Watercare
An Auckland Council Organisation

Auckland Regional
Water Demand Management Plan
2013 - 2016

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Executive Summary

About 80% of the world's population lives in areas where the fresh water supply is not secure, according to research published by the magazine *Nature* in September 2010. New Zealanders are lucky enough to be part of the remaining 20%. However, the common belief that water is plentiful in New Zealand and consequently does not need to be used wisely is mistaken. The 1994 drought in Auckland and the 2013 drought in most parts of New Zealand show that at times water scarcity is a reality in temperate climates.

Demand management is about reducing the amount of water we all use. This delivers:

- Immediate benefits to water users
- Long term benefits for Watercare and for everyone in the region
- Reduced environmental impacts
- Acknowledgement of enhanced opportunities to express Kaitiakitanga.

Watercare Services Limited is the water and wastewater service provider for Auckland. It is a Council Controlled Organisation, wholly owned by Auckland Council. It operates assets valued at $7.8 billion and provides 119 billion litres of drinking water annually to 1.35 million customers.

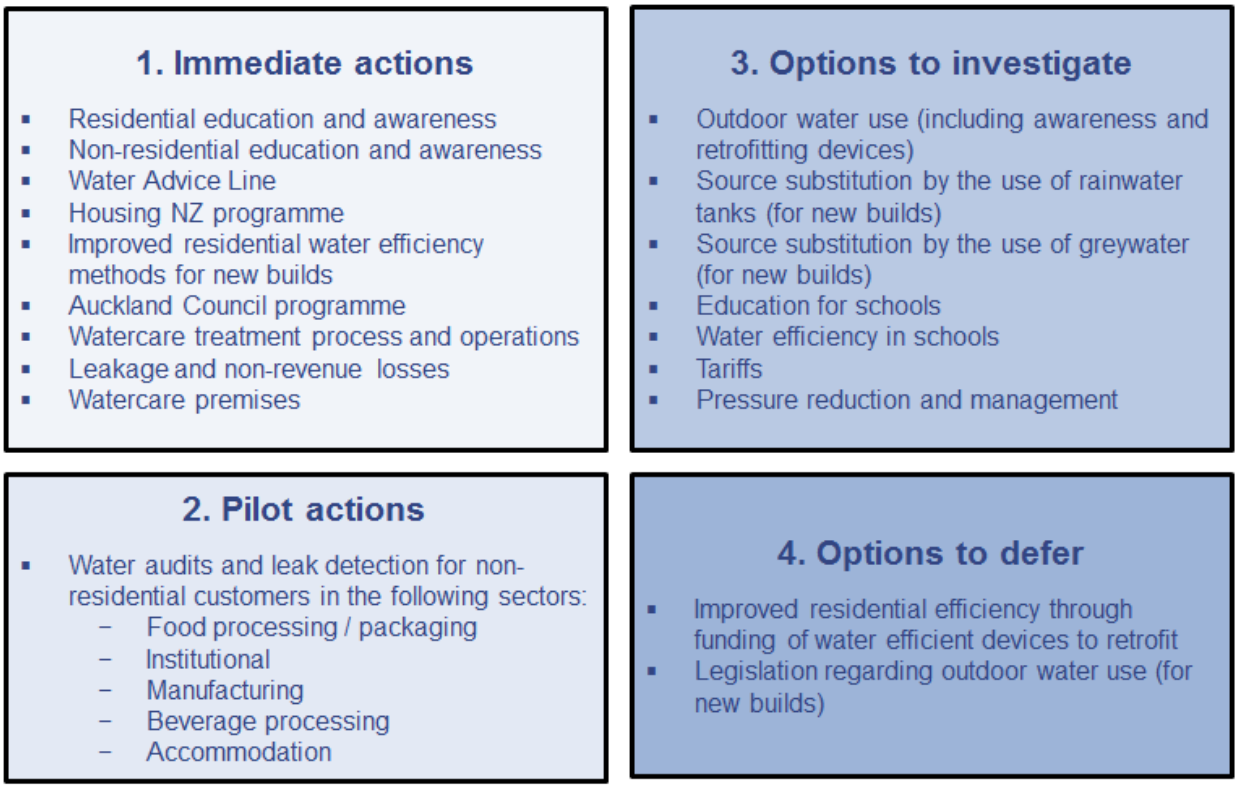
In the 2011 Auckland Regional Demand Management Plan (DMP), Watercare adopted a demand management target of 15% reduction in gross per capita consumption by 2025, compared with 2004 usage levels of 298 Litres per person per day. The target is a gross per capita consumption of 253 Litres by 2025. Auckland is currently tracking well as we are outperforming the intermediary 2013 target by 5 Litres per person per day. Per capita water use is already the lowest in New Zealand. However, the region will need to make estimated savings of 35 MLD (Megalitres a day) on current levels of consumption to reach the target in 2025. This is an ambitious target as 35 MLD is the equivalent of volume of water available from a medium size dam of the Auckland region when used in conjunction with the other sources.

This 2013 Plan updates the 2011 DMP. It doesn't change the target. Its purpose is to provide new data analysis, assess the programmes that have been implemented to date, identify additional actions to be developed and areas where effort should be directed. It provides actions and timeframes for implementation. Demand management options are targeted at the different sub-sectors that contribute to the overall demand for water in Auckland.

The two most important factors which affect Watercare's approach to water management in the future are population growth and peak demand. By 2051, the population of Auckland is forecast to increase by 57%. This population increase will require substantial investment across all infrastructure sectors, including the supply of water. Besides, infrastructure is sized to meet peak demand. It is important that demand management initiatives contribute to reducing demand all year round and above all during peak. This will enable the provision of further infrastructure to be deferred.

Watercare has based this update of the 2011 DMP on the *Guide to Demand Management* (2008), developed by the Water Services Association of Australia (WSAA). This framework represents one of the available best practice methods for demand management. Potential approaches to demand management were developed by considering existing information and best practice. This included bringing together previous demand management approaches used in Auckland and New Zealand, best practice from overseas and a review of how customers in Auckland use water. This information was combined with the drivers for water supply in Auckland in the future.

Following this work, a suite of options and actions have been selected to meet the 2025 target. These are categorised as immediate actions, pilot actions, options to investigate and options to be deferred.



The immediate and pilot actions are expected to generate savings of 19 MLD. This means that potentially further savings of up to 16 MLD will be required, either by extending the immediate and pilot options, or by implementing options that will be investigated.

Demand management is a journey. The journey includes Watercare and its customers. It involves changes to behaviour, new technologies and different management practices. This Demand Management Plan is therefore a live document and will be reviewed every 3 years. This will include monitoring and evaluation of each of the existing demand management measures and demonstration of progress towards the overall target. This will enable the Plan to be re-focused on new or existing options, to enable the target to be achieved by 2025.

1 Introduction

1.1 Demand Management

About 80% of the world's population lives in areas where the fresh water supply is not secure, according to research published by the magazine *Nature* in September 2010. New Zealanders are lucky enough to be part of the remaining 20%. However, the common belief that water is plentiful in New Zealand and consequently does not need to be used wisely is mistaken. The 1994 drought in Auckland and the 2013 drought in most parts of New Zealand show that at times water scarcity is a reality in temperate climates.

Demand management is about reducing the amount of water we all use. This delivers:

- **Immediate benefits to water users,** since volumetric charging means water savings result in lower water and wastewater charges. Reduced use of hot water also reduces energy costs.
- **Long term benefits for Watercare and for everyone in the region,** achieved through delaying the need for a new water source and additional water and wastewater treatment capacity.
- **Reduced environmental impacts**, as less abstraction means more water for the environment and less infrastructure construction. Less wastewater is produced, treated and discharged into the sea. Less energy is used for treating and pumping water and wastewater, resulting in a lower carbon footprint.
- **Acknowledgement of enhanced opportunities to express Kaitiakitanga,** as catchment management and the preservation of water resources is of primary importance for Tangata Whenua.

Demand management is a long term commitment to more efficient water use. Consistent and ongoing work is required to achieve enough water savings to delay the need for further water abstraction and infrastructure.

1.2 Watercare Services Ltd

Watercare Services Limited is the water and wastewater service provider for Auckland. It is a Council Controlled Organisation (CCO), wholly owned by Auckland Council. It operates assets valued at $7.8 billion and provides 119 billion litres of drinking water annually to 1.35 million customers.

By law Watercare has to manage its operations efficiently with a view to keeping the overall costs of water supply and wastewater services to its customers (collectively) at minimum levels. The company does not operate to make a profit and is prohibited by statute from paying a dividend to its owner.

1.3 Demand management target

In 2008, Watercare collaborated with the local councils of Auckland on the *Three Waters Strategic Plan*. One of the key proposals of the plan was to suggest reduction of the 2004 gross per capita

consumption (PCC) by 15% by 2025[1]. The target is significantly greater than the previous one established in the *From Sky to Sea* report published in 2004, which was aiming at a 5% reduction.

Amalgamation of the former councils in the Auckland region in November 2010 allowed Watercare an opportunity to review the regional approach to demand management. The *Auckland Regional Water Demand Management Plan* (2011) (DMP) was a result of this review. Following this document, the 15% demand management target was approved by Watercare's Board of Directors and is now part of our *Statement of Intent* (2012). We have worked with various stakeholders and organisations to implement some of the options described by the plan, which have helped to manage water resources and reduce water consumption already.

Watercare reports annually on the Auckland region's progress towards reducing per capita demand.

1.4 Development and purpose of this Plan

This 2013 Plan updates the 2011 DMP. It assesses the programmes that have been implemented to date, identifies additional actions to be developed and areas where effort should be directed. It uses analytical techniques to provide actions, key performance indicators (KPIs) and timeframes for implementation. Demand management options are targeted at the different sub-sectors that contribute to the overall demand for water in Auckland.

Watercare has based this Plan on the 2011 DMP and on the *Guide to Demand Management* (2008), developed by the Water Services Association of Australia (WSAA). This framework represents one of the available best practice methods for water resource planning, including demand management. By following this approach, we show that a robust methodology underpins our Demand Management Plan.

This Plan sets out how Watercare aims to achieve the gross PCC target, with a detailed list of activities for the next 3 years.

1.5 How to read this Plan

The WSAA *Guide to Demand Management* presents a number of steps, including:

- Planning the overall process
- Analysing the situation
- Developing the response
- Implementing the response
- Monitoring, evaluation and review.

An extract from the WSAA *Guide to Demand Management* illustrating this framework is presented in Appendix C. This framework is summarised as Figure 1, which also shows how this Plan follows these steps and where the different aspects of this framework are included. This diagram enables the reader to refer directly to the different sections of the Plan that are of interest to them. Step 1 was completed prior to development of this Plan.

[1] Gross per capita consumption is the overall water use in Auckland divided by the number of inhabitants connected to Watercare's water supply. 2004 gross per capita consumption was 298 litres per person per day (L/p/d). See section 2.1.3 for further information.

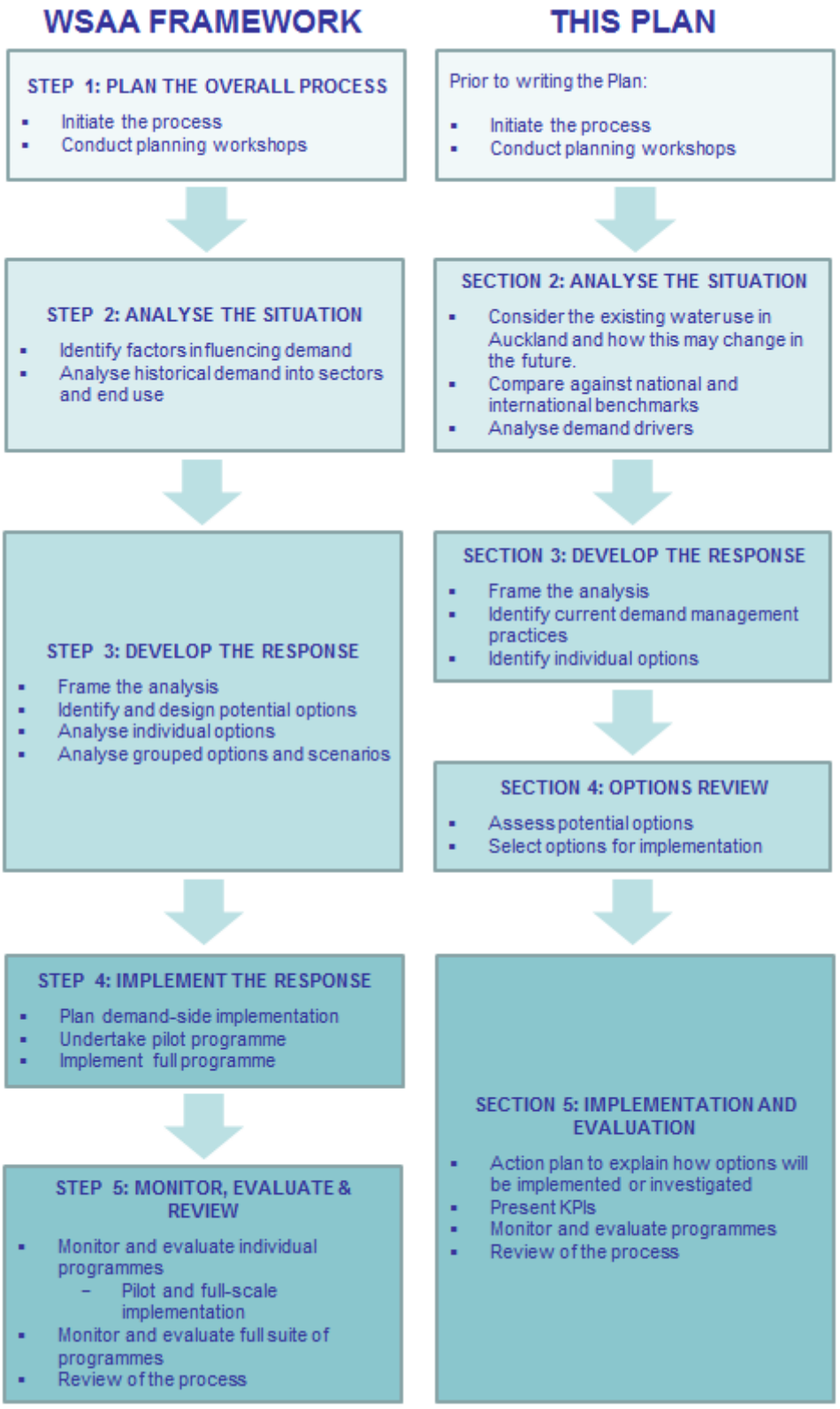


Figure 1: Mapping the WSAA framework to this Plan

2 Analyse the situation

This section introduces key concepts of supply and demand in Auckland. It follows step two of the WSAA framework. It analyses Auckland's water consumption, compares our water use against benchmarks and explains the factors which drive demand.

WSAA FRAMEWORK	THIS PLAN
STEP 2: ANALYSE THE SITUATION ▪ Identify factors influencing demand ▪ Analyse historical demand into sectors and end use	**SECTION 2: ANALYSE THE SITUATION** ▪ Consider the existing water use in Auckland and how this may change in the future. ▪ Compare against national and international benchmarks ▪ Analyse demand drivers

2.1 Water use in Auckland

2.1.1 Water supplied

This section provides an overview of how water is used in Auckland, how population has increased and the volumes of water supplied to meet Aucklanders needs.

Customer base

Watercare supplies water to a wide customer base including residential, commercial, industrial, institutional and agricultural users. The majority of water is used by Watercare's residential customers, although there is also a substantial demand from the industrial, commercial and institutional sectors, grouped under "non-residential".

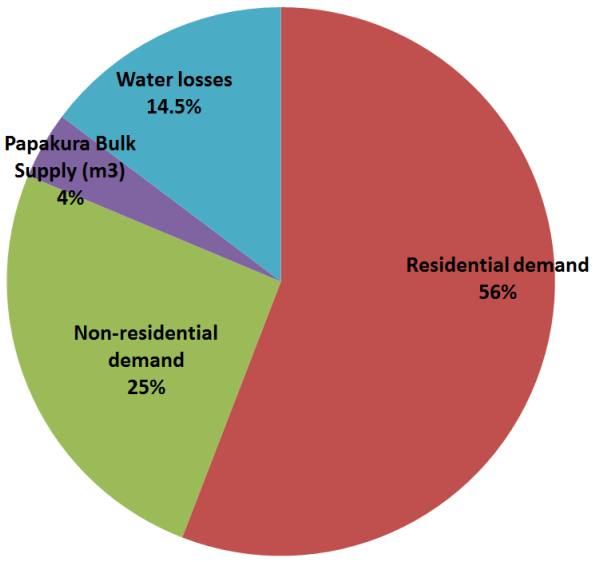


Figure 2: Typical volume consumption by customer type and non-revenue water

The non-residential sector currently includes buildings managed by Body Corporates, which include non-residential users but mostly residential users. Work has started to better categorise the two, which will increase the share of water used by residential customers and decrease the non-residential share.

