Think water, act water

Strategy for sustainable water resource management in the ACT

2009 Demand Management Progress Report

ACT Government

This report has been compiled by Sustainability Programs, Regulation and Services, Environment and Sustainable Development Directorate (ESDD), ACT Government.

For further information about *Think water, act water* and this report, contact Canberra Connect on 13 22 81 or visit www.thinkwater.act.gov.au

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EXECUTIVE SUMMARY

The *Think water, act water 2009 Demand Management Progress Report* examines the contribution of demand management programs towards meeting the following targets for the reduction of mains water usage in the *Think water, act water* Strategy for sustainable water resource management in the ACT:

- 12 per cent reduction (per capita) in mains water usage by 2013; and
- 25 per cent reduction (per capita) by 2023.

The Strategy's target to increase the use of treated waste water (reclaimed water) from 5 per cent to 20 per cent by 2010 is outside the scope of this Report.

Due to the relatively recent implementation of demand management measures around Australia, there is limited quantitative data available about the actual water savings of such initiatives. This makes it difficult to accurately identify water savings for specific demand management measures. In the absence of detailed end-use data (requiring long-term data logging and metering at the individual household level), it has been necessary to use assumptions to develop water savings attributable to the demand management initiatives. Evaluation of the effectiveness of programs is further complicated by behaviour change brought about by temporary water restrictions in place in the ACT since prior to release of the *Think water, act water* Strategy.

Significant progress has been made in improving water use efficiency since the release of *Think water, act water* in 2004, and the implementation of initiatives under the Strategy. This Report finds that the most cost-effective options in terms of water saving are permanent water conservation measures (PWCM) and the Water Efficiency Labelling and Standards Scheme (WELS), followed by showerhead replacement programs.

WELS, PWCM and the other regulatory measures, such as Water Sensitive Urban Design (WSUD) and new plumbing regulations, offer the highest degree of confidence that the gains made in water savings will continue into the future.

Collectively, residential programs account for almost 11 per cent of the demand management water savings and also provide a number of additional benefits in terms of their ability to create awareness, understanding and ownership of urban water management by the ACT community.

Further work is required in the commercial and government sectors to ensure significant improvements in water savings.

Projected savings through initiatives implemented from April 2004 to end June 2009 indicate that water efficiency targets set in *Think water, act water* are achievable. Based on the analysis, the 2013 target of a 12 per cent reduction per capita in mains water usage can be met through the current initiatives. However, meeting the 2023 target of a 25 per cent reduction per capita will require increased savings, and investigation and evaluation of further water efficiency measures, if these savings are to be achieved in the most cost-effective way.

INTRODUCTION

The ACT Government's long-term water resource management strategy *Think water, act water*[1] was released in April 2004 to provide guidance for the future management of ACT water resources.

Think water, act water set the following targets for reducing mains water consumption in the ACT:

- 12 per cent reduction (per capita) in mains water usage by 2013; and
- 25 per cent reduction (per capita) by 2023.

The base consumption, from which all savings in this Report are measured, is the 2003 unrestricted consumption rate – 182 kL/capita/annum[2].

The targets are to be achieved through a combination of water efficiency and the use of stormwater and rainwater.

The *2009 Demand Management Progress Report* focuses on the following measures implemented to address Objective 2 of *Think water, act water*, which aims to increase the efficiency of water usage through:

- residential rebate and assistance programs;
- commercial rebate and assistance programs;
- permanent water conservation measures (PWCM);
- Water Efficiency Labelling and Standards (WELS);
- information and awareness campaigns;
- water sensitive urban design (WSUD); and
- plumbing regulations.

The Canberra Integrated Urban Waterways project to harvest stormwater from constructed ponds is also addressed in this Report. By providing an alternative water source to potable water (source substitution), this project is expected to reduce use of potable water and contribute to meeting the *Think water, act water* mains water reduction targets.

This Report examines the progress made towards meeting the Strategy's water efficiency targets from the implementation of *Think water, act water* in April 2004 to June 2009.

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[1] ACT Government (2004) *Think water, act water Volume 1: Strategy for sustainable water resource management in the ACT* and *Think water, act water Volume 2: Explanatory document.*

[2] Actew Corporation model output for unrestricted water consumption.

In 2009-10 a review and evaluation of *Think water, act water* commenced. The review includes an assessment of the demand management program and its components, and the progress to attain the targets of *Think water, act water.*

The *Think water, act water* strategy including the demand management program in the future may be affected by the draft Basin Plan now being developed by the Murray-Darling Basin Authority. The draft Basin Plan will be considered in the review of *Think water, act water*.

A separate report arising from this review will be produced.

FACTORS AFFECTING DEMAND

Global context

The UN-sponsored Intergovernmental Panel on Climate Change (IPCC) concluded that '…there is now stronger evidence that most of the warming observed over the last 50 years is attributable to human activities'.[3] The enhanced greenhouse effect is believed responsible for observed high temperatures and associated impacts reported by the IPCC.

The effects of global warming play an important role in the ACT's water demand management strategy. As parts of the world become warmer, Canberra will potentially experience relatively harsher and more prolonged droughts and less rainfall. This exacerbates the present water scarcity and leads to significant challenges for any long-term water security strategy.

Climate change

It is prudent for the ACT to plan future water-supply infrastructure on the basis that climate change will happen or has happened. Work by CSIRO4 and the CRC for Catchment Hydrology on climate change projections predicts:

- an increase in the average mean annual **temperature** in the Canberra region by 2050 of between 0.8^{o}C and 1.8^{o}C (low emission scenario);
- a change in average annual **rainfall** by 2030, ranging from no increase to a decrease of 10 per cent; and
- projected annual point potential **evaporation** increase between 0 per cent and 6 per cent by 2030.

At end June 2009, the ACT's water storage level was just over 43 per cent of its capacity.

The Cotter River and Queanbeyan River catchments make up the main water supply sources for the ACT. Under current predicted climate change, these catchments are expected to experience decreases in annual water runoff by up to 20 per cent in 2030 and 50 per cent by 2070.[5] This combined with predicted population growth, means that the ACT is likely to experience increasing stress on its water supply.

Recent weather cycles

Whilst global warming changes proportionally to the build up of greenhouse gases, it can result in rapid ('step') climate changes in a particular region. Canberra has experienced much drier conditions over recent years. These sudden changes in climate place extra pressure on Canberra's water management strategies.

[3] Intergovernmental Panel on Climate Change (IPCC), Assessment Report *Climate Change 2007*
[4] CSIRO (2007) *Climate change in Australia, Technical report 2007, Chap 5, 49–107.*
[5] Chiew FHS, Zhou S & McMahon TA(2003) *Use of seasonal streamflow forecasts in water resources management* Journal of Hydrology, Vol. 270, 135–144.

Since 2003 the climate of the ACT region has changed relative to the historical average. Rainfall has been lower than average every year since 2001, with the exception of 2005. Table 1 shows the comparison between the historical average rainfall and actual rainfall.

Table 1: ACT: average annual rainfall, 2001–2008

Year	Rainfall (mm)
Historical average	**630**
2001	500
2002	505
2003	569
2004	435
2005	648
2006	392
2007	565
2008	530
Average over period	**518**

As a result of reduced rainfall over the last decade, the long-term rainfall average has declined. Average minimum temperatures also increased over the same period. While there is a question of whether this change is short-term climate variability or preliminary evidence of longer-term climate change, there has been a change in the availability of water resources.

Seasonal and daily demand

Canberra receives an annual average of 630 mm of rainfall which falls fairly uniformly throughout the year. Average annual potential evaporation in Canberra varies with the season. In winter, the rate of evaporation is less then 10 mm per day. In summer it can reach as high as 170 mm.

The seasonal demand for water is more pronounced in detached homes than any other sector in Canberra. Generally, indoor water demand is not affected by seasonal variations. However, outdoor demand increases largely because of use of water for irrigation of gardens and public places in the warmer, drier months.

Population growth

Global population has tripled over the past 70 years[6] and water use has grown six-fold. Total water consumption is growing at about the same pace as population. However, the amount of available fresh water has not changed.

Accurate population projections are critical to future long-term water planning for the ACT. While the range of projected populations is extremely broad, and historically forecasts for the ACT have tended to overestimate consumption, a high population projection remains the prudent approach for water supply planning.

