

# 2010 Metropolitan Water Plan

*Water for people and  
water for the environment*

*2010 Metropolitan Water Plan*  
NSW Office of Water

August 2010

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## Foreword from the Premier

Sydney is an exciting and vibrant city located in a diverse and beautiful region. This is why more than four million people choose to make it their home.

That population is expected to reach six million by 2036 and while this growth will create new opportunities for our city, it will also put pressure on our resources – including a safe and affordable water supply.

Our climate varies from year to year, which means our water planning needs to respond to conditions and have measures in place for when a protracted drought hits.

A review of the *2006 Metropolitan Water Plan* has confirmed that sound investments have been made in water supply and water efficiency programs over the past four years.

That plan saw us through severe drought and successfully secured our water supply to 2015 and beyond. It also delivered significant improvements in the health of our rivers.

Now, the *2010 Metropolitan Water Plan* sets out how water agencies will work in partnership with the community to provide a secure water supply for the future.

It is a responsible plan that maintains a balance between delivering water security for greater Sydney while protecting our precious river systems.

With this plan we are now able to provide water security until at least 2025.

The 2010 plan builds on the successful core elements of earlier plans:

- continuing to source most of Sydney's drinking water from our dams;
- investing in recycling to reduce the demand for drinking water;
- supplying up to 15 per cent of Sydney's current water needs through desalination; and
- reducing the water needs of households, businesses, government and farms, with innovative water efficiency programs.

The progress of the 2010 plan will be reported annually, and the plan will be reviewed again in four years.

There are few more important issues for NSW families and communities than water supply and security.

That is why I am pleased to make this plan available to explain how we are managing these issues, for both today's communities and those yet to come.

**Kristina Keneally MP**  
Premier of NSW



## Comments from the Metropolitan Water Independent Review Panel

Good planning for Sydney's water supply is essential. The *2004* and *2006 Metropolitan Water Plans* have steered us away from immediate crisis, but future droughts and climate change will test the system again, so we have to be vigilant. Major investments in a diverse portfolio of water supply options (including desalination, recycling, stormwater harvesting and drought readiness measures) should now ensure that, at least until 2025, Sydney's residents can depend on their system. How the supply-demand balance will be maintained after 2025 can only be estimated now, but the plan is adaptable and the Panel feels that it is robust, provided diligent adaptive management is applied.

This *2010 Metropolitan Water Plan* has assembled a cost effective portfolio of options and has tested them against a hypothetical drought, more than twice as bad as any experienced since records began. Moreover, that assessment allowed for the release of long-term environmental flows to maintain the health of the Hawkesbury-Nepean River system; which is valued highly by the community. Although these factors are positive, the Independent Review Panel stresses the need to keep monitoring evolving climate change modelling results, which may revise current estimates of water availability from dams.

The Panel has been closely involved in the development of this 2010 plan and was able to advise on aspects of the economic assessment, community consultation and environmental analysis. In particular, the community engagement process has created a healthy, whole-of-community partnership: recycling; stormwater harvesting; environmental flows and voluntary consumption targets all received strong support.

We have embarked on the journey to provide environmental flows, having now decided and implemented long-term environmental releases from Tallowa Dam on the Shoalhaven River, and Avon and the other Upper Nepean dams and weirs (including associated works for fish passage) in the Hawkesbury-Nepean. Planning is under way for a decision

on long-term environmental flow releases from Warragamba Dam and the Panel stresses the importance of early action there.

Although the current scale of alternative sources to dams is still modest, it is increasing and, by 2015, about a quarter of Sydney's total drinking and non-drinking water needs should be coming from desalination and recycling. The water efficiency target, another key strategy for balancing supply and demand, is high and may prove challenging to meet. Minimising leakage losses will need ongoing commitment too, to maintain the proportion of lost water in the region of world's best practice.

The plan was developed with regard to many types of costs and benefits of the various options considered including those associated with energy from renewable sources to transport and treat water. River water quality and nutrients have also been particularly considered for recycling and environmental flow options under the plan.

For future plans, the Panel would like to see an expansion in the factors considered in a system-wide approach to water planning which incorporates carbon and other greenhouse gases, materials and biodiversity. Integrated urban planning is critical; water cannot be divorced from other sectors, and that need was also emphasised by the community.

The community looks to governments to provide leadership and to foster innovation in sustainable management of water for future generations. We strongly support this approach and look forward to seeing the development of innovative approaches to meet future challenges under the plan.

Chris Davis (Chair)

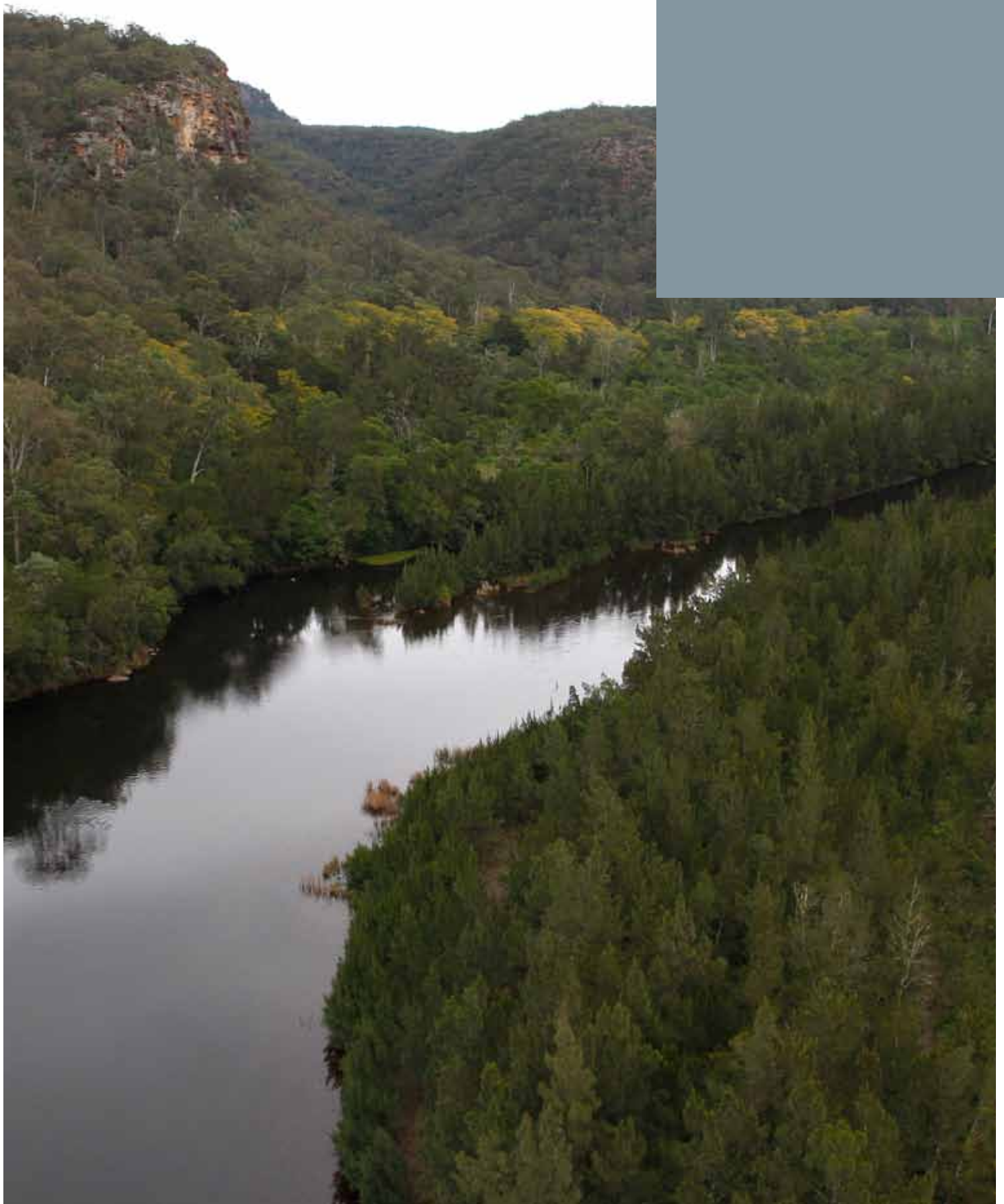
On behalf of the Panel:

**Ross Chapman**  
**Ronnie Harding**  
**John Langford**  
**Blair Nancarrow**

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## Executive summary



New variable environmental flows from Tallowa Dam are improving the health of the lower Shoalhaven River.

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Greater Sydney's water supply is secure until at least 2025. With everyone continuing to be water wise, plus dams, recycling, desalination and drought readiness strategies, we can withstand future droughts and supply our growing population while continuing to improve river health.

The *2010 Metropolitan Water Plan* builds on the significant achievements of past plans by continuing to concentrate efforts on four major areas – dams, recycling, desalination and water efficiency – to secure greater Sydney's water supply now and in the future.

The *2010 Metropolitan Water Plan* continues the commitment to recycle 70 billion litres of water each year by 2015 and to save 145 billion litres of water each year through water efficiency measures, as established in the *2006 Metropolitan Water Plan* and *NSW State Plan*.

Maintaining this commitment is vital because investments in recycling and water efficiency are essential ways to reduce pressure on drinking water supplies and protect the health of our precious river systems.

The *2010 Metropolitan Water Plan* will also continue to foster innovation and to investigate and monitor developments in climate change research and best practice water management.

### An adaptive plan

The *Metropolitan Water Plan* is designed to be flexible to enable us to adapt to challenges such as our highly variable climate, droughts, climate change and a growing population. A major review of the plan is undertaken every four years. These regular reviews take account of the latest data, techniques and research to keep our water plan current.

The review of the *2006 Metropolitan Water Plan* found that only minor adjustments to the directions of that plan are needed to ensure greater Sydney has enough water to meet its needs to at least 2025, and to help protect river health through environmental flows.

### Considerations and challenges of the review

This latest review of the plan began in late 2008. An independent panel of experts from a wide range of disciplines made sure the review was robust and included community input.

Two rounds of consultation fed into the development of the 2010 plan. In addition, the findings of the engagement resulted in the establishment of a set of community planning principles which will continue to underpin the way the plan is implemented.

Along with the community's input, the review involved complex modelling and analysis to identify a portfolio, or mix of measures, that delivers water security into the future. The water planners took account of a range of factors including achievements to date, advances in technology, updated projections of population growth, rainfall and dam inflow scenarios, results of climate change research, cost effectiveness, and social and environmental impacts.

The portfolio approach involves analysing different combinations of existing and new water supply and demand measures to identify the mix that provides water security for people and for the environment at the least cost. This challenge includes preparing for extreme drought. Our modelling made sure our water supply system could withstand a drought more than twice as severe as the recent prolonged drought in greater Sydney.

It also means making more water available for the health of our rivers, including the iconic Hawkesbury-Nepean River. Sydney's dams are progressively being modified to allow the release of new, variable environmental flows for downstream river health. This 'environmental' water needs to be balanced against the water needs of a growing city.

Sydney's desalination plant is a new element in our water equation. Water from the plant has an important role to play in our water security. Establishing a cost-effective and efficient operating regime for the plant was a key task of the review.

Targets for water savings through efficiency and recycling are major commitments under the 2006 *Metropolitan Water Plan* and the *NSW State Plan*. Reviewing and confirming these targets was an important part of the review. Many of Sydney Water's water efficiency programs, while highly effective, are reaching maturity and will have less impact in reducing water use over time. Our programs need to tackle this challenge with fresh approaches and new technologies.

While progress has been solid, challenges also exist in recycling. Providing recycled water to businesses and households in the established highly urbanised areas of Sydney can be complex, energy intensive and expensive. Most of Sydney's major recycling opportunities are concentrated in the new growth areas in western Sydney or at large industrial sites.

The review also considered how the plan aligns with the *Metropolitan Strategy* for Sydney, which sets the overall direction for our urban planning, and the water sharing plans that make sure all users who take water directly from rivers or groundwater have equitable access to water. It also ensured the process was consistent with National Water Initiative urban water planning principles.

## What has been achieved?

The review found that the 2006 *Metropolitan Water Plan* has been highly successful in making sure Sydney had continual water security during a period of severe drought while minimising economic and environmental costs.

Sydney's drinking water demand has been reduced through effective water conservation measures and recycling schemes, and supply has been boosted through the introduction of desalination. The diversification of our water supply system has further ensured sufficient water is available over time to meet population growth, protect river health, and respond to future droughts.

Key achievements under the 2006 *Metropolitan Water Plan* include:

- reused about 33 billion litres of recycled water across Sydney in 2009–10 for industry, irrigation and agriculture as well as for flushing toilets, watering gardens, washing cars and other outdoor uses. Recycling will increase by 18 billion litres a year with the start of the Replacement Flows Project at St Marys in October 2010
- saved an estimated two billion litres of drinking water each year through 70 stormwater projects across greater Sydney
- accessed deep water storage from Warragamba and Nepean dams, which can now provide an extra 200 billion litres of water or six months supply in extreme drought

- implemented new infrastructure to allow variable environmental flow releases and fish passage from Sydney's dams and weirs in the Upper Nepean River system
- delivered Sydney's desalination plant on time and \$89 million under budget, which is able to supply up to 90 billion litres of water per year
- provided almost one million water conservation rebates and offers
- rolled out education and training programs, and media campaigns to encourage the community to continue to use water wisely, support implementation of Water Wise Rules and build understanding of greater Sydney's changing water supply system
- undertook extensive work to make groundwater extraction available to supplement Sydney's water supply in severe drought. (Further development of the borefields was shelved in 2008)
- built new infrastructure to implement variable environmental flow releases and fish passage from Tallowa Dam on the Shoalhaven River to protect river health
- making more water available for environmental flows and reducing nutrients entering the river system through the Hawkesbury-Nepean River Recovery Program. The program is funded by the Australian Government through its Water for the Future Program, and managed by the NSW Government through the Office of the Hawkesbury-Nepean
- incorporated community values and attitudes into the plan's update under the expert guidance of the Metropolitan Water Independent Review Panel
- established Australia's first state-based access and licensing system under the *Water Industry Competition Act 2006* to enable the private sector to enter the industry; providing drinking water, recycled water and wastewater services (see page 12).



