

Water demand management

1. Purpose

To review Greater Wellington Water's demand management initiatives and provide a context for the level and content of that activity.

2. Demand management defined

Water management can be defined as any policy decision or initiative, typically by central or local government or water suppliers, that alters the amount of water supplied or consumed.

Supply management initiatives include the role of water suppliers (wholesaler and retailer) in preventing water loss and wastage within their networks and ensuring there is an adequate water supply to meet reasonable foreseeable needs of present and future generations.

Demand management involves initiatives that are intended to change the behaviour of water consumers, by promoting more efficient water use and discouraging unsustainable practices and wastage, or by using mandatory measures such as water use restrictions.

A water conservation strategy can utilise a range of supply and demand management options. A review of literature identifies a hierarchy of demand management approaches. Typically education is the foundation of a demand management strategy. Measures such as financial incentives, water metering and pricing, regulation (temporary or permanent water use restrictions), voluntary guidelines (codes of best practice) and planning controls (use of building codes etc. to mandate adoption of water saving appliances) are added as required. Essentially, regulation and planning controls requiring a specified response will have a more certain impact than voluntary participation tools such as education and incentives.

3. Greater Wellington Water's demand management approach

Our direct demand management work has largely been in the area of public education and the promotion of water efficient practices and technologies, particularly for garden irrigation. We also work with our water supply customers, the four city councils in the Wellington metropolitan region, to assess the potential for water shortages arising. This analysis informs the customers' decisions about the need to impose higher levels of water use restrictions.

3.1 Summer water conservation campaign

Since 1997/98, Greater Wellington Water has run an annual campaign to raise awareness about the relationship between water supply and demand during summer and to promote a range of water conservation measures in a two-month period from early January. This campaign targets both immediate behaviour change and the maintenance of more water-efficient gardening behaviour over time. Our water supply customers endorsed the campaign strategy and tactics at its inception and have continued to support this activity as a worthwhile contribution to managing demand. They have

typically run their own information programmes around local watering bylaws and current water use levels at the same time.

The actions promoted via the Regional Council's campaigns have primarily addressed gardeners with professional garden-friendly advice that aims to increase water use efficiency, rather than asking gardeners to use less water without regard for the health of their plants.

Campaigns have been consistent in that approach over the last seven years, while adopting a variety of mass communication tools to deliver the message. During the summer of 2003/04 these messages were principally conveyed via the Council's "Be the Difference" campaign.

The campaigns of 1997/98 and 1998/99 included a tie-in with local garden centres and gardening product makers, and incentives to purchase water-efficient gardening products. However, these facets of the campaigns were relatively labour intensive and delivered little apparent benefit.

Both attitudinal and quantitative research has been undertaken on several occasions since 1997, to guide the development and gauge the impact of our communications. An assessment of progress follows (see page 4).

3.2 Wider education about water

The Regional Council has for many years sought to raise the level of knowledge in the community about the value of water. This has been done by funding educational resources for schools, providing tours and presentations at our treatment facilities and producing general background information about the regional water supply system, which is made available in print form and via Greater Wellington's web site. Providing learning opportunities for children is intended to promote 'water-wise' behaviours early in life and will hopefully result in these behaviours becoming the norm.

The Utility Services division provided financial and human resource support for the development of the "Take Action for Water" environmental education programme run by the Environment division. This programme continues to provide hands-on learning for 8-12 year olds and is related directly to the environment in their neighbourhoods. While "Take Action" has not to date delivered the practical project-based investigation and learning around potable water conservation that Utility Services had anticipated, it has addressed water conservation in its wider sense. "Take Action" is likely to be of long-term value, in part by making people more receptive to more specific potable water conservation messages. However, quantifying that value in dollar terms is not possible.

3.3 Demand restrictions

A stepped water restriction strategy¹ has been in place since October 1996. It lists trigger points for a range of actions, to be undertaken jointly by Greater Wellington and our customers if needed, to elicit greater effort to conserve water by the public. However, the action trigger points for restrictions are demand based without reference to availability of source water. When water

¹ WRC Bulk Water Department, Water Conservation Crisis Strategy, October 1996

availability has been taken into account, there has not been a situation that was deemed to require more restrictive watering regulation since the strategy was adopted.