Water losses are also included in Figure 3, which is leakage through the water supply network. See section 2.5 for further information.

Connected population

Over the last ten years, the population of Auckland connected to the Watercare network has increased from 1.1 million to over 1.3 million. This is an increase of approximately 23%. This increasing population puts pressure on the volumes of water needed to cater for Auckland's growth.

Volume of water supplied

During the 2011-2012 period, we supplied Auckland with approximately 370 million litres per day (MLD) of water. Figure 3 shows that until 2007, the water supplied tended to increase in line with the increased population. Since 2007 total consumption has become more stable. Potential reasons for this are discussed in section 2.1.3.

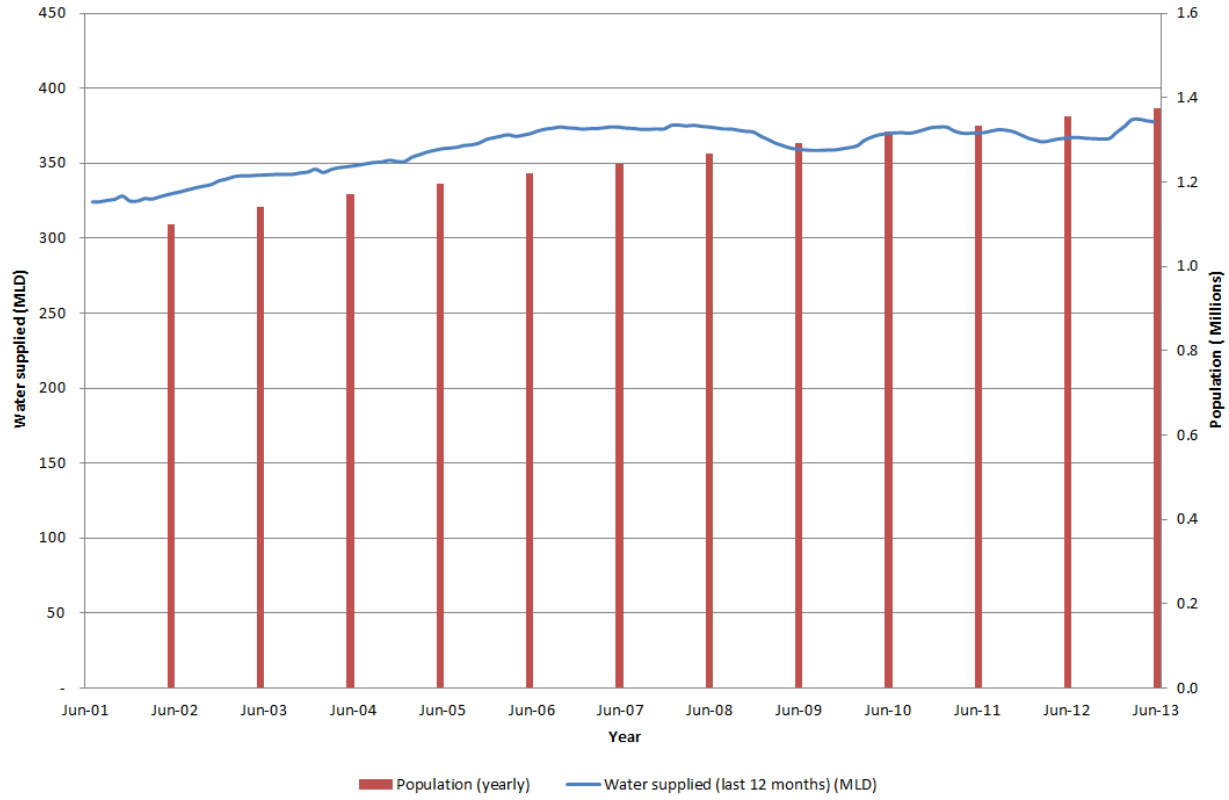


Figure 3: The water supplied to Auckland and population growth since 2001

2.1.2 Peak and average demand

Figure 4 illustrates the three day rolling averages of water supplied for the financial years 2010, 2011, 2012 and 2013. Each year follows a similar trend, with consumption increasing over the spring and summer months, from November through to March. There is generally a reduction in consumption during December, which corresponds with the Christmas period.

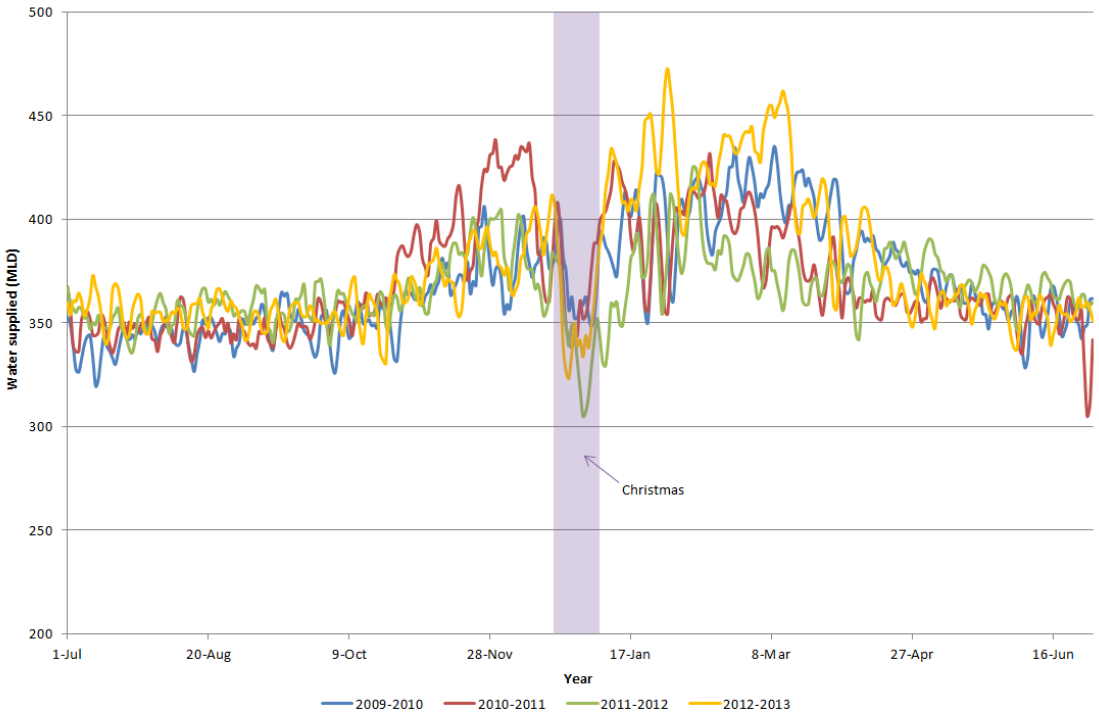


Figure 4: Three day rolling average of bulk supply volumes (2009-2013)

This analysis highlights the difference between average and peak demand. The difference between the average annual consumption and the three day peak demand for these years is between 16% and 25% or almost 100 MLD. This is similar to the entire daily water supply for a city the size of Hamilton. Watercare needs to develop and maintain water resources and treatment capacity to meet this peak demand, although these sources and plants may not be fully utilised for the remainder of the year.

Providing sufficient water to meet peak demand is one of the main drivers for Watercare's water resource needs. Consequently, efficient demand management for Auckland should have an impact on water demand all year round including reduced peak water demand. This is the only way to delay the need for new water sources. Demand management initiatives that would only reduce average demand and not reduce peak demand will be of lower interest. Table 1 summarises the difference between average and peak demand.

Table 1: Analysis of water supplied

Financial year	Average (MLD)	Three day peak (MLD)	% increase
2009 - 2010	369	435	17.8
2010 - 2011	370	438	18.4
2011 - 2012	367	425	16.0
2012 - 2013	376	473	25.6

2.1.3 Overview of per capita consumption

Gross per capita consumption (PCC) is the total water supplied divided by the total connected population. Residential PCC is the total residential water consumption divided by the total connected population. Gross PCC is the KPI that Watercare reports on to its shareholder Auckland Council. Residential PCC is used internally to better understand how household water use is evolving compared to businesses water use.

Auckland went from a population of less than 700,000 inhabitants in 1980 to 1.3 million people in 2013. Despite this massive growth, the demand for water has been controlled. Figure 5 shows how the total demand for water (shown in blue) has only increased by approximately 100,000 cubic metres per day over the same time period. This is due to the reduction in gross PCC, which is shown in red on Figure 5. Thirty years ago this stood at over 400 Litres per person per day and reduced to 298 in 2004. In 2013 this has reduced again to approximately 274 Litres per person per day.

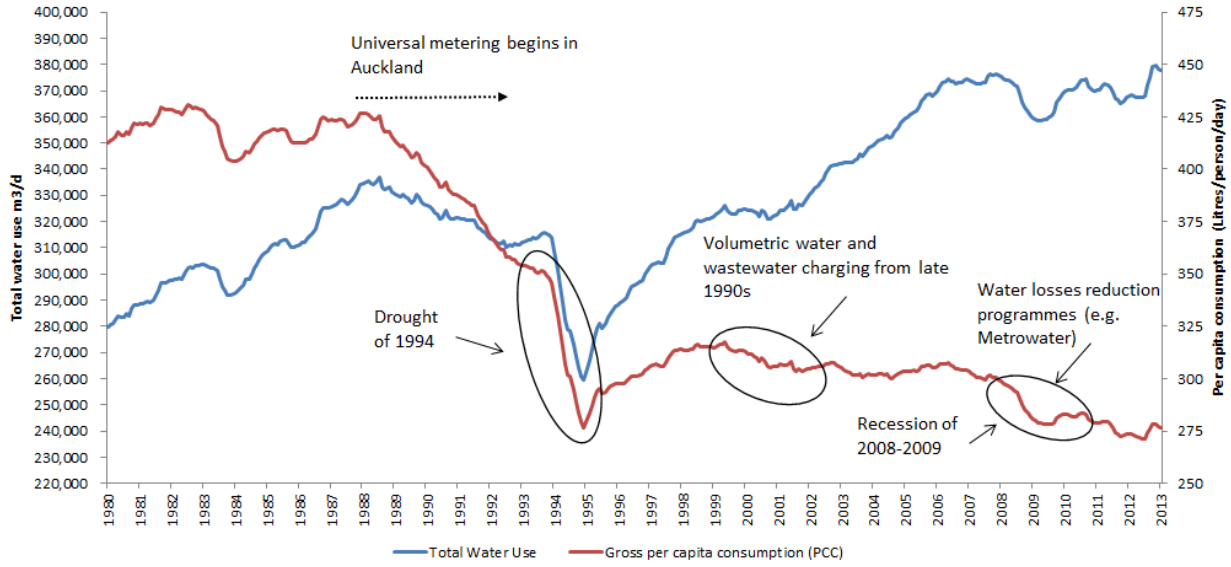


Figure 5: Auckland's historical water use (1980-2013)

There are a number of significant events and programmes highlighted in Figure 5 that have influenced and changed historical water use. Events include the 1994 drought and the recession in 2008/09. Significant demand management measures include the introduction of universal metering (including Auckland City from 1990 to 1992), volumetric wastewater charging by some Local Network Operators from the late 1990s onwards and non-revenue loss programmes. Auckland has already come a long way in terms of reducing water use. This section elaborates on the difference between and importance of gross and residential per capita consumption (PCC). It also covers the influence of pricing, the economy and climate, as well as improving our understanding of PCC in Auckland.

The calculation of gross PCC for Auckland is based only on the metropolitan supply area, i.e. those customers who are connected to the main metropolitan supply. There are areas outside of the metropolitan area that Watercare supplies, such as Helensville, Waiuku and Warkworth. The gross PCC target is based on the consumption of customers connected to the metropolitan network, although this Plan applies to all of Auckland.

Figure 6 shows how gross PCC has been reducing since 2006 and is now slightly below the target pathway. Gross PCC is influenced by a number of factors, including residential and non-residential consumption, climate, Watercare's own demand for water and leakage. Details of the PCC calculations are included as Appendix A.

2013 gross PCC is higher than 2012 gross PCC because of a dry 2013 summer, increasing outdoor water use. Gross PCC is still following a decreasing trend but is expected to stabilise between 270 Litres per person per day (Lpd) and 280 Lpd if no further demand management initiative is taken. This is the underlying assumption for the quantification of necessary water savings in section 3.1.

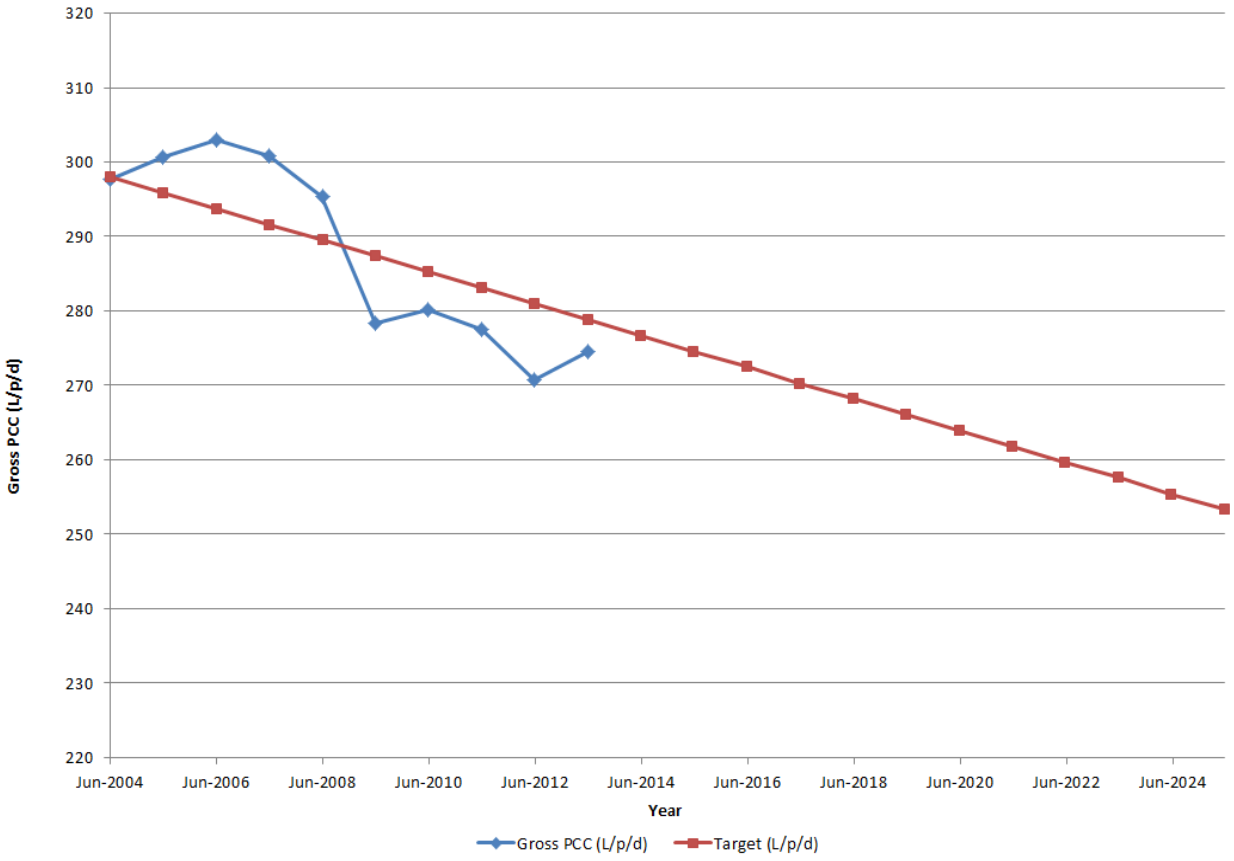


Figure 6: Auckland's demand management savings pathway

Gross and residential per capita consumption

The total water supplied has stabilised since 2007 (as shown in Figure 3). This is reflected in the reduction in gross PCC over the period from 2007 onwards (as shown in Figure 6). This period includes a significant drop in both the water supplied and the gross PCC in 2009. The source of this reduction is attributed to the 2008-2009 recession and is being investigated by Watercare.

Gross per capita consumption is often used in New Zealand as a KPI for water supply. To gain a more thorough understanding of water use and then efficiently act on it, it is important to assess the breakdown of demand across different water users. Residential PCC is particularly important, as this indicates how much water households are using. Water is also supplied to industry, commercial and institutional users. These sectors have very different dynamics from residential water users.

Figure 7 shows the breakdown of water supplied over the last three years to residential and non-residential users, the Papakura bulk supply and non-revenue water. The Papakura bulk supply is separated out as no breakdown is available for residential and non-residential demand in this area. For the same reason, the Papakura population was excluded from the residential PCC figures. Over this period of three years:

- Gross PCC reduced by approximately 10 L/p/d; but
- Residential PCC has remained broadly constant.