Water Minister Phil Costa encouraged the community to have their say during the review of the plan.



## Key initiatives and their potential contribution to the system

Measure	2010	2015	Beyond 2025
Dams	570 billion litres can be taken from the dams each year (calculated as at December 2006)	the amount of water that can be taken from the dams each year is recalculated any time there is a change to the supply system	augmentation of the Shoalhaven water supply system will increase water supplied from Tallowa Dam and protect river health
Recycling	about 33 billion litres of water is being saved through reuse projects	70 billion litres will be saved through reuse projects	future large-scale water recycling schemes will be delivered in Sydney's west as population grows
Desalination	up to 90 billion litres (about 15%* of current water needs)	up to 90 billion litres (plus potential to upscale to 180 billion litres in response to severe drought)	potential to upscale to 180 billion litres in response to severe drought and/or population growth
Water efficiency	over 100 billion litres of water is being saved every year	145 billion litres will be saved every year	continued improvement in water efficiency through the BASIX and WELS programs

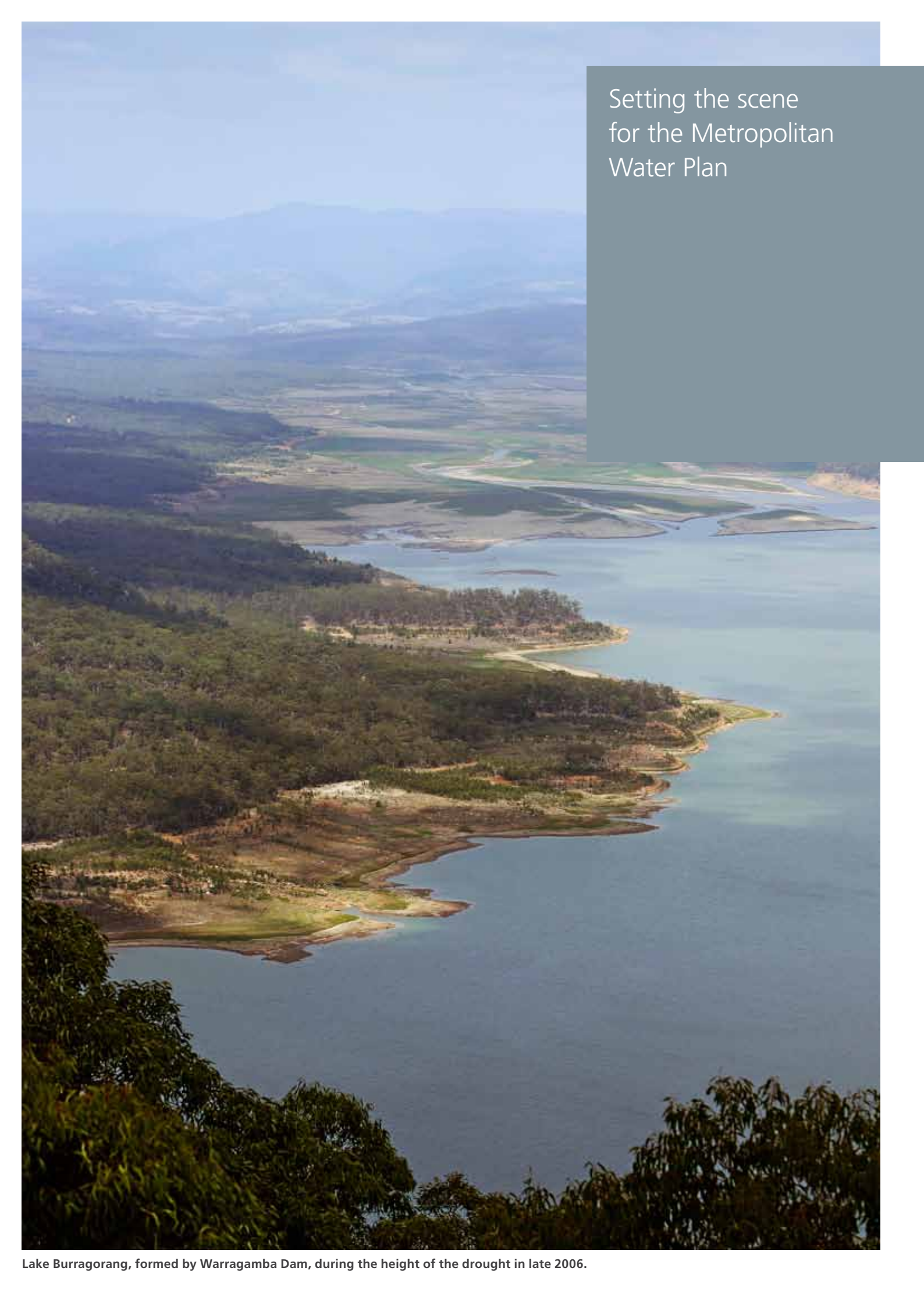
**The adoption of the measures in the table above means that, under all modelled rainfall and dam inflow scenarios, the 2010 plan secures greater Sydney's water supplies until at least 2025. A process summary document has been developed which provides more detail on the portfolio approach to water planning and explains how the security of supply has been established. The document can be found at [www.waterforlife.nsw.gov.au/review](http://www.waterforlife.nsw.gov.au/review).**

\*Based on a long-term average usage of 600 billion litres per year

### Key initiatives and directions of the 2010 Metropolitan Water Plan

It is the mix of measures that provides water security for the greater Sydney region. Consistent with this, the *2010 Metropolitan Water Plan* contains the following key initiatives:

- Dams – long-term plans to augment the Shoalhaven water supply transfer system. The timing of this initiative will depend on factors such as future climate predictions, population growth and demand. These factors will be reviewed between now and 2014 with a view to having an augmented system operational around 2025.
- Recycling – large scale recycling will be implemented, smaller-scale and cost-effective schemes that use recycled water sourced from sewer mining, stormwater, greywater, and commercial roof rainwater will continue to provide new opportunities.
- Desalination – new operating rules to come into effect in 2012, following the two-year proving period: the plant will operate at full production capacity and supply desalinated water to Sydney Water's area of operations when the total dam storage level is below 70 percent and will continue to do so until the total dam storage level reaches 80 percent.
- Water efficiency – continue to offer existing water efficiency programs to the community to save water in homes and businesses. Long-term water savings will be realised through the Building Sustainability Index (BASIX) and national Water Efficiency Labelling and Standards (WELS) scheme.
- Environmental flows from Warragamba Dam – further investigation and research to determine the optimal environmental flow regime and infrastructure requirements will be undertaken to enable a decision on the long-term flow regime from Warragamba Dam to be made in 2014.
- Drought restrictions – new simpler restrictions, based on the Water Wise Rules, will be implemented should Sydney experience another drought.
- Innovation – continued investigation and investment into new techniques and technologies and developing water sources.
- Rare and extreme drought – a number of measures are available to be implemented in extreme drought to slow the depletion of dams. These include: increasing the amount of water transferred from Tallowa Dam in the Shoalhaven by lowering the allowable drawdown, accessing groundwater, implementing voluntary water usage targets, upscaling the desalination plant, and investigating the optimal rules for reducing environmental flow releases from dams. Pricing is also being examined as a potential tool for managing demand during a drought.
- Research – climate change research will move into its second phase, investigating techniques to improve the way we build extended drought periods into climate modelling.
- Water for Life – communication, education and capacity building will continue to play an important role in implementing the *2010 Metropolitan Water Plan*.

An aerial photograph of Lake Burrangorang, a large reservoir formed by the Warragamba Dam. The lake is significantly lower than its normal level, exposing large areas of dry, brownish-green earth and sparse vegetation along its shores. The water is a deep blue-grey color. In the background, there are rolling hills and mountains under a clear sky. The foreground shows some green foliage, likely from trees on the hillside where the photo was taken.

## Setting the scene for the Metropolitan Water Plan

Lake Burrangorang, formed by Warragamba Dam, during the height of the drought in late 2006.

We know that Sydney's population is growing, that our climate and rainfall are highly variable, and we understand the impacts of prolonged drought. We also understand the need to balance the supply of water to people with the supply of water for the environment.

Uncertainty exists, however, about the impacts of climate change, the nature of future droughts, and how our rivers will respond to new river health initiatives. While we can plan for what we do know, we must ensure our approach remains innovative, flexible and adaptive in order to manage these uncertainties.

## Sydney's water supply system

The majority of Sydney's water supply comes from capturing rainwater and storing it in dams. Our storage capacity is one of the largest in the world per head of population. With desalination and recycling, our system is now more diverse and more secure.

Regardless of how we source our water, water quality is a primary consideration. Our drinking water is treated to meet the Australian Drinking Water Guidelines, which are among the highest standards in the world, and we invest heavily in protecting and monitoring our water quality.

Our community has told us that having affordable and safe drinking water should be the most important consideration in planning for water supply, and we have multiple measures in place to make sure this expectation is met.

The two main agencies responsible for managing our water supply system are the Sydney Catchment Authority (SCA) and Sydney Water. The SCA and Sydney Water work together to maintain and improve greater Sydney's water supply assets and deliver high quality water to consumers.

Water quality testing and monitoring take place at every stage of the supply system. Samples are taken in the catchments and dams, after water is treated, in distribution pipes and at customers' taps.

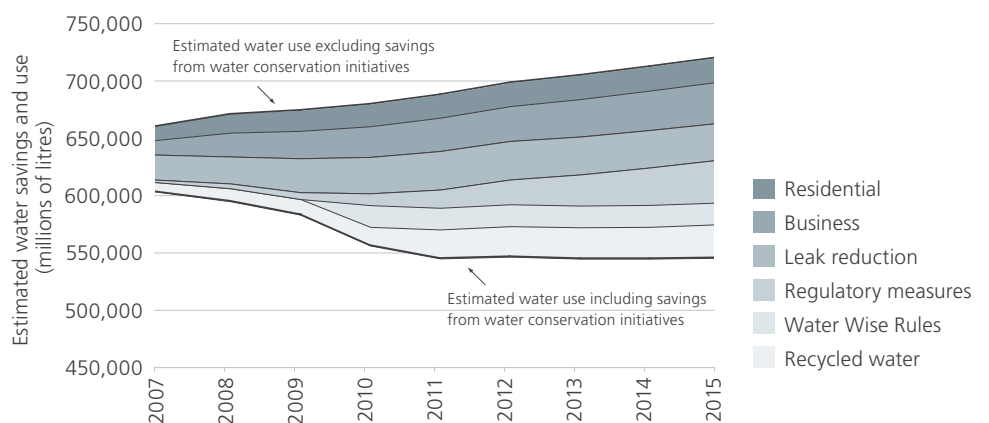
## Sydney's demand for water

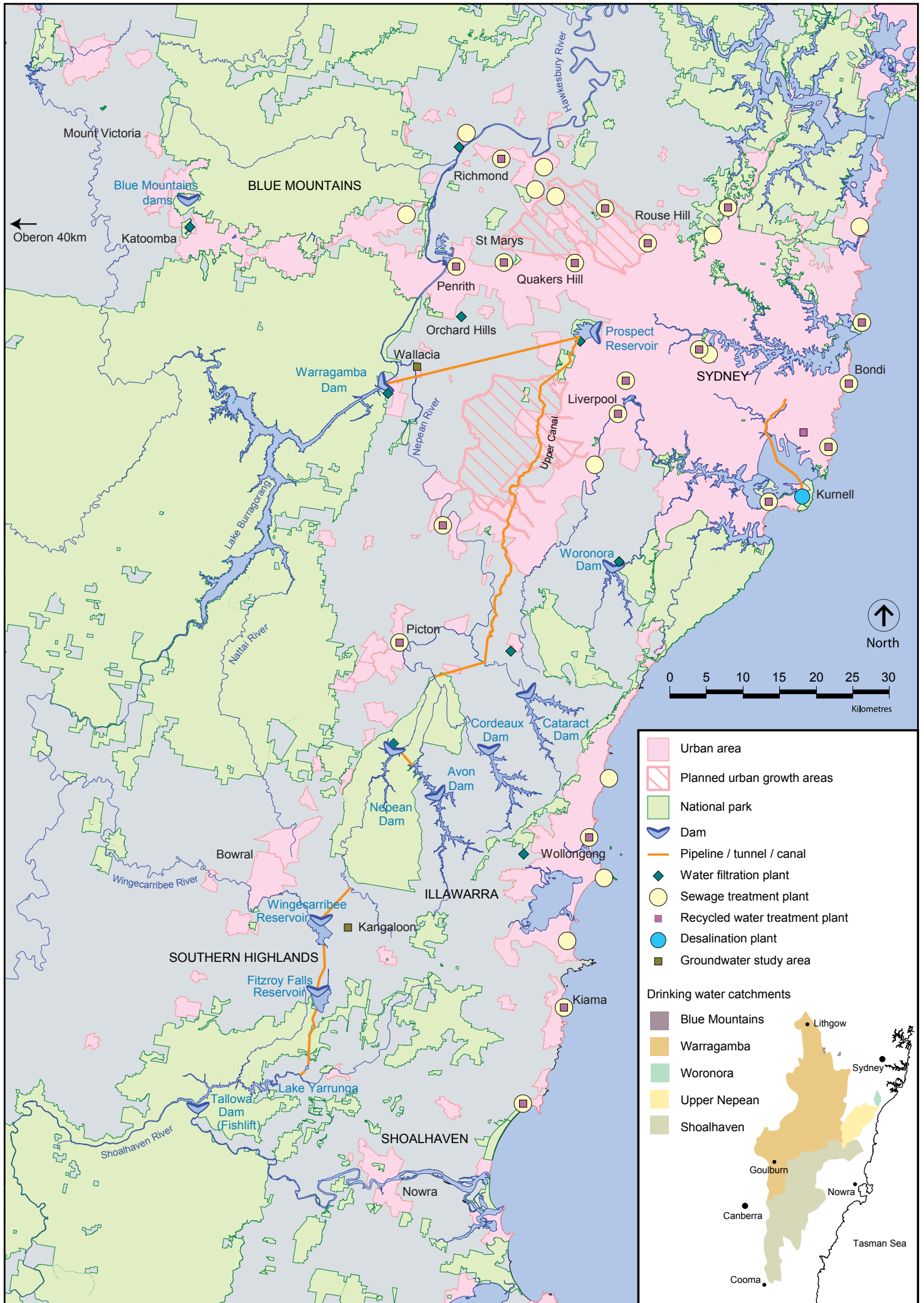
Sydney's average demand is 600 billion litres per year based on a 10-year average when drought restrictions were not in place. There are a number of factors that impact on water demand over time. Population growth and demographic trends, changes in the housing mix, the efficiency of water using household appliances and new technologies all affect how much water we use.

