greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Report	13.810
Date	2 September 2013
File	WM/02/03/01

Committee	Social and Cultural Wellbeing Committee
Authors	Andrew Samuel, Team Leader, Marketing - Water Supply Erin Ganley, Development Engineer - Water Supply

Water Supply Demand Reduction

1. Purpose

To inform the Social and Cultural Wellbeing Committee about the possible influences leading to the low levels of water supply for the 2012/13 financial year.

2. The decision-making process and significance

No decision is being sought in this report as it is for information purposes.

3. Introduction

At the Committee meeting of 6th August, Water Supply information was provided that observed that water supply during the 2012/13 financial year was the lowest annual volume in many years. The Committee asked for a breakdown of the reduction in water use in order to determine if this was a result of increased user consciousness or technical drivers such as less leakage from pipe networks.

Various drivers influence the volumes of water supplied and future demand. Some of the drivers are:

- Water use – domestic, industry, commercial, urban irrigation, water loss
- Climate – rainfall, temperature, sunshine
- Demand management– community education, retrofit and rebate measures, regulation
- Demographic – population density, housing types, development type

The ability to measure the influence of each of the drivers relies upon the level and accuracy of information collected and available.

4. Water use information

The Regional Council's Water Supply Group operates a system that continuously measures water supplied to Upper Hutt, Lower Hutt, Porirua and Wellington. This system provides a high degree of accuracy of water supplied.

Within each city, end-user water demand is generally only measured (metered) for commercial and services customers. Most domestic customers (as well as a small percentage of commercial) are not metered. Further, most commercial and services users' meters are only read a few times per year with the timeframe between readings spanning varying seasons. Therefore, a large portion of the demand is "unmetered" and the data available does not allow robust analysis of seasonal variation by user / usage type or reliable determination of unaccounted for water.

Large "unmetered" portions of such a large network mean that data sets are not extensive enough, with the lack of refinement making it difficult to quantify the interactions between the various drivers.

To better understand the factors behind the recent decrease in demand, Water Supply commissioned a pilot study of Porirua City's water use in June 2013. Of the four cities, Porirua has the most comprehensive set of data. The aim of the study is to facilitate a more robust demand forecast and identify / predict how these drivers may change the demand in the future.

5. Demand drivers

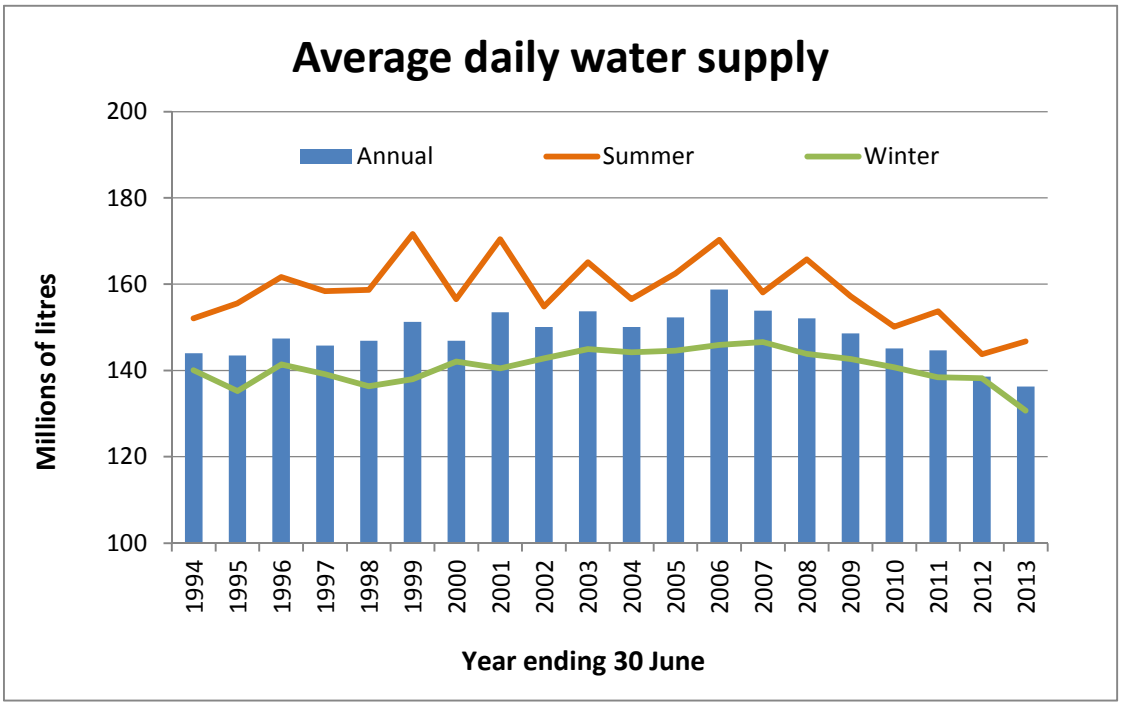
Despite the lack of refinement in the water demand data available for each city, as discussed above, the various estimates available of water use types do serve as indicators of the relative importance of several demand drivers.