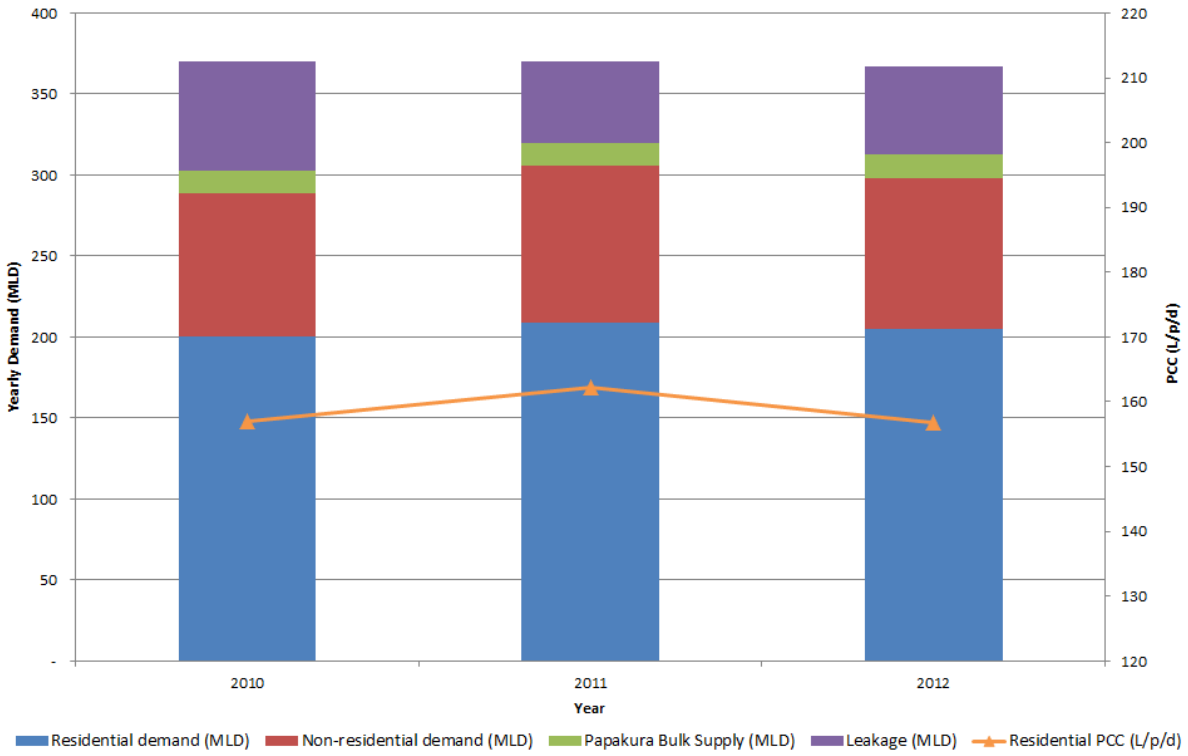


Figure 7: Consumption classification for 2010-2012

Therefore the residential PCC has not shown the same trend in reduction as gross PCC in the last three years. These limited data suggest that the change in gross PCC is not always linked to a reduction in residential consumption. In the last three years, it was potentially a result of the increasing population and the ratio of residential to non-residential demand coupled with reduction of non-residential water use due to volumetric charging of water. However, in the years before there have been clear reductions in both residential and gross PCC linked with demand management initiatives like pricing regimes and universal metering.

Demand management is a partnership between Watercare and customers whereby both parties need to play an important role. It is important for Watercare to put in place the framework for water efficiency, to which customers respond.

Influence of charging regimes and pricing on per capita consumption

All water supplied in the Auckland region is metered, with the price of water being the same for both residential and non-residential customers. Water is charged volumetrically at a rate of $1.343 per 1,000 litres (GST inclusive, 2012-13 prices). The water used in Auckland reduced significantly following the introduction of metering and this has been a key component of managing demand to date.

Some work has been carried out to assess the price elasticity of water in Auckland (Covec Ltd, September 2011). This work suggests that the price elasticity is low, particularly for residential customers. This means that the demand for water is relatively insensitive to the price of water. The decrease in water use following the introduction of metering is due to the “user pay” system introduced by volumetric charging. Paying for their own actual usage is a great financial incentive for users to be more water-wise. Volumetric charging helped decrease water use in Auckland, though pricing has a much lower impact.

Influence of the economy on per capita consumption

There are a number of factors which influence water demand, including the recession of 2008-2009 which may have contributed to the significant drop in consumption over this period. Covec published a report in 2011 titled *Water Demand Drivers and Forecasting: Analysis of Demand Drivers in Auckland*. This report used a time-series analysis which identified the drivers of changes in total water demand over time.

The results of this indicated that climate variables (monthly mean temperature and soil moisture deficit) demonstrated the strongest statistical significance towards influencing demand.

Influence of climate on per capita consumption

Figure 8 shows the effect summer rainfall has on annual gross PCC. The chart shows summer rainfall (December to February) against the long term trend for normal, below normal and above normal conditions[2] .

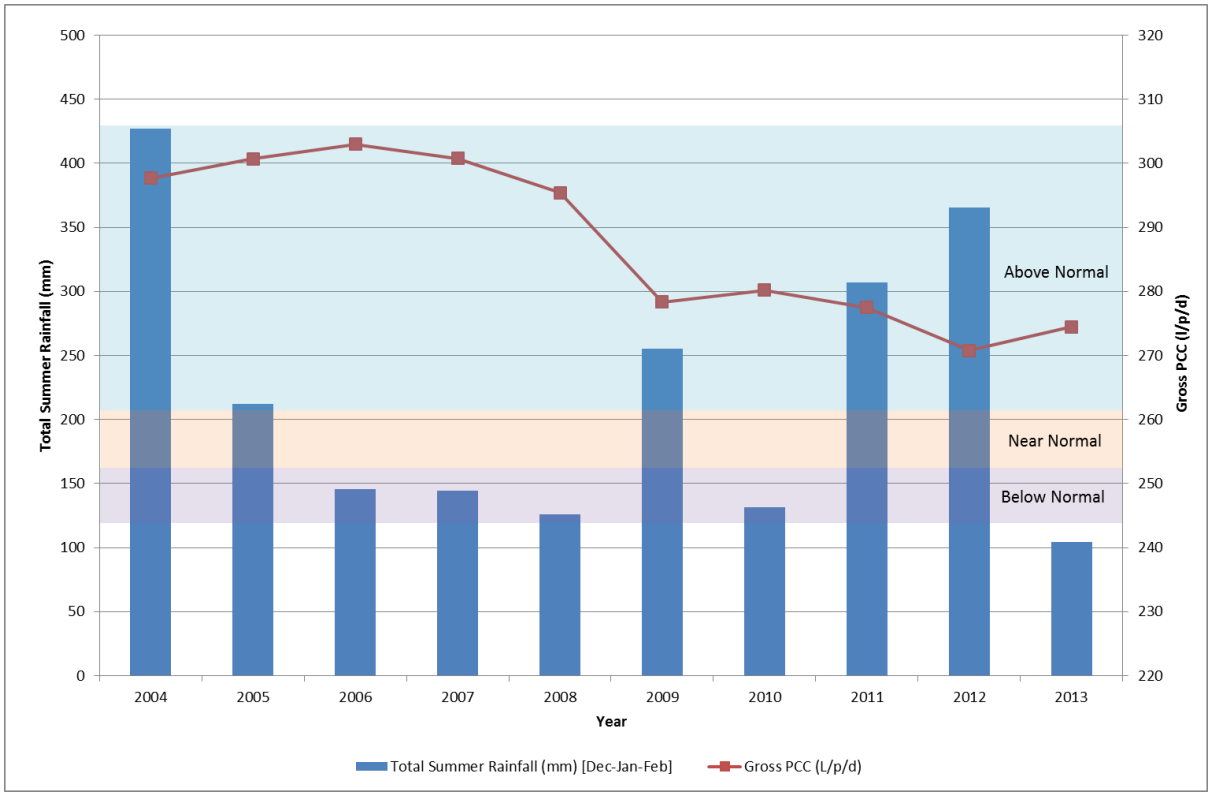


Figure 8: Total summer rainfall and gross PCC since 2004

This shows that summer rainfall tends to influence gross PCC. When adjacent years are compared, gross PCC is lower in wet years and higher in dry years.

2013 has been the year with the lowest level of summer rainfall in the last ten years, which was a major contribution to gross PCC going up this year. However, it is noticeable that 2013 gross PCC is lower than gross PCC in previous years that were not as dry.

Improving our understanding of per capita consumption in Auckland

Watercare will continue to monitor and review consumption data to identify trends and will use this information to inform its approach to demand management. As part of this work, Watercare is supporting a Doctorate student to conduct research on the "*Future Implications of Past Domestic Usage Trends*". This research will investigate the reasons for the reduction in residential demand over the last 10 years and the effect Auckland's strategic plans will have on these trends. The research will also cover the implications on water use over time of the replacement of appliances, changes in technology and changes to the current housing stock. Data from this research is not expected to be available before 2015, but will be important for Watercare's future planning.

[2] Based on 30 years of rainfall data from gauge C74082 at Auckland Airport

2.2 Residential water use

To understand how water demand management measures could reduce residential water use, it is important to first understand how water is used around the home. From February to September 2008, the Building Research Association of New Zealand (BRANZ) monitored the water use of 51 randomly selected households across the Auckland region. BRANZ monitored residential use in both the summer and winter periods to see how water use differs during the year. The results of this study were used to assess which water efficiency options can best be used to reduce water use in Auckland.

Some of the results of this study are presented as Table 2. While indoor use was similar between the two monitoring periods, the outdoor water use differed greatly. Summer water use tended to be approximately 10% higher than winter use.

Table 2: Water use identified in the 2008 BRANZ study

Season	Average residential water use	Median residential water use
Summer	179 L/p/d	143 L/p/d
Winter	174 L/p/d	130 L/p/d

Overall, the highest indoor water end use was the shower, followed by the washing machine and the toilet. Figure 9 shows how water use changes between summer and winter.

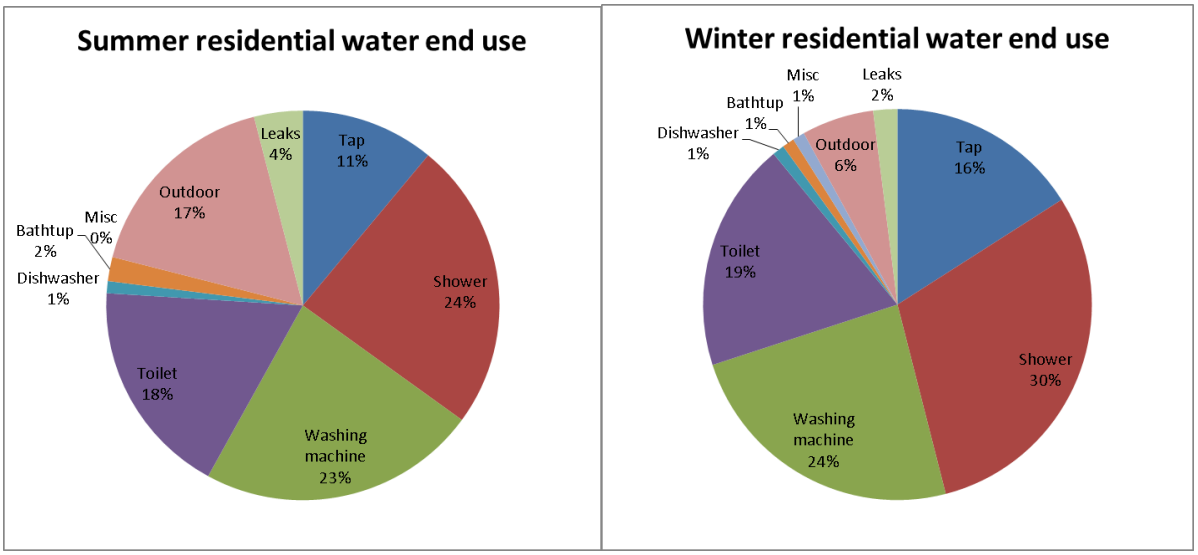


Figure 9: Residential water end use

The highest water uses are reviewed further below, to understand where water use could be reduced by this Demand Management Plan. Dishwashers, bathtubs and 'miscellaneous' are considered minor water uses, and a reduction of water use in these areas would not have a significant impact on overall water consumption. Showers, toilets and taps were all ranked according to the Water Efficiency Labelling Scheme (WELS) star rating. BRANZ has recommended that the WELS rating system should be reassessed for taps and showers as many installed systems currently have a high rating which reduces the incentive to improve efficiencies further.

Showers	On average showers are used less than once a day per person, with an average length of 6.6 minutes in the summer, 7 minutes in the winter and with an average flow rate of 8 L/min. A wide range of flow rates were recorded, ranging from 3 L/min, up to a maximum of 20 L/min. It is very likely that the average of Auckland showers has a flow rate closer to 13 L/min as recorded in many New Zealand and Australian cities.
Toilets	Most of the toilets analysed would receive a WELS rating of zero, with only 6% of toilets being classed as two stars or better. Toilets use an average of 6.7 L/flush, and are flushed just less than five times per person per day. Replacing inefficient toilets could have a significant impact on water demand.
Taps	Indoor taps, similar to showers, have a high efficiency with over 80% having a WELS 6 star rating. Flow restrictions would have a minimal effect in water savings, as although some taps are capable of high flows, they are not often used this way.
Washing machines	The BRANZ study found that the average water use for a load was 122 L/load, with a maximum of 190 L/load. On average there were 5.6 loads per household per week, or 0.35 loads per person per day. Replacing washing machines with more efficient models (or front loading washing machines) would greatly reduce residential water and wastewater volumes.
Leaks	Leaks include dripping taps and other fittings, as well as leakage from the supply pipe between the meter and the house. Leakage has a large impact on water use if undetected or ignored, and when fixed has the potential to provide significant savings.
Outdoor use	Outdoor use is dependent upon the season, with higher water use in summer. Only a small number of households were responsible for the high usage and were those households with both a swimming pool and a spa pool. The single highest outdoor usage was irrigation, which contributes to peak demand.

The BRANZ water use report highlighted the key areas where improvements could be made to reduce water use in and around the home. These include:

- Showers, where although the average water flow rates is efficient, a wide range was recorded
- Toilets, where upgraded designs use much less water than older models
- Washing machines, which on average are highly inefficient
- Leaks, where one in ten customers is likely to be wasting water unnecessarily.

2.3 Non-residential water use

In 2012 Watercare sponsored a Masters of Engineering research project that investigated how non-residential users consume water and their contribution to peak summer water demand. The research project reviewed non-residential water use between November 2007 and February 2012 for monthly metered accounts. One of the project's primary goals was to establish how non-residential water consumption was divided between the major sectors (commercial, industrial, institutional), and the corresponding subsectors (e.g. schools, agriculture, manufacturing). The results of this analysis were used to determine where savings could be made by non-residential users.

Figure 10 shows the distribution of non-residential water use between the major sectors. Industrial users account for the largest portion of non-residential water demand (40%) and institutional and commercial demands are fairly similar, at 30% and 25% respectively[3]. The 'other' section represents those accounts which could not be satisfactorily classified.

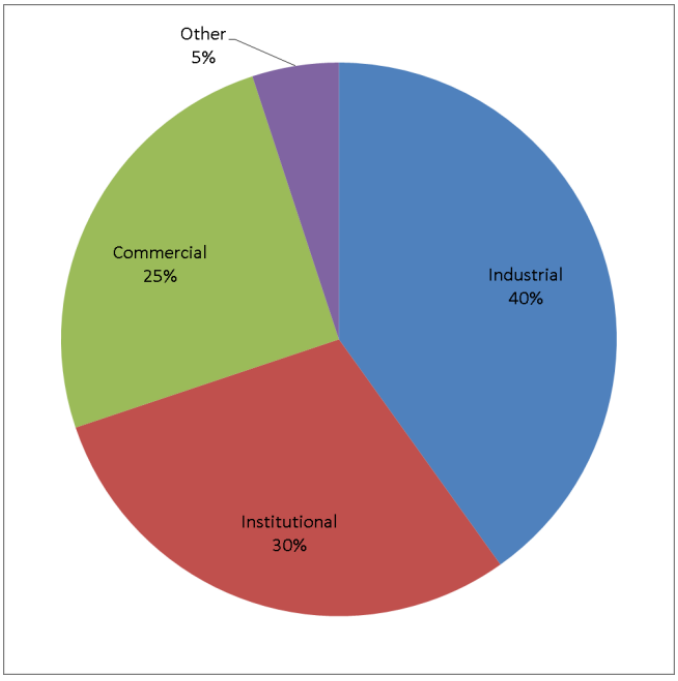


Figure 10: Distribution of non-residential water use

Further detailed analysis was carried out to estimate the proportion of non-residential water use in each of the subsectors[4] . The distribution of water use within each sector is illustrated in Figure 11 and described below.