In September 2008 the Australian Bureau of Statistics (ABS) released new population projections for the ACT and the surrounding area. The main differences from the 2005 projections are that there is now a higher base population and a higher projected

[6] United Nations (2006) *World Population Prospect, The 2006 Revisions*

population growth. The ABS provides three sets of population projections – low, medium and high – based on different assumptions.

The ACT Government report *ACT Population Projections 2007 to 2056* (2009, Chief Minister's Department) takes into account the latest ABS data and supersedes the previous ACT Demographics Report of 2003. The ABS estimated that the population of the ACT at 30 September 2008 was 346,429. At the low projection this is predicted to increase to 370,000 by 2023. However, at the high projection it could be as high as 441,000 by 2023.

The new population projections are now included in modelling for ACTEW's purposes. The substantive impact on short and medium-term planning is not deemed significant as ACTEW bases its plans on high population projections with lead times for major infrastructure and system changes well in advance.

As is normal practice, this Report uses the medium population projection in calculating water savings from demand management measures.

Population behaviour and culture

Australia-wide, excluding irrigation, the major consumption of water occurs in large metropolitan areas. Water consumption for urban areas includes industrial and commercial activities, with the domestic component by far the largest. Domestic consumption of water has increased over the past 30 to 40 years as a consequence of both increased population and rising per capita demand. However, since the onset of the prolonged drought from 2002, most Australian capital cities have reduced their consumption per capita, often via a water restriction regime.

Canberra, unlike other Australian capital cities, is located inland with a generally drier climate. Canberra's climate affects water consumption. Canberra's domestic water consumption is dominated by outdoor use[7] – some 30 to 50 per cent – especially lawn and garden watering, and is a reflection of larger residential property sizes in some areas and the attention devoted to gardens. Detached houses use some 54 per cent of total water consumption compared with six per cent by flats and units.[8]

Gardens are also the major factor in peak summer water demand. It has been estimated that on a hot summer's day, some two-thirds of all water consumed goes on gardens[9]. The large proportion used on gardens, combined with its variability due to prevailing weather conditions, tends to hide the seasonal increase in per capita average consumption.

Another factor historically influencing increased domestic consumption of water has been the expansion of the sewerage system to previously non-sewered areas and new suburbs.

[7] ACT Government (2004) *Think water, act water*
[8] *ibid*
[9] *ibid*

WATER DEMAND MANAGEMENT INITIATIVES

Between 2004 and 2009 the following water efficiency programs were implemented under the *Think water, act water* Strategy. Table 3 displays the estimated savings from each of these measures.

Residential sector initiatives

Showerhead rebate programs

Two showerhead rebate programs were conducted by the ACT Government in 2004-05 and 2005-06 during which 10,953 rebates were issued for 3-star showerheads.

WaterSmart Homes Program

The WaterSmart Homes Program, formerly called Indoor Water Tune-up, was offered to residents from 2004 to 2007. During this time 7,260 WaterSmart Homes visits were conducted. The Program cost the resident $30 and comprised a home visit by a licensed plumber who provided:

- advice on practical ways to use less water inside the home;
- the installation of a 3-star, water-efficient showerhead (with the option for a second showerhead at a cost of $22);
- the installation of two aerating flow regulators for the kitchen and bathroom;
- minor repairs to leaking taps;
- inspection of toilet cisterns, including minor repairs where feasible; and
- the installation of a cistern weight into single flush toilets to reduce toilet water use.

Participants were also eligible to receive a rebate of up to $100 for the replacement of a single flush toilet with a 6/3 litre dual flush toilet (cistern and pan), with a maximum of two dual flush toilet rebates per residence.

This Program ceased on 1 July 2007 when commercial companies commenced free showerhead and compact fluorescent light globe replacements under a Greenhouse Gas Abatement Scheme (GGAS).

Greenhouse Gas Abatement Scheme (GGAS)

Companies operating under the NSW Greenhouse Gas Abatement Scheme (GGAS), administered by the Independent Pricing and Regulatory Tribunal (IPART) NSW, have offered free compact fluorescent light (CFL) bulbs and 3-star showerheads through a number of demand-side abatement programs in the ACT. IPART advised that due to the reduction to the Installation Discount Factor for giveaway programs during late 2006, the majority of showerheads distributed from 2007 onwards were installations, and that most companies ceased their programs as of 1 January 2009 when the CFL default factors were reduced. In addition, the drop in NSW Greenhouse Abatement Certificates (NGAC) prices made the programs uneconomic.

Data from IPART indicates that 15,218 showerheads were distributed in the residential sector through the GGAS during the 2007 and 2008 calendar years, and that most of these were likely to have been through the installation programs, rather than giveaways.

Under GGAS 1,270 showerheads were also installed in the commercial sector.

Dual Flush Toilet Rebate Program / ToiletSmart
A dual flush toilet rebate program commenced in December 2004 as an optional component of the WaterSmart Homes Program. The rebate was $100 for the replacement of a single flush toilet with a 3L/6L dual flush suite. Six hundred and fifty-eight (658) dual flush toilets were replaced under this Program.

In May 2008, a new toilet rebate program, ToiletSmart, commenced and offered rebates on the supply and installation of 3L/4.5L dual flush toilets to replace single flush toilets. For Pensioner Concession Card holders a full rebate was offered on the standard toilet suite, while a $100 rebate was offered to all other customers. By the end of June 2009, 3,719 toilets were replaced through the ToiletSmart Program.

GardenSmart Program
The GardenSmart Program, previously called the Outdoor Water Tune-up, has been offered to ACT residents since December 2004. A qualified horticulturist visits the household to demonstrate practical ways to use less water through a variety of gardening techniques. The Program originally cost $30 per participant, but the cost was subsequently dropped to encourage greater participation rates.

This Program provides:

- an analysis of the garden;
- advice on how the garden could be made more water-efficient through plant choice, garden design, garden maintenance and improved watering practices; and
- a rebate of up to $50 on the purchase of selected water-saving products.

By the end of June 2009, 4,922 GardenSmart Home visits were provided and 1,512 rebates were issued.

Rainwater Tank Rebate
Rebates for the installation of approved rainwater tanks are offered for residential properties connected to the ACTEW Corporation water supply network. Since the rebate program was first introduced, rebate amounts and conditions have changed. The rebates during 2008-2009 were:

- total storage capacity of 2,000 to 3,999 litres – $750 (with internal connection);
- total storage capacity of 4,000 to 8,999 litres – $900 (with internal connection); and
- total storage capacity 9,000 litres or greater – $1,000 (with internal connection).

A rebate of $600 is available for internal connection of existing rainwater tanks.

The main change in conditions for the program occurred on 1 August 2005 when a mandatory eligibility condition for the rebate was introduced, requiring all tanks to have a plumbing connection to fixtures inside the home (for example, to the toilet or washing machine). The purpose of this condition was to maximise water savings.

By the end of June 2009, 1,524 rainwater tank rebates and 54 internal plumbing connection only rebates were issued. The potable water savings from tanks installed in the rainwater tank rebate program is estimated to be 131 ML of potable water, about 1 per cent of total water saved by various demand management strategies.

The average tank capacity installed per rebate issued through the program since July 2007 is in the range of 7 to 8 kL.

Greywater
To assist ACT residents use domestic greywater safely, the ACT Government released *Guidelines for greywater use in residential Canberra properties* in December 2004. These guidelines were revised and the second edition was released in October 2007.

A greywater hose scheme ran in 2007-2008 during which 10,000 greywater hoses were distributed, free-of-charge, to the community.

Commercial and institutional sector initiatives

Commercial Water Audit Program
A Commercial Water Audit Program commenced in February 2005 and ceased in June 2007. The program targeted large water users and provided data-logging of water consumption patterns, a walk-through audit and recommendations for increased water efficiency. The program continued in 2005-06 and 2006-07, with 80 sites receiving audits. Potential water savings of 5,000kL/year/property were estimated based on average potential savings reported by auditors.

Follow up by the Department after the audit found that very few organisations were taking actions recommended in the audits. This may be due to companies being unable to justify the scheme on a commercial basis.

In some states (i.e. Queensland and NSW), development and implementation of Water Efficiency Management Plans are mandated, which may give the impetus for large organisations to take action in this area. However, this is not mandated in the ACT.

