	<b>Pros</b>	No pumping
	<b>Cons</b>	High social impacts – a lot of properties affected and inundation of farms A lot of debris in floods and gravel movement Legal position of released water uncertain
	<b>Gaps</b>	No detailed investigations have been undertaken
	<b>Yield</b>	18,100 m <sup>3</sup> /day for 56 day drought (1 in 50 years). 25,100 m <sup>3</sup> /day for 1 day duration
	<b>Capital Cost</b>	\$12.1 million (1995) Escalated to 2009: \$17 million

OPTION 14	<b>Name</b>	Upper Ngatiawa Dam
	<b>Description</b>	19m high dam structure located approximately 3 km upstream of the confluence of the Ngatiawa and Waikanae Rivers. This reservoir will submerge approximately 14 ha of land, which is mainly clear farmland
	<b>Pros</b>	No pumping Access is relatively direct from adjacent existing public roads
	<b>Cons</b>	Some dwellings affected Legal position of released water uncertain
	<b>Gaps</b>	No detailed investigations have been undertaken
	<b>Yield</b>	18,100 m <sup>3</sup> /day for 56 day drought (1 in 50 years). 25,100 m <sup>3</sup> /day for 1 day duration.
	<b>Capital Cost</b>	\$7.4 million (1995) (but insufficient investigations undertaken) Escalated to 2009: \$11 million

OPTION 15	<b>Name</b>	Rangiora Dam
	<b>Description</b>	18m high dam structure with submerged land area of 35.5 ha, located in the Rangiora Stream valley. The dam captures winter rainfall in the Rangiora Valley for controlled release during low flows in the Waikanae River. Water may be conveyed to the Waikanae WTP by pipeline or river
	<b>Pros</b>	No pumping
	<b>Cons</b>	Large land area required Reservoir will be an obvious feature Large number of properties affected Part of Rangiora Road would be submerged Legal position of released water uncertain
	<b>Gaps</b>	No detailed investigations have been undertaken
	<b>Yield</b>	18,100 m <sup>3</sup> /day for 56 day drought (1 in 50 years). 25,100 m <sup>3</sup> /day for 1 day duration.
	<b>Capital Cost</b>	\$9.4 million (1995) Escalated to 2009: \$13 million

## 5 Kapiti Coast: Water Supply Options

OPTION 16	<b>Name</b>	Reikorangi Dam (Cambridge Farm)
	<b>Description</b>	17m high dam structure with submerged land area of 28.75 ha, in the Reikorangi River valley, approximately 5km south of Waikanae. Water may be conveyed to the Waikanae WTP by pipeline or river
	<b>Pros</b>	No pumping Land owner was a willing seller in 2008 No conservation orders
	<b>Cons</b>	High social impact - relocation of properties Ground instability and significant landslide in the vicinity Unstable river terraces Potential for seepage issues Build up of gravel considered to be an issue May raise groundwater levels in the area Legal position of released water uncertain
	<b>Gaps</b>	No detailed investigations have been undertaken
	<b>Yield</b>	18,100 m <sup>3</sup> /day for 56 day drought (1 in 50 years). 25,100 m <sup>3</sup> /day for 1 day duration.
	<b>Capital Cost</b>	\$12.2 million (1995) Escalated to 2009: \$17 million

OPTION 17	<b>Name</b>	Upper Maungakotukutuku Dam
	<b>Description</b>	This option is a storage dam located in the Maungakotukutuku Stream. The dam location is in an incised valley with a narrow flat floor, with slopes heavily vegetated with pine and native forest. Water would be impounded in winter for release during times of low flow in the Waikanae River. Water is released to the Waikanae WTP by pipe or by river
	<b>Pros</b>	No pumping
	<b>Cons</b>	Narrow valley, so long and deep reservoir and thus higher (and more expensive) dam is required for the same storage volume Heavily vegetated - pine & native forest (perceived higher environmental impact) Reservoir inundates parts of Maungakotukutuku Scenic Reserve Faulting risk Consenting risk, ecological values Legal position of released water uncertain
	<b>Gaps</b>	No detailed feasibility investigations have been undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown

## 5 Kapiti Coast: Water Supply Options

OPTION 18	<b>Name</b>	Lower Maungakotukutuku Dam
	<b>Description</b>	Storage dam located in the Maungakotukutuku Stream. The dam location is in broad and flat valley floor, with surrounding land covered in pasture and some pine and native forests. Water would be impounded in winter for release during times of low flow in the Waikanae River. Water is released to the Waikanae WTP by pipe or by river. 1.2M m <sup>3</sup> live storage volume
	<b>Pros</b>	Feasible from work to date No pumping Seismic risk not considered prohibitive Large volume - flexibility to increase Hydropower potential Active fault trace does not intersect dam footprint
	<b>Cons</b>	High consent risks Conservation covenant within area of inundation Concern with ecological values Legal position of released water uncertain
	<b>Gaps</b>	Detailed feasibility study Detailed fault assessment Environmental impact assessments Updated planning requirements assessment & consultation
	<b>Yield</b>	12,000 m <sup>3</sup> /day for 99 days (1.2M m <sup>3</sup> live storage volume)
	<b>Capital Cost</b>	\$14 million (2008) Escalated to 2009: \$14 million

OPTION 19	<b>Name</b>	Low-low Maungakotukutuku Dam
	<b>Description</b>	Dam and storage reservoir in lowest reaches of the Maungakotukutuku Stream near the confluence with the Waikanae River. Stream or pipeline to convey water to the intake of the Waikanae WTP. The dam would be 29 m high and would inundate 8.75 ha of land
	<b>Pros</b>	No pumping Isolated area
	<b>Cons</b>	Difficult access Legal position of released water uncertain
	<b>Gaps</b>	Feasibility investigations required
	<b>Yield</b>	18,100 m <sup>3</sup> /day for 56 day drought (1 in 50 years). 25,100 m <sup>3</sup> /day for 1 day duration.
	<b>Capital Cost</b>	\$11.8 million - \$12.9 million (1995) Escalated to 2009: \$18 million

## 5 Kapiti Coast: Water Supply Options

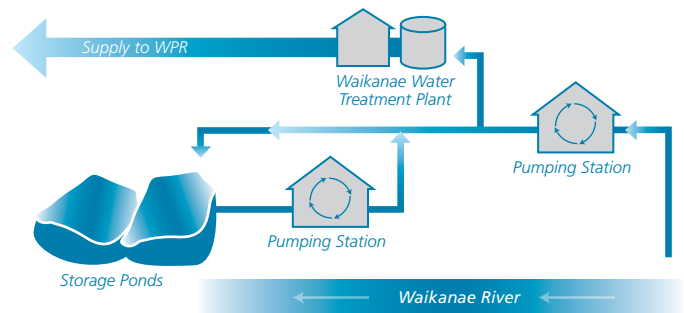
OPTION 20	<b>Name</b>	GWRC Whakatikei Dam
	<b>Description</b>	<p>Council connect to Greater Wellington Regional Council's (GWRC's) proposed Whakatikei Dam via pumping main for transferring water from the storage dam to the upper Maungakotukutuku Stream, which is a tributary of the Waikanae River. The water would flow down the Maungakotukutuku Stream into the Waikanae River and be abstracted from the river at the intake adjacent to the Waikanae WTP. GWRC dam to be increased in height to provide additional storage for District requirements.</p> <p>Pipeline route, approximately 11 km long, may follow existing access tracks (eg Transpower) or future tracks for other developments (eg wind farm)</p>
	<b>Pros</b>	Significant volume of additional storage can be provided in the proposed GWRC Whakatikei Dam with a small addition to height of dam
	<b>Cons</b>	<p>Pipeline to be constructed in steep, high terrain and would follow an indirect route to make use of existing or future tracks</p> <p>Timing of GWRC development (dam planned to come into operation in 2022)</p> <p>Potential adverse effects on GWRC's water supply</p> <p>Need to lift the water in the order of 200 m to get over catchment boundary</p>
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown

## 5 Kapiti Coast: Water Supply Options

### 5.3 Storage Ponds

Storage pond options involve constructing shallow storage ponds, off line from the river, for raw water storage. Ponds are filled by pumping from the Waikanae River at times of low demand, for use in supplying the stored water back to the Waikanae WTP at times of low flow in the Waikanae River. Storage ponds may also be filled using borewater.