In Sydney, water efficiency programs for people and businesses, water saving appliances, a growing recognition in the community that we all need to use water wisely, and increased recycling initiatives have all had a positive impact on reducing demand. Over the past 19 years demand has dropped from 506 litres per person a day in 1990–91 to 314 litres per person a day in 2009–10.

Currently, households consume about 73 percent of all water used in greater Sydney. From our consultation we know the people of greater Sydney recognise that responsibility for water management is shared by government and the community.

### Projected water savings from water conservation programs





Area covered by the Metropolitan Water Plan

## What is the Metropolitan Water Plan?

The NSW Government's *Metropolitan Water Plan* outlines the mix of measures that ensure Sydney, the Illawarra and the Blue Mountains (greater Sydney) have enough water now and for the future. The NSW Office of Water – within the Department of Environment, Climate Change and Water – leads a whole-of-government approach to implementing and updating the *Metropolitan Water Plan*.

In the face of severe drought, affecting at least 80 percent of the state between 2002 and mid-2007, the government developed the *2004 Metropolitan Water Plan*. The plan set out how greater Sydney's water supply would be secured in the short term. It included actions already under way as well as new initiatives to reduce demand through recycling and water efficiency, increase supply from dams, and investigate desalination and groundwater.

Following a comprehensive review, an updated plan was released in 2006. The *2006 Metropolitan Water Plan* aimed to put in place a set of measures that met the government's medium-term plan to secure greater Sydney's water supply and protect river health, while responding to the deepening drought. These measures included increased water recycling and efficiency, and developing the capacity to introduce desalination and groundwater if needed. With the Sydney total dam storage level approaching 30 percent in early 2007, the government triggered the construction of Sydney's desalination plant.

The landscape has now changed. Good rains in mid 2007 and 2008 meant drought restrictions could be lifted in mid 2009 with the introduction of permanent Water Wise Rules. Sydney's desalination plant is on line and through water efficient behaviour Sydney is now using a similar amount of water as in the early 1970s, despite a population increase of about 1.4 million people. Our latest review of the *Metropolitan Water Plan* has shown that greater Sydney's water supply is secure to at least 2025. While we need to maintain our focus on achieving water efficiency and recycling targets, this means there are now further opportunities to ensure that river health is protected.

The *2010 Metropolitan Water Plan* sets out how the NSW Government will:

- provide a secure supply of water to meet the medium-term needs of a growing city, while keeping long-term goals in mind (a key concern for the community)
- help protect the health of our precious rivers
- ensure our water supplies are adequate during drought
- minimise costs to the community.

The 2010 plan will continue to focus on four main areas to secure our water for life:

- dams
- recycling
- desalination
- water efficiency.

## What area does the plan cover?

The *Metropolitan Water Plan* was developed to ensure there is enough water for greater Sydney, which includes the Blue Mountains and the Illawarra. This area, supplied by Sydney Water, is home to more than 4.3 million people.

The water supply catchments for greater Sydney's dams are managed by the Sydney Catchment Authority. The catchments cover more than 16,000 square kilometres to the south and west of the city, reaching west past Lithgow and south past Goulburn.

The *Metropolitan Water Plan* is also concerned with protecting the health of the major river systems that supply the dams, and with water security for people in the Shoalhaven and Southern Highlands, where dams that form part of Sydney's water supply system also supply local communities.

The community feels strongly that consideration should be given to all relevant sectors and regions in planning for greater Sydney's water security.

“I feel that the maintenance of a healthy environment enables many of the other needs to be enacted and sustained, including that of addressing the needs of the future generations.”

*Community comment,  
Consultation workshop 2009*

## Strengthening the legislative framework

### Creating a dynamic and competitive water industry

Meeting the challenge of securing greater Sydney's long-term water supply requires innovation, resources and cooperation on the part of government and the private sector.

Making it easier for the private sector to supply water and services to the NSW metropolitan water market was a key action in the *2006 Metropolitan Water Plan*.

To foster diversity and growth in the industry, the government established Australia's first third-party access and licensing system under the *Water Industry Competition Act 2006*. The licensing system enables the private sector to enter the industry, providing drinking water, recycled water and wastewater services while ensuring water quality and protecting public health and the environment.

The system has been in place for over 12 months and private companies have been licensed for four separate schemes.

One of the projects is proposed to supply wastewater services in regional NSW.

The other three schemes all include a recycling component. The first, was to construct, maintain and operate a new recycled water plant at Fairfield. As part of the Rosehill-Camellia Recycled Water Scheme, the plant will initially provide 4.7 billion litres of recycled water a year to industrial and irrigation customers in western Sydney. High-quality recycled water will then be transported to users through a network of retrofitted gas pipes.

Further licences have been issued to a company to operate a recycled water treatment plant in the heart of the Sydney CBD, which will supply recycled water for indoor non-drinking uses.

Another recent project has been granted licences to undertake sewer mining in a major development at Darling Harbour to provide recycled water for non-drinking purposes.

The *2010 Metropolitan Water Plan* will continue to encourage the private sector to develop new technology and enter the industry. Work to streamline the approval process between the *Water Industry Competition Act 2006* and the *Local Government Act 1993* will ensure that private schemes captured by these Acts receive consistent support through government regulation without the burden of overregulation.

### Balancing the needs of the environment and water users

For our river and groundwater systems to be healthy and productive in the long term, it is critical to balance the competing needs of the environment and water users.

As part of the *Metropolitan Water Plan*, greater Sydney's dams are now releasing more water for river health through environmental flows that mimic natural inflow patterns.

Under the *Water Management Act 2000*, the government has developed draft water sharing plans for surface and groundwater sources for greater Sydney. These plans will provide the legal framework for the water sharing aspects of the *Metropolitan Water Plan*, including legal protection for water allocated to the environment. Following a period of public exhibition, the *Water Sharing Plan for the Greater Metropolitan Region Unregulated Water Sources* and the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources* are expected to come into force in 2010.

These measures support the community's desire to make sure enough water is available to meet both environmental and human needs, with one not more important than the other. They also reflect community concern that water planners should consider all relevant sectors and regions.



Students from Jasper Road Public School testing the water flow from school taps as part of the Every Drop Counts in Schools Program.

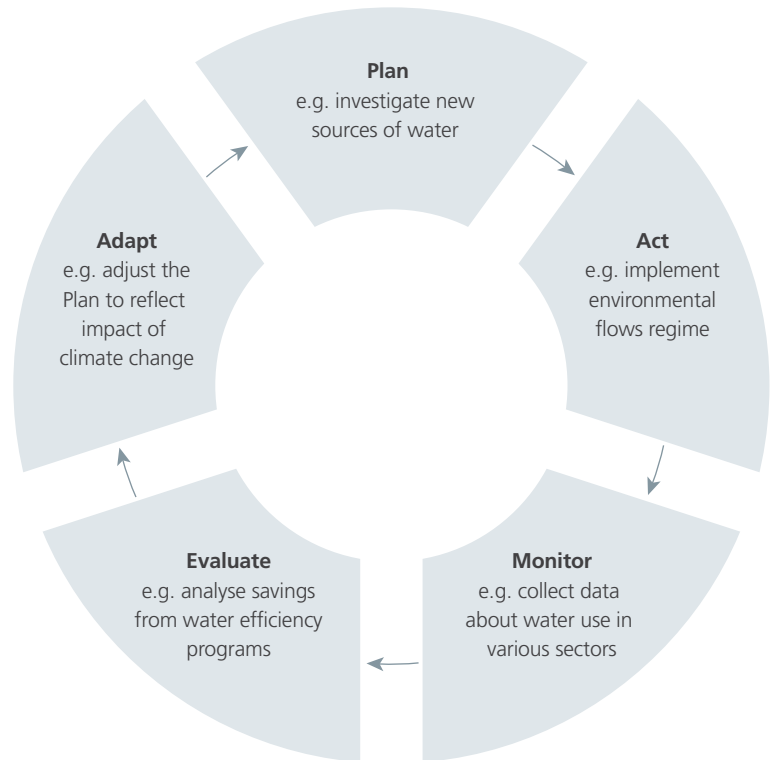
## How is the Metropolitan Water Plan managed so it stays current?

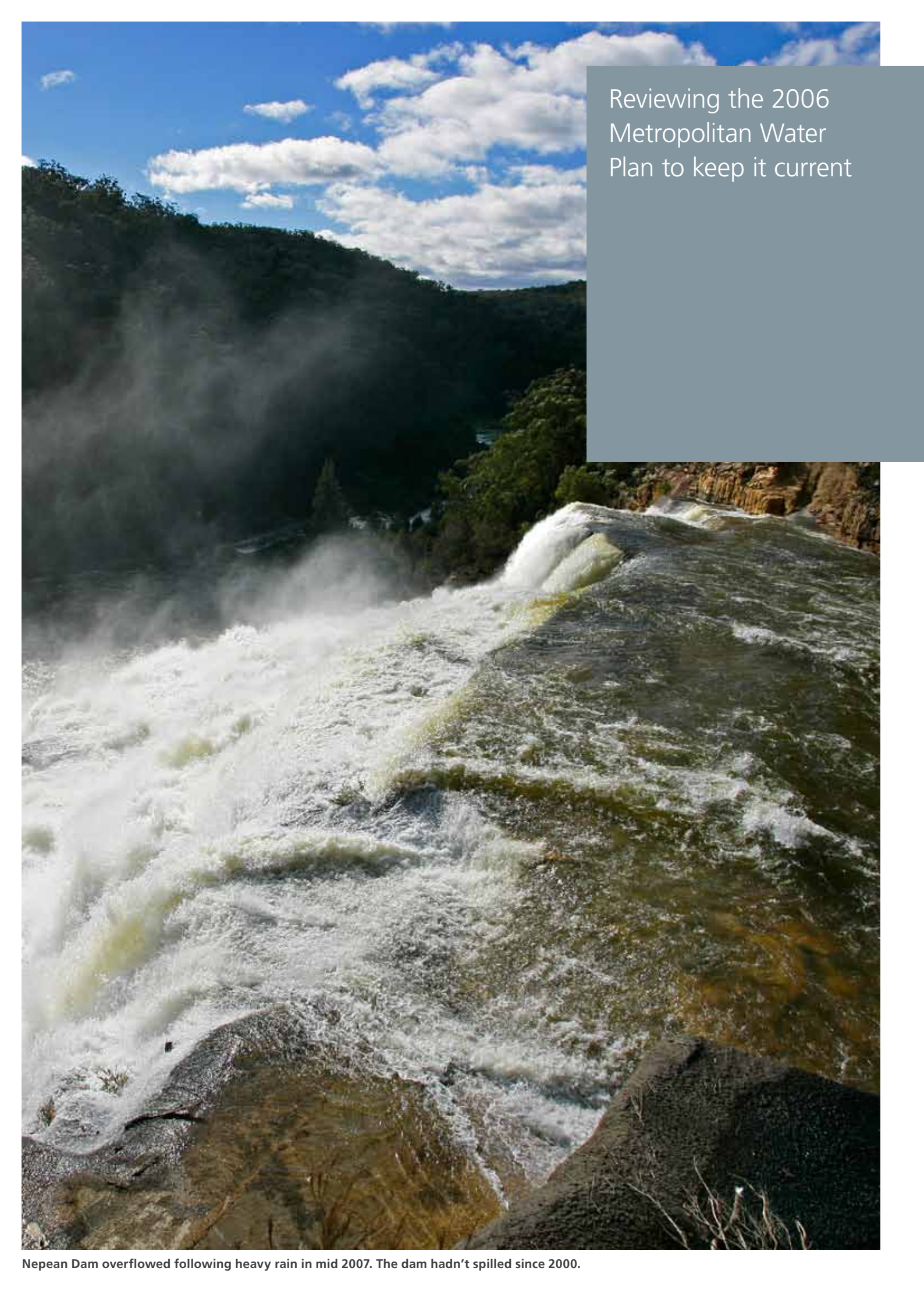
The *Metropolitan Water Plan* is designed to be flexible and to adapt to challenges such as our highly variable climate, droughts, climate change and a growing population. This means we identify options to use in the future if or when we need them, without building new infrastructure unnecessarily. It also means that what is in the plan and the options for the future are continually updated based on the latest information and innovations.

Progress under the *Metropolitan Water Plan* is reviewed and reported every year. A major review and update is conducted every four years to consider changing circumstances, advances in technology, latest research, and social, environmental and economic analysis. An independent panel with a range of relevant expertise was appointed by the Premier to oversee the review process. The next update of the plan is scheduled for 2014.

The *2010 Metropolitan Water Plan* is consistent with the Council of Australian Governments' principles for urban water planning. These principles, which were agreed in late 2008, require transparent consideration of all available options. They also require the use of the best available information and involvement of a full range of stakeholders.

### Adaptive management approach





Reviewing the 2006  
Metropolitan Water  
Plan to keep it current

Nepean Dam overflowed following heavy rain in mid 2007. The dam hadn't spilled since 2000.