Commercial Bathroom Retrofit Program
To address low take up of audit recommendations in the Commercial Water Audit Program outlined above, a new Commercial Bathroom Retrofit Program was developed. Commencing in February 2009, it provides building owners and managers with a financial incentive of a rebate up to the value of $20,000 per building to participants on a dollar for dollar basis to upgrade bathroom fixtures in commercial buildings. The take-up of the Program was initially slow, but expected to increase in 2009-10. After signing up for the Program, businesses have up to two years to implement water saving fixtures to claim the rebate.

Due to the wide variation in scope of retrofits and size of participating organisations, formulating an average water saving per year at this early stage of the Program is not

feasible. By end 2011-12, most participating businesses are expected to have completed their retrofits and sufficient data is expected to be available to make more informed assumptions on the actual and potential water savings of this program.

School water audits
Since 2005-2006, water audits on ACT schools have been undertaken as part of the ACT Sustainable Schools Initiative (AuSSI). The audits examine a school's indoor and external water use. Reports from completed audits are provided to schools to assist them to develop school environmental management plans.

Schools and Government sports field irrigation
To the end of June 2009, COMTROL, a centralised irrigation management system, has been installed in six sports grounds, eight irrigated parks and seventeen Government schools. Six school irrigation systems were upgraded and designs for the replacement of three irrigation systems in parks were completed. Estimated water saving[10] per hectare per year for sportsfield and school irrigation systems under COMTROL is 3,261 kL and for public parks is 1,202 kL. It should be noted that due to temporary water restrictions, COMTROL control in schools has not been operating and a new system of management will be required for its use.

Water Sensitive Urban Design

Water sensitive urban design (WSUD) principles and measures are implemented to manage water in our urban environments by reducing the demand for potable water and improving the water quality and natural amenity of urban water systems.

The implementation of WSUD requires the application of a broad range of measures aimed at:

- reducing reliance on the potable water supply system;
- reducing stormwater runoff with its associated pollutants; and
- maximising opportunities to reuse waste water.

Under the *Planning and Development Act 2007*, the Government has put in place the *Waterways: Water Sensitive Urban Design General Code*. The Code came into effect in 2008. It covers the management of the total urban water cycle and contains mandatory targets for mains water-use reduction, stormwater quality and stormwater quantity. The guidelines require a reduction in mains water use of 40 per cent, compared to pre-2003 levels, for all new developments and redevelopments – residential, commercial, industrial and institutional. This is consistent with the approach taken in other jurisdictions such as New South Wales.[11]

The WSUD guidelines will apply to all phases of the planning and development process and, as such, commits Government as well as developers and builders. In this regard, the guidelines are focused on providing a shared responsibility for implementation, not simply the passing of responsibility on to one sector of the community.

[10] Water savings estimate based analysis of COMTROL water consumption data.
[11] Coombes, Kuczera & Kalma (2003) *Economic, water quantity and quality impacts from the use of a rainwater tank in the inner city.*

Canberra Integrated Urban Waterways

The Canberra Integrated Urban Waterways Project is a joint ACT and Commonwealth initiative that aims to substitute 1.5 gigalitres of potable water per annum by 2011 and 3 gigalitres of potable water 2015. Three gigalitres of substituted potable water equates to approximately 15 % of the 25% potable water reduction target. The project was announced in November 2006. The ACT signed a Funding Deed with the Commonwealth in March 2007 that has provided $10.2 million to construct two new ponds on Flemington Road in Mitchell and a reticulation system to pump and pipe harvested stormwater from ponds to large irrigators in the Inner North.

The ACT has funded two new ponds in Dickson and Lyneham ($13.9 million) which will add additional stormwater volumes to the Inner North Reticulation Network. The ACT has also funded a reticulation network from the North Weston Pond ($5 million) and from Lake Tuggeranong ($14 million).

The three reticulation networks (Inner North, North Weston and Tuggeranong) are being developed as a pilot initiative to trial the costs and operation of broad scale stormwater harvesting in the ACT. The three pilot projects with the addition of several other smaller projects are expected to meet the first target of 1.5 gigalitres of potable water substitution water by 2011.

End users include private and public sportsgrounds, private and public schools and recreational and sporting facilities such as sporting clubs, golf courses.

Permanent Water Conservation Measures for the ACT

The persistence of drought led to the introduction of temporary water restrictions in December 2002. The temporary water restrictions regime resulted in significant water savings. However, these savings are not included in calculations to determine permanent increases to water efficiency in the ACT due to their temporary influence.

Permanent Water Conservation Measures (PWCM) were introduced in March 2006 after community consultation. The main measures are to:

- restrict watering of lawns and gardens to morning and evening hours;
- ban hosing of hard surfaces including driveways and windows;
- control use of sprinklers for dust suppression; and
- introduce compulsory use of trigger hoses for car washing.

In contrast to temporary restrictions, which are designed to meet short-term demand reduction targets, PWCM are designed to secure permanent water efficiencies in the ACT without imposing unreasonable impositions to the lifestyle of ACT residents.[12]

Modelling for the ACTEW Corporation's *ACT Future Water Options* Report indicates that PWCM may generate up to 8 per cent reduction in demand.

[12] ACTEW (2006) *Permanent Water Conservation Measures - Consultation Report.*

Regulations

Two significant regulatory reforms were introduced in the ACT during 2004-2005. The Legislative Assembly passed amendments to the *Water and Sewerage Act 2005* and the *Water and Sewerage Regulations 2001* to ensure that all new shower heads and taps installed inside buildings in the ACT are water efficient (9 litres flow per minute or less).

In a separate amendment to the *Water and Sewerage Regulations 2001*, the Government provided for separation of greywater in domestic premises to the edge of the floor slab. In addition, new developments are required to install 'provisional water pipes' to toilets, washing machines and an external point that will allow for future use of either greywater or rainwater.

These amendments have been designed to allow for installation of rainwater tanks and greywater reuse facilities in the future without the obstacle of prohibitive costs.

Information and awareness campaigns

Information and awareness campaigns are essential components of any policy mix designed to encourage increased water efficiency. In 2007–2009 the *Think water, act water* information and awareness campaigns focused on:

- promotion and awareness of residential water-use efficiency programs including press and radio advertising and displays at public events;
- development of two new web-based tools – the Canberra Plant Selector and the WaterRight Gardens Webtool – providing information to assist residents to be more efficient in garden water use; and
- awareness raising of water-efficient practices and appliances through fact sheets, residential indoor and outdoor water tune-up information kits, displays at public events and the *Think water, act water* website (www.thinkwater.act.gov.au).

Water Efficient Labelling and Standards

The national Water Efficiency Labelling and Standards (WELS) scheme operates in a similar way to energy efficiency labelling of electrical appliances. Appliances such as washing machines and dishwashers are labelled to provide consumers with information describing the water efficiency of these products. This information enables more informed purchasing choices by consumers and increased awareness of the importance of water conservation generally.

From 1 July 2006, WELS certification was mandatory for products in the following seven categories:

- clothes washers;
- dishwashers;
- toilet equipment;
- showers;
- tap equipment;

- urinal equipment; and
- flow controllers.

It is estimated that by 2021, national water savings of 87.2 million litres of water annually (5 per cent of total household water use) can be achieved.[13] In the ACT, by 2021, the scheme is expected to realise a saving of 1.39 million litres of water annually, the equivalent of 5 per cent of total water savings.

Pricing

While not a scheme directly targeted at reducing demand, changes to water pricing approved by the Independent Competition and Regulatory Commission (ICRC) since 2004 may have an indirect benefit of increasing awareness of water consumption for some users and even affect water consumption behaviour consumers who may be looking to reduce household costs. Allowances could be made for this in assessing potential water savings.

While water is regarded as an inelastic good with respect to demand and pricing, there has been a significant decline in the volume of water consumed per household since 2004 coinciding with a marked increase in the price of water.

Since April 2004, there have been two price path determinations in the ACT by the ICRC resulting in price increases, especially for high water usage. High volumetric water users (over 100 kL) now pay $3.50 per kilolitre now compared to $1.00 per kilolitre in 2004. Table 2 provides a summary of water pricing changes for 2004 to 2009.