We are currently investigating a more appropriate set of demand restriction triggers that will include time of year as a variable (see *Best-practice drought forecasting*, page 8).

4. Background – why this approach

A water conservation strategy for the Wellington metropolitan water supply area was investigated jointly by Wellington Regional Council and the four territorial authority customers during 1994 and 1995. Underlying this initiative was the expectation that demand for water in the metropolitan region would continue to rise while yields from water sources were expected to reduce as a result of water take consent renewals due in 2001. Under the terms of the Resource Management Act 1991, all existing water take consents had to be renewed by 1 October 2001; this was achieved.

While it was identified that future water needs could be met by developing new sources, a preference for demand management was expressed, to reduce water usage and defer the need to invest in new capacity. This view was principally driven by the desire for avoid expenditure on new capacity but recognised the environmental advantages of reduced water supply volumes.

A firm of consultants was commissioned to carry out a wide-ranging investigation of water conservation options, with a cost-benefit analysis. The detailed analysis of options contained in the final report (December 1995²) was confined to five measures deemed appropriate for communities that were not metered for water use. Of these five, it concluded that leak detection and repair would yield the greatest savings in water use in the medium term, followed by public information/school education and residential fixture retrofitting (the remaining two measures were commercial/industrial fitting retrofits and commercial/industrial water audits). The Regional Council was identified as having a role in public education and leak detection.

The final report also identified that the reduction of peak day water use could be effective for deferring proposed water capital improvement projects, but suggested that the region did not have an excessive peaking factor, so reducing base load and unaccounted-for water should also be a priority.

A review of the consultant's report by Regional Council personnel noted that the programme placed almost total emphasis on reducing overall consumption and in light of the significant influence of peak demand on future system development³, that emphasis appeared somewhat misplaced. The same review went on to moot that a focussed two-month programme (of water conservation promotion) would be more effective in realising a useful reduction in the peak demand period than employing year round conservation strategies. (While per capita water use figures for Auckland and Australia indicate that there is room to reduce the base level of demand in the metropolitan Wellington region, the most significant threat of a shortfall between source water availability and demand relates to peak summer water use.)

² Water Conservation Strategy for Wellington Metropolitan Supply Area (December 1995)

³ Identified in a Coopers & Lybrand report on marginal cost pricing

During dry summers, extended periods of low rainfall and warm weather can reduce the volume of river water available to treat, while causing the amount of water used in our supply area to increase by as much as 50 percent over winter levels. This situation can make it difficult to treat and deliver enough water to keep up with peak day demand and can also require us to draw on the metropolitan region's water supply reserves, held in the Stuart Macaskill Lakes and the Hutt aquifer.

Returning to the consultant's report for a moment, it also noted that:

- Residential water use tends to be more variable than other demand and accounts about half of total water use in the metropolitan region.
- Residential water use has the most significant impact on water demand and demand patterns.
- Residential water use has tended to rise on a per capita basis, mainly associated with increased garden irrigation, increased use of water-using appliances, higher personal hygiene standards use and increased supply system coverage and pressure.

In summary, reducing mid summer water use peaks was identified as being of primary importance by the Regional Council, while the most extreme peaks were identified as being primarily driven by domestic garden irrigation. The consultant identified public information and school educational material as worthwhile avenues to pursue in trying to reduce both peak and base load water use.

5. Summary of results and feedback

There was no formal evaluation of the Regional Council's summer water conservation activity prior to 1998⁴. A baseline survey in 1997⁵ reported that most people didn't associate water conservation with gardening activity; just 16% mentioned watering the garden less (the sixth most commonly mentioned action) while 6% mentioned using a trigger on their hose. When it came to taking action, 7% of respondents claimed to have watered their gardens less in the last 12 months (14% of those who had taken any steps to save water).