[3] A limitation of this data is that many smaller accounts were excluded from this assessment as they were not metered on a monthly basis. This is likely to have excluded many Commercial users such as retail stores or supermarkets, and hence commercial demand may be greater than suggested by these results.

[4] The accuracy of these estimates was again affected by which users were included in the original dataset. A number of users were also removed during data processing due to meter reading inaccuracies, which is also likely to have influenced the distribution of water between subsectors.

Commercial	Accommodation, multi-storey offices, and shopping centres were the large consumers of water within the commercial sector. Major uses of water within these subsectors includes cooling (air conditioning and cooling towers), bathrooms (toilets and showers), and landscaping (irrigation of gardens).

Industrial	The food processing/packaging, manufacturing/refining, and beverage processing subsectors were the largest consumers within the industrial sector, and hence accounted for a major proportion of overall non-residential demand. Major uses within these subsectors fall under the label 'process', which generally includes water used for rinse processes and sanitation.

Institutional	The 'large institution' subsector is the highest consumer within the institutional sector and had the second largest demand of any subsector. The majority of the 'large institution' demands came from power stations, airports, and government accounts. Hospital water uses generally include cooling, bathrooms, and landscape irrigation.

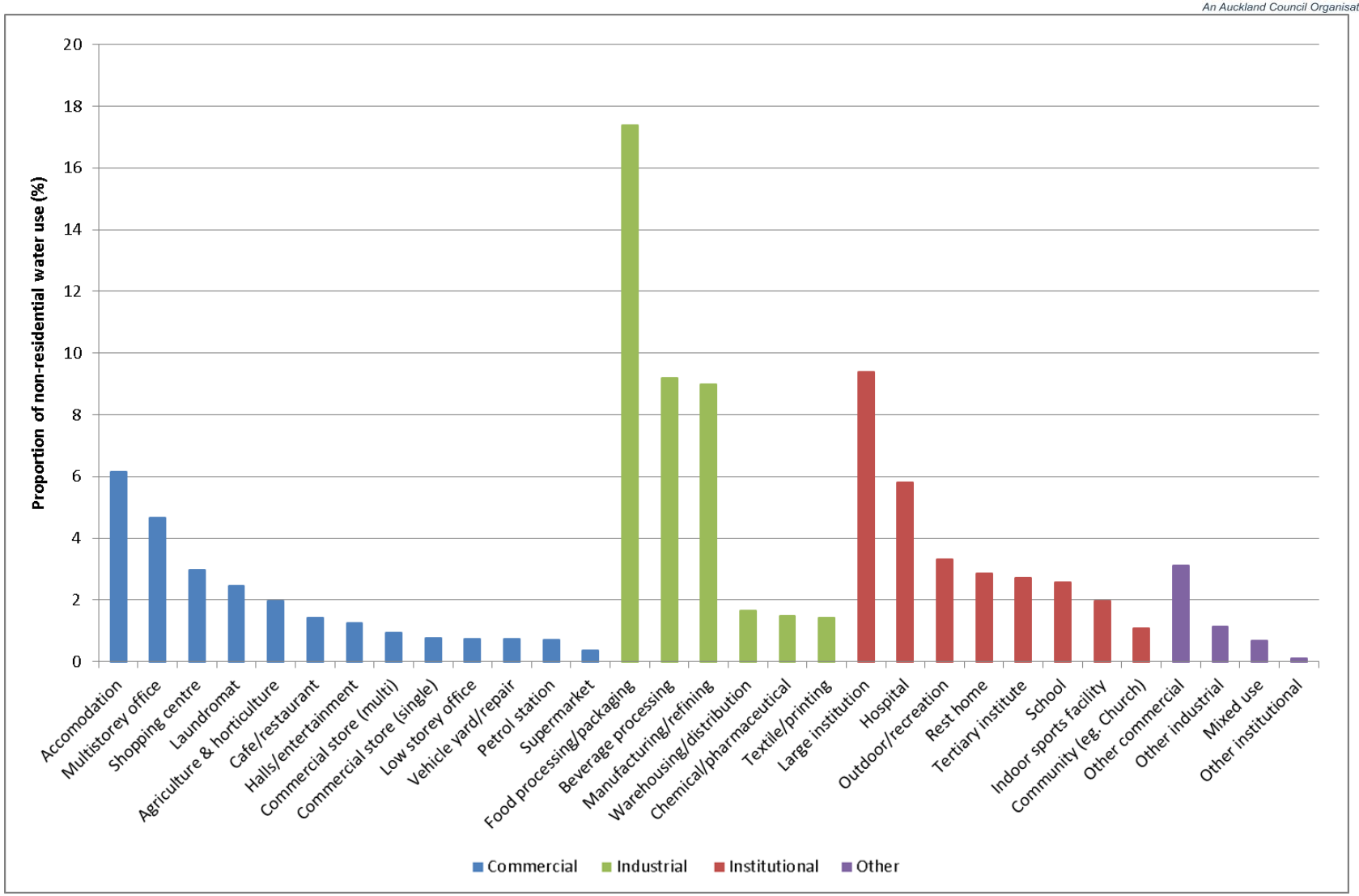


Figure 11: Distribution of non-residential water use between sectors and sub-sectors

2.4 Benchmarks for water use

It is possible to benchmark water consumption to compare how this changes over time or between different locations. This section presents gross PCC and residential PCC benchmarks, developed in New Zealand and internationally, compared against Auckland's water consumption. Comparing the consumption of different local water authorities against one's own performance can identify where and how improvements can be made.

Comparison of gross PCC figures is complex, as the figure includes industrial, commercial and other uses which are not consistent between cities.

This benchmark is an indication of how well Aucklanders are doing, which is influenced by measures in place in Auckland like metering, pricing and demand management initiatives. However, climate and other factors have an impact on the quantity of water used in different cities. Therefore it is important to treat any comparisons of PCC with caution.

2.4.1 New Zealand benchmarking

Water New Zealand

The Water New Zealand *2011/2012 National Performance Review* benchmarks financial and non-financial performance measures, one of which is water consumption. The gross PCC of seven local authorities is shown in Figure. These local authorities were chosen for benchmarking as more than 80% of the total properties are considered to be urban, which is most comparable to Auckland's situation. These local authorities are:

- Invercargill City Council (ICC)
- Capacity – Wellington (CAPW)
- Dunedin City Council (DCC)
- Capacity – Hutt City (CAPH)
- Hamilton City Council (HCC)
- Tauranga City Council (TCC)

Figure shows that Auckland's 2012 metropolitan gross PCC of approximately 271 L/p/d is the lowest of the all the New Zealand cities included in the comparison. It is considerably less than the next lowest consumption which is that of Tauranga City Council, reported as 301 L/p/d.

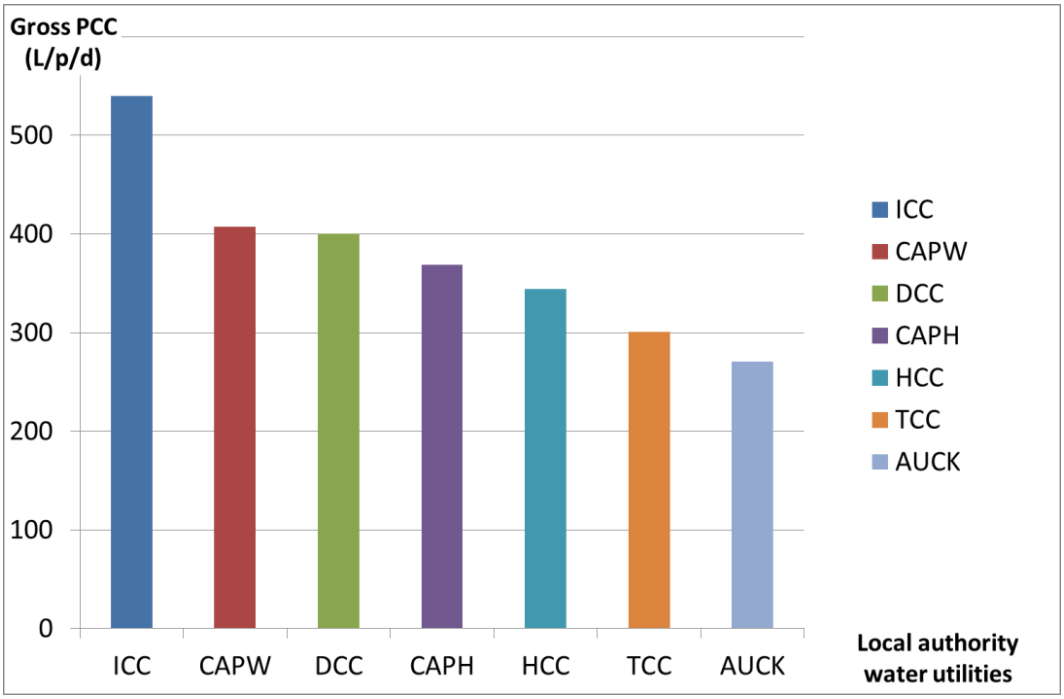


Figure 12: Local authorities' gross PCC (Water New Zealand, 2011/2012)[5]

Auditor General

As noted above, it is difficult to draw conclusions from comparisons of gross PCC as it includes a wide range of demand and external influencing factors. Residential PCC, although harder to measure, provides more insight about water use. This is calculated by dividing the total residential consumption by the total connected population.

The Auditor General of New Zealand published a performance audit report in 2010 titled *Local authorities: Planning to meet the forecast demand for drinking water.* It conducted audits of eight local authorities to determine whether they are managing potable water supplies effectively in order to meet future demand. The results of this audit showed that Nelson City Council and Tauranga City Council have residential consumptions of 180 L/p/d and 198 L/p/d respectively. Auckland's residential demand is significantly lower than both of these local authorities with a consumption of 151 to 157 L/p/d (figures between 2010 and 2012). Other local authorities included in the report performed less well than Auckland. However, we did not include them here as they included a high proportion of farms and agriculture in their customer base, which is not comparable with Auckland.

[5] The Water New Zealand performance review has been carried out when Auckland water supply was going through integration of the Local Network Operators and the bulk seller. As a result, there was no consolidated data for the Auckland area in the Water New Zealand report. The Auckland PCC presented in this graph is the 2012 PCC as calculated by Watercare.

2.4.2 International benchmarking

Gross PCC

Auckland aspires to be the 'world's most liveable city'. Other cities were identified from the top ten of the Economist Intelligence Unit's (EIU's) G*lobal liveability report* (August 2012). Those cities where water consumption data are available are shown in Table 3.

Table 3: The EIU's Global Liveability rankings

Ranking	City	Country	Gross PCC (L/p/d)	Year
1	Melbourne	Australia	331.0[6]	2005
2	Vienna	Austria	217.5[7]	2007
3	Vancouver	Canada	471.0[8]	2011
4	Toronto	Canada	430.8[9]	2010
5	Adelaide	Australia	323.0[10]	2012
6	Calgary	Canada	428.9[11]	2005
7	Sydney	Australia	297.0[12]	2012
8	Helsinki	Finland	209.0[13]	2007
9	Perth	Australia	Not available	
10	Auckland	New Zealand	271.0	2012

The gross PCC data reported in the table above cover a variety of years. As such direct comparisons should not be made. However, it can be seen that the European cities in the index perform better than Auckland, which may be attributed to a more service-based economy in these cities, strong water saving culture or denser urban development. Conversely, Auckland compares well against the Australian and Canadian cities with a significantly lower gross PCC.

Residential PCC

Bristol Water and Southern Water in the United Kingdom (UK) both have partial household water metering. UK water companies are subject to strict audit and estimates of residential consumption are expected to be accurate. The consumption figures are shown below.

- Anglian Water[14] (supplies 4.4 million customers with over 950 MLD of water and of whom 67% are metered)
  - 165 L/p/d (unmetered)

[6] (Melbourne Water, 2006-2055)

[7] (Siemens, 2009)

[8] (Metro Vancouver, 2011)

[9] (Siemens, 2011)

[10] (South Australian Water Corporation, 2012)

[11] (Siemens, 2011)

[12] (Sydney Water, 2011-12)

[13] (Siemens, 2009)

[14] (Anglian Water, 2011)

  - 135 L/p/d (metered)

- Bristol Water[15] (supplies over 1.1 million customers with 266 MLD of water (average))
  - 157 L/p/d (unmetered)
  - 121 L/p/d (metered)
- Southern Water[16] (supplies over 2.2 million customers with 550 MLD of water (average))
  - 164 L/p/d (unmetered)
  - 134 L/p/d (metered)

This shows that the unmetered PCC for these UK water companies is similar to Auckland's residential PCC. However, the PCC for metered households, the equivalent situation to Auckland, is lower. It should be noted that the number of metered households in the UK is relatively low, as it is typically up to the owners to elect to have them installed.

Based on this information, Auckland's existing performance is excellent for New Zealand and compares well internationally. However, it also suggests that there are still opportunities to reduce water consumption as shown by some European cities.

2.4.3 Commercial demand benchmarking

A further study by BRANZ (Roberti, 2013) analysed the water use of a dataset of 5,725 properties. This study aimed to create benchmarks for water use per floor area (m^2) for office and retail buildings.

The study found that;

- Building use and size are the key influences on water use within retail and office buildings
- Building age does not appear to have a significant effect on water use
- General office buildings used less water per m^2 of floor area than retail buildings
- Within the office building class, smaller office buildings tended to use less water per m^2 than larger office buildings
- Conversely, smaller retail buildings used more water per m^2 than larger retail buildings.

The study observed that non-residential water use tends to be dominated by a number of very large users.

2.5 Leakage/losses

Following a review of various publications on water losses, Watercare has adopted a total water mass balance approach to understand and account for the water from the point of production

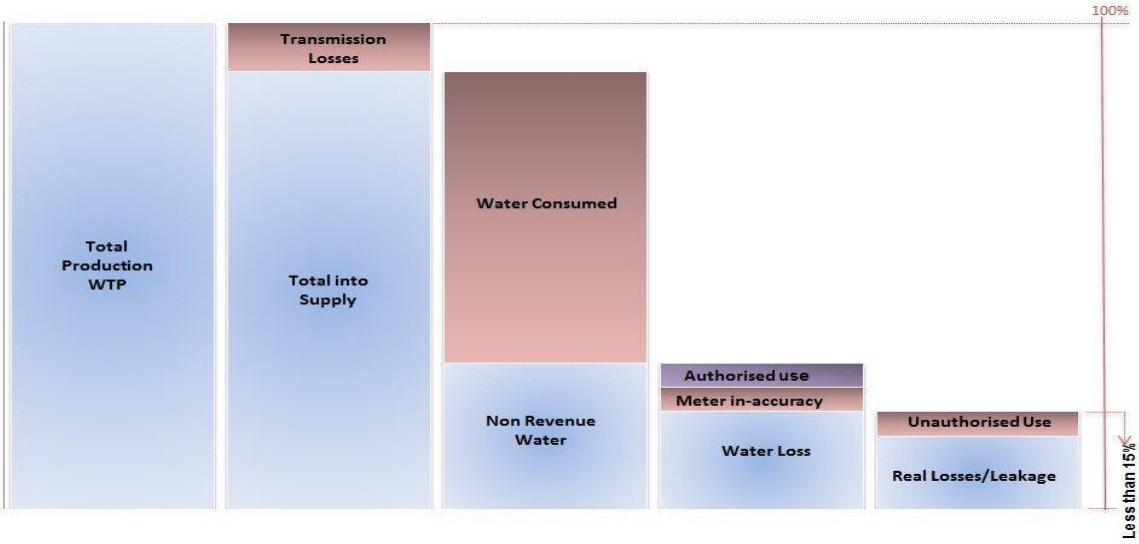
[15] (Bristol Water, 2011)

[16] (Southern Water Services Ltd, 2011)

through to transportation and delivery to the consumer. This approach is consistent with international best practice.

For the purposes of understanding and reporting its water losses on a consistent basis, Watercare will use a water mass balance approach, with specific emphasis on calculating non-revenue water and real losses. The mass balance approach is shown in the Figure below. It identifies the total water produced, incorporating the transmission network losses. Water is then categorised into water consumed that generates revenue and an unbillable component, known as non-revenue water. The non-revenue water is further defined into the following four categories:

1. Authorised use that is not billable i.e. Fire fighting, operational flushing.
2. Meter under-reading i.e. inaccuracy inherent in all meters.
3. Unauthorised consumption i.e. illegal usage
4. Real losses i.e. water leaking from the network reticulation



Non-revenue water is the water that has been put into supply but has not been billed. There can be a few reasons for this:

- Some water is used for operational purposes, flushing pipes during works on the water network, and fire fighting which is assessed to be 0.5% of the water produced
- Unauthorised use also happens, which we assessed to be 0.1% of the water produced
- When they age, water meters tend to under-record water use, which results in around 3% - 5% of the water produced and used by customers not being billed

The remaining non-revenue water is leakage, or “real losses” from the network.