ACTEW, in submitting its basis for an increase in water charges to the ICRC, also seeks to cover loss of revenue arising from the impact of the cost of water restrictions, and the cost of providing the Water Conservation Office which manages the water restrictions regime. These costs are recognised by the ICRC in setting water charges.

Table 2: ACT water charges, 2004–2009

ACT water prices ($ are nominal excluding WAC and NFT)	**2004–05**	**2005–06**	**2006–07**	**2007–08**	**2008-09**
Fixed $/annum	75.00	75.00	75.00	75.00	$85.00
Tier 1 (0–100 kL) $/kL	0.515	0.58	0.66	0.775	$1.75 for the first 200 kL
Tier 2 (101–300 kL) $/kL	1.00	1.135	1.29	1.67	$3.50 in excess of 200 kL
Tier 3 (301 kL+) $/kL	1.35	1.53	1.74	2.57	

Note: Average household consumption has declined since 2003–04.

[13] Wilkenfed G & Associates Pty Ltd (2004) *Regulation Impact Statement: Proposed National System of Mandatory Water Efficiency Labelling and Standards for Selected Products.*

Additionally, the water abstraction charge (WAC), a volumetric charge set by the ACT Government, has also increased since 2004. It is not subject to review by the ICRC, although in 2003 the ICRC conducted an investigation on the basis of the charge.

The WAC covers the cost of the environmental management of the ACT's catchments and includes a component for the scarcity value of water. It also sends a signal to consumers about the true cost of water. The WAC has increased since its introduction in 2000. The WAC is currently $0.51 per kL for water used in the urban network, and $0.25 per kL for non-urban.

The conclusions of a 2005 study[14] of pricing in response to the ACT Government's demand management targets highlighted that:

- pricing will be most effective when implemented in combination with other demand management policies;
- there is a role for pricing in achieving targets;
- there will be a 'kink' in the demand curve for water in the ACT, estimated within the range of 170 to 200 kL/customer/annum;
- this kink corresponds to the consultant's range estimate of the average level of domestic indoor water use. Domestic consumption above this level will largely be for outdoor purposes and be more responsive to changes in price;
- the price structure that will best achieve the targets is an inclining block tariff with a single step threshold in the range 170 to 200kL/annum;
- the water tariff required to meet the 2013 target would have a top step price (including WAC) of around $2.00/kL; and
- the 2023 target would be achieved by a top step price of around $2.60/kL combined with real price increases or around 3 per cent each year until 2023.

Overall, however, it should be noted that it is very difficult to differentiate the impact of price increases on demand in isolation from that of the impact of prolonged water restrictions, community awareness campaigns and demand management programs.

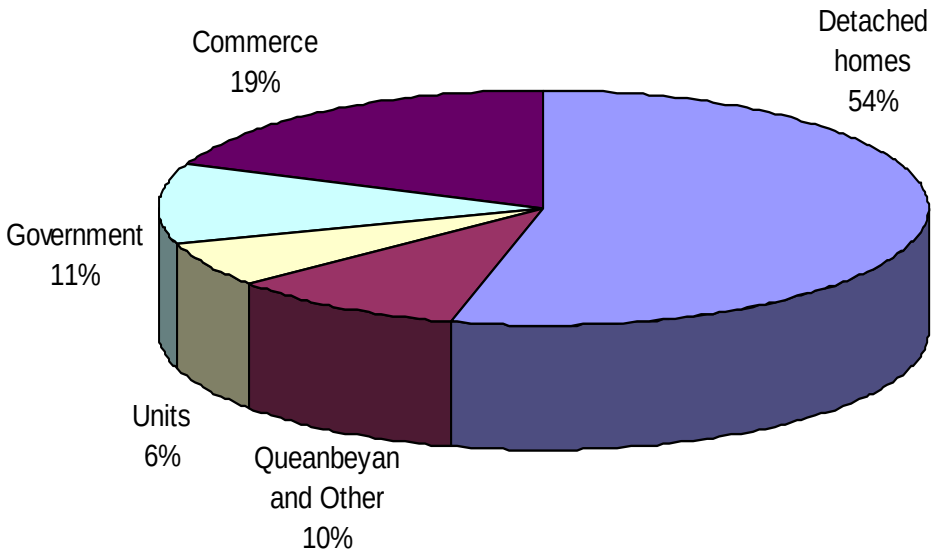
[14] Barrett Greg (2005) *Pricing in response to ACT Government's per capita demand management targets*, University of Canberra.

MEASURING PROGRESS

WATER USE BY SECTOR

Figure 1 depicts water consumption by sector in the ACT. This breakdown shows the large proportion used by the residential sector, which to date has been the main sector of focus for the ACT's demand management programs.

Figure 1: ACT Water use by sectors



Source: ACT Government (2004) *Think water, act water*.

The Government sector comprises ACT and Australian Government water usage.

The 'Queanbeyan & Other' sector in Figure 1 refers to Queanbeyan usage and unaccounted for water. 'Unaccounted for water' is the losses associated with joint weeps, breaks and apparent water losses averaged over the total number of service connections and unavoidable annual real losses, which are those losses that are unavoidable considering the network, supply pressures and number of connections.' [15]

The commercial sector includes hotels and motels, irrigators, shopping centres, golf courses, office blocks, clubs and sporting grounds, caravan parks and commercial buildings.[16]

[15] Turner & White (2003) *Preliminary Demand Management and Least Cost Planning Assessment – Final Report.*
[16] ACT Government (2004) *Think water, act water*

CALCULATING WATER SAVINGS

Due to the relatively recent implementation of demand management measures around Australia, there is limited quantitative data available about the actual water savings of such initiatives, making it difficult to accurately identify water savings for specific demand management measures. Evaluation of the effectiveness of programs is further complicated by behaviour change brought about by temporary water restrictions in place in the ACT since prior to release of the *Think water, act water* Strategy.

Assumptions

In the absence of detailed end-use data (requiring long-term data logging and metering at the individual household level), it has been necessary to use assumptions to develop water savings attributable to the demand management initiatives discussed in this report, including:

- baseline per capita water consumption;
- population projections;
- number of people per household (for some residential programs);
- program participation rates;
- program specific assumptions;
- cost to implement the initiative; and
- effective life of the program (i.e. how long the water savings will be maintained).

For several programs, water savings have been based on the Institute for Sustainable Futures (University of Technology Sydney) report.[17]

Per capita consumption

The base water consumption, from which all savings in this Report are measured, is the 2003 unrestricted consumption rate – 182 kL/capita/annum[18].

Population projections

Population estimates from the Australian Bureau of Statistics (ABS)[19] are used when deriving the consumption targets in *Think water, act water*. The ABS provides three sets of population projections based on different assumptions – low, medium and high. The ABS medium population projections provided at Appendix A are used in this report.

Based on ABS data [20], it is assumed there are currently 2.6 people in each household in the ACT.

Program participation rates

Where available, the actual number of participants is used. For those measures that will take place in the future, an estimate of participation rates is used.

[17] Turner A & White S (2004) *ACT Water Strategy, The 2004-2005 Demand Management Program Implementation Plan.*
[18] Actew Corporation model output for unrestricted water consumption.
[19] ABS Population projection 2006 to 2101.
[20] ABS (2004) *Water Account*, Australia.

It should be noted that participation rates are dependent on consumer behaviour and perceptions, which in turn are influenced by economic conditions and weather.

Program specific assumptions
For each program there is a specific set of assumptions related to the nature of the program which are used to estimate water savings and calculate a levelised cost for the program. Assumptions for each program are listed in Appendix C.

Accumulated water savings

Based on the assumptions outlined above and in Appendix C, Table 3 summarises the response to demand management measures and temporary water restrictions in the ACT from 2005-06 to 2008-09. It also shows the projected saving for the two target years of 2012-13 and 2023-24.

The **Overall Response** section of the table provides:

a. **Expected baseline consumption:** based on 182 kL/person/annum and the population projection of that year.
b. **Actual consumption:** consumption data from ActewAGL.
c. **Water savings** = a.- b. and includes water saving through temporary restrictions and demand management measures.
d. **Target savings:** the 2012-13 and 2023-24 targets from *Think water, act water.*
e. **Percentage savings:** actual savings as a percentage of expected baseline consumption.