The following schematic illustrates the general operation of the storage ponds options.



The general location of the storage pond options are identified on the map in Figure 12.

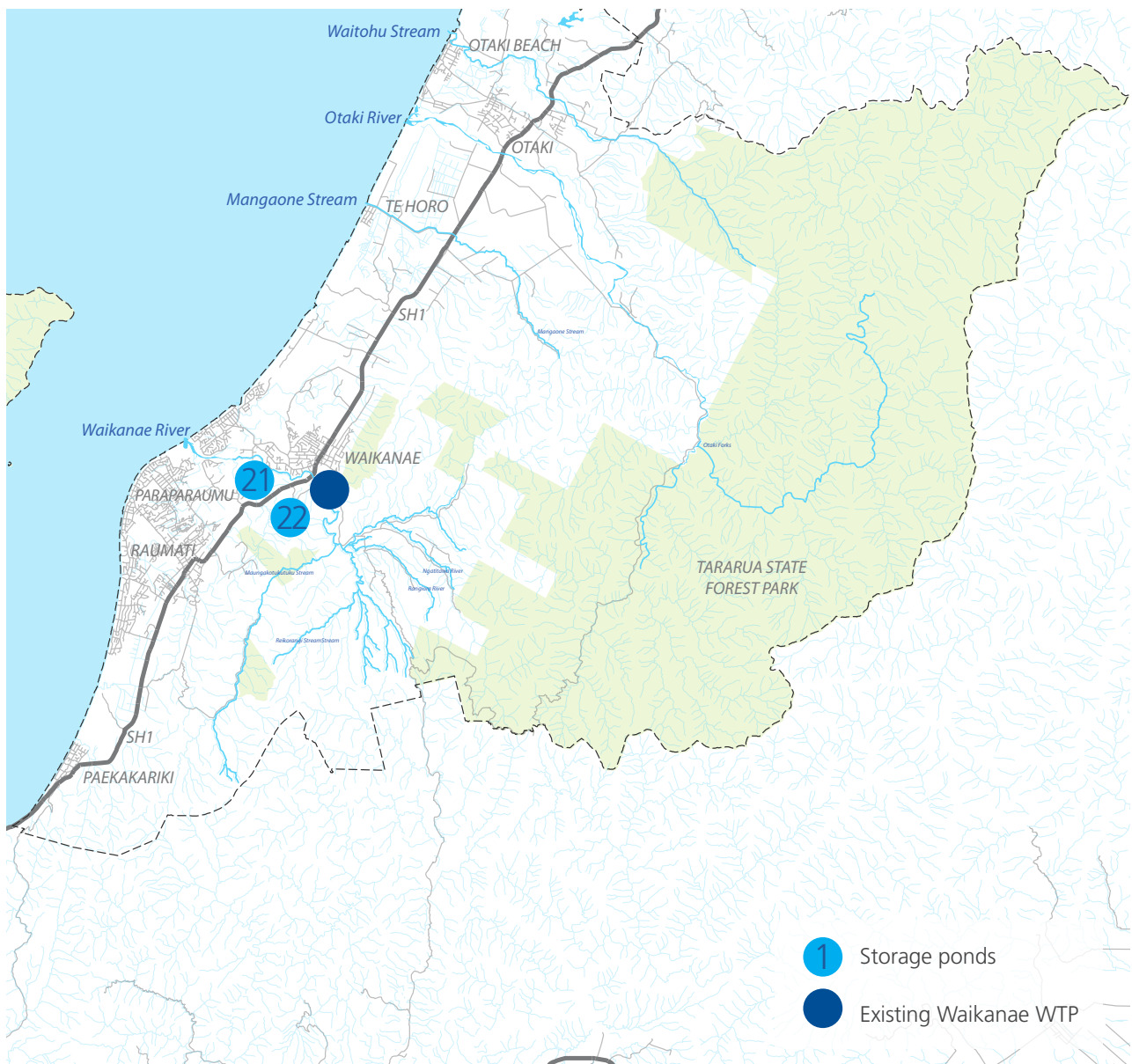


Figure 12: Water Supply Options - Storage Ponds

OPTION 21	<b>Name</b>	Storage Ponds – West of SH1
	<b>Description</b>	Storage ponds (out-of-river) located on the west side of SH1. Four sites have been considered west of SH1, with the preferred site being between Otaihanga Road to the south and Waikanae River to the north. The other sites identified on the west of SH1 included two sites to the north of Waikanae and another site further to the west of the preferred site 1.2M m <sup>3</sup> volume  The ponds are filled from Waikanae River, assumed to be from the existing intake and pumped back to the WTP through the same pipeline
	<b>Pros</b>	Low consent risk Potential for staged implementation Potential to store & mix bore water & river water Availability of material for compacted clay liner Site is large enough Potential to connect into the borefield pipework
	<b>Cons</b>	Algal bloom risks Potential conflicts with State Highway 1 and railway. Pumping required, both in and out of ponds
	<b>Gaps</b>	Update 2004 concept design & costs Detailed geotechnical testing of on site materials for liner and other geotechnical design issues. Environmental impact assessments Updated planning requirements assessment & consultation
	<b>Yield</b>	12 ,000 m <sup>3</sup> /day, 99 days (1.3M m <sup>3</sup> volume)
	<b>Capital Cost</b>	\$18.0 million (2004) Escalated to 2009: \$22 million
OPTION 22	<b>Name</b>	Storage Ponds – East of SH1
	<b>Description</b>	Storage ponds (out-of-river) located on the east side of SH1. Two sites have been considered east of SH1, One site is situated between the WTP and the State Highway, and the other site is south of Waikanae near the Otaihanga turnoff and extends on both sides of the highway. 1.2M m <sup>3</sup> volume  The ponds are filled from Waikanae River, assumed to be from the existing intake and pumped back to the WTP through the same pipeline
	<b>Pros</b>	Low consent risk Potential for staged implementation Potential to store & mix bore water & river water Availability of material for compacted clay liner Potential to connect into the borefield pipework
	<b>Cons</b>	Faulting risk for site near WTP No room for expansion in the future Potential conflicts with SH1 Algal bloom risks Pumping required both in and out of ponds
	<b>Gaps</b>	Update 2004 concept design & costs Detailed geotechnical testing of on site materials for liner and other geotechnical design issues. Environmental impact assessments Updated planning requirements assessment & consultation
	<b>Yield</b>	12,000 m <sup>3</sup> /day, 99 days (1.1M m <sup>3</sup> volume)
	<b>Capital Cost</b>	\$16.6 million (2004) Escalated to 2009: \$20 million