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The *2006 Metropolitan Water Plan* sought to secure greater Sydney's water supply to 2015 and beyond. Our review of the plan has revealed that, with only minor adjustments, the measures adopted in the *2006 Metropolitan Water Plan* ensure enough water for our growing population and the environment to at least 2025.

## Outcomes of the review of the 2006 Metropolitan Water Plan

The review of the *2006 Metropolitan Water Plan* has confirmed that sound investments have been made in water supply and water efficiency programs. These investments have benefited both the people and the environment of the greater Sydney region.

Analysis shows that with everyone continuing to be water wise, along with dams, recycling, desalination and drought readiness strategies, Sydney has enough water for future droughts and our growing population while continuing to improve river health until at least 2025.

There are four key elements that make up the plan to secure our water for life:

**Dams** – continuing to provide most of Sydney's drinking water

**Recycling** – reducing the demand for drinking water (around 70 billion litres a year by 2015)

**Desalination** – having capacity to supply up to 15 percent\* of Sydney's current needs (90 billion litres a year)

**Water efficiency** – reducing demand for water by households and business (145 billion litres a year by 2015)

We have also identified measures that can be readily implemented in the future should we need them – be it in a severe drought, or in the longer term to supply a growing population. These measures would secure our supply well beyond 2025.

\* Based on long-term average usage of 600 billion litres per year

## The review

### The review process

The *Metropolitan Water Plan* is reviewed every four years to factor in changing circumstances. These include advances in technology, updated projections of population growth and associated water demands, climate change research, rainfall/dam inflows, and community views. In this way we ensure the most effective and appropriate solutions are in place for securing the water needs of greater Sydney.

The review of the *2006 Metropolitan Water Plan* began in late 2008 and was overseen by the Metropolitan Water Independent Review Panel, a panel of independent experts from a wide range of disciplines. One of the Panel's primary roles was to oversee community consultation, which is an integral part of the review process.

Following a cross-government review of the latest research, a first phase of community consultation was undertaken in May 2009. The aim was to identify values of high priority to the community and stakeholders in planning for Sydney's water future.

In parallel, extensive modelling of the suite of available water supply and demand options was undertaken for input into a cost effectiveness analysis. This round of modelling told us how various portfolios performed under different rainfall and inflow scenarios, including modelling a drought more than twice as severe as the recent drought.

A range of supply and demand management options was then presented to the community and stakeholders in November and December 2009. The review also included an assessment of the environmental and social impacts of the mix of measures by expert panels. The panels used the findings of the community consultation and existing information and data on environmental and social indicators to assess the impacts of a range of portfolios.

The findings of the consultation, along with analyses of social and environmental factors, were then considered in combination with the cost effectiveness analysis, which compared the portfolios based on the cost of providing water security. From this, government determined the mix of measures needed to secure greater Sydney's water supply to 2025 and beyond. Further detail on the review can be found in a separate process summary published concurrently with this plan and available at [www.waterforlife.nsw.gov.au/review](http://www.waterforlife.nsw.gov.au/review).

The portfolio of agreed measures forms the basis for this *2010 Metropolitan Water Plan*.

### Existing commitments

There is a wide range of measures currently in place to secure greater Sydney's water supply. These measures reflect past commitments and include major assets such as Sydney's dams and the recently constructed desalination plant. In addition, there are other water supply sources that have not been triggered, such as groundwater borefields (which have been shelved), and the substantial water efficiency and recycling programs that will be implemented to meet targets for the future.

Existing commitments also include provision for environmental flows to be released from dams, the operational rules for pumping water from the Shoalhaven system and the triggers for drought water restrictions.

For the purposes of this review these current assets and commitments were taken as given and formed the basis of the cost effectiveness analysis.

### Modelling future water demand and supply options

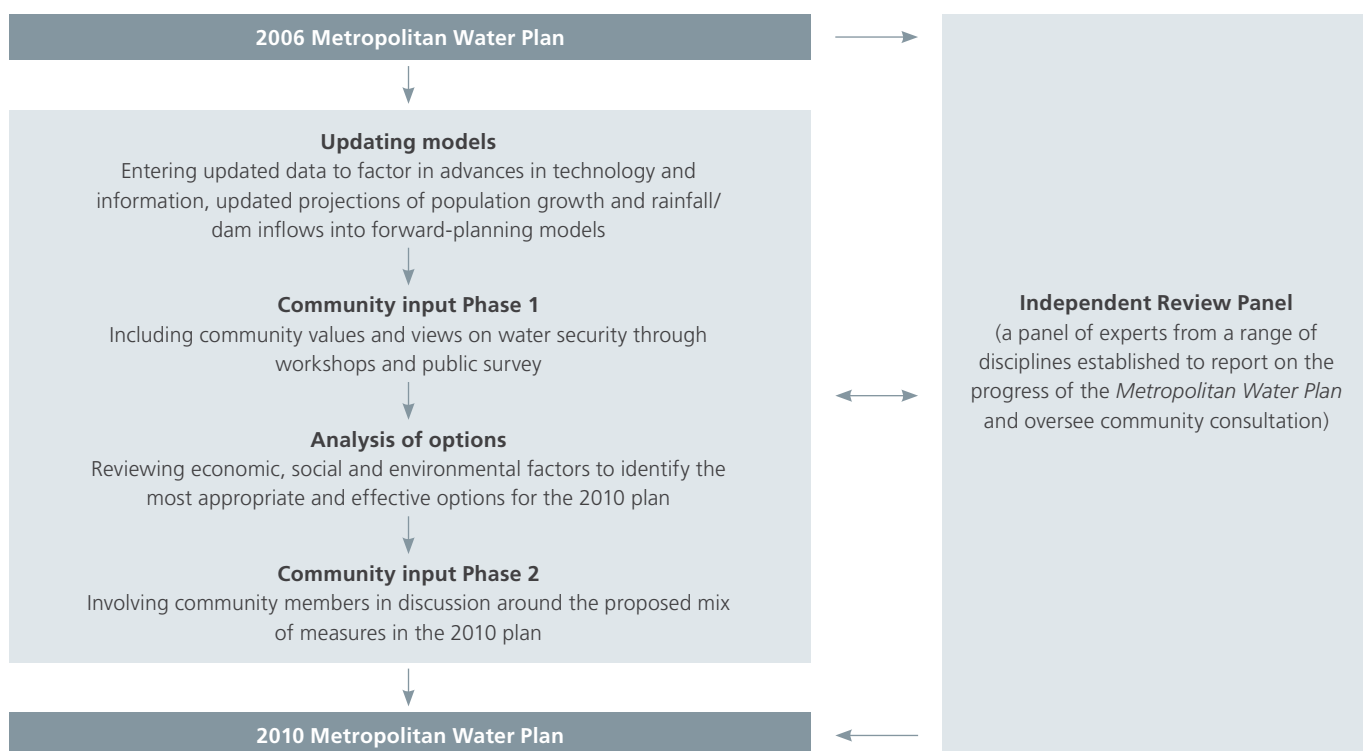
The Sydney Catchment Authority uses a sophisticated computer model to simulate the performance of the water supply system under various conditions. The model, called WATHNET, includes a detailed representation of the dams, pipes, canals and pumping stations that make up the water supply system, including the desalination plant. Generating thousands of potential inflow events, including a drought more than twice as severe as the recent drought, the model is able to simulate the long-term performance of the existing system under various water supply and demand management options, or potential future portfolios.

### Cost effectiveness analysis

A major part of the review was to analyse the cost effectiveness of various portfolios and their ability to ensure greater Sydney's future water needs are met.

Achieving an optimal supply and demand mix requires careful consideration of how all the options interact as part of a portfolio of measures. The cost effectiveness analysis incorporated the cost of the whole portfolio of measures, in order to determine how each portfolio performed against a range of potential rainfall and runoff scenarios for the Sydney catchments (using WATHNET).

## Metropolitan Water Plan review framework



The WATHNET model outputs include time in drought restrictions, minimum dam storage level reached, volumes of water supplied from different sources, environmental releases and spills from dams. Consideration of these factors shows that while some individual options have a higher unit cost than others, when combined within a whole portfolio they may represent value for money.

The costs included in this analysis primarily focused on the capital and operational costs of the various measures and on the social and environmental costs for which data were available. Some environmental and social impacts and benefits are difficult to cost. These were estimated in qualitative terms and used in evaluating the best mix of measures to include in this plan.

## Considerations for the review

### Population growth

Greater Sydney is using a similar amount of water now as in the early 1970s, despite an increase in population of about 1.4 million people. Water use has reduced due to implementation of measures in the *Metropolitan Water Plan* and the huge effort by households, businesses and the government to use water wisely.

Even with water wise behaviour and future water efficiencies, further increases in Sydney's population will increase the overall demand for water.

The population in Sydney Water's area of operation is expected to reach 5.69 million by 2036, a 35 percent increase from 4.22 million in 2006. This growth in population is likely to increase annual demand for drinking water by around 66 billion litres compared to demand in 2006 (assuming there are no drought restrictions). Other factors such as housing density, availability of recycled water, uptake of water efficient appliances and other water efficient behaviours also affect the total drinking water demand.

### Climate variability and drought

Climate variability relates to the naturally occurring weather events and patterns that have been tracked over time. Balancing greater Sydney's water supply and demand over the long term requires improved understanding of climate cycles and trends and how best to respond.

Historical records show that Sydney's climate is highly variable, even without climate change impacts. This is due to a number of climate patterns such as El Niño and La Niña, which are associated with droughts and floods. Circumstances can change quickly and rainfall can vary substantially, as the past decade has shown us.

While it is probable there will be severe drought conditions in the future, the exact nature of these droughts – timing, duration and severity – cannot be known. However, we do have a sound understanding of the effects of drought, and the importance of non-rain dependent supplies such as desalination.

As part of the review process, climate variability, rainfall and dam inflows were extensively modelled. This information was then used in the cost effectiveness analysis to derive the best water supply and demand management approach to secure greater Sydney's water into the future.

### Climate change and its implications for Sydney

To better understand the impacts of climate change on Sydney's water supply system and future urban water demand, a collaborative study titled 'The climate change impacts on water supply and demand in Sydney' (*Sydney Water Balance Project* for short) was undertaken. The *Sydney Water Balance Project* is the only research to date that has tried to determine the potential impacts of climate change on greater Sydney's water supply and demand. It broke new ground in modelling climate change impacts at the regional level and has helped to identify the next quantum of research needed to improve the confidence of modelling at this scale.

The project began in June 2006 and the final report is due for release in 2010. The collaboration involved the NSW Office of Water, the Commonwealth Department of Climate Change and Energy Efficiency, the NSW Department of Environment, Climate Change and Water, Sydney Water, Sydney Catchment Authority, the University of New South Wales and the CSIRO.

### Estimated population growth in Sydney Water's area of operation



Source: Sydney Water

“Plan for the future because we need to manage the water so that it never reaches critical levels.”

Community comment,  
Consultation workshop 2009

The results of the *Sydney Water Balance Project* provide information on how greater Sydney's water supply may be affected by climate change over time. However, climate change modelling is an evolving science. Uncertainties exist because of the limitations in downscaling global climate models to estimate climate impacts at the regional level and to model future droughts. Further uncertainties exist because we do not know for certain what levels of greenhouse gas concentrations we can expect in the future.

In relation to water supply, the results indicate there may be decreases in annual rainfall and runoff in the inland catchments and minor increases in coastal catchments by 2030.

Draft findings from the *Sydney Water Balance Project* also indicate that climate change:

- will likely result in an increase in temperature by 2030
- may result in an increase in evaporation throughout the catchments, with the most significant increase being recorded in the Goulburn area
- may result in a very minor increase in water demand in greater Sydney by 2030.

While this research indicates potential changes to supply and demand, the low impact of these changes and lack of certainty in the findings means that for the short term this research has not fundamentally changed our water management planning. The study highlighted the need for more research, particularly in relation to drought persistence under future climate conditions, and regional and local level climate modelling.

In recognition of the current lack of certainty around future climate conditions, the *2010 Metropolitan Water Plan* maintains a flexible approach to managing greater Sydney's water supply. These draft findings confirm that it is important that the *Metropolitan Water Plan* maintains the capacity to:

- manage risk by having an appropriate buffer between supply and demand
- understand the likely pressure points on the supply and demand balance in the future
- respond to changing conditions due to both climate change and climate variability
- continue to improve our knowledge of climate change impacts on greater Sydney's water supply
- incorporate this knowledge into future strategies.

Given that information about climate change projections and anticipated impacts will improve over time, it is important to maintain our flexible approach to managing greater Sydney's water supply. We will continue to undertake, monitor and review climate change research over time and adapt the *Metropolitan Water Plan* as required.

Further information on climate change and the research government is undertaking that has relevance for the *Metropolitan Water Plan*, including the NSW Climate Impact Profile, is at [www.waterforlife.nsw.gov.au/climatechange](http://www.waterforlife.nsw.gov.au/climatechange).

### Providing for environmental flows for the health of our rivers

Protecting the health of our rivers is an important part of the *Metropolitan Water Plan*. This includes investment in new infrastructure to allow the release of environmental flows from the water supply dams to improve the ecological, recreational and tourism value of our rivers.

Environmental flows can help native fish and other species to breed, reduce the growth of weeds, and improve the suitability of the river for swimming and boating. Accordingly, the new variable environmental flows at Tallowa Dam on the Shoalhaven River have been factored into the water balance, as were new flow releases from the Upper Nepean dams and weirs.



Participants in the community consultation workshops developed the community planning principles used during the review of the plan.

Also included for planning purposes were new environmental flow releases from Warragamba Dam, beginning from 2018. The flow regime used in the modelling was that recommended by the Hawkesbury-Nepean River Management Forum in 2004. In the context of the plan, the volume of these releases would be significant and it was important to account for them in the planning for the future.

### **Innovative research, technology and demand management practices**

The *2006 Metropolitan Water Plan* established a strong focus on innovation and research. Through the implementation of the *Water Industry Competition Act 2006* the NSW Government is fostering innovation in recycling technology. Our water conservation program is one of the most innovative and comprehensive in the world targeting residential, industrial, commercial, agricultural and government water users. Our research into climate change is the first to provide projections of the potential impact of climate change on the Sydney water system.