Following Utility Services' conservation campaign of 2001, a survey⁶ found awareness⁷ (without prompting) of five specific gardening-related conservation methods (awareness range from 10% to 27%). This apparent increase in knowledge is also evident from a qualitative survey from mid 2002⁸, when awareness of the same five behaviours was assessed as being 'moderate' or 'high-moderate'. In the 2001 quantitative survey, 43%⁹ of all respondents claimed to have taken action to save water *in the garden* that summer.

Public awareness and recognition of the need to conserve water is generally viewed as important to any water conservation programme. Several studies show that the metropolitan region's population typically believes that water conservation is important where they live (60% and 75% in two

⁴ 1997/98 Summer Water Conservation Campaign Proposal, 23 September 1997

⁵ Quantitative Water Survey Report, Colmar Brunton, October 1997

⁶ 2001 Summer Water Campaign, Colmar Brunton, April 2001

⁷ Awareness based on spontaneous recall of methods mentioned in our advertising, which probably understates total awareness of those methods

⁸ Water Conservation and Garden Watering Attitudes and Actions, NFO NZ, August 2002

⁹ This reports only the actions of people who recalled our advertising (67% of respondents recalled our advertising, 69% of that 'aware' group took some action and 94% of the 'took action' group maintained that action.).

studies). However, our research has also indicated that many people either don't believe that the Regional Council sometimes struggles to meet demand during summer or are unsure (46% and 63% in two studies). Most people (86%) don't think irrigation is a large part of their summer water use and a majority of people (54%) don't think they could do more to conserve water in the garden.

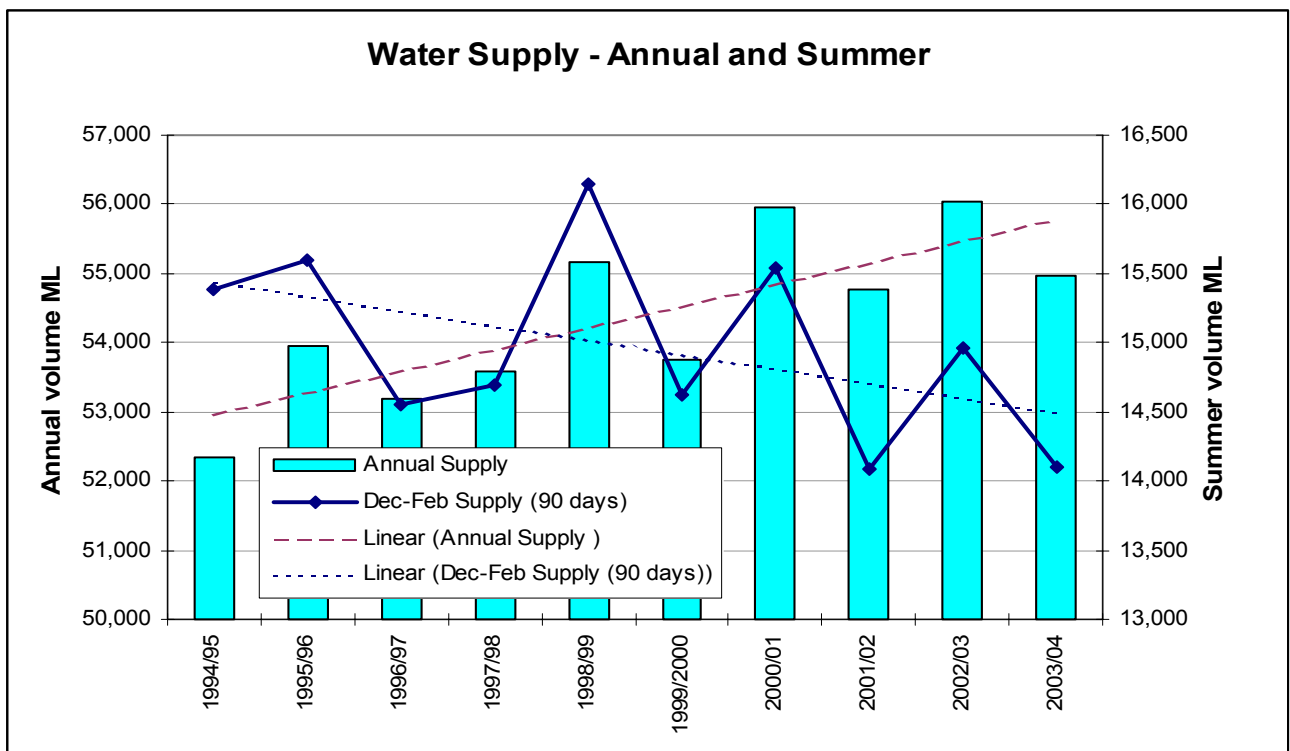
These results indicate useful progress in terms of top-of-mind awareness for appropriate gardening/watering actions and for taking some action (although there is no way to verify whether the self-reporting of actions is accurate). However, they also suggest that many people either don't recognise or are unclear about the potential impact of garden irrigation or particular watering practices on peak summer water use, which may be holding back the further transfer of knowledge to action.

