greater WELLINGTON
THE REGIONAL COUNCIL

Report **04.301**
Date 9 June 2004
File B/01/01/01

Committee **Utility Services**
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Population projections and development of the next water source

1. Purpose

To outline population trends and how these will impact on the development of the wholesale water supply system.

2. Background

2.1 Population projections

Statistics NZ carry out population census every five years (e.g. 1996, 2001). The number of people resident in an area on census night is adjusted to take account of people away from home, to give the *Usually Resident Population,* the parameter we use for strategic planning.

Between census Statistics NZ adjusts the *Usually Resident Population* to take account of immigration, births and deaths. It also provides population forecasts at three levels of growth, *High, Medium and Low.* While medium growth is considered to be the most likely to occur, high growth projections provide a more conservative basis for long term planning of major infrastructure development.

In 1998, the high growth population projection for 2020 was 377,000.

A significant increase in population was detected during the 2001 census, which showed that population estimates between 1996 and 2001 had understated growth.

The Resident Population estimate released in late 2003 gives the population in the Wellington Urban Area at 30 June 2003 as 363,400. This figure is close to previously published "High Growth" estimates (see **Attachment 1**). The high growth projection for 2020 is now 400,000.

These significant changes in population projections make it necessary to review the timing of proposed source upgrades to enhance the capacity of the water supply system.

A further factor to consider with regard to population growth is the Wellington Regional Strategy Project (Report 04.283, considered at the Policy, Finance and Strategy Committee on 31 May 2004). Greater economic growth is likely to lead to an enhanced population growth rate.

2.2 Sustainable Yield Model

Long range strategic planning for water supply is carried out using the Sustainable Yield Model (SYM). This model uses historic climate information to model both the availability of water from the current sources and the demand for water. It can be run either over the period of historic record (110 years) or in a statistical manner, in which case the yearly records are randomly mixed to form 10,000 pairs of records using the "Monte Carlo" simulation technique.

Initial work using this model, reported to the committee in Report 98.528 showed that the current system could sustain a population of 377,000. Using the Statistics NZ "High Growth" scenario at the time, it was anticipated that this population would not be reached until 2020. These calculations were based on providing adequate (unrestricted) water in all but a 2% AEP (Annual Exceedance Probability) event – effectively a drought that may occur on average every 50 years.

In 2002/3 the SYM was reviewed and upgraded, incorporating new climate and demand information. A new demand model was developed. Even though a number of the variables were refined, the updated model confirmed the previous findings that the sustainable population is 377,000 for the current water sources.

3. Water source upgrades

Potentially the two most cost-effective water source upgrades have been identified as off-river storage at Wainuiomata, and construction of the Te Marua River Pumping Station. Both are currently shown on the proposed 2004-2013 Capital Works programme, but the timing is tentative. Completion of Wainuiomata off-river storage is programmed for 2009/10 and the Te Marua Pumping Station for 2011/12.

Off-river storage at Wainuiomata is attractive because it can fulfil two functions, in the same way that the Stuart Macaskill Lakes do at Te Marua. It would enable the plant to continue production using stored raw water when the river sources are of poor quality, and it would provide supplementary water to keep the plant running during periods of low river flow.

A study is underway to evaluate the off-river storage capacity of several sites in the Wainuiomata catchment area and the likely construction costs. The results of this study will then be compared with other development options.

In 1999, consultants updated earlier work on five potential new source developments that could provide in the range of 10-20 million litres per day (MLD). These were:

	1999 Cost $M
1. Akatarawa River intake and water treatment plant	15.3
2. Hutt River intake and pumping station at Te Marua	2.9
3. Upper Hutt aquifer development and treatment plant	13.9
4. Wainuiomata on river storage options	40.7 – 66.1
5. Hutt River recharge of Waiwhetu aquifer	3.3

A further possibility that was not evaluated in the 1990's work is a new membrane filtration plant on the banks of the Hutt River near Haywards. Membrane filtration is relatively new technology and was used by Watercare Services for its Waikato River plant. Costs for this type of plant are still reducing as the efficiency of the membrane fibres improves. A plant in this location would have relatively high electrical energy costs because of the need to pressurise the water so it can be pumped over Haywards Hill. As a rough estimate, the marginal cost per megalitre of water produced would be 50-80% higher than the cost at the Waterloo water treatment plant. A membrane plant may be a viable option, but it would be built after the Hutt River intake at Te Marua.

4. Timing of source upgrades

There are uncertainties and errors associated with the SYM, particularly associated with the demand estimates, which cannot accurately reflect the random aspects of human behaviour. Hence confidence bands are associated with predictions made using the model. **Attachment 1** shows 90% upper and lower confidence limits associated with the sustainable population projection shown as a thicker line.

Conservatively the point at which we can be confident that demand can be met without restriction occurs at the intersection of the lower confidence limit and the high growth population estimate. It can be seen in **Attachment 1** that this happens at a population of 375,000, which could occur as soon as 2007. Consequently there may be a need to advance one or other of the source enhancement projects. This will be considered when the Capital Works programme is reviewed in December 2004.

5. Wainuiomata off-river storage

Modelling using the SYM predicts that the availability of 300 ML[1] of water storage at Wainuiomata would increase the population that could be reliably supplied from 377,000 to 384,000. This would delay the need for the next source development until at least 2011. However, preliminary indications are that a single site is not available to develop this storage volume.

Investigations into the cost and feasibility of constructing an off-river storage facility at Wainuiomata have started. An initial consultant's report is expected within the first quarter of the new financial year.

A project of this nature has a lead-time of at least two years, and would take another year to build.

6. Discussion

GWW's target level of service is that water use restrictions (apart from currently applied routine hosing bans) will not be put in place except during a drought that is equalled or exceeded in severity once in 50 years.

In practice of course, the severity of a drought is not known until it has finished. In a situation of high demand and low river and/or storage levels, restrictions would progressively be introduced as a precautionary measure. A way of using long range weather forecasts to improve our understanding of potential drought situations and provide guidelines for the introduction of restrictions is currently being considered.

We will not suddenly run out of water in 2007 but, if the population reaches 377,000 by then, we will begin to operate at a level of risk assessed to be higher than our target level of service.

While a number of studies of the proposed Te Marua River Intake and Pumping Station have been conducted, investigations for the provision of off-river storage at Wainuiomata are not yet completed.

The lowest cost development based on the work undertaken in 1999 is the Hutt River intake at Te Marua followed by recharging the Waiwhetu aquifer. With the later project, the costs are known but the benefits are difficult to quantify. Until these can be calculated with more precision, that project should not proceed.

Hence, the Te Marua intake and the Wainuiomata off-river storage are now the two more likely projects for the next stages of system development. This is based on the assumption that the Wainuiomata off-river storage will cost less than the Akatarawa scheme or development of the upper Hutt aquifer.

[1] About one tenth of the storage of the Stuart Macaskill Lakes

With growth not being uniformly distributed amongst the four cities, a review of pipeline capacities will also be carried out to see if any pipeline enhancements are required to deliver greater volumes of water, particularly to Wellington city.

It is envisaged that a further review and update of the SYM would be undertaken (probably in 2007) before a final decision to proceed with either the Wainuiomata off-river storage or the Te Marua River Intake and Pumping Station is made.

7. Communications

There are no immediate communication issues.

8. Recommendations

That the Committee:

1. ***receive*** *the report and note it contents.*

2. ***note*** *the higher than expected population increase.*

3. ***note*** *that the next budget round may bring forward system enhancement projects to meet the updated assessment of demand growth.*

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Attachment 1: Wellington population estimates