The Statement of Intent of sets a 15% real losses target for the 2012/13, 14% for the 2013/14 and 13% for the 2014/15 years.

A number of initiatives, which form part of the regional leakage management strategy, aimed at reducing water losses, have commenced. These include:

- Creation of smaller water balance zones to better define specific areas with high leakage
- Developing a meter consumption reporting database that allows actual meter consumption analysis
- Pro-active leak detection, using technique's such as night flow testing, acoustic noise logging and ground survey to identify leaks
- Validation of assumptions relating to fire fighting and operational flushing usage
- Testing programme for domestic and commercial meters
- Meter replacement programme
- Pressure management and pressure reduction
- Reducing unbilled revenue, through ground survey and smart metering
- Undertaking benchmarking against other comparable utilities.

2.6 Growth

This section provides an overview of the projected growth Auckland is set to face in the future. Figure 13 shows that the number of people living in Auckland connected to the metropolitan water supply is forecast to increase significantly between now and 2051. Watercare has adopted Auckland Council's medium growth population scenario to inform its water planning forecast, which projects a population increase from 1.375 million people to 2.2 million by 2051 – an increase of 57%. This rate of growth over the next 35 years presents Auckland with a challenge that most other cities in the developed world do not face.

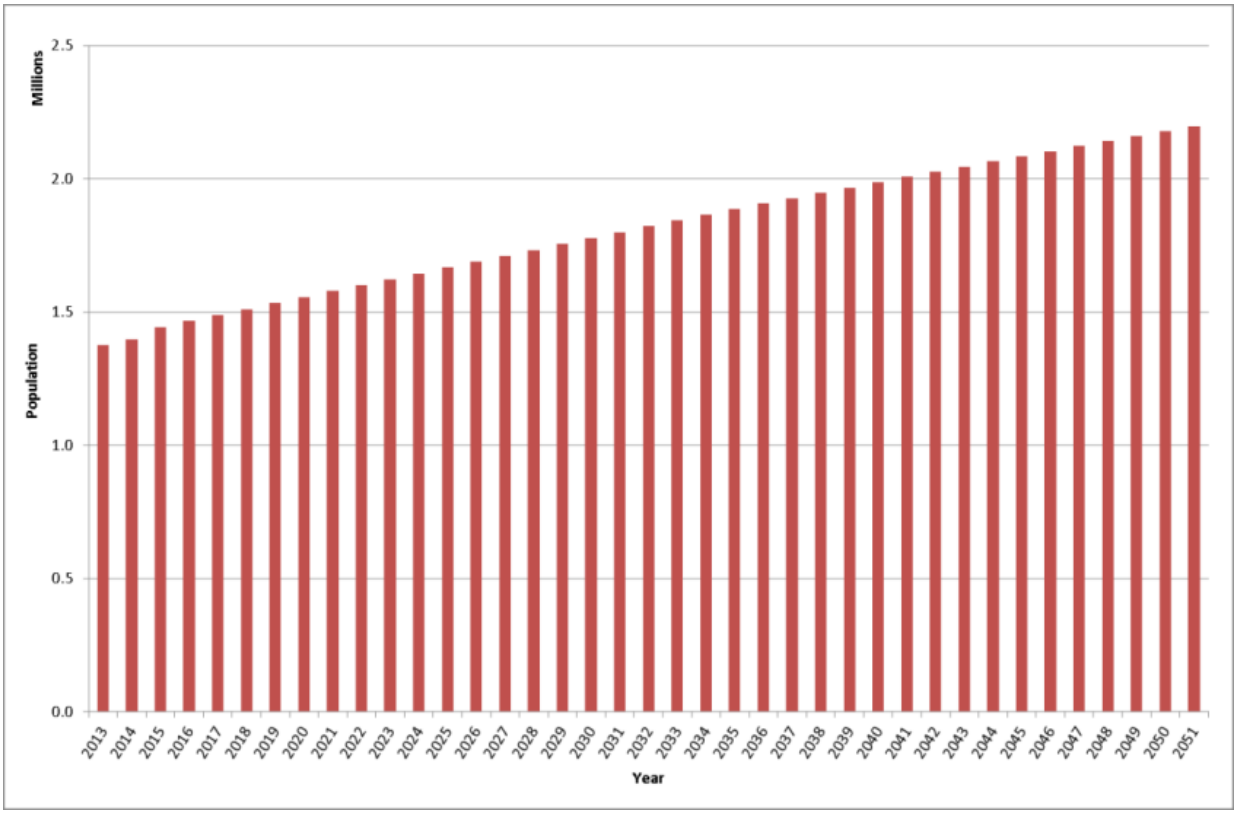


Figure 13: Projected population connected to Auckland's water supply to 2051

The *Auckland Plan* (2013) determines the distribution of this growth across the Auckland region. It forecasts some urban expansion in the form of green field development but primarily aims to create a 'compact city'. These objectives will ultimately affect the demand for water services in the future.

Watercare's *Asset Management Plan* (2011) outlines that the increase in population along with reduced occupancy rates will increase the total water demand. Urban expansion could also increase the demand for water due to larger sections. However, the expected intensification of development in existing urban areas could result in reduced demand per capita, as outdoor water use may reduce. It is important that Watercare understands the impact these drivers have on demand.

2.7 Summary

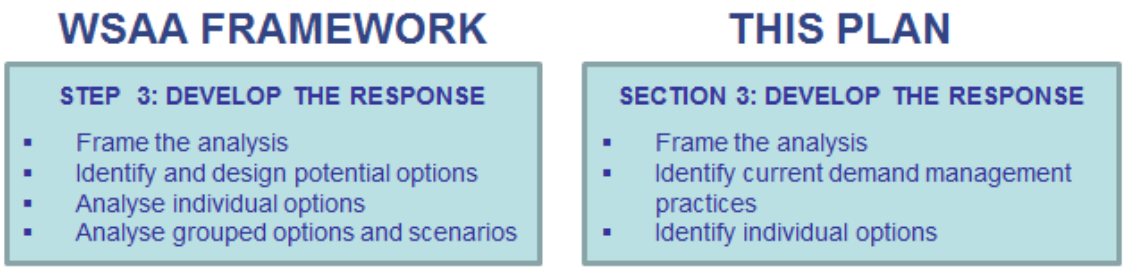
This section has reviewed existing water use in Auckland and the factors that influence the consumption of water, both now and in the future. It is possible to conclude that:

- Watercare has a target to reduce gross PCC by 15% from 2004 levels, to 253 L/p/d
- Auckland's water use per capita is already the lowest in New Zealand
- Growth and peak demand are two of the most important factors affecting the future demand for water
- The population in Auckland is forecast to increase by an additional 57% by 2051
- Substantial investment will be required across all infrastructure sectors , including water, to provide for this population increase
- Watercare is required to invest and operate additional infrastructure to meet peak demand over the summer period.

The demand management measures proposed in this Plan aim to minimise the forecast increase in water demand and reduce the scale of investment required.

3 Develop the response

This section reflects the first part of step three of the WSAA framework. It begins by explaining the target and how much water needs to be saved. It then identifies the demand practices which have already been implemented and the options which are considered.



3.1 Framing the analysis

3.1.1 Target

We have analysed how much water needs to be saved by demand management measures to achieve the target of reducing gross PCC to 253 Litres per person per day by 2025 (15% gross PCC reduction compared with 2004 levels). This enables us to consider the number and type of demand management measures that should be implemented. This analysis compares:

- The annual volume of water that Aucklanders would be using in 2025 if PCC stays the same as the 2013 PCC as population grows; with
- The annual volume they would use if the target PCC is met.

This approach brings a more tangible assessment of demand management options.

The blue line in Figure 14 shows the average annual volume of water Aucklanders will use each year if the demand management target is met. The step increase in 2014 is due to additional communities being connected to the metropolitan supply, including Pukekohe and Kumeu. The red line shows the volume that will be used if PCC stays at the 2013 levels. It is lower than the blue line now as consumption is currently lower than the target, but by 2025 it is 35 MLD higher.

Overall progress to date has exceeded the interim target savings, but this performance needs to be maintained in the future to enable the year on year reduction in PCC to be achieved.

This plan sets out how Watercare can work with its customers to save 35 MLD by 2025. It is important to consider the demand management options within the context of this target. This helps to focus on those approaches that give greater certainty of savings, together with those which can assist the greatest number of customers to save water.

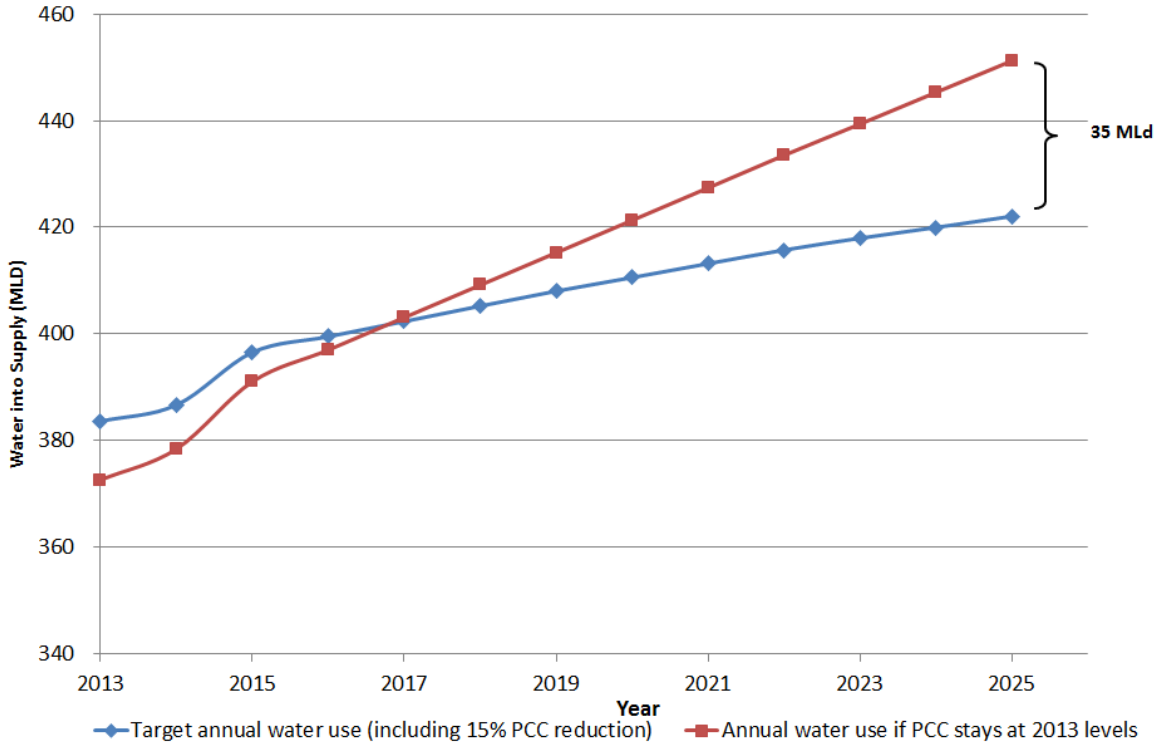


Figure 14: Projected annual water demand based on current and target per capita consumption

3.2 Current demand management practices

This section summarises the key demand management practices that Watercare and other organisations are currently implementing in Auckland.

3.2.1 Education and awareness

Watercare provides customers with information on how to save water around the home (indoor and outdoor), at school and at work. The 'Using Water Wisely' pages on Watercare's website provide tips and hints, including how to detect a leak.

During the 2013 summer billing period, an information insert was included with customer bills to remind customers about how to save water at home, particularly outdoors. This was also provided with non-residential customers' bills.

Billing is now monthly, which provides a regular reminder to customers of the cost of water and wastewater services. Each invoice includes a figure to show the customer's average consumption for the last four months and the location of their water usage on a band of typical household consumption values as formulated by the 2008 BRANZ *Water Use in Auckland Households Study*. This is recognised as best practice. Extracts from an example bill are shown as Figure 15.

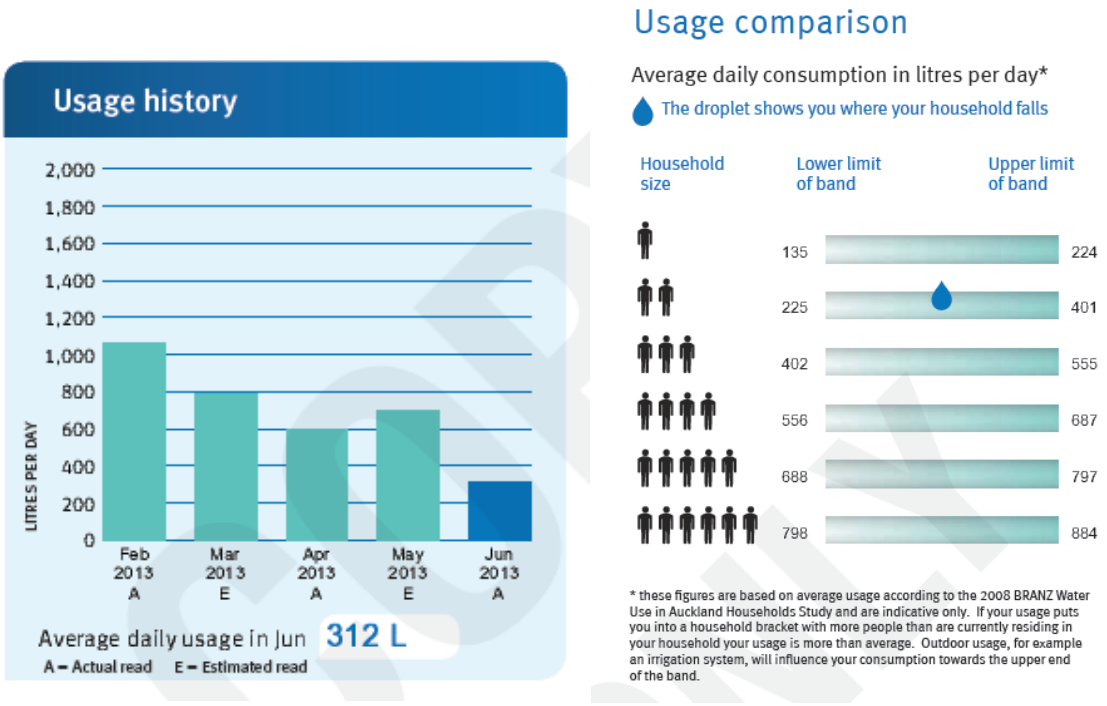


Figure 15: Example of a Watercare bill

Additional information currently provided by Watercare includes:

- Attending events such as the Auckland Home Show, working with EcoMatters Environment Trust to engage with customers about efficient water use and provide water efficient devices for sale.
- Advertisements in local newspapers about how to save water are also published, particularly during hot, dry periods; and
- Surveys to identify how customers use water outdoors.

3.2.2 Water Advice Line

Watercare has launched a 'Water Advice Line' alongside EcoMatters Environment Trust. This programme targets residential customers with high water use across the region. High water users who contact Watercare and request assistance in reducing their consumption are offered the opportunity to participate. A water audit is conducted over the telephone and used to develop customised water saving recommendations. Regular reports on the customer's water usage over a 12 month period are provided to monitor progress and hence assess the benefits of the programme. This project is currently in a pilot stage. Between November 2012 and July 2013, over 135 households have entered the process of the Water Advice Line.

3.2.3 Housing New Zealand programme

Watercare is working with Housing NZ on a regional water efficiency programme which aims to detect leaks and reduce the water use in their Auckland properties.

Each month water consumption readings for Housing NZ properties are reviewed and those with very high water use or a significant change in consumption are identified. Housing NZ contractors are then sent to these properties to examine whether this is due to a leak, which they repair, or some other reason. Properties where no leak is found, but water use is still considered high, are

now being identified. Strategies to reduce consumption in these properties through education and behavioural change are being explored.

Over the financial year of 2011-12, 351 houses were examined for leakage. Of those, 255 houses were identified as having leaks and therefore required repairs. Through this, Housing NZ achieved water savings of 132,000m3 over one year, or approximately 0.35 MLD.

3.2.4 Auckland Council programme

Auckland Council is one of Auckland's largest water users, with more than 2,700 accounts across the city. These accounts include properties owned and occupied by Auckland Council or are leased to communities and businesses. Watercare has been working closely with Auckland Council as they include water in their energy management system (Ellserve) and roll out real time metering equipment for medium large building including for water. The system will enable the Council to establish benchmarks for each type of site, for example offices, libraries or community centres. It will be able to target buildings and locations with high water use and install water efficient devices or change water use practices at these sites.