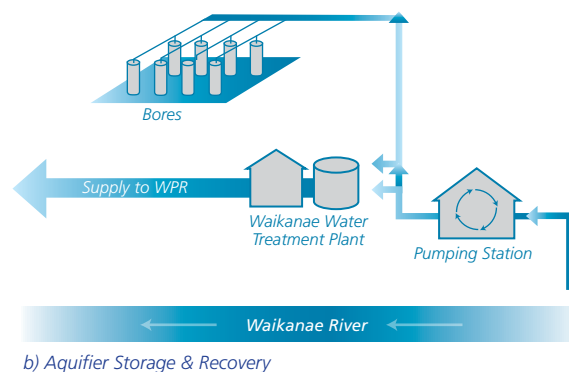
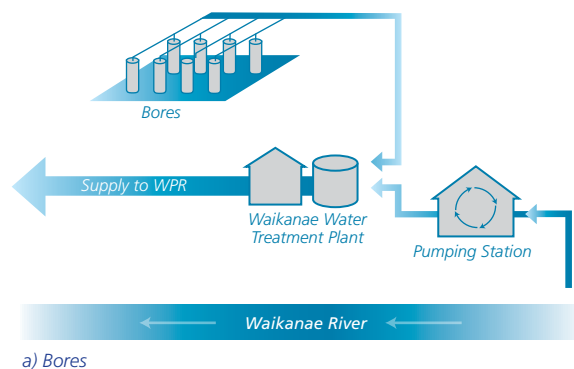
## 5 Kapiti Coast: Water Supply Options

### 5.4 Groundwater

In addition to the existing Waikanae Borefield, three other groundwater options have been considered in the past, and two new groundwater options are proposed for consideration. Typically, groundwater is abstracted by drilling one or more bores (also called “wells”) into the target aquifer, lining the borehole with a steel casing, and pumping the water to where it can be treated and delivered into the water supply network. For certain groundwaters that are of a very high chemical and microbiological quality, treatment can be eliminated altogether, but normally some level of treatment will be needed. Treatment can either be centralised (as it is for the existing borefield), or carried out at the site of the bore and then pumped directly into the network.

The following schematics illustrate how a groundwater option would typically be configured.

The general location of the groundwater options are identified on the map in Figure 13.



## 5 Kapiti Coast: Water Supply Options

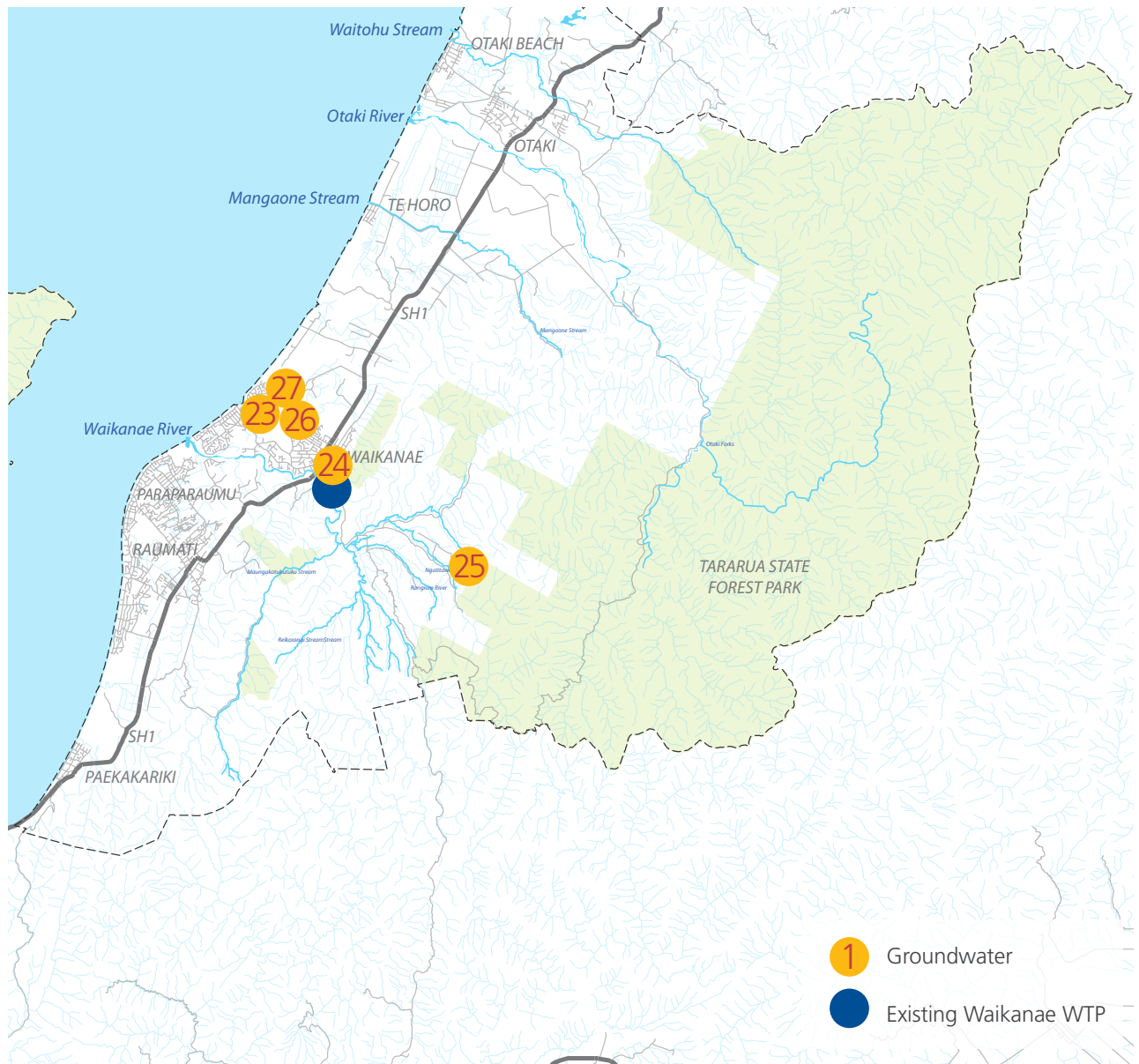


Figure 13: Water Supply Options - Groundwater

## 5 Kapiti Coast: Water Supply Options

OPTION 23	<b>Name</b>	Extended Waikanae Borefield
	<b>Description</b>	<p>Extend existing Waikanae borefield with new wells in area between existing borefield and Otaihangā. This would ideally include additional treatment for hardness and taste &amp; odour of the water from the existing and extended borefield to render aesthetics of water acceptable to the community</p> <p>The extended borefield area could include consideration of the Hemi Matenga foothills area, although this did form part of the desk-top investigations undertaken in 2002/2003 and was not selected as part of the drilling strategy because of concerns over increased boundary effects</p>
	<b>Pros</b>	<p>Two separate water sources (river and borefield), although in severe drought would be totally reliant on only one (borefield)</p> <p>Uses existing borefield pipeline and treatment plant infrastructure</p>
	<b>Cons</b>	<p>Community opposition to bore water</p> <p>Treatment and disposal of lime softening sludge from treating bore water for hardness</p> <p>Limited additional water (9,000 m<sup>3</sup>/day)</p>
	<b>Gaps</b>	Further hydrogeological investigations required to prove that abstracting additional aquifer water is sustainable
	<b>Yield</b>	32,000 m <sup>3</sup> /day (this includes the existing 23,000 m <sup>3</sup> /day from the current borefield)
	<b>Capital Cost</b>	<p>\$7 million (2008, incl. treatment)</p> <p>Escalated to 2009: \$7 million</p>

OPTION 24	<b>Name</b>	Eastern Waikanae Borefield
	<b>Description</b>	Two new wells in the order of 50m to 70m deep, located to the east of the township, between the railway and the water treatment plant. This was considered as short-term augmentation in 2003 when the Council delayed the construction of the proposed borefield pipeline until the long-term sustainability of that borefield was proven.
	<b>Pros</b>	<p>Two separate water sources (river and borefield), although in severe drought would be totally reliant on only one (borefield)</p> <p>Uses existing borefield pipeline and treatment plant infrastructure</p>
	<b>Cons</b>	<p>Yield not proven, and water quality unknown</p> <p>Community opposition to bore water</p> <p>Limited additional water (4,000 m<sup>3</sup>/day)</p>
	<b>Gaps</b>	No investigations have been undertaken
	<b>Yield</b>	4,000 m <sup>3</sup> /day (assumes two production wells)
	<b>Capital Cost</b>	<p>\$1.7 million (2003)</p> <p>Escalated to 2009: \$2 million</p>