Drivers that can be commented on are; water use, climate, demand management and system characteristics.

5.1 Water Use

Each day the volume of water supplied to the city councils from the bulk system is measured with a high degree of accuracy. The average daily water supply for the period 1994 to 2013 is provided in Figure 1 (below). Included on the graph is the average demand for the corresponding winter and summer periods.

Figure 1 Average daily water supply 1994 to 2013 including winter and summer demand



As noted above, metering of end use isn't universal, so usage by sector or usage type can only be estimated.

Beyond our total water supply data, the city councils have provided metered commercial and services water use data and estimated data for domestic water use and unaccounted-for water (which includes losses due to leakage) for the period 2005/06 to 2012/13.

A summary of this information is presented in the table below.

Table 1 Water use information

	2005/06 (Millions of litres per year)	Share of Total Supply	2012/13 (Millions of litres per year)	% of Total Supply	Change between years
Total Water Supply	57,912		49,685		-14.2%
Metered commercial supply	10,720	18.5%	10,447	21%	-2.5%
Unmetered supply (Derived)	47,191	81.5%	39,238	79%	-16.9%
Residential supply (Estimated)	*31,784*	*55%*	*31,366*	*63%*	*-1.3%*
Unmetered commercial supply (Estimated)	*1,117*	*2%*	*696*	*1.5%*	*-38%*
Unaccounted for water (Assumed)	*14,290*	*25%*	*7,175*	*14.5%*	*-50%*

The estimate for domestic water use has been based on a variety of data sources, typically small samples of individually-metered or cul-de-sac metered homes. Details of household make-up are not typically known and the sample set of meters has been changed over time. Historically, values have been presented as likely to be within a range of +/- 30 litres per person per day (roughly 13%). UFW has been determined by subtracting estimates for the domestic and unmetered commercial usage from the unmetered total, so is also subject to significant uncertainties, including from those described above.

The unaccounted-for water in 2005/06 was assumed at 25% of the total water supply, in 2012/13 this had decreased to 14.5%.

It should be noted that a major leak in south Wellington, estimated to have been losing water for 8-9 months between January/February and October 2006, serves to inflate the 2005/06 year. The reduction from 2005/06 to 2006/07 was 25% to 20%.

The assumed decrease in unaccounted-for water from 2005/06 to 2012/13 could be attributed to leakage reduction through active leak detection and pipeline renewals, increase in metered commercial supply and reduction in the level of unmetered properties.

Active leak detection is assumed to be part of the reduction in the amount of unaccounted for water estimates as noted above.

The change in estimated total domestic water use (-1.3%), is modest, but covers a period when resident population has increased (+5.5%) and is perhaps more reasonably viewed on a per-capita basis.

Estimated per-capita residential usage has fallen 6.5% over seven years, averaging just over 0.9% reduction per year. This represents an annual water saving at present population of 290 million litres (0.8 ML/day) from the actions of domestic water users, potentially including purchase of more water-efficient plumbing fittings, appliances and watering equipment, a decline in the proportion of households with a significant garden or lawn area to water, greater attention to water saving behaviours and the weather-driven need to water.

5.2 Climate

A Water Supply commissioned analysis of climate on the region's bulk water production concluded that much of the variation in the region's seasonal demands can be explained by climate.

Sunshine hours, temperature and rainfall are analysed each year to determine the climatic influences on water demand.

Comparison against the 30 year average has been provided below in relation to the climatic factors for two relatively fine summers (2005/06 and 2012/13) and two relatively wet summers (2001/02 and 2011/12).

Table 2 Climate factors for "fine" and "wet" summers relative to 30-year averages

Factor	2005/06 (fine)	2012/13 (fine)	2001/02 (wet)	2011/12 (wet)
Rainfall (mm)	-4%	-4%	+105%	+57%
Sunshine (hours)	+13%	+13%	-18%	-21%
Average temperature	+5%	+4%	-1%	-5%
Days without rain	10	17	10	13
Days with rain	22	16	35	26

When examining climate factors alongside winter-to-summer demand for these sets of years, it is apparent that the variance in the demand between winter and summer is lower for the wetter years (Table 3). The information indicates as noted above that a considerable variance in the demand is linked to the climatic factors.