Auckland Council has set a water savings target of 20% of their 2011-12 consumption figures by 2025. This applies to the properties owned and occupied by Auckland Council only. Baseline consumption for these accounts is currently being confirmed, therefore the quantification of the projected savings will be available as part of the next iteration of this Plan.

3.2.5 Metering and pricing

All water is charged on a volumetric basis, and as of July 2012 a unified residential wastewater tariff was put into place. This is best practice for demand management. Volumetric charging allows customers to appreciate the value of water and wastewater services. A reduction in use leads to customers making monetary savings across both the water and wastewater services. This is a clear financial incentive for water conservation.

Non-residential wastewater tariff will be changed in 2014 and will include volumetric pricing.

3.2.6 Watercare operations

Watercare's four largest wastewater treatment plants (WWTP) all use recycled effluent in place of potable water where possible. The volumes of water currently consumed and re-used are as follows:

- Mangere WWTP uses a total of 56.43 MLD, 55.72 MLD of which is re-cycled (98.7%)
- Rosedale WWTP uses a total of 2.12 MLD, 2.06 MLD of which is re-cycled (97.6%)
- Army Bay WWTP uses a total of 0.24 MLD, 0.23 MLD of which is re-cycled (94%).

Similarly Watercare's water treatment plants (WTP) recycle water from the treatment processes. This includes recycling water back to the head of the plant from, for example:

- Filter washout processes
- Water that would be filtered to waste
- Clarifier sludge thickener supernatant.

Over the 2011-12 year, the following approximate average daily volumes of water were recycled:

- 10 MLD at Ardmore WTP (4.2%)

- 3 MLD at Huia WTP (3.5%)
- 0.3 MLD at Waitakere WTP (4.5%)
- 0.1 MLD at Onehunga WTP (4.1%)
- 10.5 MLD at Waikato WTP (13.6%)

3.3 Options considered

Watercare has investigated a number of different demand management options. These options aim at promoting more efficient water use and dissuade unsustainable practices and the waste of water. These options were identified by a combination of:

- Reviewing Watercare's current activities
- Considering options from the existing DMP
- Carrying out a review of demand management options and industry guidance from across New Zealand, Australia and the UK.

The options are categorised by the customer type, being:

- Residential, i.e. those options that reduce water use in the home
- Non-residential, which promote water efficiency amongst businesses, industry and Councils organisations
- Options that apply to both residential and non-residential sectors
- Options that apply directly to Watercare.

3.3.1 Residential demand management options considered

The residential demand management options are listed below. Unless specifically stated, all options are expected to reduce demand at both average and peak demand.

- Residential education and awareness
- Water Advice Line (extend existing pilot programme targeting high residential water users)
- Housing NZ programme (extend existing leak detection and high water use programme)
- Residential water efficiency (retrofit devices within existing properties)
- Residential water efficiency (legislation for new builds)
- Outdoor water use (including awareness and retrofitting devices)
- Outdoor water use (legislation for new builds)
- Source substitution through rainwater tanks (new builds) – limited benefit during dry periods.
- Source substitution through greywater re-use (for new builds)

3.3.2 Non-residential demand management options considered

The non-residential demand management options are listed below. Similarly, all options are expected to reduce demand at both average and peak demand unless stated otherwise.

- Non-residential education and awareness
- Non-residential volumetric water charge
- Auckland Council programme (water efficiency programme)
- Non-residential water audits and leak detection.

- Water-wise education for schools
- Water efficiency in schools

3.3.3 Joint options considered

These demand management options can be applied to both residential and non-residential customers.

- Tariffs (investigation into tariff options which target peak demand).
- Promotion of indoor water efficiency / WELS rated devices

3.3.4 Watercare options considered

These options are specific to Watercare.

- Watercare treatment processes and operations
- Leakage and non-revenue losses
- Pressure reduction and management
- Reduced consumption at Watercare's office premises

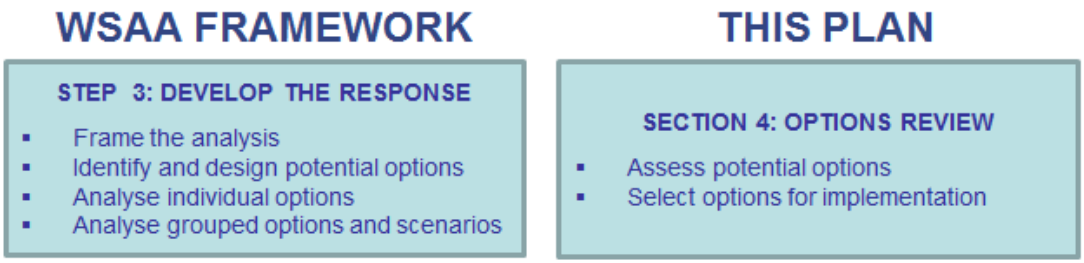
3.4 Summary

This section quantified the necessary water savings and listed the existing and potential demand management initiatives.

- Water savings needed by 2025 at the current levels of consumption are 35 MLD
- Existing demand management initiatives are in place and have potential for expansion
- Further demand management initiatives can be developed and will be researched in the next section of this plan.

4 Options review

This section builds on section 3, and continues work classified under step 3 of the WSAA framework. The options are assessed and classified as options to implement now, a pilot programme, options to investigate and those to defer. Required actions are identified along with the potential savings which could be achieved.



Section 3 of this plan listed the options that were considered as part of the preparation of this DMP. A workshop was held to describe and assess these potential options, establish the required savings and select a number of options for implementation.

This approach is different to an options assessment to select, for example, an engineering scheme to implement. Demand management covers a broad spectrum of tools to reduce demand across different customer types; there is no one, single option to be taken forward.

The selection process therefore considered:

- The potential savings, especially regarding peak demand
- The ease of implementation, including cost-effectiveness
- Watercare's ability to either implement the option or influence its implementation.

The cost-benefit of demand management is inherently complicated to measure, as an evaluation of present and future costs and benefits is difficult. Some studies are available which have measured the costs and benefits, notably those based on in-depth research in the UK. Watercare has a responsibility to operate at least cost, which includes the implementation of demand management. Therefore it is important that the demand management options implemented provide value for money and learn from previous experiences..

The selection process categorised the options as:

- Those for immediate action
- Those for a pilot programme to assess how they can be best implemented
- Those options where further investigation is required
- Options which are deferred.

To enable the options to be compared, an estimate of the potential savings has been made. Where options are already being carried out these estimates are based on observed data. Otherwise, the estimates are based on information from published data or guidance documents. These demand savings are based on the estimated daily savings in MLD. The figures quoted are the savings in the year 2025.

For some options the estimated savings increase year on year as a wider group of customers are targeted. The effect of other options is expected to be more of a step change, such as a reduction in leakage from 14% to 13%. The figures quoted are the expected daily savings by 2025 as a result of implementation of the option.

A summary of how the different options have been categorised is included as Figure 16. The individual options are not prioritised within these categories. More detailed tables setting out how the different options are to be treated are set out in the sections below. The potential savings identified is based on an assessment of the savings in 2025, against current levels of demand. Further information on actions to be implemented can be found in Appendix D.

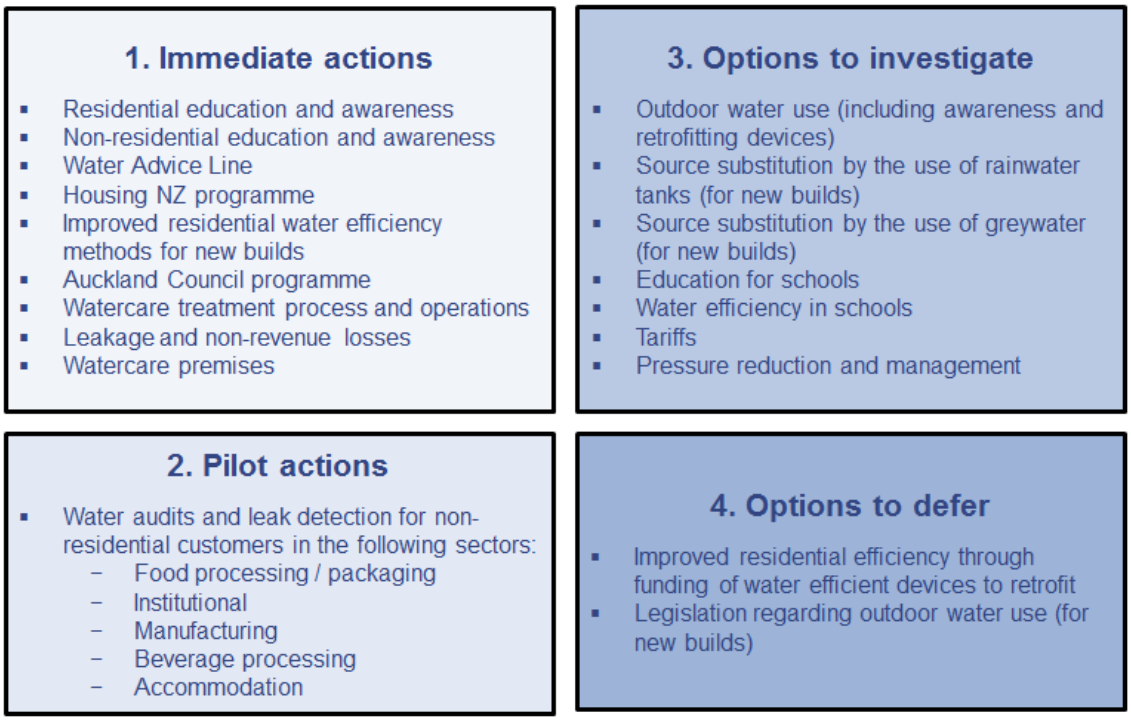


Figure 16: Actions

4.1 Plan of immediate actions

This section summarises the options that were identified as 'immediate' actions. These include those actions that Watercare are either already doing and have a potential for expansion or options that clearly have the potential to save large volumes of water and so should be implemented now. These options, summarised as Table 4, have the potential to save around 17MLD of water by 2025, compared with the overall requirement of 35MLD. Estimates of savings are based on a number of assumptions, including the potential uptake. Assumptions are available in Appendix B. These potential savings will be reviewed as more data become available.

- **Residential education and awareness**

Raising customers' awareness about the benefits of saving water and how they can reduce their own use is a fundamental part of all demand management campaigns. This option entails providing information and key messages about water conservation to customers through various media (section 3.2.1). There is room for enhancing the information currently provided.

– **Non-residential education and awareness**

This is similar to the previous option, but for non-residential customers. Raising customers' awareness about the benefits of saving water and how they can reduce their own use is a fundamental part of all demand management campaigns. This option entails providing information and key messages about water conservation to customers through various media (section 3.2.1).

– **Non-residential volumetric wastewater charge**

All Aucklanders, residential and non-residential, are currently charged volumetrically for water use. Residential users are charged partly volumetrically for wastewater. In some areas (Auckland City and Manukau), non-residential users are charged partly volumetrically for wastewater. All non-residential water users could also be charged partly volumetrically for wastewater. As seen in section 2, volumetric charging as a significant impact on usage.

– **Water Advice Line**

The Water Advice Line is an existing programme being piloted by Watercare and the EcoMatters Environment Trust and is described in section 3.2.2. Following a review of the pilot programme, this could be extended and offered to more customers.

– **Housing NZ programme**

Housing NZ is one of the largest water users in Auckland. It is currently conducting a region-wide water efficiency programme targeting high water use Housing NZ homes as described in section 3.2.3. The programme will be extended in 2013.

– **Improved residential water efficiency through legislation (new builds)**

Legislation could be passed that requires devices with a minimum water efficiency to be installed in new homes, or that new homes are designed to meet a low per capita consumption target.

– **Auckland Council programme**

Auckland Council is an important leader in the sustainable use of resources, including water. It has set targets for water savings within its own organisation. Information on the current water saving initiatives within Auckland Council is provided in the next sections.

– **Watercare treatment processes and operations**

Watercare aims to continue to recycle the water required in water and wastewater treatment processes. The extent to which Watercare recycles water within its water and wastewater treatment plants is described in section 3.2.6.

– **Leakage and non-revenue losses**

Reducing non-revenue water, primarily by leakage reduction, is an important part of Watercare's overall strategy. Watercare's approach to the management of non-revenue water is summarised in section 2.5.

– **Watercare premises**

Watercare currently operates office premises, in Newmarket and East Tamaki.

Watercare East Tamaki and Newmarket are moving to new office premises which will incorporate water efficient features. As part of this, we expect to reduce consumption so that this is benchmarked within the top quartile for office buildings.

Table 4: Immediate actions

Reference	Option	Why it is an immediate action	Potential savings in 2025
1.1	Residential education and awareness	■ Some mechanisms currently in place, potential for enhancement ■ Low level of complexity ■ Strong customer need	4 MLD
1.2	Water Advice Line	■ Pilot programme already in place, potential for expansion	0.5 MLD
1.3	Housing NZ programme	■ Programme already in place, potential for expansion	0.55 MLD
1.4	Improved residential water efficiency through legislation (new builds)	■ Very high potential for water savings ■ Not under the direct control of Watercare ■ Ongoing involvement needed to effect change	3 MLD
1.5	Non-residential education and awareness	■ Limited information currently available ■ Low level of complexity ■ Strong customer need	1.25 MLD
1.6	Non-residential volumetric wastewater charge	■ Very high potential for water savings ■ Already implemented in some parts of the region ■ Harmonisation of charging needed	1.50 MLD
1.7	Auckland Council programme	■ First steps of the programme already started	To be confirmed
1.8	Watercare treatment process and operations	■ Important to set a good example for other industrial businesses ■ Within Watercare's direct control	Minor above existing savings
1.9	Leakage and non-revenue losses	■ Target of our Statement of Intent, part of Watercare's core responsibilities ■ Within Watercare's direct control	6 MLD
1.10	Watercare premises	■ Important to set a good example ■ Within Watercare's direct control	Minor

4.2 Actions to be piloted

The options summarised as Table 5 are those that will be piloted. This is because they are options which Watercare believes could result in savings, but the actual processes and costs are unknown. Hence a pilot programme is required to enable the approach, costs and savings to be developed.

– **Non-residential water efficiency options for large water users**

Non-residential users consume approximately 25% of the total water supply. Customers with high consumption include those in the food processing / packaging, municipal, manufacturing / refining, beverage processing and accommodation sub-sectors. Typically, a small number of customers are responsible for a large proportion of water use in each sub-sector, which enables Watercare to target water efficiency activities where there will be the greatest benefit.

Table 5: Pilot options

Reference	Option	Why it is a pilot programme	Potential savings in 2025
2.1	Food processing / packaging (industrial)	■ Very high potential for water savings ■ New service, requiring time and investment to develop ■ Detailed sector-specific approaches and their merits need to be assessed through pilots	2 MLD (targeting Top 100 users)
2.2	Institutional		
2.3	Manufacturing / refining (industrial)		
2.4	Beverage processing (industrial)		
2.5	Accommodation (commercial)		

4.3 Options to investigate

The options that were identified as requiring further investigation before making a firm decision whether to implement them or not are summarised as Table 6.

These investigations will enable more information to be collected or reviewed. The collection of information will start in 2013. The decision on whether to implement the related actions will be made when reviewing the demand management plan in 2016.

– **Investigate outdoor water use (including awareness and retrofitting devices)**

This option includes education and awareness in relation to how customers use water outdoors and how they could reduce it. It also covers retrofitting more efficient outdoor water using devices. This option focuses on reducing demand during peak summer periods, when outdoor water use is at its highest.

– **Investigate source substitution through rainwater tanks (for new builds)**

Rainwater can be captured, stored and if necessary treated before use. This would reduce the demand for potable water from Watercare. Common uses for rainwater include gardening, toilet flushing and clothes washing. It is however suspected that the effect on peak water use would be minimal.

- **Investigate source substitution through greywater re-use (for new builds)**

Greywater is water that is used and then captured from the washing machine, shower and bathroom sink. This water can be captured, treated and stored to replace selected uses of potable water, including toilet flushing and garden watering.

- **Investigate water-wise education for schools**

Working with schools to advocate water wise messages is an efficient way of 'spreading the word' throughout the community. By providing schools with information about water efficiency, it will also educate the next generation of water users about why we need to reduce our water consumption.

- **Investigate Water efficiency in schools**

In addition to offering schools information about water efficiency, a programme could be developed to implement cost-effective water saving measures in schools. Currently, there is little incentive for schools to reduce water use as bills are paid for centrally by the Ministry for Education.

- **Investigate Tariffs**

Understanding the price impacts of water and wastewater charging, including tariffs and volumetric water charges are an essential tool in demand management. This option focuses on investigating different tariff options.

- **Investigate Pressure reduction and management**

Pressure reduction and management is one of the tools which enable Watercare to manage leakage more effectively. By reducing pressures at periods of low demand (during the night, for example), volumes of leakage can be further reduced.