The **Demand Management Response** section of the table shows how each demand management measure has contributed to water savings up to 2008-09, and is expected to contribute to the water savings in the two target years 2012-13 and 2023-24. The assumptions used to derive these water savings are listed in Appendix C.

Progress against targets

Canberra residents have responded to the ACT's water situation by decreasing their overall water consumption.

This analysis shows that Permanent Water Conservation Measures, information awareness and water sensitive urban design are the measures contributing the most to water savings through the demand management programs.

Collectively, the residential programs account for almost 11 per cent of the demand management water savings. They also provide a number of additional benefits, apart from water savings, in terms of their ability to create awareness, understanding and ownership of urban water management by the ACT community.

The final section (Water Saved) in Table 3 shows that in 2008-09 demand management and other water efficiency measures are attributed with saving 11.36 GL of water, which equates to 16.54% of the expected baseline consumption. Based on projected consumption, population and water savings from demand management programs, it is expected that the 2012-13 targets can easily be met but 2023-24 targets will be hard to meet unless more new demand management programs are on board.

As previously noted, this assessment is based on a range of assumptions and it is difficult to determine the ongoing impact of measures until temporary water restrictions are lifted and water use behaviours readjust. As such, ongoing monitoring and adjustment of programs is required.

Table 3: Summary of response water efficiency measures

	2005-06	2006-07	2007-08	2008-09	2012-13	2023-24
OVERALL RESPONSE	GL	GL	GL	GL	GL	GL
Expected baseline consumption (GL)	66.31	66.76	67.73	68.71	72.11	81.48
Actual consumption	54.34	51.06	43.56	44.95		
Water savings	11.97	15.70	24.17	23.76		
Target savings					8.65	20.37
Percentage savings	18%	24%	36%	35%		
PROGRAM RESPONSE						
Water saving stratagies						
PWCM	5.29	5.35	5.40	5.45	5.67	6.33
Information and awareness	3.30	3.33	3.36	3.39	3.51	3.84
WELS	0.08	0.16	0.25	0.33	0.66	1.39
WSUD	0.00	0.00	0.22	0.49	1.28	3.46
New plumbing regulations	0.15	0.20	0.20	0.20	0.20	0.20
Residential programs						
WaterSmart homes	0.12	0.15	0.16	0.16	0.16	0.00
GardenSmart	0.04	0.07	0.11	0.14	0.26	0.00
ToiletSmart	0.01	0.02	0.04	0.16	0.49	0.49
Showerhead [1]	0.19	0.29	0.42	0.44	0.44	0.00
Rainwater tank	0.09	0.10	0.11	0.13	0.20	0.20
Greywater hose giveaway			0.19	0.19	0.19	0.00
IrrigationSmart pilot [2]				0.00	0.01	0.00
Commercial and Government Programs						
Govt and school irrigation			0.17	0.27	0.51	1.05
Canberra integrated urban waterways					1.50	3.00
Commercial bathroom retrofit [3]						
WATER SAVINGS FROM PROGRAMS						
Water saved (GL)	**9.29**	**9.68**	**10.62**	**11.36**	**15.09**	**19.97**
Water saved (%)	**14.00%**	**14.50%**	**15.68%**	**16.54%**	**20.92%**	**24.51%**
Target savings (%)					**12%**	**25%**

Assumptions and calculations for each measure are detailed in Appendix C; Calculations are based on 182 kL per capita/year consumption

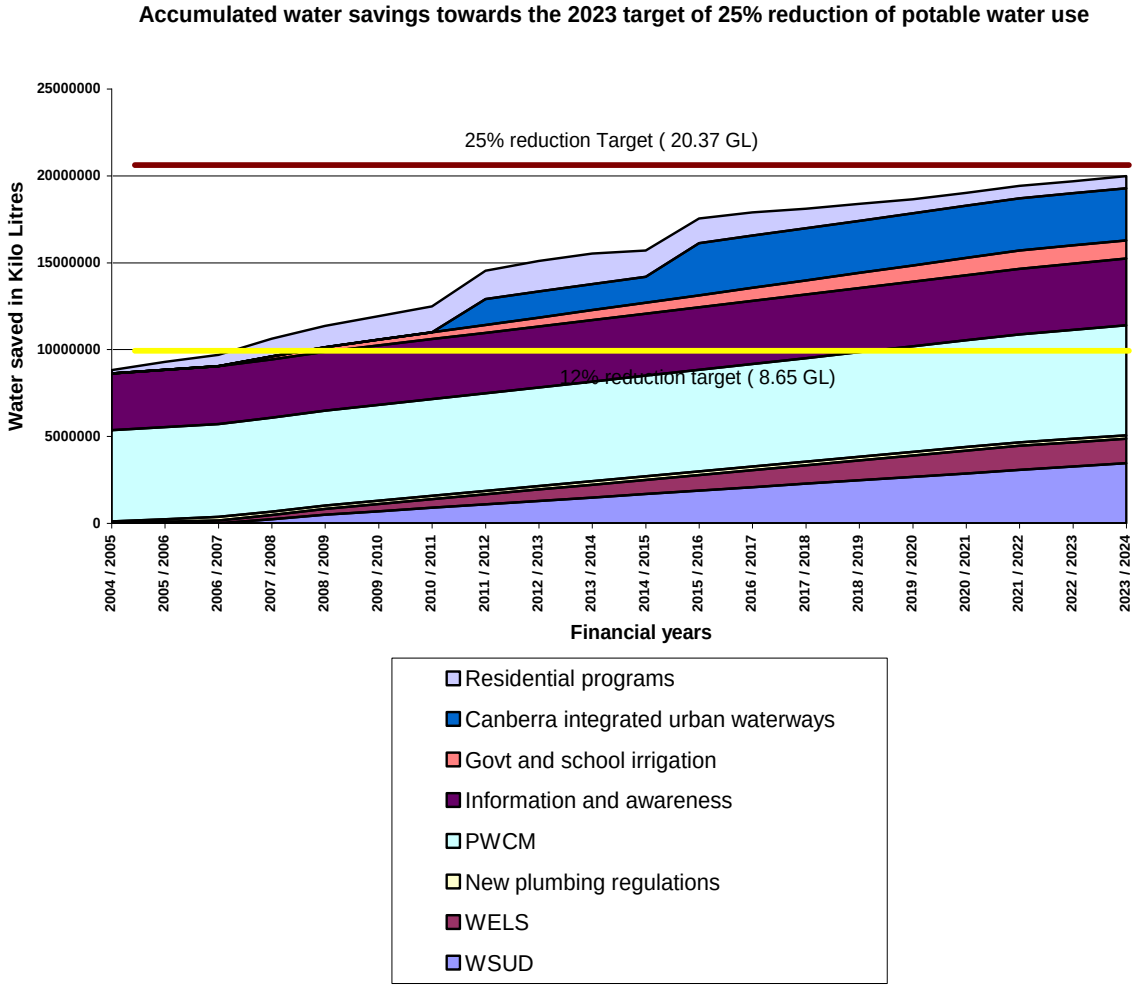
[1] This includes ACT Government showerhead rebate program and the Greenhouse Gas Abatement Scheme

[2] Savings are based on 200 participants in the pilot program 2009-10. The decision to implement IrrigationSmart beyond the pilot will be subject to the findings of the pilot evaluation report.

[3] Due to high variability of the size of each retrofit and uncertainity of the uptake rate no assumption is made on the savings from this program. In future when the program becomes more mature a forecast of savings will be made.

Figure 2 is a graphical representation of Table 5 which represents the contribution of demand management measures towards achieving *Think water, act water* targets.