The review of the *2006 Metropolitan Water Plan* took account of:

- information provided through existing state-of-the-art modelling programs such as WATHNET, which incorporates rainfall and inflow data, and climate projections to simulate a range of potential water balance scenarios

- the effectiveness of existing water conservation initiatives, outcomes of pilot programs and investigation into potential new programs
- advances in leak detection and smart metering technology
- advances in water supply and recycling technology
- water quality data available through the extensive research and monitoring program undertaken by the Sydney Catchment Authority
- findings of the *Sydney Water Balance Project* (see page 17) – which pushed the boundaries of climate science in relation to water supply.

### **Community engagement for the review**

Community consultation is a key input into developing the long-term plan for greater Sydney's water future. The Independent Review Panel was tasked with recommending consultation methods and overseeing the consultation process.

### **First phase of community engagement (Phase 1)**

The aim of Phase 1 of the consultation was to gauge the public's values and general attitudes towards water.

Phase 1 involved 10 workshops across greater Sydney, an online survey, and a review of existing social research on attitudes to water use and management. In May 2009, eight workshops were attended by community and business representatives. Two further workshops were held with key metropolitan and catchment stakeholders, including representatives of local government, catchment management authorities, industry, environment groups, water users and recreational bodies.

Three key values emerged from Phase 1:

- having a safe and affordable water supply for homes
- considering the needs of future generations in decision-making and water planning
- ensuring human needs for water are balanced with those of the environment.

The complete findings from Phase 1 were condensed into seven key planning principles, which were used in assessing options during Phase 2 of consultation. These community planning principles are outlined over page.



**Reverse osmosis technology is used to extract salt from seawater during the desalination process.**

## Community planning principles

The community planning principles were developed from the findings of the Phase 1 consultation and validated during Phase 2. These principles will continue to underpin the way in which the 2010 plan is delivered.

- Provide water that is affordable and safe to drink.
- Ensure enough water to meet both environmental and human needs – one not more important than the other.
- Ensure a dependable long-term water supply for current and future generations.
- Maximise water efficiency and recycling, especially capturing stormwater and invest in research and innovation.
- Restore clean healthy waterways and ensure health of catchments by reducing pollution.
- Ensure government and community take joint responsibility for water management.
- Share water – taking into consideration all relevant sectors and regions.



Community input is an important part of water planning for Sydney. The 2006 Metropolitan Water Plan spelled out the Government's commitment to consult with the community when reviewing that plan and developing this 2010 plan.

## Second phase of community engagement (Phase 2)

The aim of Phase 2 was to involve the community in discussion around the proposed supply and demand management options for the *2010 Metropolitan Water Plan*, including evaluation of the options using the community planning principles.

Phase 2 involved three one-day workshops in November and December 2009. Two workshops were attended by community representatives and one workshop was held with key stakeholders and opinion leaders. Participants from Phase 1 were invited to participate in Phase 2 – 70 percent attended.

The key findings included:

- endorsement of the seven planning principles – developed following feedback in Phase 1
- continued agreement that everyone is responsible for saving water (i.e. government, industry, and the community) – water efficiency initiatives are crucial
- overwhelming support for environmental measures (e.g. environmental flows and river system improvements) – reducing environmental flows during droughts was seen as a decision of last resort
- support for a simplified drought restrictions regime by the majority of participants (two levels of drought restrictions on top of the Water Wise Rules) – also strong support for introducing drought restrictions earlier (at higher total dam storage level) and maintaining them for longer
- supporting the use of the desalination plant as long as the focus remained on water efficiency and recycling initiatives
- strongly held view that education and empowerment are fundamental to the delivery of water supply and demand measures and that the provision of information must be transparent.

## Our major achievements

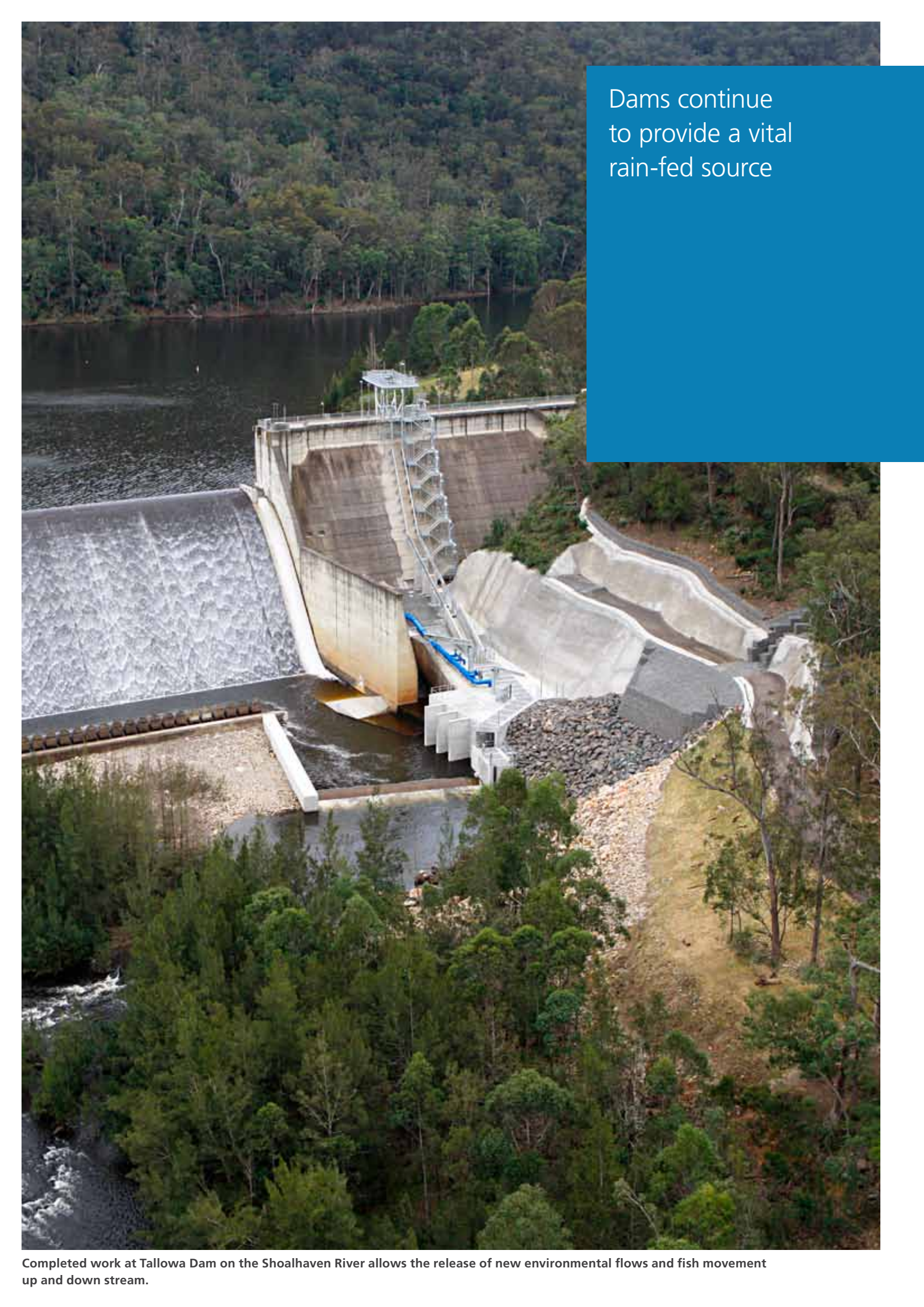
- Constructed and commissioned the award-winning desalination plant on time and under budget, including the Capital Wind Farm near Bungendore which fully offsets the plant's energy requirements.
- Delivered recycled water to 19,000 homes in Rouse Hill as part of a large-scale residential recycling scheme.
- Created competition in the water industry through supportive legislation.
- Upgraded Tallowa Dam and implemented new environmental flows for the Shoalhaven River (see page 24).
- Implemented the Building Sustainability Index (BASIX) to achieve water and energy efficiencies in new and renovated homes.
- Constructed the Replacement Flows Project at St Marys (see page 28).
- Completed the interagency climate change research *Sydney Water Balance Project*.
- Undertook extensive community consultation on individual initiatives in the *2006 Metropolitan Water Plan*, including groundwater extraction.
- Delivered *2007 and 2008 Progress Reports* on the implementation of the *2006 Metropolitan Water Plan*.
- Developed and applied a comprehensive review methodology including community consultation for the review of the *2006 Metropolitan Water Plan*.

## What's next

- Monitor population projections and changes in water demand.
- Continue annual reporting on progress of the plan and reporting to the Independent Review Panel.
- Monitor and review future climate change research to better understand the implications for Sydney's water supplies.
- Continue interagency discussions to determine the most strategic approach to develop and use climate change information in Sydney's water supply planning, including investigations to improve the way that we model droughts at the local level.
- Continue investment in innovative research, technology and demand management practices.
- Continue monitoring existing environmental flow releases and undertake detailed investigations to determine an optimal environmental flow regime for Warragamba Dam.
- Further investigate long-term water supply and demand options.
- Finalise and implement water sharing plans for greater Sydney.
- Undertake community and stakeholder consultation in future reviews of the *Metropolitan Water Plan* and major initiatives coming from it.



Recycled water is delivered in purple pipes to 19,000 homes in the Rouse Hill area for non-drinking use. Capacity of this network has now increased to serve a potential 36,000 homes.



Dams continue to provide a vital rain-fed source

Completed work at Tallowa Dam on the Shoalhaven River allows the release of new environmental flows and fish movement up and down stream.



Dams are our major source of drinking water. However, Sydney is no longer totally reliant on rainfall stored in dams because water is now also available through desalination and recycling.

### Contribution of dams to our water supply

For the last 130 years, Sydney has relied on rainfall stored in dams for its water supply. The 2006 *Metropolitan Water Plan* put in place measures to diversify our system through desalination and recycling. However, dams continue to provide most of greater Sydney’s drinking water and we need to use this water wisely so we have enough for drinking and for a healthier river environment.

Consultation shows that providing enough water to meet both environmental and human needs, with one not more important than the other, is a key issue for the community.

Sydney’s network of 11 major dams:

- provide water to serve greater Sydney’s residential, commercial and industrial water needs
- together capture and store more than 2,600 billion litres – one of the largest per person storages in the world – so we are able to cope with our highly variable climate
- have protected catchments that help protect water quality and provide a home to a variety of rare and endangered flora and fauna
- are interconnected so water can be transferred to where it’s needed most.

### Maintaining and upgrading Sydney’s dams

Sydney Catchment Authority (SCA) manages the network of dams that supply raw water to greater Sydney.

Over the life of the *Metropolitan Water Plan*, the SCA has continued a comprehensive program of asset maintenance and upgrades. This multi-million dollar program ensures our dams are operated safely and deliver a reliable supply of high quality water.

This asset management program is in addition to the specific projects outlined in the *Metropolitan Water Plan*.

### Protecting the health of our catchments

The Sydney Catchment Authority (SCA) is responsible for protecting the health of the drinking water catchments and delivering high quality water from dams to retailers, including Sydney Water, Wingecarribee Shire Council and Shoalhaven City Council.

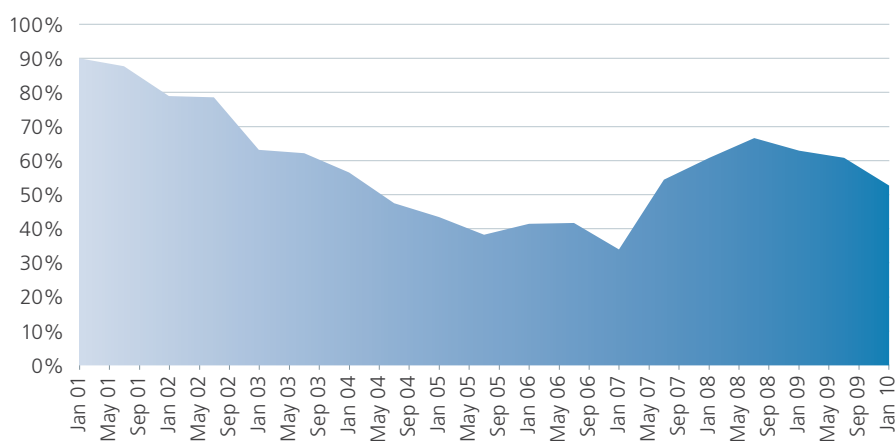
The SCA works in partnership with local councils, landholders, government agencies, industry and other community stakeholders to protect the health of the catchments and provide high quality water. It uses the best available science, water monitoring and modelling, education, regulation and technology to manage the catchments and the water supply network.

### Transferring water around the system

#### Shoalhaven water transfers

The Shoalhaven is an integral part of the water supply system. Since the 1970s, in times of drought, Sydney and the Illawarra have relied on water pumped from Tallowa Dam on the Shoalhaven River to boost Sydney’s total dam storage level and supplement water supplies. In the last drought the system provided around 30 percent of the supply to greater Sydney. Water is transferred using the river system to provide additional water into Warragamba Dam or the Upper Nepean dams.

### Sydney’s total dam storage levels



Investigations under the *Metropolitan Water Plan* have shown more water could be sourced from the Shoalhaven system by transferring when water is readily available rather than accessing low flows during times of drought. In effect, transfers could occur when there will be less impact on the health of the Shoalhaven River. The investigations also looked at ways to provide improved releases of water for the health of the lower Shoalhaven River, and to reduce the impacts of water transfers on rivers in the Southern Highlands.