## 5 Kapiti Coast: Water Supply Options

OPTION 25	<b>Name</b>	Ngatiawa Aquaflow
	<b>Description</b>	Abstraction from an aquifer likely to be being recharged by the Ngatiawa River in its upper reaches
	<b>Pros</b>	
	<b>Cons</b>	Its is very likely that the water being lost to groundwater in the upper reaches of the Ngatiawa returns to the river channel upstream of the water treatment plant and is therefore already accounted for
	<b>Gaps</b>	No record of investigations having being undertaken, although Wellington Regional Council was commissioned to undertake stream gaugings to determine the extent of the losses
	<b>Yield</b>	Unknown, but likely to be zero as water being lost to groundwater is returned to the river upstream of the water treatment plant
	<b>Capital Cost</b>	Unknown

OPTION 26	<b>Name</b>	Deep Groundwater (New Option)
	<b>Description</b>	Abstraction of very deep groundwater (approx. 100m to 200m below ground) in Waikanae area, from basement rock
	<b>Pros</b>	Potential for finding a secure groundwater, possibly requiring minimal treatment Potential for increased drought resilience
	<b>Cons</b>	Risks significant as hydrogeology of deep aquifers unknown, and one reference states that "Well logs indicate that basement rock does not yield groundwater "
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown

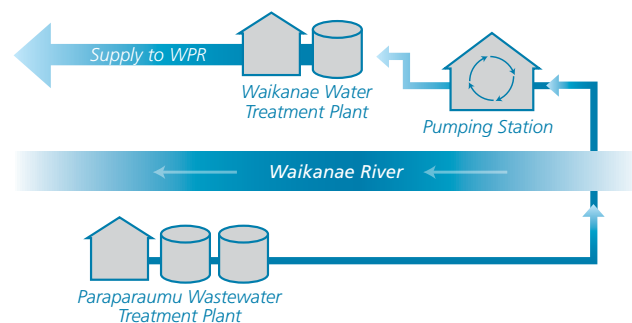
OPTION 27	<b>Name</b>	Aquifer Storage and Recovery (New Option)
	<b>Description</b>	Injection of river water into existing Waikanae Borefield aquifer over winter for storage until summer abstraction
	<b>Pros</b>	If feasible, could improve quality of supplied water when totally reliant on Borefield
	<b>Cons</b>	Risks associated with proving feasibility
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown

## 5 Kapiti Coast: Water Supply Options

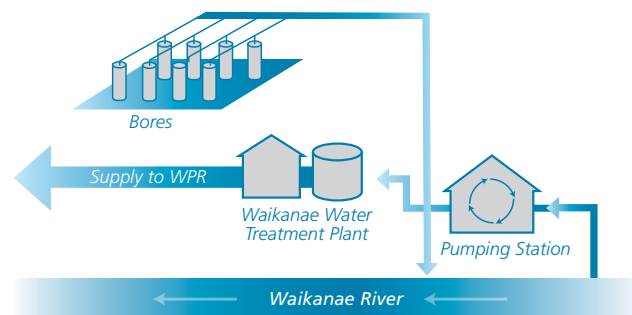
### 5.5 River Recharge

The river recharge options involve discharging water to the Waikanae River immediately downstream of the Waikanae WTP intake under low river flow conditions. The discharge to the river offsets the water abstracted from the river for water supply, and so the river flow is unchanged from its natural flow rate. Also, a greater volume of water potentially could be taken from the river than at present if the abstracted water is effectively replaced. The water discharged to the river may be groundwater, treated wastewater effluent or water abstracted from the lower reaches of the Waikanae River before it flows into the sea.

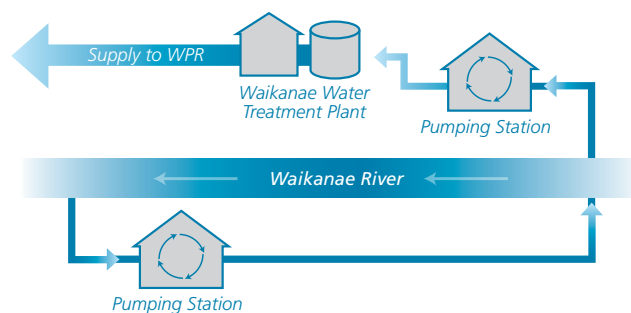
The river recharge options are identified on the map in Figure 14 and summarised below.