It is not possible to measure actual water use change as a result of our advertising, because of a range of variables – notably weather conditions – which mask any impact that our advertising may be generating. An analysis of trends appears below.

Feedback about the content and value of the treatment plant tours we offer has been sought from visitors since July 2002. Visitors are asked to rate various aspects of the tour on a five-point scale. The feedback received has been highly complimentary in almost all cases (four or five out of five).

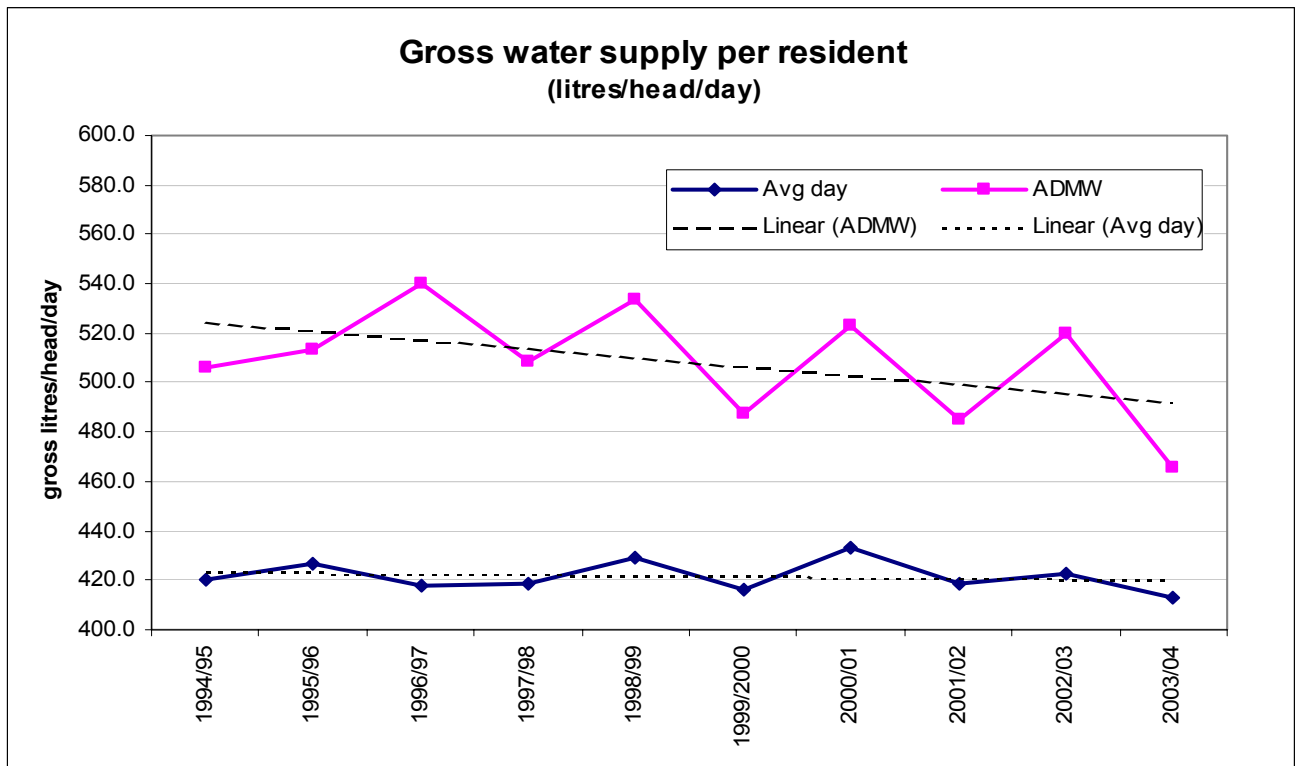
6. Water use trend

Over the last 10 years the total annual volume of metered water supply to our customers has increased by an average of 0.6 percent per year. Over the same period, total supply in summer (1 December to 28 February) has decreased by an average of 0.7 percent per year.