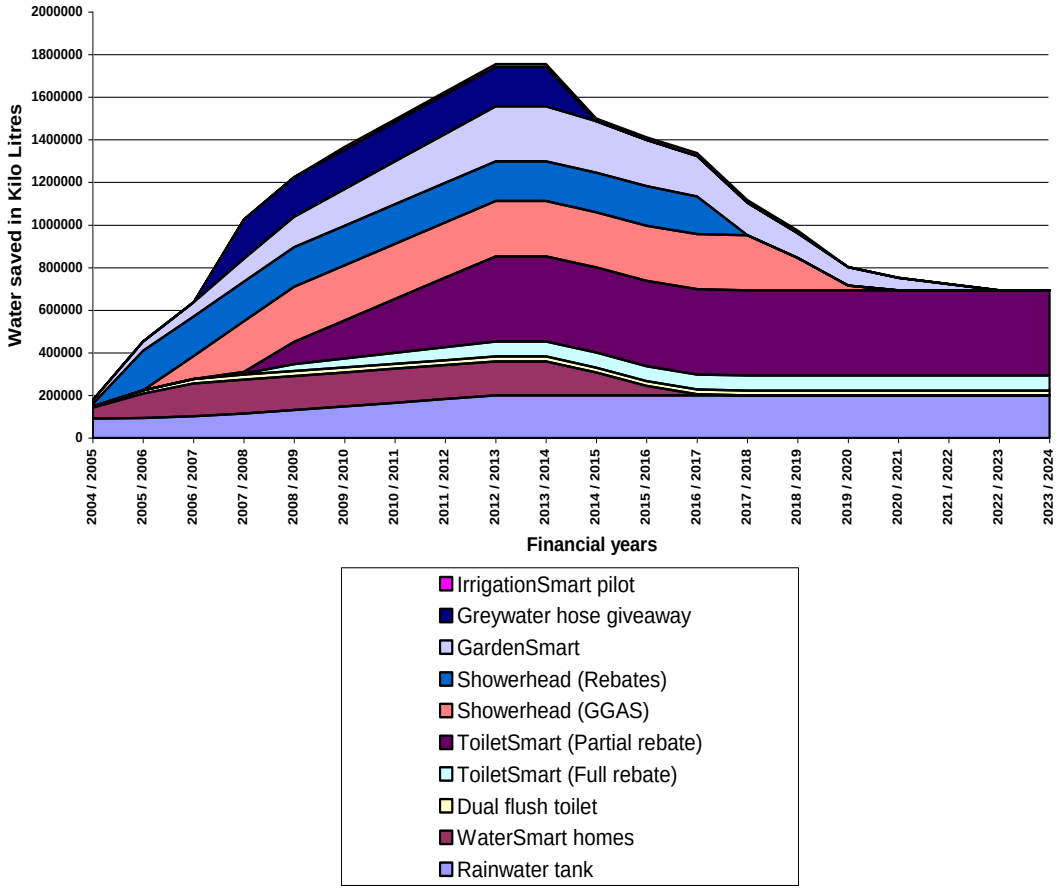
Figure 2: Accumulated water use by programs, 2004–2024



In Figure 2, the collective contribution to the targets of residential programs is shown. Individual residential program impacts are shown in Figure 3.

From 2012-13 the graph in Figure 3 shows a reduction in water savings by the residential programs. This results from the cessation of programs, which are currently funded to 2012-13, and also the effective water saving life of each program (see assumptions in Appendix C).

Figure 3: Accumulated water use by residential programs, 2004–2024



While the focus of demand management thus far has been mainly on the residential sector, it is recognised that residential water-efficiency programs alone will not provide all the water efficiency gains needed to meet *Think water, act water* targets, especially the 2023 target of 25 per cent reduction.

COMPARISON OF PROGRAM EFFECTIVENESS

In addition to analysing demand management programs with respect to potential water savings, effectiveness of programs can also be compared using permanence of water savings, cost effectiveness and a range of other benefits such as additional environmental and social benefits.

Permanence of water savings

One of the challenges faced by urban water policymakers is ensuring that the achieved water efficiencies are ongoing. For initiatives like WELS or PWCMs, the efficiency gains are protected by legislation and are therefore considered to be permanent. For initiatives relying upon modifications to social behaviour and attitude, it is more difficult to secure such permanent change.

Table 4 shows the initiatives with a permanence rating from 0 to 5, with 5 being the most reliable in delivering permanent savings.

Table 4: Permanence ratings for water efficiency measures

Initiative	Security measure	Rating
New plumbing regulations	Legislation	5
WELS	Legislation	5
PWCM	Legislation	5
WSUD	Legislation	5
Canberra integrated urban waterways	High capital costs / government policy	4
Govt and school irrigation	High capital costs / government policy	4
ToiletSmart	Household infrastructure	3
Commercial bathroom retrofit	Change in infrastructure	3
Rainwater tank	Personal choice / individual investment	2
IrrigationSmart pilot	Personal choice / individual investment	2
Greywater hose giveaway	Personal choice / individual investment	2
WaterSmart homes	Personal choice	1
Showerhead	Personal choice	1
GardenSmart	Personal choice	1
Information and awareness	Personal choice	1

Rating Key

Rating	Comments
0- Not secure	Cannot be expected to be continued, easily reversed
1- Insecure	May remain, requires little effort to reverse
2- Moderately secure	Should remain, relatively significant up front investment
3- Secure	Expected to remain, requires some effort to remove
4- Very secure	Expected to remain in long term, significant cost to reverse
5- Permanent	Will remain in long term, requires significant resources and political will to reverse

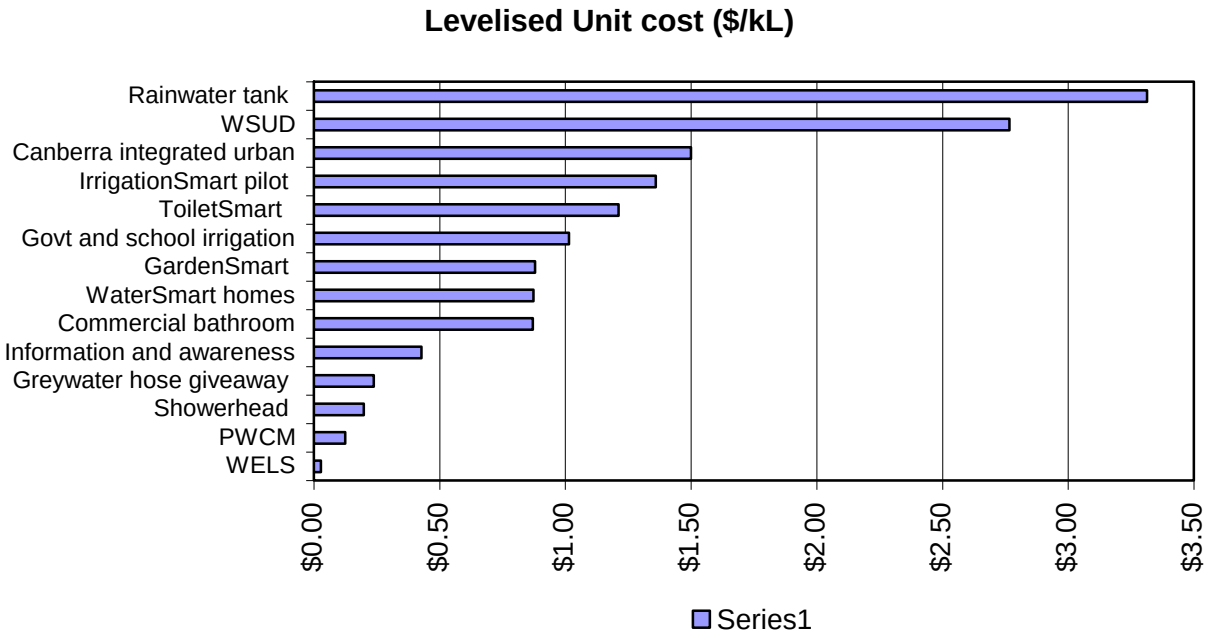
Levelised unit cost

Levelised unit cost is a measure that enables consistent comparisons to be made between initiatives of differing nature with respect to both costs and water savings. The levelised unit cost is calculated by dividing the cost of an initiative by the water savings resulting from the initiative[21].

The levelised cost comprises delivery costs to the Government/ACTEW (e.g. the rebate amount, program contractor, information and awareness about the program, etc), plus the costs to the community (e.g. cost to participant of installing a tank, cost to householder to meet regulations, etc).

The levelised unit costs calculated for the demand management measures are shown in Figure 4.