Table 3 Winter-to-summer demand change within years

Winter to summer	2005/06 (fine)	2012/13 (fine)	2001/02 (wet)	2011/12 (wet)
Demand change	14.8%	12.3%	8.4%	4.0%

The change from winter to summer demand within single years has also been analysed and indicates a further trend.

The comparison of winter and summer demand within single years with similar climate attempts to distinguish between longer-term impacts unrelated to weather, such as leakage reduction or increasing use of water-efficient appliances and plumbing, and weather-related water use behaviours. Both the 2012/13 and 2011/12 years show a smaller winter-summer demand variance in comparison to earlier years with similar summer climate, indicating a behaviour-related effect (see Table 2)

5.3 Demand management

For most of the last 16 years, GWRC Water Supply has concentrated its annual water conservation programme on promoting 'water-wise' gardening and watering methods during late-spring and summer, with the aim of reducing summer water-use peaks. The timing of promotions over the last two years has remained similar, but the focus has been broader – while still including gardening methods – to reflect the changed risk and opportunities presented by the Stuart Macaskill Lakes upgrade.

The late-summer period of 2012/13 provides an example of what community education through effective communication can inspire when a message connects strongly with the beliefs and priorities of many individuals.

Table 4 Late-summer 2012/13 demand

Use Period	Daily Average (Millions of litres)	Change from prior to ban implementation
Prior to sprinkler ban	158	
Between sprinkler ban and outdoor use ban	146	-8%
Outdoor use ban	125	-21%

The period of outdoor water use ban was supported by a heavy advertising schedule with widespread publicity. The very short timeframe over which water reduction was achieved indicates that behaviour change rather than other factors was the major influence in reduced water use. Table 4 provides the different demand periods and the impact of the communication.

Of further note is that the average daily consumption during the outdoor ban period was 5% lower than the 2012 winter-day demand average.

GWRC communications about the lake-upgrade work and associated risk of a water shortage if the summer was dry – as well as conservation tips – ran from October (until late February), as it had during the 2011/12 summer. The water use through the mid-summer period 2012/13 was amongst the lowest seen in over 25 years (second only to December-February 2011/12).

Research into public recognition and response to our communications following the 2011/12 summer (the first summer of the Stuart Macaskill Lakes upgrade project) found that 99% of respondents claimed to have taken some action to conserve water that summer, with a third claiming they'd tried one or more new water-saving behaviours in and around their home, and just-over a third (35%) claiming to have made extra effort with at least one existing water-saving action. The increased risk of water shortage was a main reason by those who had undertaken new water-saving actions. The very low increase from winter to summer average water use in 2011/12, as provided in Table 3, supports the feedback from respondents that they had made extra effort to conserve water.

5.4 Demographic factors

Between 1994 and 2013, the estimated residential population has grown by 21% while water use has declined by 5% over the same period. This indicates that population change alone is not a reliable predictor of water supply volume change.

Housing type is potentially a contributing factor to the water demand reduction, in the form of an increase in apartment living and in-fill housing. The immediate impact is the smaller or nil green space areas, i.e. less gardens to water, the longer term impact is the use modern materials and fittings leading to more efficient use of water.

This can also be said for the recent increase in residential subdivisions where the trend is towards smaller lot sizes, more impermeable coverage and the use of new and modern infrastructure.

The level of information required to provide a definitive percentage to the impact of the above factors is not readily available.

6. Conclusion

Measurement of water use at the bulk water supply level is reliable and accurate. The water use information attributed to different sectors of water use within cities is estimated, based on various assumptions that introduce significant uncertainty.

Total supply has declined and the Regional Council's Water Supply Group is able to draw on various indications from the drivers that influence demand. The reduction is likely due to a number of factors including, leak reduction, improving efficiency of fitting and fixtures, housing and development types, communication and changing usage behaviours.

Climatic factors play a part in the demand and provide a level of complexity when analysing influences, with the considerable variation in the region's seasonal demands explained in part by climate.

The recently commissioned pilot study is working to refine the demand forecast, this however is also subject to imperfect datasets.

7. Recommendations

That the Committee:

1. ***Receives*** *the report.*

2. ***Notes*** *the content of the report.*

Report prepared by:	Report prepared by:	Report approved by:
Andrew Samuel Team Leader, Marketing - Water Supply	Erin Ganley Development Engineer - Water Supply	Chris Laidlow General Manager - Water Supply