Table 6: Options to investigate

Reference	Option	Why investigation is required	Potential savings in 2025
3.1	Outdoor water use (including awareness and retrofitting devices)	▪ To determine how to reduce outdoor water use in a cost-effective manner	Unknown
3.2	Source substitution through rainwater tanks (for new builds)	▪ To determine whether savings can help reduce peak demand ▪ To consider appropriate options ▪ To identify barriers to implementation and how these can be overcome ▪ To assess cost-effectiveness	1.0 MLD (on average, expected to be much less at times of peak demand)
3.3	Source substitution through greywater re-use (for new builds)	▪ To determine the possible extent of savings ▪ To consider appropriate options ▪ To identify barriers to implementation and how these can be overcome ▪ To assess cost-effectiveness	1.0 MLD (at both average and peak times)
3.4	Education for schools	▪ To assess the cost-effectiveness of an education programme	Unknown
3.5	Water efficiency in schools	▪ Preliminary work on 'best practice' irrigation is needed to inform schools ▪ To assess cost-effectiveness	<0.5 MLD
3.6	Tariffs	▪ Changes to the tariff structure are sensitive ▪ Watercare has an obligation to provide water at minimum cost	Unknown at this stage
3.7	Pressure reduction and management	▪ Typically reduces water use and non-revenue water ▪ High investment needed ▪ The costs, benefits and detailed options are specific to each water supply zone	Unknown at this stage

4.4 Options to be deferred

The options that are deferred at this point are summarised in

Table **7**. These options were deferred based on either the technical complexity of their implementation or the potential costs involved. Deferment of the options at this stage does not preclude them from being implemented in the future.

- **Improved residential water efficiency through funding of water devices for retrofitting**

Reducing water use by retrofitting more water efficient devices makes saving water easy for customers. Under this option Watercare could encourage retrofitting existing homes with water efficient devices. This could be done by subsidising water efficient devices, running competitions or other incentive systems or by offering rebates. These devices include low flow showerheads, dual flush toilets and washing machines with a low volume per load.

However, this is not a cost-effective option.

- **Outdoor water use (legislation for new builds)**

Legislation could be passed that requires drought tolerant gardens to be planted in all new homes, or that new homes are designed to meet a low external consumption target.

Whilst this could encourage low water use outdoors, home owners are likely to change garden layouts and types to meet their own personal preference and any savings could not be guaranteed in the long term.

Table 7: Deferred options

Reference	Option	Why it is a deferred option
4.1	Improved residential efficiency through funding of retrofitting	■ Technical complexity and difficulty of implementation ■ Overseas studies have shown these schemes are not cost-effective
4.2	Outdoor water use (legislation for new builds)	■ Difficult to define and implement ■ Homeowners likely to change gardens, so benefits very short term and uncertain

4.5 The potential water saved

Figure shows the potential savings which may be made by implementing the immediate and pilot actions. These savings have been estimated until 2025.

A review is required in 2016 which will enable progress against the demand management target to be evaluated. The updated Plan will determine which of the pilot studies or other options that have been investigated should be implemented, in order to meet the overall target by 2025.

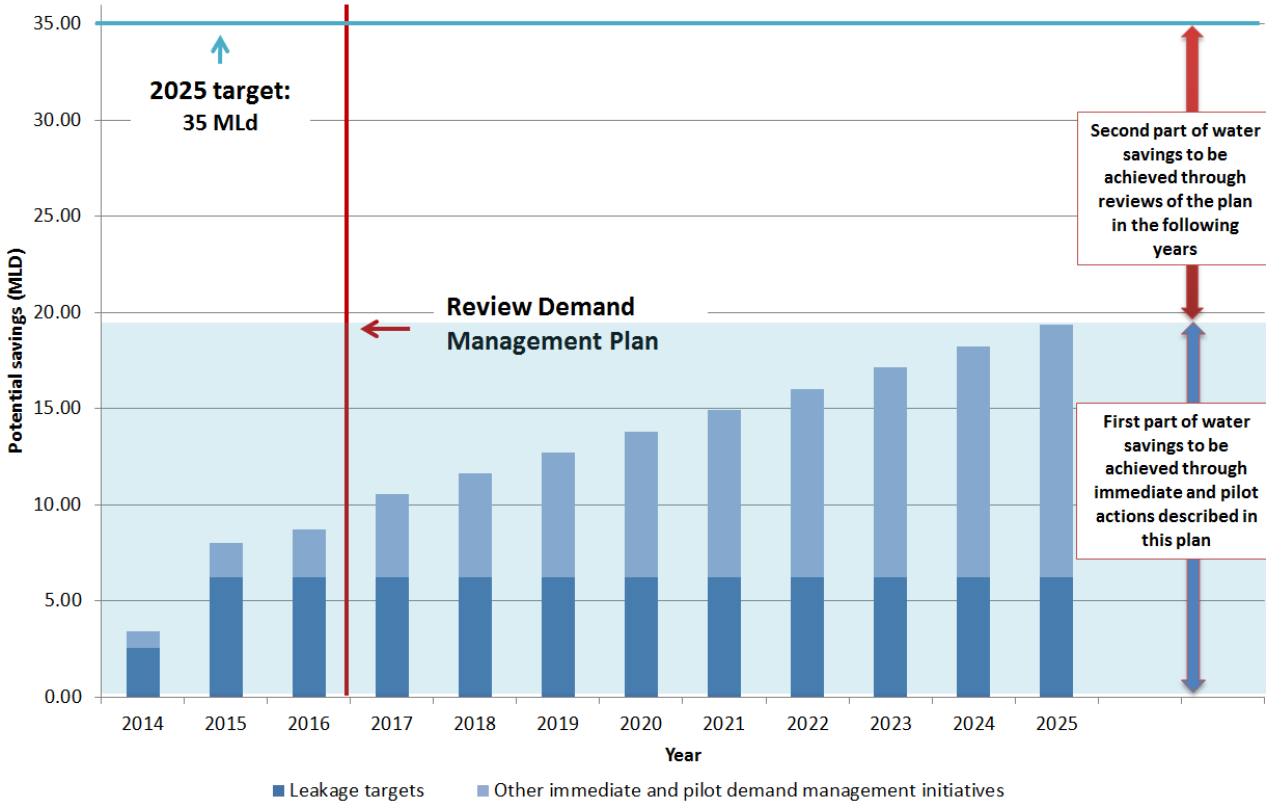


Figure 17: Potential savings generated by the immediate and pilot actions until 2025

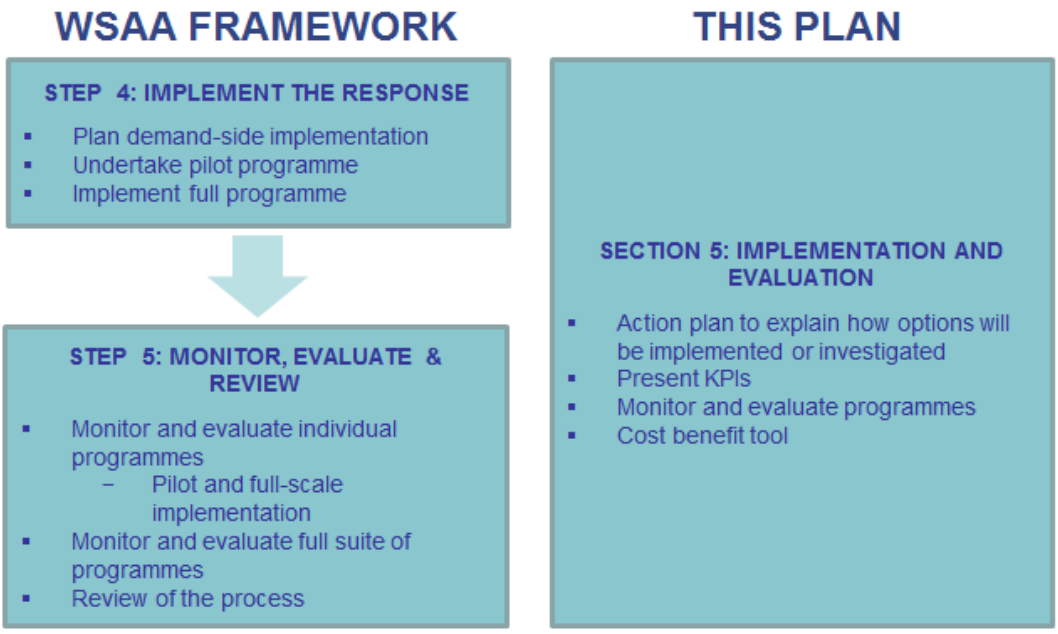
4.6 Summary

This section reviewed the possible options listed in section 3 and classified them into “Immediate”, “Pilot”, “Investigate” and “Deferred” categories.

- Water savings of over 19 MLD can be achieved through Immediate and Pilot actions.
- Actions will be reassessed at the next review in three years. Implementation and evaluation

5 Implementation and evaluation

This section reflects steps four and five of the WSAA framework. It identifies how the chosen demand management options will be implemented or investigated over the next 5 years. It starts by considering general reporting actions, followed by an implementation plan related to each option.



5.1 Annual reporting and key performance indicators

Ongoing review and analysis of consumption data and trends is essential to inform this demand management programme in the future. Watercare will review and publish the following key performance indicators on an annual basis:

- Gross per capita consumption and progress against the agreed target
- An estimate of residential per capita consumption
- Commentary on any trends as they emerge
- Benchmark these results both nationally and internationally.

Other actions are specific to each of the ongoing demand management options or projects. For those that are underway, a review of performance should be carried out on an annual basis or at the end of the project. This should include:

- A summary of the option or project
- The key actions developed
- Any information about the water saved and the cost (either expenditure or staff time).

Key performance indicators relevant to each option will be developed at the start of the project. This will include relevant water saving and cost information, together with any other relevant objectives. This will enable information to be collated to support the development of cost benefit analysis and hence better inform future updates of this Plan.

5.2 Water efficiency targets by sector

This Plan has developed targets to reduce consumption using a suite of different water efficiency options. These options are specific to different sectors of demand (residential, non-residential and Watercare) and also target different sectors, such as residential new build or commercial, industrial and municipal uses.

These options will be monitored going forward and therefore it will be possible to identify the progress that different sectors are making towards the overall water efficiency target.

5.3 Monitoring and evaluation

Demand management is a journey. The journey includes Watercare and its customers. It involves changes to behaviour, new technologies and different management practices. Progress therefore needs to be monitored on an ongoing basis, to determine how the demand management programme is performing and where improvements can be made.

Figure 18 shows the planning cycle which will be used as the basis for the review of this demand management programme. It is a cycle of continual improvement. It begins with the audit stage to benchmark the current performance. This audit along with an analysis of future demand can then be used to plan where potential savings can be made. The resulting action plan for implementation will undergo continuous evaluation. The audit stage should be conducted at regular intervals to demonstrate the changes and improvements that have been implemented and for comparison against benchmarks.

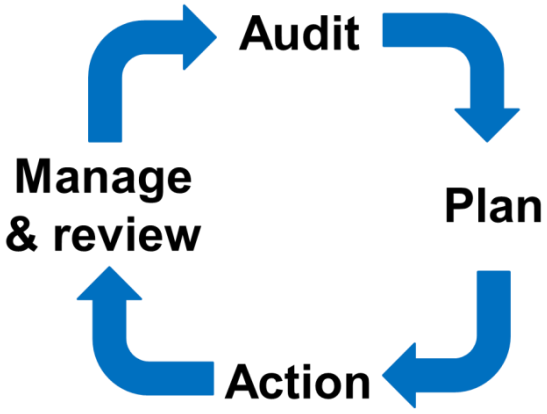


Figure 18: Planning cycle

5.4 Review of this Demand Management Plan

As part of the demand management planning cycle, Watercare intends to review this Plan on a three yearly cycle. This review will include:

- Analysis of progress against the demand management target
- A review of the demand management options that have been implemented and their effectiveness at contributing to the target
- Progress that has been made towards piloting and investigating other potential options
- An assessment of which further options need to be implemented or expanded to meet the target in the future.

The review of this Plan will enable Watercare to identify the demand management measures that will ensure customers save water in the most cost-effective manner.

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Appendix A

Gross PCC calculations

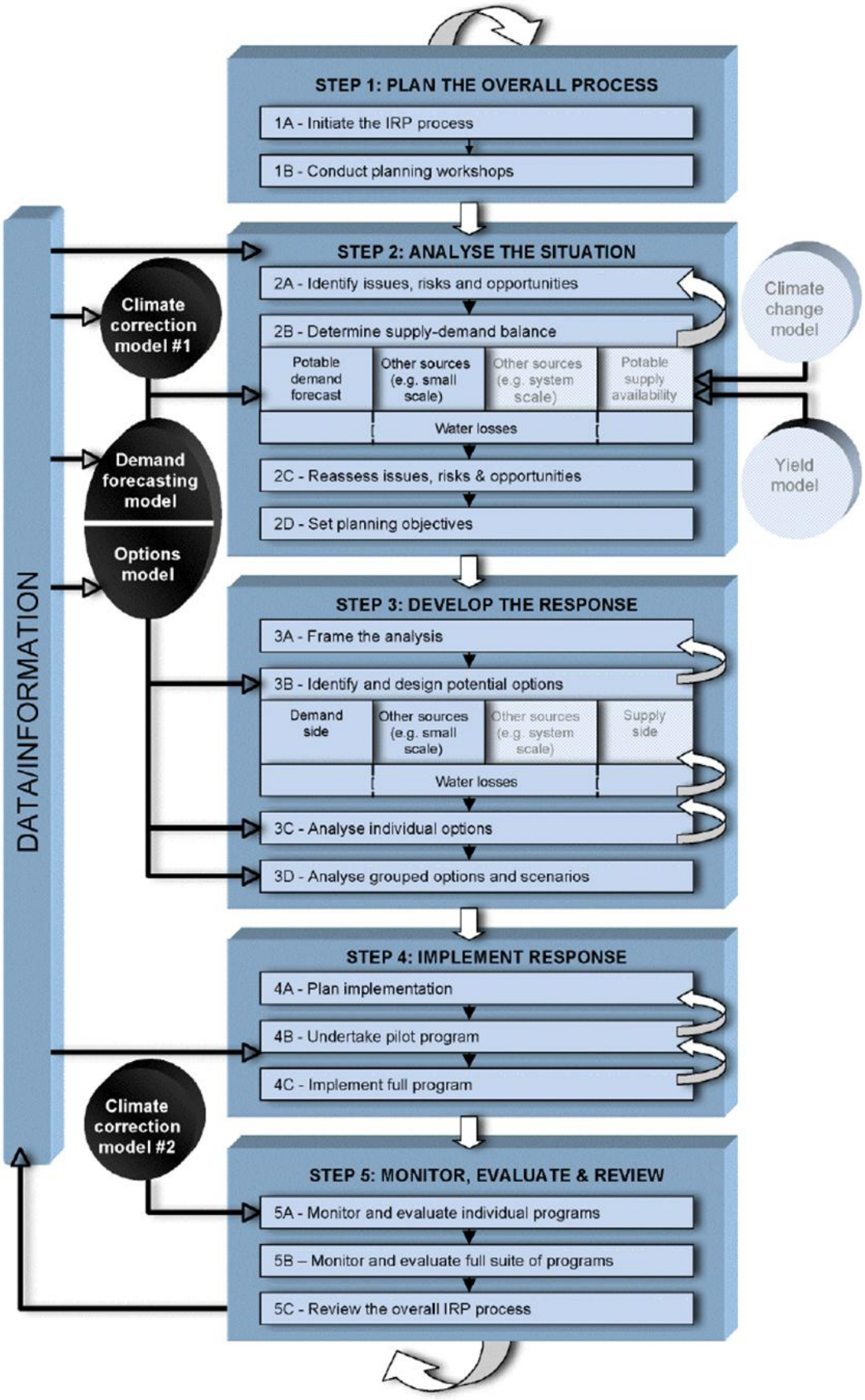
1 Year ending	2 Connected Population (yearly)[17]	3 Water supplied[18] - Last 12 months (m^3)	4 Days in year	5 Daily production volume (m^3/d)	6 Gross PCC (L/p/d)	7 Target (L/p/d)
Jun-2004	1,169,933	127,466,634	366	348,269	297.68	298.0
Jun-2005	1,196,156	131,286,244	365	359,688	300.70	295.9
Jun-2006	1,220,748	134,995,374	365	369,850	302.97	293.7
Jun-2007	1,243,698	136,534,078	365	374,066	300.77	291.6
Jun-2008	1,266,905	136,975,734	366	374,251	295.41	289.5
Jun-2009	1,291,739	131,220,622	365	359,509	278.31	287.4
Jun-2010	1,319,709	134,950,560	365	369,728	280.16	285.2
Jun-2011	1,334,385	135,141,165	365	370,250	277.47	283.1
Jun-2012	1,354,401	134,229,925	366	366,748	270.78	281.0
Jun-2013	1,375,893	137,843,669	365	377,654	274.48	278.8

[17] 'Smoothed' population figures, derived by Covec

[18] Watercare 'Sales total', equivalent to the supply to the former Local Network Operators through the Bulk Supply Meters, including consumption at Mangere WWTP

Appendix B

WSAA Integrated Resource Planning Framework


STEP 1: PLAN THE OVERALL PROCESS
1A - Initiate the IRP process
1B - Conduct planning workshops
STEP 2: ANALYSE THE SITUATION
2A - Identify issues, risks and opportunities
2B - Determine supply-demand balance
Potable demand forecast
Other sources (e.g. small scale)
Other sources (e.g. system scale)
Potable supply availability
Water losses
2C - Reassess issues, risks & opportunities
2D - Set planning objectives
Climate change model
Yield model
Climate correction model #1
Demand forecasting model
Options model
STEP 3: DEVELOP THE RESPONSE
3A - Frame the analysis
3B - Identify and design potential options
Demand side
Other sources (e.g. small scale)
Other sources (e.g. system scale)
Supply side
Water losses
3C - Analyse individual options
3D - Analyse grouped options and scenarios
STEP 4: IMPLEMENT RESPONSE
4A - Plan implementation
4B - Undertake pilot program
4C - Implement full program
Climate correction model #2
STEP 5: MONITOR, EVALUATE & REVIEW
5A - Monitor and evaluate individual programs
5B – Monitor and evaluate full suite of programs
5C - Review the overall IRP process
DATA/INFORMATION

Appendix C

Options review

Immediate actions

The options summarised below are those identified as 'immediate' actions.