During that same 10 year period the estimated usually resident population has increased by 6.4 percent¹⁰: an average of 0.7 percent annually. This essentially means that gross annual water supply per resident over the period is unchanged (average decrease of 0.2 percent per year¹¹).

Greater Wellington’s main water conservation promotion has targeted summer watering activity, in an attempt to reduce peak demand levels for water. Analysis of the average day water supply volume during the maximum supply week (ADMW) in each of the last 10 years shows almost no change. However, when calculated relative to the usually resident population, maximum week supply per capita has reduced by an average of 0.7 percent annually since 1994/95.



ADMW = Average Day of Maximum Week

These results are likely to have been influenced at least in some part by other factors, such as climatic variation. However, the reducing peak per capita water use trend coincident with a campaign targeting more efficient garden irrigation methods during summer in each of the last seven years indicates some value in that approach.

7. Customer City Councils’ water conservation activity

The summer water conservation campaign run jointly with our water supply customers has been the most significant demand management activity within the metropolitan region over the last decade.

¹⁰ Usually resident population estimates at 30 June 1st for the years 1996-2003 from Statistic NZ. A conservative estimate has been adopted for 30 June 2004 (unchanged from 30 June 2003). The population at 30 June 1995 was estimated using a straight-line increase between the 1991 Census figure and the estimate for June 1996.

¹¹ This reflects bulk supply only, so excludes any reduction in losses from our customers’ reticulation systems.

The territorial authorities employ a variety of tools for supply and demand management in support of water conservation. At a base level, zone and sub zone metering of council reticulation systems is being managed/enhanced to provide monitoring of consumption patterns and identification of priority areas for leak detection and repair. Garden watering restrictions are used by each of the four city councils to manage peak flows and encourage efficient watering practices.

Other methods employed by one or more councils include local advertising - of watering bylaw rules, summer water demand levels and water conservation tips - bylaw enforcement patrols, 'listening' surveys for leak detection and repair, and use of council web sites to provide water use and conservation related information and links.

Upper Hutt City Council has proposed to install water meters on all domestic water consumers from 2006/07¹². A shift to unit based pricing to accompany metering is implied. An associated reduction in water use of approximately 25% is anticipated from this initiative¹³, which represents slightly over two percent of Greater Wellington's total annual supply.

8. Where to from here

8.1 Measure to manage

Greater Wellington's modelled system yield is forecast to meet the unconstrained¹⁴ water needs of a population of 377,000 to the 1-in-50 year security of supply standard that was adopted after consultation with our customers. The Regional Council's Ten Year Plan (2003-13) notes that our current sources and treatment plants may reach capacity some time around 2020. The latest usually resident population estimate is 363,400: if the recent rate of increase in estimated population were to continue, then further system capacity or previously unused demand restrictions may be necessary as soon as 2007 to keep the risk of shortfall at less than two percent. This situation has been conveyed to our customers and we will continue to monitor population change trends and per capita water use closely. The estimated resident population at 30 June 2004 is expected to be available from Statistics NZ by November this year.

Sustainable yield modelling shows that our security of supply standard may not be achieved when sustained periods of low rainfall result in a sustained shortfall of consented water take relative to demand. The Stuart Macaskill storage lakes would be used to make up the shortfall and would be drawn down over weeks of relatively high (summer) demand. Under this scenario there would be insufficient source water to replenish the lakes, while the first significant rainfall after the drought event may result in relatively turbid river water for treatment, adding further to the short-term challenge of satisfying unconstrained demand.