After extensive research, analysis and community consultation important improvements to the Shoalhaven system were announced in March 2007. These included:

- new environmental flow rules for the lower Shoalhaven River (see page 50)
- changed operation of Tallowa Dam:
  - water transfers will begin when Sydney's total dam storage level falls to around 75 percent and continue until total dam storage level rises above 80 percent
  - water will not be drawn down further than one metre from Tallowa Dam's full storage level – this will be increased to three metres in times of severe drought (see page 56)
- new infrastructure at Tallowa Dam to allow native fish passage and improve the quantity and quality of water releases downstream for the environment (see case study on this page)
- upgraded picnic facilities at the dam site.

The Shoalhaven and Wingecarribee communities were also invited to comment on six options to upgrade the water supply transfer system. The options looked at ways to transfer more water from Tallowa Dam to Sydney and the Illawarra, if required in the future. Several options had the benefit of protecting the health of the Southern Highlands' river system by reducing the use of rivers to transfer water between dams.

Based on community feedback, scientific and engineering investigations, and social, economic and cultural heritage assessments, three options were short listed. Further detailed technical investigations of these options have been

### Upgrades to Tallowa Dam to improve the health of the Shoalhaven River

A major project to improve the health of the Shoalhaven River was completed in 2009 with the construction of new environmental flow infrastructure and fishlift at Tallowa Dam in the Kangaroo Valley.

The \$26 million project allowed variable flows that better mimic natural river conditions to be released downstream for the health of the river, and is allowing for the upstream and downstream migration of native fish.



**The Emperor Gudgeon is one of the native fish species benefitting from the new fishlift at Tallowa Dam.**

A mechanical fishlift, built as part of the project, is the largest fishlift to be fitted to an existing dam anywhere in Australia. The innovative solution to a technically complex project has been recognised with engineering awards.

Since it was built in the 1970s, the dam has been a barrier to the migration of native fish. The new fishlift moves fish up and over the dam restoring full access for 10 native fish species, including the Emperor Gudgeon and the endangered Grayling.

A major component of the project was infrastructure works to allow for variable flows to be released from the dam to improve the health of the Shoalhaven River. The temperature of water released from the dam more closely matches the downstream river environment with the construction of a surface level off-take at the dam.

The new environmental flows began in mid 2009 following the lifting of drought water restrictions in Sydney.

The project was a key initiative of the *2006 Metropolitan Water Plan* and meets the community planning principle of ensuring enough water to meet both environmental and human needs.

undertaken. The preferred augmentation option is a tunnel from Burrawang to Avon Dam.

There are significant costs and lead times for the augmentation and a decision on its timing will depend on factors such as future climate predictions, and population growth and demand. These factors will be reviewed over the next few years with a view to having an upgraded system built and operational by around 2025.

### Water transfers from the Upper Nepean dams

The Upper Canal is integral to Sydney's water supply network. The 130-year-old, 64 kilometre long combination of open channels, tunnels and aqueducts transfers water from the Upper Nepean dams (Cataract, Cordeaux, Avon and Nepean), to Prospect Water Filtration Plant.

The catchments of the Upper Nepean and Shoalhaven provide more reliable inflows than Warragamba, and with climate change, may become even more important to Sydney's water supply. The Upper Nepean transfers system can transfer the equivalent of up to 30 percent of Sydney's water supply. The canal also provides flexibility to change the source or mix of water being supplied to Sydney in response to water quality issues or to planned or emergency system maintenance.

The Upper Canal, which now passes through urban areas of greater Sydney, has been used for illegal recreation and is subject to vandalism. The open canal can pose a risk to public safety and can also impact reliability, water security and water quality. A range of options for rehabilitation and or replacement have been assessed to identify the best option for renewal of the canal and concept designs drawn up. Work on the canal will continue over the life of the 2010 plan.

## Accessing water deep in the dams

Complex projects completed at Warragamba and Nepean dams in 2007 at a cost of \$119 million allow water deep in the dams, which was not previously accessible, to be used if needed. In a severe drought, another 200 billion litres of water will be available, which amounts to an additional five or six months of supply if drought restrictions are in place. This increases the annual average amount of water available over the long term by 40 billion litres, or about seven percent of Sydney's water needs.

At Nepean Dam, the deep water transfer pumps and pipes have already been used to pump water to Avon Dam to make water supplies more secure for the residents and businesses of the Illawarra.

The deepwater projects received awards for their excellence in engineering and project management.

## Improving reliability of water supplies to the Blue Mountains

The community feels strongly that in planning for greater Sydney's water security consideration should be given to all relevant sectors of the community and regions.

The government has identified the need to do works in the upper Blue Mountains to secure water supply for the longer term. Due to a continuing water shortage in the Oberon and surrounding regions, water has not been drawn from the Fish River Scheme near Oberon since late 2008. While the Blue Mountains has been able to be supplied water from three other dams in the region, upgrades to the existing water supply infrastructure will improve the system and allow access to additional supply in the coming years.

The preferred option is to source more water from Warragamba Dam via Orchard Hills water filtration plant. Operational improvements to existing infrastructure to increase capacity is under way and additional works to improve the capacity and reliability of existing water pumping stations are expected to be completed by 2013.

## Our major achievements

- Tallowa Dam and the Shoalhaven River:
  - extensive community consultation, environmental, economic, and cultural heritage assessments undertaken to determine the optimal approach to increasing water supplies and establishing new environmental flows
  - built a fishlift and environmental flow infrastructure at Tallowa Dam (see case study on page 24)
  - implemented new environmental flows for the lower Shoalhaven River (see page 50)
  - revised dam operating rules (see page 24)
  - upgraded public amenities at Tallowa Dam.
- Modified Avon Dam in the Upper Nepean Catchment to allow variable environmental flow releases, which began in March 2008 (see page 49).
- Completed major infrastructure upgrades at Warragamba and Nepean dams to allow access to water deep in the dams if required (see this page).
- Completed extensive investigations and concept designs for the rehabilitation and or replacement of the Upper Canal.
- Investigating options for the long-term security of water supply to the middle and upper Blue Mountains.

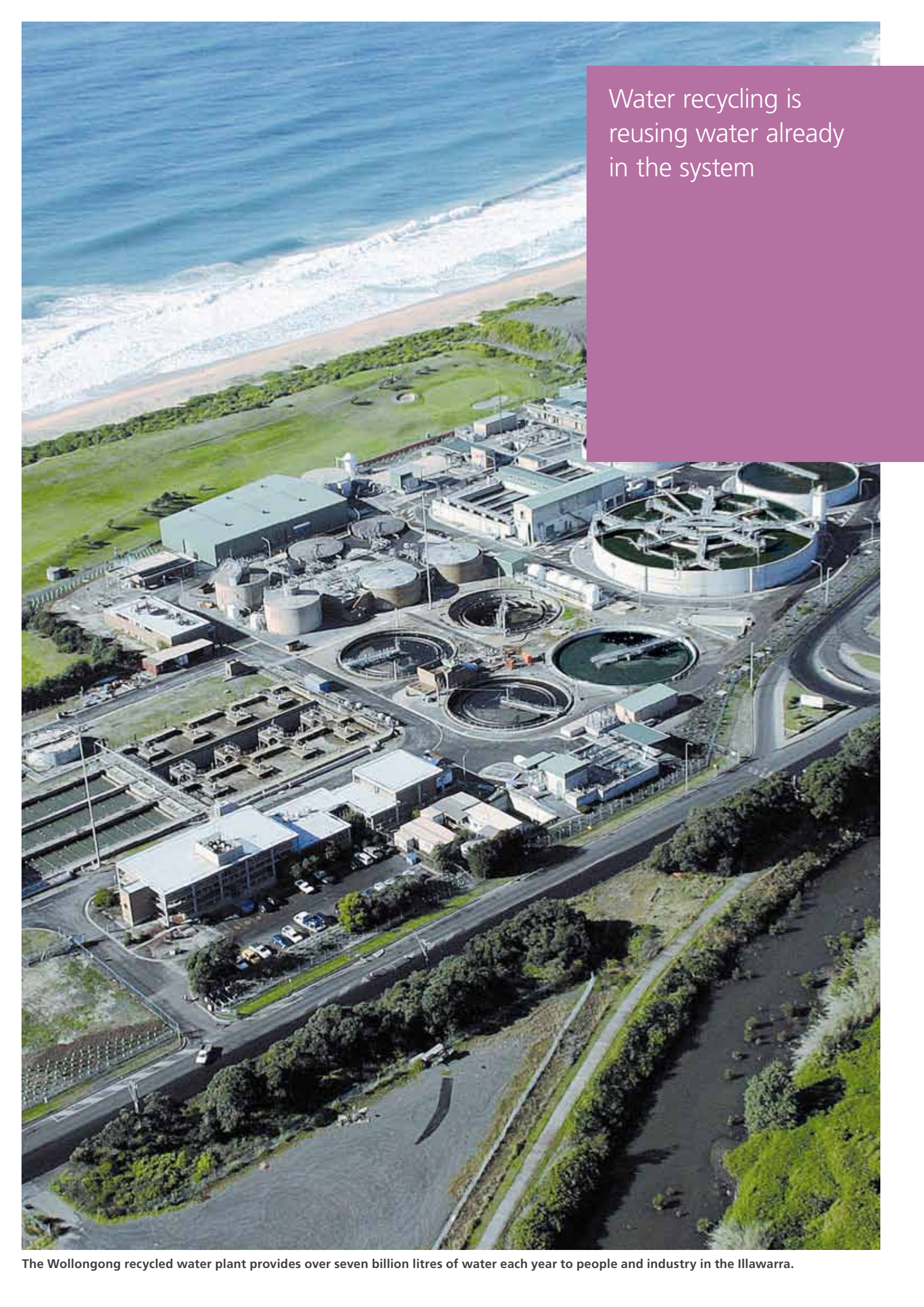
- Began new variable environmental flow releases into the Hawkesbury-Nepean River system from Cataract, Cordeaux and Nepean dams implemented on 1 July 2010 (see page 49).
- Modified weirs on the Nepean River to allow variable environmental flows and fish passage (see page 49).

## What's next

- Review factors relating to the timing of the augmentation of the Shoalhaven water transfers system with a view to having an augmented system operational around 2025.
- Complete work to improve reliability of supply for the upper Blue Mountains.
- Continue work on the rehabilitation and or replacement of the Upper Canal water supply transfer system from the dams in the Upper Nepean Catchment to Sydney.
- Continue to monitor, assess and report on the effectiveness of the new environmental flow rules for Tallowa Dam in the Shoalhaven, the Upper Nepean dams and the operation of the weirs on the Nepean River.



**The new deep water pumping station at Warragamba Dam completed in early 2007, which, along with a deep water pumping station at Nepean Dam, provide access to previously inaccessible water, extending supply by around six months during drought.**

An aerial photograph of the Wollongong recycled water plant. The plant features several large circular aeration tanks, rectangular clarifiers, and various industrial buildings. It is situated near a coastline with waves breaking on a sandy beach. A road and a river or canal are visible in the foreground. A purple rectangular box is overlaid on the top right of the image, containing white text.

Water recycling is reusing water already in the system

The Wollongong recycled water plant provides over seven billion litres of water each year to people and industry in the Illawarra.

Increased water recycling is a key element of the *2010 Metropolitan Water Plan*. Recycling initiatives will produce 70 billion litres a year by 2015 – equivalent to about 12 percent of greater Sydney’s current water needs.

## Water recycling in Sydney

Water recycling is treating and reusing wastewater, greywater and stormwater for use in homes, industry, irrigation and agriculture. The key role of recycled water in the *Metropolitan Water Plan* is to reduce pressure on water supplies by reducing demand for drinking water. Using recycled water for non-drinking purposes makes the drinking water supply go further and can help delay the need to invest in new supply infrastructure.

When treating sewage for reuse we treat it to the level that is appropriate, and safe, for the particular situation. Different types of reuse have different requirements. The treatment objective is to make it ‘fit for purpose’. For example, treating sewage to a standard suitable for reuse in some industries can require technology similar to that used in desalination, and is similarly energy intensive. Generally speaking, the higher the quality required for fit for purpose water, the more treatment will be required and the higher the cost involved with producing it.

A further challenge to the efficiency of recycling is the cost of transferring water around the system. Water is heavy and cheap to move with gravity, but expensive when pumping is required. Recycled water projects are most viable if customers are located close to the source of the effluent, such as a sewage treatment plant or sewer main. Clearly, recycling is more easily achieved in new growth areas as there are high costs associated with retrofitting houses and laying recycled water pipes in existing urban areas.

The community has told us that maximising recycling, especially capturing stormwater and investing in research and innovation, must be a key focus in the *2010 Metropolitan Water Plan*.

The NSW Government supports recycling schemes across greater Sydney and continues to investigate new, innovative and cost effective ways to treat and use recycled water.

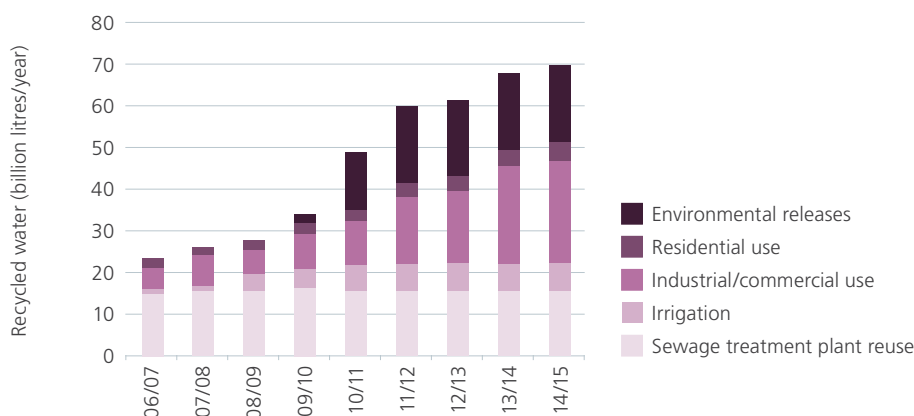
### Recycled water targets

In mid 2010, use of recycled water was saving about 33 billion litres of water that might otherwise come from our drinking supplies each year. Implementation of the Replacement Flows Project at St Marys from October 2010 will increase recycling by 18 billion litres a year.