Reference	Option	Why it is an immediate action	What needs to be done and by whom	Potential savings in 2025
1.1	Residential education and awareness	■ Some mechanisms currently in place, potential for enhancement ■ Low level of complexity ■ Strong customer need	Watercare ■ Continue with provision of specific water use information on customer bills ■ Continue to attend events to promote water efficient devices ■ Enhance Watercare's website to a more interesting and interactive format with water efficiency tips and hints ■ Develop a wider suite of customer leaflets and brochures on water savings and devices, where to find them and what they involve (water savings, costs, consents, etc.) ■ Consider advertisements for magazines, for example Home and Garden ■ Create an interactive on-line water savings tool, which will allow customers to identify where and how they could save water around the home	4 MLD ■ Based on a 25% uptake and cumulative savings of 2 L/prop/d/yr
1.2	Water Advice Line	■ Pilot programme already in place, potential for expansion	Watercare ■ Continue the one-to-one work with residential high users ■ Provide customised recommendations and regular reports on water usage over a 12 month period ■ Review savings and extend programme if appropriate ■ Gather data to improve understanding of residential water use	~0.5 MLD ■ If recruitment of 10 properties / week can be maintained
1.3	Housing NZ programme	■ Programme already in place, potential for expansion	Housing NZ and Watercare ■ Continue with the leak detection programme ■ Benchmark water use between Housing NZ properties ■ Audit high water users and work with them to reduce consumption	0.55 MLD ■ Identified savings from existing programme ■ Potential to be increased in the future

Reference	Option	Why it is an immediate action	What needs to be done and by whom	Potential savings in 2025
1.4	Improved residential water efficiency methods for new builds[19]	■ Very high potential for water savings ■ Not under the direct control of Watercare ■ Ongoing involvement needed to effect change	Government ■ Develop legislation to mandate, or enable local government to require, the installation of water efficient devices (dual flush toilets, low flow showers, etc.) with a high WELS rating in new build properties. This will provide a high level of certainty that lower per capita consumption will result. Watercare ■ Lobby for an improved legislative focus on water efficiency	3 MLD ■ Based on legislation being approved in 2016
1.5	Non-residential education and awareness	■ Limited information currently available ■ Low level of complexity ■ Strong customer need	Watercare ■ Enhance the 'Save water at work' section of Watercare's website to a more interesting and interactive format and to provide water efficiency tips and hints specific to non-residential customers ■ Provide information about non-residential benchmarks for water use where available, for example m^3/area of floor space ■ Develop a wider suite of leaflets and brochures about water saving to provide with customer bills	1.25 MLD ■ Based on savings of 2 Litres per connexion per day on the 2,500 lowest non-residential water users by 2025

[19] Similar schemes operate in the United Kingdom and the states of Victoria and New South Wales in Australia.

Reference	Option	Why it is an immediate action	What needs to be done and by whom	Potential savings in 2025
1.6	Non-residential volumetric wastewater charge	■ Very high potential for water savings ■ Already implemented in some parts of the region ■ Harmonisation of charging needed	Watercare ■ Consultation with non-residential customers happened in 2013 ■ New non-residential wastewater tariff including a volumetric component to be implemented 1 July 2014	1.50 MLD ■ Based on 7% reduction in non-residential water use whit currently no volumetric charging for wastewater ■ Assumption that savings are achieved within 3 years and don't improve further
1.7	Auckland Council programme	■ First steps of the programme already started	Auckland Council ■ Finalise baseline for water efficiency targets ■ Continue to analyse water use data to set benchmarks for each site type ■ Retrofit council buildings and community facilities with water efficient fittings during refurbishments ■ Educate staff and the general public ■ Review water used for irrigation of sports fields	To be confirmed
1.8	Watercare treatment process and operations	■ Important to set a good example for other industrial businesses ■ Within Watercare's direct control	Watercare ■ Carry on current water re-use practices at WTPs and WWTPs ■ Improve water re-use in Army Bay WWTP ■ Install sub-metering during upgrades to help identify leaks or water wastage within processes	Minor (above existing savings)

Reference	Option	Why it is an immediate action	What needs to be done and by whom	Potential savings in 2025
1.9	Leakage and non-revenue losses	■ Target of our Statement of Intent, part of Watercare's core responsibilities ■ Within Watercare's direct control	Watercare ■ Improve understanding and management of water network system to reduce losses ■ Perform leak detection measures ■ Monitor and demonstrate compliance with targets set for non-revenue water. These are as follows: –15% by 2013; –14% by 2014; –13% by 2015; and –12% by 2025.	6 MLD ■ Based on leakage targets and current leakage of 14.7%
1.10	Watercare premises	■ Important to set a good example for other commercial businesses ■ Within Watercare's direct control	Watercare ■ Watercare headquarters building expects to meet the criteria for a 5 star green building ■ Monitor and report water use annually at Watercare's new office ■ Benchmark with data for New Zealand offices	Minor

Pilot programme

The options summarised below are those that will be piloted. These are non-residential water efficiency options for large water users targeting the following sectors:

Reference	Option	Why it is a pilot programme	What needs to be done and by whom	Potential savings in 2025	
2.1	Food processing / packaging (industrial)	■ Very high potential for water savings ■ New service, requiring time and investment to develop ■ Detailed sector-specific approaches and their merits need to be assessed through pilots	Watercare ■ Approach a selection of customers within each of the sectors ■ Help carry out a water audit to investigate where cost-effective water efficiency measures can be implemented to reduce water use ■ Consider using smart water metering to provide time of use information on water usage and identify leaks ■ Develop and promote key learning points about cost-effective water efficiency measures within each sub-sector Customers ■ Work with Watercare to identify possible areas of savings ■ Implement the cost-effective options that are identified	<0.5 – 1.0 MLD	2 - 4 MLD (targeting Top 100 users) ■ Based on savings between 5-10%
2.2	Institutional			< 0.5 MLD	
2.3	Manufacturing / refining (industrial)			< 0.5 MLD	
2.4	Beverage processing (industrial)			< 0.5 MLD	
2.5	Accommodation (commercial)			< 0.5 MLD	

Options to investigate

The options that were identified as requiring further investigation are summarised below.

Reference	Option	Why investigation is required	What needs to be investigated and by whom	Potential savings in 2025
3.1	Outdoor water use (including awareness and retrofitting devices)	■ To determine how to reduce outdoor water use in a cost-effective manner	Watercare ■ More information on an upgraded and interactive website ■ Working with garden centres to educate customers about drought tolerant planting and eco gardening ■ Articles or information in magazines, such as NZ Gardener ■ Subsidising devices such as trigger nozzles for hoses or water efficient irrigation systems ■ Providing rebates for pool owners who use covers or non-potable water to top up their pools	Unknown
3.2	Source substitution by the use of rainwater tanks (for new builds)[20]	■ To determine whether savings can help reduce peak demand ■ To consider appropriate options ■ To identify barriers to implementation and how these can be overcome ■ To assess cost-effectiveness	Watercare ■ The development of collaborative work on rainwater tanks and participation in a study to assess the potential effect of rainwater tanks. ■ Provision of information on Watercare's website Government ■ How Government could develop legislation regarding rainwater tanks for new build properties	1.0 MLD (on average, expected to be much less at times of peak demand) ■ Water use for toilet flushing ■ Assumes 10% of new homes have rainwater tanks

[20] The optimal tank size and possible benefits will vary depending on the type and size of housing. For example, the volume captured and end uses in an apartment block will be very different to a stand-alone residential house.

Reference	Option	Why investigation is required	What needs to be investigated and by whom	Potential savings in 2025
3.3	Source substitution by the use of greywater (for new builds)[21]	■ To determine the possible extent of savings ■ To consider appropriate options ■ To identify barriers to implementation and how these can be overcome ■ To assess cost-effectiveness	Watercare ■ The potential cost and effect of greywater re-use ■ Provision of information on Watercare's website Government ■ How Government could develop legislation regarding greywater re-use for new build properties	1.0 MLD (at both average and peak times) ■ Water use for toilet flushing ■ Assumes 10% of new homes have greywater re-use
3.4	Education for schools	■ To assess the cost-effectiveness of an education programme	Watercare ■ How Watercare could work with schools to advocate water wise messages and the staffing level required to achieve this –Presentations to schools –Provision of leaflets or brochures about water savings that students can take home with them ■ Enhance existing schools education programme that focuses on water quality, to also promote water efficiency	Unknown
3.5	Water efficiency in schools	■ Preliminary work on 'best practice' irrigation is needed to inform schools ■ To assess cost-effectiveness	■ How to develop a 'best practice' approach to irrigation to pass on to schools Watercare and Ministry of Education ■ How to implement a programme, likely to include: –Leak detection and minimisation –Improved irrigation practices (potentially based on the results of work by Auckland Council) –Retrofitting some water efficiency devices, such as units to prevent automatic urinal flushing	<0.5 MLD ■ Based on savings of 10%

[21] One of the key advantages of greywater reuse is that it provides a source of water that is not dependent on rainfall, so it can provide a drought resilient water source.

Reference	Option	Why investigation is required	What needs to be investigated and by whom	Potential savings in 2025
3.6	Tariffs	■ Changes to the tariff structure are sensitive ■ Watercare has an obligation to provide water at minimum cost	Watercare ■ How different tariff structures could be used to reduce peak water use and promote water conservation ■ Whether changes to the tariff structure to promote water efficiency are consistent with current legislation	Unknown at this stage
3.7	Pressure reduction and management[22]	■ Typically reduces water use and non-revenue water ■ High investment needed ■ The costs, benefits and detailed options are specific to each water supply zone	Watercare ■ Development of small District Metered Areas (DMA's) which are actively managed at an optimum level of pressure ■ Determine the costs and benefits of implementing pressure reduction and management on a zone by zone basis	Unknown at this stage

[22] Part of the strategy to achieve the leakage reduction targets included as option 'W2 – Leakage and non-revenue losses'

Options to be deferred

The options that are deferred at this point are summarised below.

	Reference	Option	Why it is a deferred option
	4.1	Improved residential efficiency by retrofitting water efficiency devices	■ Technical complexity and difficulty of implementation ■ Overseas studies have shown these schemes are not cost-effective
	4.2	Legislation regarding outdoor water use (for new builds)	■ Difficult to define and implement ■ Homeowners likely to change gardens, so benefits very short term and uncertain

Appendix D

Action plan

9 Reference	10 Option Name	11 Responsibility	12 Year 1 2013-14	13 Year 2 2014-15	14 Year 3 2015-16	15 Year 4 2016-17	16 Year 5 2017-18
1.1	Residential education and awareness	Watercare	Continue and enhance existing water efficiency information Investigate an interactive water savings calculator	Implement an interactive water savings calculator	Review and update residential customer water efficiency information	Review and update residential customer water efficiency information	Review and update residential customer water efficiency information
1.2	Water advice line	Watercare	Continue existing programme Review actual water saved	Refine programme based on identified savings	Implement an enhanced version of this programme if cost-effective	Continue to operate and monitor savings	Continue to operate and monitor savings
1.3	Housing NZ programme	Housing NZ Watercare	Continue to audit properties and identify leaks Audit high users and identify options to reduce consumption	Monitor savings Audit high users and identify options to reduce consumption	Monitor savings Audit high users and identify options to reduce consumption	Monitor savings Audit high users and identify options to reduce consumption	Monitor savings Audit high users and identify options to reduce consumption
1.4	Improved residential water efficiency methods for new builds	Government Watercare	Information gathering about how and where these approaches are implemented	Review potential for implementation of legislation to mandate the use of water efficient devices	Recommend approach to local and national Government	Support Government approach to improved water efficiency	Support Government approach to improved water efficiency
1.5	Non-residential education and awareness	Watercare	Develop non-residential water efficiency tips and hints	Implement non-residential customer water efficiency information	Review and update non-residential customer water efficiency information	Review and update non-residential customer water efficiency information	Review and update non-residential customer water efficiency information

9 Reference	10 Option Name	11 Responsibility	12 Year 1 2013-14	13 Year 2 2014-15	14 Year 3 2015-16	15 Year 4 2016-17	16 Year 5 2017-18
1.6	Non-residential volumetric wastewater charge	Watercare	Inform about the new tariff	Implement the new tariff	Implement the new tariff	Implement the new tariff	
1.7	Auckland Council programme	Auckland Council	Define target Develop plan	Implement plan and reduce water use	Monitor savings Develop best practice irrigation guidance	Monitor savings	Monitor savings
1.8	Watercare treatment process and operations	Watercare	Maintain existing approach to the re-use of water	Investigate opportunities to reduce use at Army Bay WWTP	Implement savings at Army Bay WWTP if these are feasible	Maintain existing approach to the re-use of water	Maintain existing approach to the re-use of water
1.9	Leakage and non-revenue losses	Watercare	Continue to monitor and report non-revenue losses Reduce to 14%	Reduce to 13%	Reduce to 12%	Retain at 12%	Retain at 12%
1.10	Watercare premises	Watercare	Monitor and report water use within its office premises Compare against available benchmarks	Continue to monitor water use Investigate any options to reduce water use further	Continue to monitor water use	Continue to monitor water use	Continue to monitor water use
2.1-2.5	Non-residential water efficiency options for large water users	Watercare	Identify and categorise large users	Approach customers Develop a pilot programme within one sub-sector	Implement and evaluate pilot programme Recommend approach based on these outcomes	Implement as recommended from the first pilot programme	

	9 Reference	10 Option Name	11 Responsibility	12 Year 1 2013-14	13 Year 2 2014-15	14 Year 3 2015-16	15 Year 4 2016-17	16 Year 5 2017-18
	3.1	Outdoor water use (including awareness and retrofitting devices)	Watercare	Gather information about approaches in NZ and overseas	Develop preferred approaches to help customers reduce outdoor water use Discuss with potential partners	Implement a pilot project to assess this programme	Evaluate its effectiveness Develop a programme based on this pilot project	Implement recommended programme
	3.2	Source substitution by the use of rainwater tanks (for new builds)	Watercare and other stakeholders	Carry out a piece of work to establish the benefits of rainwater tanks	Implement the recommendations of this study			
	3.3	Source substitution by the use of greywater (for new builds)	Watercare	Gather information about approaches in NZ and overseas	Investigate the potential costs and benefits of greywater use Investigate legal and other challenges	Implement the recommendations of this study		
	3.4	Education for schools	Watercare	No work planned	Investigate how an expanded schools programme could be used to promote water efficiency	Pilot programme with a small group of schools Seek feedback and update programme	Implement recommended approach	Maintain scheme
	3.5	Water efficiency in schools	Auckland Council Watercare Government		Gather information about schools' water use	Auckland Council to develop 'best practice' approach to irrigation	Investigate most appropriate water efficiency options for schools Develop programme	Pilot programme with a small group of schools Seek feedback and update programme

	9 Reference	10 Option Name	11 Responsibility	12 Year 1 2013-14	13 Year 2 2014-15	14 Year 3 2015-16	15 Year 4 2016-17	16 Year 5 2017-18
	3.6	Tariffs	Watercare	No work planned	No work planned	Gather information about tariff options	Investigate different tariff options that could be implemented in the future	
	3.7	Pressure reduction and management	Watercare	Update existing work on pressure reduction and management Assess how this could help achieve leakage reduction targets	Implement agreed programme	Continue to monitor pressure and non-revenue water		