Relatively high demand associated with the irrigation of gardens during summer still represents the most pressing need for a demand management response, in terms of marginal cost of production, deferral of investment in new capacity, and the impact on our water sources.

¹² Upper Hutt City Council LTCCP 2004/05 to 2013/14, Page 83

¹³ Impact of residential metering on water levies, 24 May 2004, File B/05/08/01

¹⁴ Unconstrained other than the standard garden irrigation restrictions that each city council has in place

8.2 Best-practice drought forecasting

Greater Wellington is currently investigating with NIWA the workability of a drought-forecasting model based on climatic data. Our intention is to be able to provide a more systematic probability based approach to early warning of an impending water shortage. It is envisaged that a stepped demand management programme of public information and increasing restrictions on irrigation of gardens and other outdoor hosing would eventually be linked to the output of this tool. This project is potentially groundbreaking, but still at a relatively early stage of development. We anticipate the model being ready for first use during summer 2004/05.

8.3 Summer water conservation campaign

The Summer Water Conservation Campaign, addressing the impact of garden irrigation and low river flows in dry years and coupled with appropriate gardening and watering advice, will continue to be the significant demand management activity by expenditure.

The detail of our campaign for the coming summer has still to be developed and agreed with our customers. It is my view that the emphasis on “why summer and why garden irrigation” needs to be increased and that we need to make increased use of communication channels that allow messages and the level of activity to be modified at relatively short notice. These requirements indicate a shift away from television advertising. The proposed approach for the summer campaign 2004/05 should be ready to be presented to the Utility Services Committee in September.

We will review the opportunities for building new partnerships both to deliver the campaign to appropriate audiences and provide incentives to participate. As noted previously, this type of activity is likely to require significantly more staff time to pursue, but such activity has proven successful in other situations and is consistent with the direction of the Regional Council’s communication strategy.

8.4 Investigation of further co-operation with customers

A recent study for the Auckland region that undertook a multi-criteria analysis of demand management options (criteria were environmental, social/cultural, economic and implementation) identified planning control and regulation as necessary to drive greater value from subsidies and educational tools¹⁵.

Greater Wellington is only part of the metropolitan region’s water management chain and does not have a direct service relationship with water users. Our customers, the territorial authorities, set and enforce the regulations and bylaws within their boundaries and determine the way that water supply is priced to consumers. Unit based pricing, regulation and planning controls are considered to deliver a greater impact on reducing demand than ‘softer’ approaches such as education. Clearly any move to more comprehensive demand management measures must involve our customers, the city councils.

¹⁵ The Auckland Water Management Plan 2004, Technical Report, Table 9.6, page 124

8.5 The Auckland model

An Auckland-wide water management plan was recently agreed between the Auckland Regional Council, Watercare Services, and the local water network operators of the Auckland Region¹⁶. The plan seeks to establish a comprehensive and unified approach to managing the existing and future water needs of the Auckland region in a sustainable, wise and efficient manner.

The rationale for developing the Auckland Water Management Plan contains many arguments that also apply to the Wellington region. The two reports that comprise the Plan have been obtained from Watercare and copies provided to our customers for their consideration. In the coming weeks we intend to seek an expression of their interest in developing a similar co-operative plan for our region.

8.6 Metering

A recent memo to Councillors from Murray Kennedy¹⁷ outlined that metering of all households in the Wellington metropolitan area would be expected to reduce water use by approximately 25%. On that basis the current water levy would reduce by \$567,000 (an average of approximately \$5 per household). The capital cost of installing meters was estimated to be at least \$52 million, or \$400 per household. The annual cost of reading, maintaining and replacing meters would be additional. The cost of metering would need to be weighed against the environmental and cost benefits of deferring development of a new water source.

8.7 Other partnerships

Other potential partners include government agencies, the garden industry, educators, community-based groups and water consumers.

8.8 Water efficiency labelling

The recently published Water Management Plan for Auckland has reiterated the effectiveness of increased adoption of water efficient devices and appliances in reducing per capita demand.