Figure 4: Levelised cost of various options



[21] Unit costs have been calculated using a levelised cost method developed by The Institute of Sustainable Futures. Further details can be found in:
Turner & White (2003) *Preliminary Demand management and Least Cost Planning Assessment – Final Report*
Fane S, Robinson J, White S (2005) *The Use of Levelised Cost in Comparing Supply and Demand Side Options*

Other program benefits

Many demand management measures are capable of delivering more than just water savings. While detailed analysis of all additional benefits offered by these initiatives is beyond the scope of this review, these additional benefits include:

- WELS will create energy savings due to reduced energy needs for heating water used in efficient appliances[22] and the presence of labelled products in the retail environment will create additional consumer awareness of the need to conserve water.
- By employing WSUD in the planning process[23] '…improved land use and urban development planning through greater integration of the natural water cycle can generate long-term social, economic and environmental benefits for the ACT.'
- New regulations requiring installation of water efficient appliances in the ACT will create reductions in energy consumption and greenhouse gas emissions through the same mechanisms as the WELS scheme.
- Energy savings can also result from the installation of water efficient showerheads and tapware as less hot water is used and therefore less energy is used to heat water.
- Rainwater tanks can significantly reduce volumes of stormwater runoff discharging from the roofs to street drainage systems and reduce peak stormwater discharge from roofs.[24]
- Garden and irrigation programs can provide the social benefit of assisting with the maintenance of green spaces in the community.
- The construction of new ponds in the ACT in new and established suburbs will potentially help meet the water quality targets outlined in *Think water, act water*. Ponds reduce peak flows and sediments and nutrients entering regional waterways. Stormwater harvesting projects implement the principle of "fit-for-purpose" by using lower quality water for irrigation, rather than high quality drinking water. Stormwater harvesting enables water to be provided to the end user at a less expensive rate than potable water, as treatment is not required for irrigation uses. Regularly drawing down lakes and ponds has a beneficial impact on the biodiversity of macrophytes (water plants).

Table 5 provides a comparison of demand management measures incorporating water savings, permanence of water saving, levelised cost and other benefits.

[22] Wilkenfeld G & Associates Pty Ltd (2004) *Regulation Impact Statement: Proposed National System of Mandatory Water Efficiency Labelling and Standards for Selected Products.*
[23] ACT Government (2006) *Water Sensitive Urban Design, Guidelines for sustainable development in Canberra*. Draft.
[24] Coombes, Kuczera & Kalma (2003) *Economic, water quality and quality impact from the use of a rainwater tank in the inner city.*

Table 5: Comparison of initiatives

Item	Water savings (GL/yr)	Permanence rating	Levelised Unit cost ($/kL)	Externalities (comments)
WELS	0.33	5	$0.028	Energy savings and Long term change to community values
PWCM	5.45	5	$0.125	
New plumbing regulations	0.20	5	$1.025	
WSUD	0.49	5	$2.767	Reduced costs for urban water management and increased social amenity
Canberra integrated urban waterways	0.00	4	$1.500	
Govt and school irrigation	0.27	4	$1.015	
Commercial bathroom retrofit	0.00	3	$0.871	
ToiletSmart	0.16	3	$1.212	
Greywater hose giveaway	0.19	2	$0.238	
IrrigationSmart pilot	0.01	2	$1.359	Long term change to community values
Rainwater tank	0.13	2	$3.315	Reduced costs for urban water management and long term change to community values
Showerhead (GGAS and stand alone)	0.44	1	$0.199	Energy savings
Information and awareness	3.39	1	$0.428	Long term change to community values
WaterSmart homes	0.16	1	$0.874	Energy savings and long term change to community values
GardenSmart	0.14	1	$0.880	Long term change to community values

The table shows that the most cost-effective options are WELS and PWCM, followed by showerhead replacement programs.

WELS, PWCM and the other regulatory measures (WSUD and new plumbing regulations) offer the highest degree of confidence that water savings will continue into the future.

Residential programs appear to be less cost effective than other measures but provide for a number of additional benefits, apart from water savings, in terms of their ability to create awareness, understanding and ownership of urban water management by the ACT community.

CONCLUSIONS

In 2008-09, the ACT's water resource management strategy, *Think water, act water*, completed its fifth year of implementation. During this time significant progress has been made towards meeting objectives and targets of the Strategy.

Based on the current analysis, it can be concluded that the 2013 target can be met through current initiatives. However, meeting the 2023 target will require increased savings, and investigation and evaluation of water efficient measures to achieve these savings in the most cost-effective way.

Table 3 and Figure 2 show that water savings to date (with enforced water restrictions impacts aside) are relatively significant. To the end of June 2009, 35 per cent water savings were achieved, of which 16.5 percent was attributed to demand management programs.

By 2012-13, it is projected that demand management measures will achieve 20.9 per cent savings, meeting the target of 12 per cent per capita by 2013.

By 2023-24, the demand management measures are expected to achieve 24.5 per cent reduction, just short of the 2023 reduction of 25 per cent per capita.

In order to create certainty in our ability to meet water efficiency targets, existing measures will require further evaluation with new water efficiency measures likely to be developed. Any new measures will provide a buffer against less than expected water savings from the current mix of measures. Future population growth and residential development and expansion will need to be considered in implementing current and future measures.

Since the commencement of *Think water, act water*, greater understanding has been attained by the ACT community in identifying the complex relationships of the ACT urban water cycle, and the importance of meeting water efficiency targets over time.

Residential programs, while not as cost effective as regulatory options, can provide additional benefits including raising awareness and understanding, as well as encouraging ownership of urban water management by the ACT community.

Work will continue to improve the water saving and cost calculations that underpin the assessment of current programs and inform the development of future programs.

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APPENDIX A – POPULATION FORECASTS

Year	ACT Population Forecast	Queanbeyan Population Forecast	Total Population Forecast	Notes
2002-03	322.92	33.424	355.85	Source: NSW Statistical Local Area Population Projections 2001 - 2031, 2004 Release
2003-04	325.66	33.921	359.08	
2004-05	328.49	34.427	362.41	
2005-06	329.92	34.939	364.35	
2006-07	331.89	35.460	366.82	
2007-08	336.68	35.988	372.14	Source: ABS Population projection 2006 to 2101
2008-09	341.52	36.524	377.51	
2009-10	345.55	37.067	382.07	
2010-11	349.66	37.619	386.73	Calculation: Queanbeyan Population 32,450 in 2001 and average growth rate is 1.4892 per cent up until 2031
2011-12	353.85	38.180	391.47	
2012-13	358.03	38.748	396.21	
2013-14	362.20	39.325	400.95	
2014-15	366.36	39.911	405.68	*www.planning.nsw.gov.au/tpdc/ pdfs/nsw_slaprojections_nsw_06.pdf
2015-16	370.50	40.505	410.41	
2016-17	374.62	41.109	415.13	
2017-18	378.73	41.721	419.84	
2018-19	382.81	42.342	424.53	
2019-20	386.87	42.973	429.21	
2020-21	390.89	43.613	433.87	
2021-22	394.89	44.262	438.50	
2022-23	398.84	44.921	443.10	
2023-24	402.76	45.590	447.68	
2024-25	406.64	46.269	452.23	
2025-26	410.49	46.958	456.76	
2026-27	414.29	47.657	461.25	
2027-28	418.04	48.367	465.69	
2028-29	421.73	49.087	470.09	
2029-30	425.35	49.818	474.44	

APPENDIX B – DEVELOPMENT APPLICATIONS

Number of Development Application for the period July 2004 to June 2007		
Period	**Month**	**Number of DA's**
2008/2009	Jul-08	302
	Aug-08	155
	Sep-08	125
	Oct-08	442
	Nov-08	194
	Dec-08	109
	Jan-09	102
	Feb-09	179
	Mar-09	221
	Apr-09	360
	May-09	275
	Jun-09	278
TOTAL		**2742**
2007/2008	Jul-07	294
	Aug-07	118
	Sep-07	93
	Oct-07	180
	Nov-07	298
	Dec-07	107
	Jan-08	117
	Feb-08	195
	Mar-08	101
	Apr-08	202
	May-08	96
	Jun-08	429
Total		**2230**
2006-2007		**2102**
2005-2006		**1867**
2004-2005		**2279**