a) Wastewater



b) Groundwater



c) River Recycle

## 5 Kapiti Coast: Water Supply Options

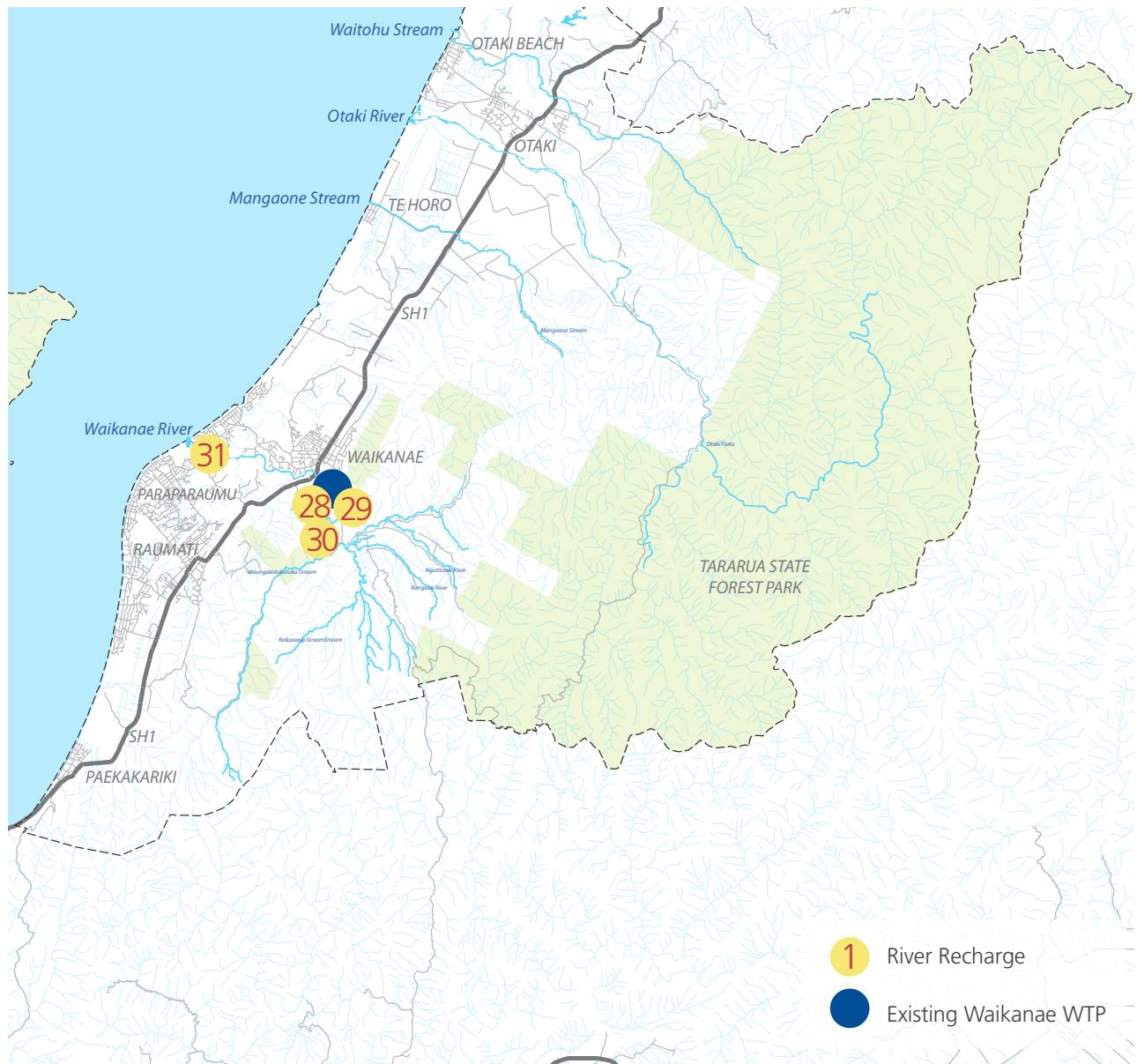


Figure 14: Water Supply Options - River Recharge

## 5 Kapiti Coast: Water Supply Options

OPTION 28	<b>Name</b>	Wastewater River Recharge
	<b>Description</b>	Treated effluent from the Paraparaumu Wastewater Treatment Plant would be discharged to the Waikanae River immediately downstream of the Waikanae WTP intake during periods of low river flow
	<b>Pros</b>	Water could potentially still be abstracted from the Waikanae River for water supply under low flow conditions
	<b>Cons</b>	<p>Insufficient yield, i.e. the volume of treated effluent is likely to be less than the volume of river water required for water supply. Also, Waikanae River may have insufficient yield for longer term requirements</p> <p>Public health and cultural issues and ecological impacts as the treated wastewater effluent will affect a longer stretch of the Waikanae River than the present situation with discharge to the Mazengarb Drain</p> <p>Water temperature matching of recharge water to river water is extremely difficult</p>
	<b>Gaps</b>	No detailed feasibility work undertaken
	<b>Yield</b>	Approximately 8,600 m <sup>3</sup> /day
	<b>Capital Cost</b>	Unknown

OPTION 29	<b>Name</b>	Groundwater River Recharge
	<b>Description</b>	Groundwater from the existing Waikanae bores would be discharged to the Waikanae River immediately downstream of the Waikanae WTP intake during periods of low river flow
	<b>Pros</b>	<p>Water could potentially still be abstracted from the Waikanae River for water supply under low flow conditions</p> <p>The groundwater discharge restores natural flow rates in the Waikanae River</p> <p>Continue use of existing infrastructure (bores, pipelines and river intake)</p>
	<b>Cons</b>	<p>Technical and consent challenges associated with linking groundwater abstraction, river water abstraction and discharge of groundwater to the river</p> <p>Groundwater may need to be treated before discharge to river to reduce iron and manganese concentrations</p> <p>No additional yield, i.e. simply swapping groundwater for river water. However, could extend existing borefield</p> <p>Water temperature matching of recharge water to river water is extremely difficult</p>
	<b>Gaps</b>	No detailed feasibility work undertaken
	<b>Yield</b>	23,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	<p>\$4.3 million (2002)</p> <p>Escalated to 2009: \$6 million</p>

## 5 Kapiti Coast: Water Supply Options

OPTION 30	<b>Name</b>	Wastewater and Groundwater River Recharge
	<b>Description</b>	A combination of treated effluent from the Paraparaumu Sewage Treatment Plant and groundwater from the existing Waikanae bores would be discharged to the Waikanae River immediately downstream of the Waikanae WTP intake during periods of low river flow
	<b>Pros</b>	Water potentially could still be abstracted from the Waikanae River for water supply under low flow conditions Discharged wastewater and groundwater restores natural flow rates in the Waikanae River Continue use of existing infrastructure (bores, pipelines and river intake)
	<b>Cons</b>	Public health and cultural issues and ecological impacts as the treated wastewater effluent will affect a longer stretch of the Waikanae River than the present situation Technical and consent challenges associated with linking groundwater abstraction, river water abstraction and discharge of effluent and groundwater to the river Groundwater may need to be treated before discharge to river to reduce iron and manganese concentrations Water temperature matching of recharge water to river water is extremely difficult
	<b>Gaps</b>	No detailed feasibility work undertaken
	<b>Yield</b>	Approximately 31,600 m <sup>3</sup> /day
	<b>Capital Cost</b>	\$5-6 million (2000) Escalated to 2009: \$9 million

OPTION 31	<b>Name</b>	River Recycle
	<b>Description</b>	Water abstracted from the lower reaches of the Waikanae River would be pumped back to an upstream site on the river immediately downstream of the WTP intake. Abstraction would need to be positioned upstream of the point of saline influence
	<b>Pros</b>	Water potentially could still be abstracted from the Waikanae River for water supply under low flow conditions Restore natural flow rates in the Waikanae River
	<b>Cons</b>	Potential adverse effects on river ecology from continuously recycling some or all of the water in the river as a somewhat closed system, instead of the natural system of flow through the river and discharge to the sea Possible social and cultural impacts Issues around natural loss of river flow into river gravels (300 L/s) between SH1 and Jim Cooke Memorial Park Reduced flows in the Waikanae River between the downstream abstraction point and the Waikanae Estuary, with consequent effects on river's ecology
	<b>Gaps</b>	No detailed feasibility work undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown

## 5 Kapiti Coast: Water Supply Options

### 5.6 Other

The following options for supplementary water supply do not fit within the categories described above.

Indicative locations are shown in Figure 15.