A joint Australia/New Zealand water efficiency rating and labelling standard has recently been developed to cover common water use products such as dishwashers, clothes washing machines, taps, showerheads, toilet suites and urinals. This approach is similar to that already in use electrical efficiency rating and labelling of appliances.

The scheme is currently voluntary, although Australia is moving towards mandatory water efficiency labelling for dishwashers, clothes washers, toilet suites and shower heads: this may become effective in early 2005. Australian Federal Law personnel have contacted the Ministry for the Environment (MfE) regarding New Zealand introducing parallel legislation. The MfE is currently investigating the impact of such a move¹⁸.

¹⁶ From the Sky to the Sea, framework and technical reports, Watercare Services Limited, February 2004

¹⁷ Impact of residential metering on water levies, 24 May 2004, File B/05/08/01

¹⁸ Report to Water Supply Managers' Group Meeting, 1 April 2004

Greater Wellington Water endorses the national Water Supply Managers Group's (WSMG) support for the introduction of mandatory water efficiency labelling in New Zealand. The view of the WSMG has been conveyed to the MfE. If mandatory labelling were introduced here we would look to encourage consumers to use the scheme to inform their purchase choices, via the water conservation information and advertising channels that we were then using.

8.9 The garden industry

The garden industry, including product manufacturers and retailers, has the potential to be very effective at delivering water conservation education and advocating appropriate products. However, while conservation of potable water nationally remains a low profile issue, there is relatively little incentive for the industry to commit resources in this area. There may be tactical opportunities locally through this channel, but a widespread and consistent focus on water conservation by the industry is only likely to come when a broad base of consumers demand it.

8.10 Consumers

Our research has indicated a substantial group of water users who believe water conservation is important and that they could do more to conserve water in the garden, but don't for a variety of reasons. Our summer water conservation effort will primarily attempt to overcome the obstacles to change for this group.

Various research studies over the last decade have highlighted the importance of unit based pricing and/or obvious water shortages in giving impetus to more widespread and effective use of water conservation measures by consumers. Neither of these drivers exists at present in relation to Greater Wellington's water supply to the metropolitan region. Investment in new capacity is likely to occur before water shortages are allowed to have a significant impact on consumer behaviour.

Unless water is priced to encourage its careful use or the regulation and control side of demand management is given greater emphasis, education and incentive tools are likely to remain relatively cost inefficient and/or underused by consumers and therefore our achievements are likely to remain modest.

8.11 Education opportunities

In addition to the web based and printed resources already available, we have identified two areas for development.

There is a body of detailed 'how to' garden water conservation advice available, from a range of credible sources, that is not currently available on Greater Wellington's web site. Providing links to this information in conjunction with advertising the Council's web address as a source of conservation advice is seen as a useful and cost effective way to promote a deeper level of appropriate actions to people who are already active at some level in conserving water.

We are also seeking to increase the number of school students studying water and visiting our treatment plants by introducing a new resource for teachers of year 3-8 students (age 8-12). For a range of study activities relating to water supply, the resource will demonstrate links to the national

education curriculum and appropriate achievement objectives. It is being written by an education consultant to be used in conjunction with a tour to one of Greater Wellington's water treatment plants, which is consistent with the criteria for the 'Learning Outside the Classroom' component of the curriculum and provides an opportunity for us to directly engage students. Several schools will trial the resource during term three of the 2004 school year. Review and final changes will follow.

9. Summary

- Greater Wellington Water's current demand management activities are educational only, apart from contributing to customer decision making about whether to introduce more limiting watering restrictions.
- Demand management is primarily focused on reducing water use for garden irrigation during summer. This approach is considered the most likely to maintain water use within the capacities of current water sources and supply assets.
- Recent water use patterns indicate a modest reduction in summer and peak summer water use per head of population. Total water use in summer shows a decreasing trend. However, there is no decrease in the trend for total volume of supply in the maximum supply week of each year.
- Education is typically a foundation for effective demand management. However, using a wider set of tools including more prescriptive measures tends to yield more significant results.
- A more comprehensive demand management programme would primarily require the agreement and active participation of our customers. We are currently investigating whether there is support for such a programme, with particular reference to the co-operative water management plan recently adopted in Auckland.

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