Source: ABS: Building Approvals, Australia Table19

APPENDIX C – PROGRAM ASSUMPTIONS

Measure	Assumptions
WaterSmart homes	1. 22 kL savings per average indoor tune up per year[25]. 2. This program closed in 2007-08 financial year. 3. Unit cost: $150. 4. Water saving is expected to be realised for 10 years from the time of each WaterSmart homes visit. 5. The discount rate is 6% for the levelised cost calculation.
Rainwater tank rebate	1. 86 kL savings per rainwater tank per year, assuming 10 kL tank collecting from 150 m² roof and internal connection for toilet flushing[26]. 2. Future estimates assume number of units increases by 200 per year for the duration of the program. 3. Duration of the program is to end of last funding year of 2012-13. 4. Unit cost comprises $3,240 and $50 per year operating cost. 5. 25 year life for each tank. 6. The discount rate is 6% for levelised cost calculation.
GardenSmart	1. 29 kL savings per year per GardenSmart visit[27]. 2. Future estimates assume number of visits increases by 1,000 each year for the duration of the program. 3. Duration of program is to end of last funding year of 2012-13. 4. Total cost comprises unit cost of $150 (includes visit and rebate) and $48,000 per year for administration by contractor. 5. Water savings expected to be realised for 10 years from time of each each GardenSmart visit. 6. The discount rate is 6% for the levelised cost calculation
IrrigationSmart pilot	1. 33 kL savings per year per IrrigationSmart visit, based on 80m^2 garden size[28]. 2. Number of units for the pilot is 210. 3. Unit cost: $350. 4. Duration of the pilot: One year. Future of the program will be determined pending outcomes of pilot. 5. Water saving will be realised for 10 years from the date of the IrrigationSmart visit. 6. The discount rate is 6% for levelised cost calculation
Showerhead rebates (ACT Government)	1. 17 kL savings[29] per shower head per year (assumes 9 L per minute flow rate compared to 17 L for older shower head; and 6 minutes shower time per day). 2. This program closed in 2005-06. 3. Unit cost: $30.

[25] Turner A & White S (2004), *ACT Water Strategy, The 2004-2005 Demand Management Program Implementation Plan*.
[26] Rainwater tank guidelines, ACTPLA
[27] Turner A & White S (2004), A*CT Water Strategy, The 2004-2005 Demand Management Program Implementation Pla*n.
[28] URS IrrigationSmart pilot results.
[29] Turner A & White S (2004), A*CT Water Strategy, The 2004-2005 Demand Management Program Implementation Pla*n.

Measure	Assumptions
	4. Life of showerhead: 12 years. The discount rate is 6% for the levelised cost calculation.
Showerhead (GGAS)	1. 17 kL savings[30] per shower head per year (assumes 9 L per minute flow rate compared to 17 L for older showerhead; and 6 minutes shower time per day). 2. Number of units based on figures provided by IPART. 3. Program deemed to have ceased in 2008-09 as most companies ceased their programs as of 1 January 2009. 4. Unit cost: $30. 5. Life of showerhead: 12 years. 6. The discount rate is 6% for the levelised cost calculation.
ToiletSmart (partial rebate)	1. 37 kL savings per year per 3/4.5 dual flush toilet compared with 11 litre single flush (based on 4 half flushes and one full flush per person per day[31]). 2. Future estimates assume number of toilets installed increases by 2000 per year for the duration of the program. 3. Duration of program is to end of last funding year of 2012-13. 4. Unit cost: $545 (includes supply & installation). 5. Life of each toilet suite is 20 years from date of installation. 6. The discount rate is 6% for the levelised cost calculation.
ToiletSmart (full rebate)	1. 37 kL savings per year per 3/4.5 dual flush toilet compared with 11 litre single flush (based on 4 half flushes and one full flush per person per day[32]). 2. Future estimates assume number of toilets installed increases by 250 per year for the duration of the program. 3. Duration of program is to end of last funding year of 2012-13. 4. Unit cost: $465 (includes supply & installation). 5. Life of each toilet suite is 20 years from date of installation. 6. The discount rate is 6% for the levelised cost calculation.
Dual flush toilet (option of WaterSmart Homes)	1. 35 kL savings per year per 3/6 dual flush toilet compared with 11 litre single flush (based on 4 half flushes and one full flush per person per day[33]). 2. This program closed in 2007-08. 3. Unit cost: $350. 4. Life of each toilet suite is 20 years from date of installation. 5. The discount rate is 6% for the levelised cost calculation.
Water sensitive urban design	1. Each household will save 99 kL of water (assumes 60% [34]of 182 kL per capita consumption is residential use; average occupancy is 6 people; 35% savings - i.e. 40% savings from WSUD[35] less 5% to avoid double counting from WELS savings). 2. Future estimates assume number of Development Applications increases by 2,000 per year.

[30] Turner A & White S (2004), A*CT Water Strategy, The 2004-2005 Demand Management Program Implementation Pla*n.
[31] WELS estimation (Department of Environment, Water, Heritage and Arts)
[32] WELS estimation (Department of Environment, Water, Heritage and Arts)
[33] WELS estimation (Department of Environment, Water, Heritage and Arts)
[34] *Think water, act water* 2004.
[35] WSUD savings 40%: Source Waterways Code

Measure	Assumptions
	3. Unit cost: $4,000 per development. 4. Water saving will be realised from WSUD up to 50 years from the construction date. The discount rate is 6% for the levelised cost calculation.
Water Efficiency Labelling & Standards	1. By 2021 5% of household water use will be saved which is 87.2 GL Australia wide. (Source WELS: 1.60% of 87.2 GL will be saved in ACT which is 1.394 GL. This equates to 82 ML increase each year up until 2021[36].) 2. Initial cost is 1.6% of $8.3m spread over five years and 1.6% of $0.9 m is the operating budget of the program. 3. Duration is 20 years. 4. The discount rate is 6%. 5. After 2021 the market will be saturated with water-efficient products as required by WELS standards and no further increase in savings will be generated by WELS.
Plumbing regulations	1. 22 kL savings will occur for each Development Application. 2. Unit is number of Development Applications. 3. Unit cost: $400 for each application. 4. The effect of this regulation was superseded by WSUD in 2007; water savings from this measure after 2007 are counted as WSUD savings to avoid double counting. 5. The discount rate is 6% for the levelised cost calculation.
Permanent water conservation measures	1. 8% of the 2003 actual consumption (65.5 GL) is the initial savings*. 2. Savings will increase by 1% each year due to population increase. 3. Initial deployment cost is $3m and $0.5m will be required each year for enforcement and education. 4. Duration is 20 years. 5. The discount rate is 6% for the levelised cost calculation.
Information and awareness	1. 5% [37]of 2003 actual consumption (65.5 GL) is the initial saving. 2. Savings will increase by 1% each year due to population increase. 3. $1.5m [38]will be required each year for the promotional activities unless otherwise stated. 4. Duration is 20 years. 5. The discount rate is 6% for the levelised cost calculation.
Government & school irrigation	1. 40% savings achieved through COMTROL (Source: COMTROL analysis for sportsfields) 2. 3,261 kL savings per Ha per year for sportsgrounds & schools. 3. 1,202 kL savings per Ha per year for Parks. 4. In 2007-08, average water saved across sportsgrounds, schools & parks = 2,601 kL/Ha. 5. Initial irrigated area is 64 Ha.

[36] Source of WELS costing and water savings is based on ACT proportion of national figures provided by WELS (Department of Environment, Water, Heritage and Arts)
[37] ACTEW estimates
[38] ACTEW estimates

Measure	Assumptions
	6. Assume 10 schools added each year (10 x 1.84 Ha). 7. Duration of the program is 14 years. 8. After 2021-22 all possible schools expected to be under COMTROL. 9. $11,193 is required per hectare as installation cost and $2,000 for annual maintenance. 10. The discount rate is 6% for the levelised cost calculation.
Greywater hose giveaway	1. 18.5 kL savings per greywater hose per year = 50% of laundry use. 2. Laundry use is 13% of household use of 284kL = 37kL. 3. 10,000 greywater hoses at unit cost of $26. 4. Life of hose is 7 years. 5. The discount rate is 6% for the levelised cost calculation.
Canberra integrated urban waterways	1. Expected total savings from the program is 3 GL per year, which is expected from 2015/16 onwards but staged savings from pilot of 1.5 GL will start from 2011/12. 2. Water savings based on savings targets identified in the funding deed between ACT and Australian Governments. 3. Levelised cost of $1.5/kL identified in ICRC Pricing Paper - *Pricing Recovery for Pilot Stormwater Reuse Projects* (Dec 2009). 4. Life time is 50 years.