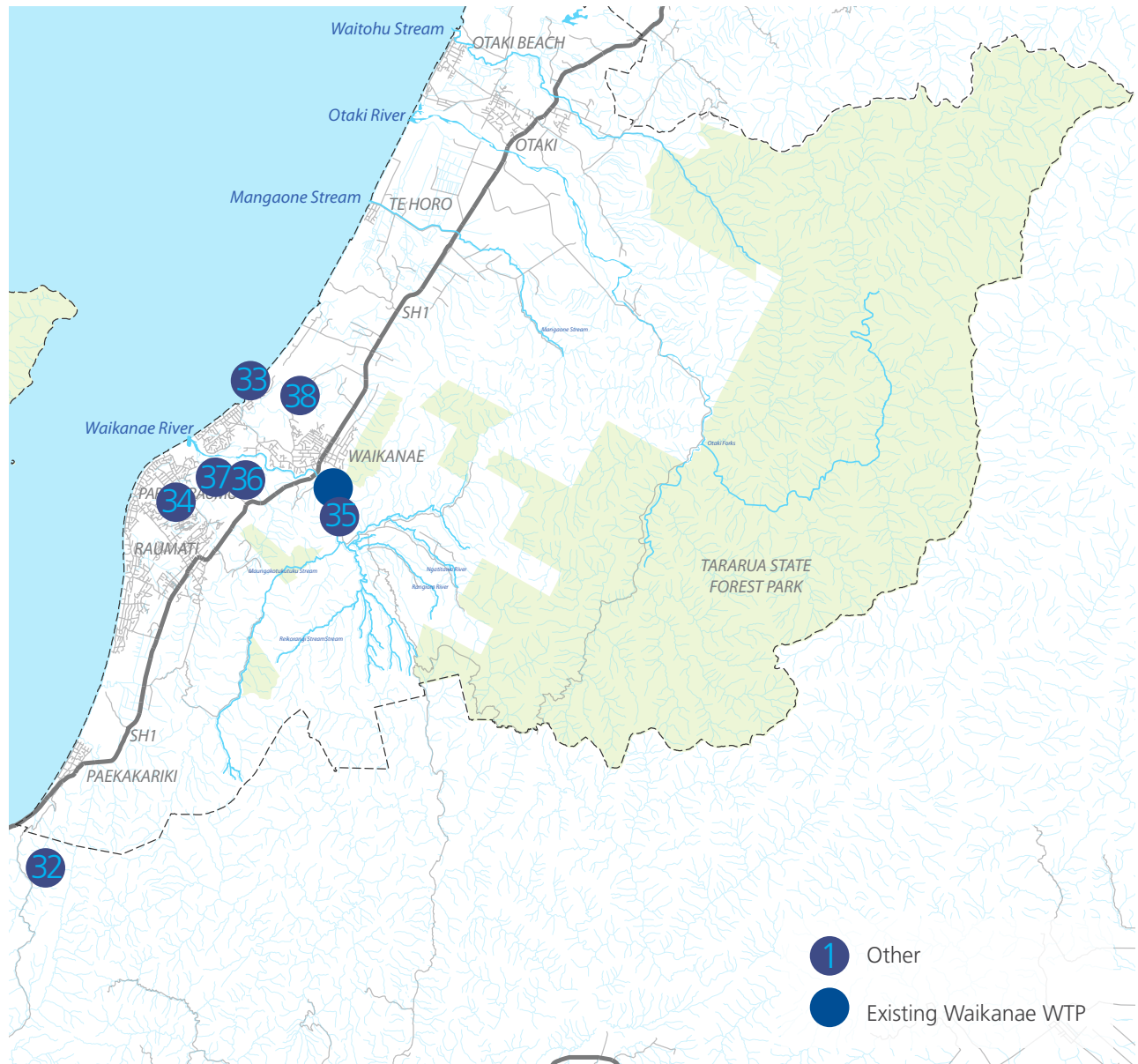


Figure 15: Water Supply Options - Other

## 5 Kapiti Coast: Water Supply Options

OPTION 32	<b>Name</b>	Wellington Regional Supply Pipeline
	<b>Description</b>	<p>Kapiti would connect to Greater Wellington's bulk water supply system by way of a pipeline. Greater Wellington's bulk water supply system presently serves Upper Hutt, Lower Hutt, Porirua and Wellington City Councils</p> <p>There are a number of options for the connection point and the pipeline route. One option is a pipeline from Judgeford over the Paekakariki Hill Road, with a pumping station at Battle Hill, through Paekakariki and Queen Elizabeth Park connecting to Council system behind Paraparaumu</p> <p>There are also various options for the management and funding of an expanded bulk water supply scheme that includes the Kapiti Coast District Council</p>
	<b>Schematic</b>	
	<b>Pros</b>	<p>Some flexibility from having two water sources, including the ability to potentially take Waikanae WTP offline for maintenance</p> <p>Could supply water to Paekakariki as well the Waikanae, Paraparaumu and Raumati area</p>
	<b>Cons</b>	<p>Uncertainty around arrangements and costs for Council's entry to the existing bulk water supply scheme. Also, uncertainties associated with longer term management of growth in water demand, situations of limited supply and required investment in additional water sources</p> <p>Historically concerns expressed by other local authorities about potential economic and development impacts</p> <p>Possible concerns within Kapiti community about loss of control over water supply service</p>
	<b>Gaps</b>	<p>Need to update 2002 proposal</p> <p>Further consultation with GWRC and other local authorities needed, particularly in regard to entry arrangements and long term management; most recent consultation was in 2004</p>
	<b>Yield</b>	28,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	<p>\$28.2 million (2002), plus entry fee which is unknown</p> <p>Escalated to 2009: \$37 million + entry fee</p> <p>For 3,000 m<sup>3</sup>/day, indicative capital cost is likely to be less than \$23 million</p>

## 5 Kapiti Coast: Water Supply Options

OPTION 33	<b>Name</b>	Desalination
	<b>Description</b>	Construction of a desalination plant to treat seawater for potable water supply by removal of dissolved salts. Desalination plants are becoming more common in areas where the availability of fresh water is limited. This option has not been investigated in any detail
	<b>Schematic</b>	
	<b>Pros</b>	Good drought reliability Proven technology
	<b>Cons</b>	Need to dispose of concentrated brine from the desalination process Significant energy requirement for the desalination process Desalination plants are typically better suited for continual use rather than as a supplementary water supply
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	>26,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	In excess of \$270 million (2008) Very indicative capital cost for 3,000 m <sup>3</sup> /day is \$15-20 million. Indicative operational costs of \$0.60/m <sup>3</sup>

OPTION 34	<b>Name</b>	Potable Water Substitution
	<b>Description</b>	Identification of water users that could use a lower grade water than potable water and therefore be diverted to another water source (e.g. groundwater, treated wastewater effluent, on-site rainwater, sewer mining). Examples of potential candidates for potable water substitution are irrigated parks and golf courses, factories and storage yards, and car washing facilities. This option has not been considered previously
	<b>Pros</b>	A reduction in potable water consumption would reduce the required volume of fresh water for abstraction, treatment and distribution
	<b>Cons</b>	Yield is likely to be too low Public health concerns about using non-potable water
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Unknown
	<b>Capital Cost</b>	Unknown

## 5 Kapiti Coast: Water Supply Options

OPTION 35	<b>Name</b>	Indirect Potable Reuse
	<b>Description</b>	Add an advanced treatment plant to Paraparaumu Wastewater Treatment Plant. During times of low flow in the Waikanae River, the highly treated effluent would be discharged to the river upstream of the Waikanae WTP intake. This option has not been considered previously
	<b>Schematic</b>	
	<b>Pros</b>	Potential benefits for the water quality of the Waikanae River as the discharge of wastewater effluent into the Waikanae River, via the Mazengarb Drain, would cease
	<b>Cons</b>	<p>Insufficient yield, i.e. the volume of treated effluent is likely to be less than the volume of water required for supply during times of low river flow</p> <p>Increased risks for public health, cultural concerns</p> <p>Negative public opinion</p>
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Approximately 7,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	Unknown

## 5 Kapiti Coast: Water Supply Options

OPTION 36	<b>Name</b>	Direct Potable Reuse
	<b>Description</b>	At the Paraparaumu Wastewater Treatment Plant add an advanced water treatment plant and discharge the purified recycled water directly into the potable water reticulation network. This option has not been considered previously
	<b>Schematic</b>	
	<b>Pros</b>	Potential benefits for the water quality of the Waikanae River as the discharge of wastewater effluent into the Waikanae River, via the Mazengarb Drain, would likely cease
	<b>Cons</b>	<p>Insufficient yield, i.e. the volume of treated effluent is likely to be less than the volume of water required for supply during times of low river flow</p> <p>Increased risks for public health, cultural concerns</p> <p>Negative public opinion</p>
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Approximately 7,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	Unknown