Increased water recycling is a key element of the *2010 Metropolitan Water Plan* and consistent with the *2006 Metropolitan Water Plan* and the *NSW State Plan*, 70 billion litres of water will be recycled each year by 2015 (equivalent to about 12 percent of Sydney’s current water needs). With ongoing efforts beyond 2015, it is projected that up to 100 billion litres of water may be recycled each year by the 2030s.

In recognition of the importance of maintaining agriculture in the Sydney region, future recycled water schemes developed by Sydney Water will consider irrigators’ water needs and use patterns. Options considered for meeting these needs will include continuing supply by pipelines and managed sewage treatment plant discharges.

Use of recycled water in Sydney: 70 billion litres a year by 2015



## Supporting councils to engage their communities and promote their local recycling, stormwater and water efficiency initiatives

The Water for Life Education Program developed a Council Partnership Kit in 2008 to help councils in the Sydney region increase community understanding of the large number of water recycling, stormwater reuse and water efficiency projects managed by councils, and to encourage wise water use.

The 2008 kit contained funding, case studies and creative templates for councils to advertise and promote their efforts through print advertisements, outdoor advertising (bus interiors, exteriors and shelters), signage (erected at sites of projects or in community centres), workshops and community consultation (prior to and during project development).

The 2008 kit was developed through input from a stakeholder survey and a council advisory group. Eighteen councils used the 2008 kit receiving \$168,000 in grants.

For example, Leichhardt Municipal Council received just over \$10,000 to implement the kit. Council used the materials and funding to promote:

- local residents being the most water efficient users in Sydney (NSW Government report card 2006–07) and to keep up the good work
- free sustainability workshops
- two main recycling initiatives:
  - 450,000 litre rainwater tank installed at Leichhardt Oval to water the sports fields
  - 40,000 litre rainwater tank at Leichhardt Park Aquatic Centre to top up pools

Results from all participating councils were positive with improved community understanding and recognition of local initiatives measured through increased visits to councils' dedicated Water for Life sponsored webpages, increased requests for information on initiatives and attendance at council water events and activities.



**Working in partnership with local government to promote recycling.**

## Large versus small-scale recycling projects

The focus in the 2006 *Metropolitan Water Plan* was on large-scale water recycling projects which would in themselves save billions of litres of water each year, for example:

- Wollongong Recycled Water Plant supplying over 7.8 billion litres each year
- Rouse Hill Recycled Water Scheme supplies about 2.2 billion litres each year to 19,000 homes for toilet flushing and outdoor uses
- Rosehill-Camellia Recycled Water Scheme will supply 4.7 billion litres of recycled water each year to industry
- Replacement Flows Project at St Marys will provide 18 billion litres of highly treated recycled water to the Hawkesbury-Nepean River. This will save dam water normally released to help protect the river down stream.

Providing recycled water to businesses and households in the established urban areas of Sydney can be costly, disruptive and energy intensive. The building of cost effective large-scale recycling schemes has addressed the major opportunities for financially viable large schemes in the short term.

Future large scale recycling opportunities will be recycled water systems supplying large new growth areas in Sydney. A focus for the 2010 *Metropolitan Water Plan* is on smaller local-scale projects. These include stormwater projects carried out by councils to irrigate parks and sports fields to the benefit of the community.

“All governments at all levels need to work together and be on the same page.”

*Community comment,  
Consultation workshop 2009*

At the end of the first quarter of 2010, there were about 150 smaller local-scale projects operating or under construction, including 70 stormwater projects (outlined on page 31). Smaller scale recycling is generally centred on replacing drinking water and improving recreational amenity with uses such as irrigating parks, sporting fields and golf courses.

Some examples include:

- Liverpool Golf Course recycling 43 million litres a year
- Sports fields at the Hawkesbury Campus of the University of Western Sydney recycling 189 million litres a year
- Farm irrigation at the Elizabeth Macarthur Agricultural Institute at Menangle, recycling 550 million litres a year.

### Recycled water sources

In most of the large-scale recycling projects, recycled water is sourced from sewage treatment plants that produce high quality treated effluent. Alternative sources of recycled water, such as sewer mining, stormwater, and greywater are also being used. In working toward the 70 billion litres a year target, projects using these sources and new sources such as capturing roof rainwater off commercial buildings, will provide the greatest opportunities.

### Industry plays a significant role in water recycling



**Artist's impression of the Fairfield recycled water plant which will be operational in mid 2011.**

The Rosehill-Camellia Recycled Water Scheme will provide high quality recycled water to major industrial and commercial customers in western Sydney and reduce the demand on Sydney's drinking water supply. It is the first project to be delivered using the third party access regime under the NSW *Water Industry Competition Act 2006*. The project is also unique as it serves existing major customers in an established urban area of Sydney.

The recycled water is proposed for various end uses including diverse industrial processes, irrigation and fire fighting.

The Rosehill-Camellia Recycled Water Scheme is built, owned, operated and maintained by two private operators, AquaNet Sydney Pty Ltd (a Jemena company) and Veolia Water Australia.

A 20 million litres a day recycled water treatment facility is being constructed at Fairfield. Pipelines, storage reservoirs, pumping stations and other ancillary work are being built to transport the recycled water to the customers at Smithfield and Camellia. One of the project's innovations is using five kilometres of disused gas mains as part of the 20 kilometres of recycled water pipeline needed. By using existing infrastructure, there will be less disruption to the community and traffic flow, less demand on resources, and cost savings.

Construction of the \$100 million scheme started in November 2009. In mid 2011 the scheme is expected to start delivering 4.7 billion litres of recycled water per year.

Sydney Water will initially be the retailer of the recycled water to seven foundation customers. The project has been set up for AquaNet to develop the market beyond these seven customers and be the retailer for any additional customers. It is one of greater Sydney's largest industrial recycling projects, with a total potential market of 7.3 billion litres of recycled water per year.



**One billion litres of recycled water is used to irrigate our parks, playing fields and golf courses saving our precious drinking water.**

### Stormwater is not lost with local government playing its part

Historically Chatswood's town centre has been subject to major flooding during storms – closing businesses, impacting local waterways and creating a potential safety hazard.

Willoughby Council, through the development of its regional cultural facility 'The Concourse' in Chatswood CBD, is undertaking a major stormwater reuse project.

Originally a measure to prevent stormwater flooding of The Concourse construction site, the innovative project now extends to ongoing water conservation and reuse.

An enormous 5,000m<sup>3</sup> tank has been built under the site to capture stormwater runoff. The stormwater will be treated and reused:

- throughout The Concourse building for toilet flushing, garden watering and air conditioning cooling towers
- by Chatswood Chase shopping centre cooling towers
- for Council landscape irrigation, dust suppression and other uses by Council's works department.

The stormwater reuse project will:

- save 103 million litres of drinking water every year
- reduce the impacts of heavy stormwater runoff on local waterways
- reduce the severity of flooding in the CBD
- showcase the latest water efficient technologies in a high profile public building
- demonstrate Council's commitment to water conservation (through the planned sustainability education centre)
- establish new models for using existing stormwater detention systems
- create a longer-term opportunity to reallocate developer funded onsite detention tanks to other ecologically sustainable development initiatives within the catchment.



**The detention tank under The Concourse at Chatswood can capture five million litres of stormwater.**

This stormwater reuse project is funded by Willoughby Council, the Federal Government's WaterSmart Australia Program and the NSW Government's Climate Change Fund.

The Concourse, which includes a performing arts venue, library and education centre, retail shops, cafes and open space is expected to open in late 2011.

A video case study of the project is available online at [www.waterforlife.nsw.gov.au/recycling/stormwater/videos](http://www.waterforlife.nsw.gov.au/recycling/stormwater/videos).



## Reusing stormwater

Stormwater management helps protect people and property from flooding, improves waterway health and, if stormwater is treated and reused, provides a valuable alternative source for non-drinking water use.

The relative costs of large-scale storage and treatment of stormwater can be high. To capture rainfall in the urban environment requires significant water storage, which would need to be built in already established areas of the city. These large detention basins would need to be connected to a recycled water treatment plant in addition to a dedicated distribution system. Moving recycled water around distribution networks usually involves pumping and can be energy intensive.

Justification for such cost and disruption can be difficult. The NSW Government is promoting and supporting an integrated approach to stormwater harvesting, focusing on smaller, local schemes which provide an alternative water source but also deliver river health, water quality and flood mitigation benefits. The combined value of the water and environmental improvements makes this approach a better use of funds than supporting schemes that focus only on delivering water.

Stormwater reuse projects in Sydney are primarily developed and managed by local councils as Sydney Water directly manages less than five percent of the total stormwater pipes and infrastructure in greater Sydney. There are currently 70 stormwater reuse projects in greater Sydney. These schemes will save over two billion litres of water a year, contributing to the recycling target of supplying 70 billion litres a year by 2015.

## Interactive map available on Water for Life website

Treated stormwater is being reused all over Sydney to irrigate public parks, golf courses and sporting fields. It is also reused indoors for cooling towers and flushing toilets. To provide information on stormwater projects that are under way or planned an innovative and interactive map has been created on the Water for Life website at [www.waterforlife.nsw.gov.au/recycling/stormwater/stormwatermap](http://www.waterforlife.nsw.gov.au/recycling/stormwater/stormwatermap).

A second map has now been created to include all recycled water projects in greater Sydney. The database that supports these maps is being upgraded to help monitor progress towards our recycling targets and make it easier for people to find out about recycling and stormwater projects in their area.

## Residential recycling of greywater

Greywater is wastewater from a household's shower, basin, bath and washing machine. It can be directly diverted to a garden, with consideration for the soaps and other cleaning agents used in the home, or treated and reused.

Greywater recycling is the main form of water recycling in existing homes. Exact uptake is difficult to determine, but it is estimated that more households in greater Sydney use greywater on their gardens (20–30 percent) than have a rainwater tank (10 percent).

However, it is important that householders follow some simple rules to ensure the long-term health of their soil. To complement the regulatory framework, guidelines and fact sheets have been developed and are available on the Water for Life website. Education and training on residential greywater recycling, and how to install and operate private recycling schemes, was rolled out to over 700 participants from councils and industry following the release of the guidelines.

## Supporting legislation

The government is working to streamline the approval process between the *Water Industry Competition Act 2006* and the *Local Government Act 1993* over the course of the *2010 Metropolitan Water Plan*. This will ensure that private recycling schemes captured by these Acts receive consistent support through government regulation without the burden of overregulation.

Further opportunities to optimise the regulatory framework relating to recycled water projects will also continue.



Interactive maps on the Water for Life website provide detail on stormwater and recycled water projects under way or planned in greater Sydney.

## Sewer mining as an alternative water source

Sewer mining schemes in Sydney are producing over one billion litres of recycled water each year. With four major projects now completed and another eight under way, this alternative water source is helping save precious drinking water supplies.

Sewer mining is the process of tapping into a sewer (either before or after the sewage treatment plant) and extracting wastewater, which can be further treated and used as recycled water. Recycled water produced from sewer mining is commonly used to irrigate sports fields, parks and golf courses. It can also be used in some commercial buildings and industrial sites.

Pennant Hills Golf Club pioneered the use of sewer mining in the Sydney region. Their Water Reclamation Plant produces up to 100 million litres of recycled water each year to irrigate tees, greens and fairways.

Faced with restricted water access during the recent drought, Pennant Hills Golf Club investigated various alternate water supplies to eliminate their reliance on drinking water for irrigation. Increasing use of existing bores and creek water sources was considered unsustainable; sewer mining was the best option as it would provide a reliable source and the technology required to produce quality recycled water was already proven.

Working with Sydney Water, the NSW Department of Environment, Climate Change and Water, the NSW Department of Health and Hornsby Council, Pennant Hills Golf Club developed their project in concert with the development of regulatory guidelines that now apply to all sewer mining projects.



**Sewer mining scheme at Pennant Hills Golf Club.**

Other sewer mining projects already completed include:

- Sydney Olympic Park Authority – over 800 million litres of recycled water through sewer mining replaces 50 percent of the drinking water used to irrigate Sydney Olympic Park and Newington Estate each year
- Kogarah Council – using almost 160 million litres of recycled water to irrigate parks, playing fields and the Beverley Park Golf Course
- the commercial development Workplace6 in Pyrmont is able to produce up to 16 million litres of recycled water each year for toilet flushing and irrigation of the site.

## Our major achievements


- Reusing about 33 billion litres of recycled water across greater Sydney in 2009–10 for industry, irrigation and agriculture as well as for flushing toilets, watering gardens, washing cars and other outdoor uses.
- Completed a number of large-scale recycling projects, including:
  - the Wollongong Recycled Water Plant supplying up to seven billion litres a year (reducing demand by around 17 percent of Illawarra’s water needs)
  - the Replacement Flows Project at St Marys will supply 18 billion litres of highly treated recycled water a year to the Hawkesbury-Nepean River. Using recycled water to replace environmental flows from the dam contributes to river health while saving the dam storages for drinking
- Implemented many small-scale recycling projects including:
  - Sydney Airport Corporation using 300 million litres of recycled water each year from an on-site wastewater treatment plant
  - Macquarie University treating 21 million litres of wastewater a year through an on-site natural reed bed system for sports field irrigation
  - Ensign Services (a commercial laundry) reclaiming, treating and recycling over 50 million litres of water each year.
- Achieved savings of two billion litres of water through 70 stormwater reuse projects in and around Sydney.
- Created interactive maps on the Water for Life website providing details on stormwater and recycling projects under way or planned in greater Sydney.
- Established Australia’s first state-based access and licensing system under the *Water Industry Competition Act 2006* to enable the private sector to enter the industry; providing drinking water, recycled water and wastewater services (see page 12).
  - Three of the first four schemes licensed under the *Water Industry Competition Act 2006* include water recycling initiatives.
- Developed a Council Partnership Kit to promote water wise use and community recycling projects undertaken by local government (see page 28).
- Developed and released user friendly guidelines and fact sheets, and held workshops to support best practice in residential greywater reuse (see page 31).
- Developed and implemented the Sewer Mining Policy in 2008.