OPTION 37	<b>Name</b>	Non-potable Reticulation Network ("Dual Pipe" System)
	<b>Description</b>	Construct a non-potable water reticulation system in some or all of the Waikanae, Paraparaumu and Raumati area. Each property would have two water supplies, one potable and one non-potable. The non-potable water supply could be used for garden watering, car washing and toilet flushing. This system is often known as a "dual pipe" or "purple pipe" system, as the non-potable water supply is often distinguished by purple pipework. The non-potable water reticulation system would be supplied with treated effluent from an advanced treatment plant added at the Paraparaumu WWTP, possibly augmented with groundwater. This option has not been considered previously
	<b>Schematic</b>	
	<b>Pros</b>	Reduced demand for potable water reduces the volume of fresh water to be abstracted from the environment and treated to potable standards
	<b>Cons</b>	Public health issues need to be carefully managed Need to provide an extensive network of infrastructure with issues associated with private and public responsibility boundaries Costs likely to be high
	<b>Gaps</b>	No investigations undertaken
	<b>Yield</b>	Approximately 7,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	Unknown
OPTION 38	<b>Name</b>	Waikanae Borefield and Storage
	<b>Description</b>	This option is similar to the storage pond options discussed above, except a smaller storage volume would be required in this case. This is because the existing Waikanae Borefield would be retained for supplementary supply. During times of low flow in the Waikanae River the stored water would be blended with the groundwater, which may improve the quality of the water supplied to the community. The storage ponds would be filled from the Waikanae River during times of high river flow. As with the storage pond options, there are several possible pond locations
	<b>Pros</b>	Continue use of existing infrastructure (bores, pipelines and river intake) Work undertaken to date indicates that the development of storage ponds is technically feasible and relatively straightforward from a consenting perspective
	<b>Cons</b>	Risk of algal blooms in the storage ponds May still require additional treatment for groundwater
	<b>Gaps</b>	Quality of, and treatment requirements for, blended groundwater and river water Need to update concept design, cost estimates and planning requirements assessment from 2004 Recent consultation Assessment of environmental effects
	<b>Yield</b>	200,000 m <sup>3</sup> storage provides 6,900 m <sup>3</sup> /day for 29 days (1 in 50 year drought)
	<b>Capital Cost</b>	\$4.9-5.9 million (2003) Escalated to 2009: \$8 million

## 5 Kapiti Coast: Water Supply Options

### 5.7 District Wide Schemes with Staging

The principle behind the following options is the idea of working towards providing an integrated water supply network to the whole Kapiti District, rather than the existing separate systems, which sometimes have more to do with the history of local government than rational engineering or resource allocation decisions. It is likely that an integrated water supply network will be too expensive to build in one step as part of this current project, and accordingly the options described below include staging. The staging could take place over 20 to 30 years, or even 50 years, but the essence of the approach is that the water supply is being developed in a rational way that best meets the long term interests of the District.

One of the real advantages of an integrated network, which is fed by two or more sources, is that it provides for redundancy in the event of failures or maintenance needs, allowing supply to be maintained, albeit typically at a reduced pressure and flow. Such events could occur, for example, as a result of mechanical equipment failures or with power outages, and on a larger scale with natural disasters.

OPTION 39	<b>Name</b>	Kapiti District Integrated Water Supply
	<b>Description</b>	Stage 1: Waikanae WTP supplied from Waikanae and Otaki Rivers Stage 2: Construct new WTP at Otaki to supply Otaki Stage 3: Extend treated water network south from Otaki to feed Te Horo/Hautere and northern extensions to Waikanae Stage 4: Completely integrate networks Stage 5: Consider adding Paekakariki
	<b>Schematic</b>	
	<b>Pros</b>	Integration allows for redundancy, and therefore improved reliability and robustness. Able to be staged, allowing costs to be spread over time, and long term benefits maximised.
	<b>Cons</b>	High cost
	<b>Gaps</b>	Not considered previously except as a high-level idea. Although many of the option's elements have been investigated, much work is required to investigate details of the staging and the integration.
	<b>Yield</b>	Potential yield could be as high as 58,000 m <sup>3</sup> /day from the Waikanae River/bore field and Otaki River, but yield required to meet district wide requirement is 33,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	Unknown

## 5 Kapiti Coast: Water Supply Options

OPTION 40	<b>Name</b>	Kapiti District Integrated Water Supply (Otaki Gorge)
	<b>Description</b>	<p>Stage 1: Run of river abstraction from Otaki River near gorge and pumped pipeline transfer to upper Waikanae River</p> <p>Stage 2: Construct new WTP at Otaki to supply Otaki</p> <p>Stage 3: Extend treated water network south from Otaki to feed Te Horo/Hautere and northern extensions to Waikanae</p> <p>Stage 4: Completely integrate networks</p>
	<b>Schematic</b>	
	<b>Pros</b>	<p>Integration allows for redundancy, and therefore improved reliability and robustness</p> <p>Able to be staged, allowing costs to be spread over time, and long term benefits maximised</p>
	<b>Cons</b>	High cost
	<b>Gaps</b>	Much work is required to investigate details of the staging and the integration
	<b>Yield</b>	Potential yield could be as high as 54,000m <sup>3</sup> /day from the Waikanae River/bore field and Otaki River, but yield required to meet district wide requirement is 33,000 m <sup>3</sup> /day
	<b>Capital Cost</b>	Unknown

## 6 Kapiti Coast: Next Steps

### 6 Next Steps

#### 6.1 Coarse Screening

Council will be implementing a program of consultation and communication with the community in relation to this project. This will focus initially on identifying appropriate selection criteria, so that the list of options presented in this report can be ranked and evaluated. The aim is to shortlist the best options for further detailed evaluation, and then to undertake further evaluation using selection criteria to identify a preferred option.

Engagement with the community, and working in partnership with iwi will be a critical part of the process. However, in recognition of the fact that there has already been significant consultation on two key matters, there are some options that can be removed from the long list at this stage. This 'coarse screening' will ensure that time and money is not wasted evaluating options that do not meet some of the basic criteria. The focus at this stage is on the WPR water supply. As part of this project, some focus may go onto whether district-wide schemes provide other benefits. However, at this point there are three critical factors that can be used to evaluate options. These are:

- Overall capital cost – Council has undergone an extensive consultation process on the LTCCP which identified the WPR water supply solution as a key item of expenditure. \$23 million (in 2009 dollar terms) has been allocated for this project. This is therefore an early evaluation criteria that is applied to the long list of options. Given that some of the options identified to date have varying degrees of design development,

there are differing levels of uncertainty associated with the historical estimates. Some judgement has been applied to take the most robust estimate available.

- Yield – Council has had the 400 L/person/day consumption target in place for a few years. Using this as a basis for calculating the required supply, alongside population projections means that up to 26,000 m<sup>3</sup>/day are required (total). While it is feasible that some options could provide a part of this total supply, in general if the option cannot contribute to meeting the total long term demand, it should be removed. This is further complicated when considering if the existing borefield should form part of the overall solution or not. If the borefield is excluded, Council effectively needs to find 26,000 m<sup>3</sup>/day from a new source or sources and would abandon its significant investment in this source. Treatment of the borefield water is included as an option to be tested with the community.
- Consent/Technical - the range of potentially challenging consenting and technical issues also feature at this stage of the evaluation. This is based on professional judgement as to the ability to consent a particular option. This has also included an assessment of potential community opposition to some options.

The following table provides a summary of the long list of options and the results of the coarse screening undertaken. The categories in many instances reflect the fact that there is insufficient information known at this point in time.

*Final options list ranking - the following "traffic light" approach was used to provide a coarse screening of the long list of options.*

Cost	Yield	Consent / Technical
<\$23m	> = 26,000 m <sup>3</sup> /day	No fatal flaws known
Unknown	8,000 – 26,000 m <sup>3</sup> /day or Unknown	Unknown or difficult
>\$23m	<8,000 m <sup>3</sup> and not able to form part of a larger scheme	Potential Fatal Flaws

## 6 Kapiti Coast: Next Steps

As a result of this initial coarse screening there are 9 options identified for elimination.

#	OPTION NAME	COST	YIELD	CONSENT / TECHNICAL	ACTION	REASON FOR ELIMINATION
<b>RUN OF RIVER</b>						
1	Waitohu Stream				Carry Forward	
2	Otaki River Gorge				Carry Forward	
3	Otaki River Gorge Transfer				Carry Forward	
4	Otaki Wellfield and Pipeline				Carry Forward	
5	Mangaone Stream				Carry Forward	
6	Akatarawa River Transfer				Carry Forward	
7	Whakatikei River Transfer				Carry Forward	
<b>DAMS</b>						
8	Waitohu Dam				Carry Forward	
9	Mangaone Dam				Carry Forward	
10	Combined Storage Dam in the Waikanae River				Carry Forward	
11	Waikanae WTP Dam				Carry Forward	
12	Kapakapanui Dam				Carry Forward	
13	Ngatiawa Dam				Carry Forward	
14	Upper Ngatiawa Dam				Carry Forward	
15	Rangiora Dam				Carry Forward	
16	Reikorangi Dam (Cambridge Farm)				Carry Forward	
17	Upper Maungakotukutuku Dam				Eliminate	Reservoir and dam partly within the Maungakotukutuku Scenic Reserve and inundation would result in considerable loss of native vegetation
18	Lower Maungakotukutuku Dam				Carry Forward	
19	Low-low Maungakotukutuku Dam				Carry Forward	
20	GWRC Whakatikei Dam				Carry Forward	
<b>STORAGE PONDS</b>						
21	Storage Ponds - West				Carry Forward	
22	Storage Ponds - East				Carry Forward	

## 6 Kapiti Coast: Next Steps

#	OPTION NAME	COST	YIELD	CONSENT / TECHNICAL	ACTION	REASON FOR ELIMINATION
<b>GROUNDWATER</b>						
23	Extended Waikanae Borefield				Carry Forward	
24	Eastern Waikanae Borefield				Carry Forward	
25	Ngatiawa Aquaflo				Eliminate	Yield likely to be zero as water being lost to groundwater re-enters the river upstream of the Waikanae water treatment plant.
26	Deep Groundwater				Carry Forward	
27	Aquifer Storage & Recovery				Carry Forward	
<b>RIVER RECHARGE</b>						
28	Wastewater River Recharge				Eliminate	Public health impacts, cultural issues and ecological effects from treated wastewater discharge affecting a greater stretch of Waikanae River are unlikely to be acceptable to the community.
29	Groundwater River Recharge				Carry Forward	
30	Wastewater & Groundwater River Recharge				Eliminate	Public health impacts, cultural issues and ecological effects from treated wastewater discharge affecting a greater stretch of Waikanae River are unlikely to be acceptable to the community.
31	River Recycle				Carry Forward	

#	OPTION NAME	COST	YIELD	CONSENT / TECHNICAL	ACTION	REASON FOR ELIMINATION
OTHER						
32	Wellington Regional Supply Pipeline				Eliminate	Capital cost is much higher than amount allocated in LTCCP. Although a pipeline to supply 3,000 m <sup>3</sup> /day is likely to have a capital cost of less than \$23 million, the entry costs are unknown. In addition, because this option has historically been shown to be the most expensive, and political and community concerns over loss of control over Kapiti's water supply, this option is proposed for elimination.
33	Desalination				Eliminate	Although indicative capital cost is within \$23 million budget, when combined with a number of other factors, this option should be eliminated. These factors are: <ul style="list-style-type: none"> <li>When combined with the need to add further treatment for the Borefield, the total cost is likely to come very close to the \$23 million budget</li> <li>Although the capacity it is easily expandable, this would come at a high cost (\$2.5 to 3.0 million per 1,000 m<sup>3</sup>/day)</li> <li>Very high operational costs (approximately 60 cents/m<sup>3</sup> of water produced)</li> <li>Very high energy consumption (approximately 10,000 kWh/day)</li> </ul>
34	Potable Water Substitution				Eliminate	Few large water users in the District and some already on alternative supplies, so yield likely to be too low. Could be incorporated within Water Conservation program.
35	Indirect Potable Reuse				Eliminate	Reuse of treated wastewater effluent for water supply is highly unlikely to be accepted by the community
36	Direct Potable Reuse				Eliminate	Reuse of treated wastewater effluent for water supply is highly unlikely to be accepted by the community
37	Non-potable reticulation network ("Dual" pipe system)				Carry Forward	
38	Waikanae Borefield and storage				Carry Forward	
DISTRICT WIDE						
39	Kapiti District Integrated Water Supply				Carry Forward	
40	Kapiti District Integrated Water Supply (Otaki Gorge)				Carry Forward	



### 6.2 Actions

This report is the first stage in identifying a preferred water supply solution for the WPR area, and developing a long term approach to delivering water supply infrastructure for the District. The process from here will involve engagement with the community to determine the best option. Further technical investigation is required in some areas to inform this process.

Key actions to be undertaken next in relation to the project include:

#### 1. Technical Investigations

A summary of the further technical investigations identified in this report include undertaking the following:

- A first broad-brush comparative assessment of the planning, environmental and other issues associated with the options being carried forward.
- Further investigation of the hydrology (including the potential impact of climate change) and hydrogeology is required in the next stage of this project. This will be coordinated with other similar investigations Council is undertaking (specifically in stormwater management)
- Undertaking detailed work on historical demands and water conservation in parallel with the supplementary water source project, which will provide a basis for more robust demand forecasts.
- Confirm the amount of water use for industrial and commercial users.
- The design assumptions need to be further refined in the next stage of work. This should include in particular, confirming the drought reliability standard to remove existing confusion on how many days the 50 year drought relates to.

#### 2. Public Input

The next steps require public input and engagement with stakeholders to determine what is important to the community when choosing a preferred water supply solution. These values will be used to guide the option selection process. It is expected that there will be different ways of expressing values – in particular the differing Maori and Western world views. Ultimately however, many values are likely to be similar, but perhaps expressed differently.

#### Early Decisions

There are three key decisions arising from this report. These are as follows:

### 1. Confirming Design Assumptions

For the purposes of determining whether or not the various source options are able to meet demand in the long term, or contribute to a solution involving multiple sources, a 50-year peak daily design demand of 26,000 m<sup>3</sup>/day is proposed for the Waikanae, Paraparaumu and Raumati supply. This demand is based on the following assumptions:

- 400 L/person/day peak day consumption (incorporating commercial/industrial demands)
- estimated losses of 90 L/person/day
- population growth at the Statistics New Zealand medium-growth scenario
- population growth in each constituent water supply area matches the overall District growth
- no new wet industries
- 50 year drought reliability standard
- no allowance for climate change.

These design assumptions provide the basis for moving ahead with the project. It is accepted that some work is needed to define some aspects of these assumptions, in particular, drought reliability.

### 2. Confirming Transition to Reduced Consumption

The forecast peak daily demand in 2060 is 26,000 m<sup>3</sup>/day. This is only 3,000 m<sup>3</sup>/day more than is currently consented from the Waikanae River and Borefield. Over the last seven summers the currently consented figure of 23,000 m<sup>3</sup>/day has been at increasing risk of being exceeded (refer Table 2). The design assumptions above are based on the community achieving a relatively quick transition to a significantly reduced per capita peak demand before population growth starts to have an impact. There are significant risks that this does not occur as planned, and that other risk factors such as the borefield's capacity (which does not appear to have been proven by being run at its full capacity for an extended period of time), combined with a dry summer, require very severe water restrictions to be imposed (perhaps with heavy enforcement) to avoid the water supply running dry. For this reason we recommend that Council consider the use of a larger planning figure for forecast peak daily demand, at least for the short to medium term horizon.

### 3. Confirming the List of Options

This report includes a long list of options. Given the extensive consultation Council has undertaken previous through the LTCCP and the Sustainable Water Management Strategy, it is considered necessary to exclude those options that do not meet the criteria clearly established through previous work. This leaves 31 options for consideration. Council should consider this coarse screening approach, and whether it is appropriate to exclude these options at this early stage.