## What's next

- Complete a number of large-scale recycling schemes:
  - Hoxton Park Recycled Water Scheme will be completed in 2013 – supplying about 2.3 billion litres of recycled water to industrial areas and about 13,000 new homes, each year
  - the infrastructure for the Rouse Hill Recycled Water Scheme extension is substantially complete – currently supplying about 2.2 billion litres of recycled water each year to 19,000 homes and businesses. This project has now expanded and has the capacity to supply recycled water to 36,000 homes.
  - the private sector Rosehill-Camellia Recycled Water Scheme online in 2011 will supply 4.7 billion litres of recycled water each year.
- Continue to support cost-effective smaller local-scale recycling, stormwater and sewer mining projects across Sydney.
- Continue to provide financial assistance to recycling projects through the NSW Climate Change Fund.
- Continue to research and invest in innovative water recycling and stormwater harvesting technology and processes.
- Complete work currently being undertaken to remove duplication between the *Water Industry Competition Act 2006* and the *Local Government Act 1993* to make it easier to develop alternative water supplies.
- Investigate further options for recycling in agriculture.
- Examine further opportunities to optimise the regulatory framework relating to recycled water projects.
- Maintain commitment to funding the Caltex and Continental Carbon project at Kurnell which was delayed due to technical reasons and is now expected to be completed by mid 2012.
- Enhance the interactive recycling and stormwater maps on the Water for Life website as part the ongoing development of a comprehensive database to monitor progress towards our recycling targets and make it easier for the public to find out about recycling and stormwater projects in their area.



A new water recycling plant at St Marys will use the effluent from the Penrith (pictured), St Marys and Quakers Hill sewage treatment plants to provide 18 billion litres of highly treated recycled water a year to the Hawksbury-Nepean River. This will save dam water normally released to help protect the river down stream.



Desalination is an extra source of water that doesn't rely on rain

The desalination plant at Kurnell can produce 90 billion litres of water a year – that's 15 percent of greater Sydney's current needs.

Desalinated water was added to Sydney's water supplies in January 2010. When operating at full capacity, the desalination plant can provide 15 percent of greater Sydney's water needs, helping to provide water for people and the environment.

## Sydney's desalination plant

All mainland states in Australia have built or are building a desalination plant. Over 20 other large plants are being built internationally and there are over 3,500 land-based desalination plants around the world.

Desalination was one of the major initiatives of the 2006 *Metropolitan Water Plan*. Desalination was introduced to the Sydney water supply in response to the deepening drought and to provide an extra source of water that doesn't rely on rain.

The desalination plant began supplying water on 28 January 2010.

When operating at full capacity, the plant can produce 90 billion litres of water a year, enough water to supply up to 15 percent of greater Sydney's current water needs.

The energy requirements of the plant are 100 percent offset by renewable energy produced at the 67-turbine Capital Wind Farm near Bungendore.

Water from the desalination plant enters the system at Erskineville and is distributed to approximately 1.5 million people across the Sydney CBD, inner west, eastern suburbs, southern Sydney and parts of the Sutherland shire, and at times as far west as Auburn.

The plant has been designed and constructed so that if needed it can be upscaled to produce up to 180 billion litres of water each year.

The desalination plant project has won a number of national awards for excellence in government partnership, environmental and project management, as well as the use of innovative technologies and techniques.



The desalination pipeline connecting to Sydney Water's supply at Erskineville.

## When will we use the desalination plant?

Consistent with the design and construct contract, the desalination plant will run at full capacity during a two year 'defects correction period' which will end in mid June 2012. During this period, the operation of the plant will be monitored for water quality, performance and impacts on the supply system.

After this period, the following operating rule will apply: the plant will operate at full production capacity and supply desalinated water to Sydney Water's area of operations when the total dam storage level is below 70 percent and will continue to do so until the total dam storage level reaches 80 percent.

During the review of the 2006 *Metropolitan Water Plan* a number of operating options were modelled. Operating the plant under this regime strikes the right balance between maximising water available for people and the environment, while minimising the potential for the plant to be operating when the dams are full. If it produced water only when dams fell to the very low levels of a deep drought, it may not produce enough water to stop Sydney's total dam storages falling to a critical level and Sydney facing severe water restrictions or other extreme drought measures.

This operating regime benefits the community by reducing the likelihood of spending time in drought restrictions, reducing the probability of having to further supplement the water supply system, and providing increased water security, which helps maintain environmental flows for river health.

If necessary, the Government will be able to operate the desalination plant at other times to secure water supplies (for example if availability of water from other parts of the supply system were affected by technical or other problems).

The operating regime for the desalination plant meets the community planning principles of ensuring a dependable long-term water supply for current and future generations, and providing water that is affordable and safe to drink.

The costs of operating the plant are included in current water prices. They comprise about \$35 of the typical annual residential water and wastewater bill which was around \$1,045 in 2009–10.



The power required to operate the desalination plant is 100 percent offset with renewable energy generated at the Capital Wind Farm near Bungendore.

“Using the desalination plant as a buffer system for the water supply of Sydney seems a crucial part of future usage and management.”

*Community comment,  
Consultation workshop 2009*

## Our major achievements

- The *2006 Metropolitan Water Plan* stated that construction contracts for a desalination plant would be awarded in the event that severe drought conditions saw Sydney's total dam storage level fall to record lows (around 30 percent). In accordance with the plan, in February 2007 as Sydney's total dam storage level approached about 30 percent, the government announced a request for tenders to build the desalination plant.
- Construction of the desalination plant began in late 2007 and the plant began supplying water on 28 January 2010. The plant was delivered on time and more than \$89 million under budget.
- The power requirements of the desalination plant are being 100 percent offset with renewable energy generated at the Capital Wind Farm near Bungendore.
- The project has won a number of national awards for excellence.
- As part of the review of the *Metropolitan Water Plan*, the most effective and efficient operating regime for the desalination plant was identified in the context of the entire portfolio of water supply and demand measures to ensure its optimal use.

## What's next

- Introduce new operating rules for the desalination plant following the two-year proving period: the plant will operate at full production capacity and supply desalinated water to Sydney Water's area of operations when the total dam storage level is below 70 percent and will continue to do so until the total dam storage level reaches 80 percent.
- Should Sydney's total dam storage level drop again under severe drought conditions, the government could take the decision to build the second stage of the desalination plant – essentially upscaling the existing plant to supply twice as much water (also see Chapter 8). Exact timing of the decision would be influenced by predicted weather patterns, seasonal and projected demand levels.



**A jack-up barge, Seafox 6, was used as a drilling platform for the inlet and outlet shafts for the desalination plant. Construction of the plant was completed on time and under budget.**

Water efficiency is  
smart use of the  
water we have



It is estimated the Water Efficiency and Labelling Standards (WELS) scheme is saving over seven billion litres each year through certifying and labelling of water efficient appliances.



By using water wisely, whether it comes from rivers and dams, desalination or water recycling initiatives, Sydney will have enough water to meet the needs of its growing population and the environment.

Through water efficiency programs we will save 145 billion litres of water a year by 2015, or equivalent to 24 percent of Sydney's current water needs\*.

## Water efficiency

Over the past 20 years, the impact of Sydney's rapid population growth on the water supply system has been managed by reductions in demand per person. These reductions have been achieved through low cost, highly effective water efficiency measures, quarterly meter readings and use based pricing (introduced in 1990), as well as six years of drought restrictions. As a result, Sydney now uses the same amount of water as it did in the early 1970s, even though the number of people living in the region has increased by 1.4 million.

Since 1999 Sydney has reduced its annual demand for drinking water by over 100 billion litres a year through water efficiency. Maximising water efficiency is a key community planning principle and remains a major part of the *2010 Metropolitan Water Plan*.

Consistent with the *2006 Metropolitan Water Plan* and the *NSW State Plan*, water efficiency programs will save 145 billion litres a year by 2015 – that's 24 percent of Sydney's current water needs\*.

\*Based on the long-term average water use of 600 billion litres per year

## We all have a part to play

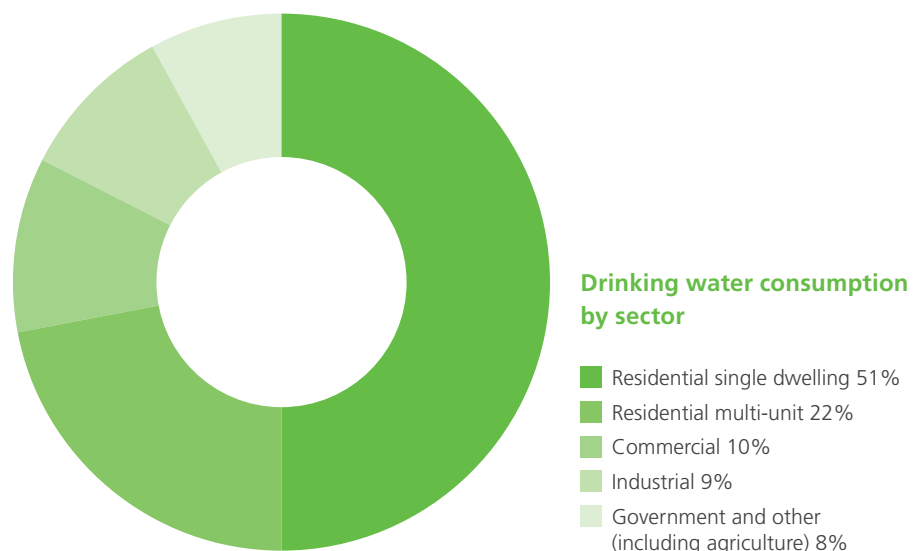
Household water use accounts for about 73 percent of water used in Sydney. But saving water is not just the responsibility of householders – business, industry, farmers and government all play a role. The community acknowledges this shared duty in the planning principle that government and community have joint responsibility for water management.

Millions of dollars have been invested in a range of water efficiency programs and initiatives targeting each sector.

Growth in savings from water efficiency programs will level out over time. This is because using water wisely is becoming normal behaviour and old appliances and fixtures have largely been replaced with water efficient models. While identifying areas for increasing water efficiency savings will become more difficult, new programs will continue to be developed and introduced wherever they are cost effective.

“I have been so cautious and efficient for so long it's now habit. I value the resource because it's precious, scarce and finite.”

*Community comment, Consultation workshop 2009*



## Residential water savings

With households using such a large proportion of water in greater Sydney, residential water efficiency programs will continue to play a vital role in saving water inside and outside the home. Current programs are saving almost 20 billion litres (or 3.5 percent) of drinking water a year compared to 1999. This is a saving of around 12 litres a day for every person.

Current residential water efficiency programs offered by Sydney Water include:

- WaterFix – from only \$22 a qualified plumber installs water saving devices in the home
- Do It Yourself (DIY) Water Saving Kits – an alternative to WaterFix providing water saving devices that people can install themselves
- Toilet Replacement Service – replacing single flush toilets with 4 star dual flush models saving customers up to \$370 on the cost of the toilet and installation
- Rebates – offering rebates for the purchase of rainwater tanks
- Outdoor water conservation – an ongoing campaign to encourage and educate the community on practical ways they can save water, for example, Water Wise Rules (see page 43).

Detail about Sydney Water's rebates can be found at [www.sydneywater.com.au/Water4Life/InYourHome/](http://www.sydneywater.com.au/Water4Life/InYourHome/).

Some of these programs are reaching their full potential in water savings and will begin to be phased out. However, ongoing water savings in residential households will be realised through two main initiatives: the national Water Efficiency and Labelling Standards (WELS) scheme and the Building Sustainability Index (BASIX).

The WELS scheme enforces mandatory ratings and labelling for a range of appliances and fittings and develops minimum performance standards for products. As new water efficiency appliances and fittings are released to retailers, customers are encouraged to purchase new and efficient appliances and fittings when their existing inefficient ones break down. It is estimated that WELS saves over seven billion litres of water each year through the rating and labelling of water efficient products.

The BASIX program applies to new homes that are built in New South Wales. BASIX is a planning policy that ensures new residential properties are designed to use less drinking water. BASIX also applies for alterations and additions in existing homes. As new homes are built or existing ones are modified, households are required to meet certain requirements to ensure drinking water savings are achieved, for example, installing a rainwater tank. It is estimated that BASIX is saving almost six billion litres each year by increasing the water efficiency of new homes and homes with additions and alterations.

Alternative ways for households to save water will continue to be investigated. Research and development programs that are currently taking place include:

- monitoring study to measure the long-term water and energy performance of rainwater tanks with the aim of identifying potential improvements
- trialling the use of smart metering technology which will provide customers with real time information about their water use through an in-home display
- working with Energy Australia on a Smart Home which showcases both current best practices and the home of tomorrow for water and energy saving technologies
- collecting data on water end uses in the home (such as toilet flushing, clothes washing and showering) to better forecast demand and target future water efficiency programs
- investigating the options of setting up a Valuing Water Framework approach that may be used to develop future community education programs and to evaluate and improve existing ones.

Some households in greater Sydney also use water drawn direct from rivers, streams and aquifers under domestic and stock rights. Such water use can help in reducing the demand for drinking water. The Government is developing *Reasonable Use Guidelines* to ensure that the quantity of water used under this right is appropriate. A draft of the guidelines has been completed will be publicly exhibited for comment.

## Schools water savings

Schools account for one percent of water used in greater Sydney (about six billion litres a year). Two programs currently target schools: the Every Drop Counts in Schools program and the Rainwater Tank in Schools Rebate. Over 310 schools have participated in the programs and received rebates, saving over 241 million litres of water each year.



**More than 310 schools in greater Sydney are saving over 241 million litres of water each year.**

## Virtual home helps make actual savings – in water and money

Sydney Water has developed an online tool to promote water efficient behaviours in the home, helping householders save water, energy and money.

As a result of the many water efficiency programs that have already been implemented, residents of greater Sydney are saving over 100 billion litres of drinking water each year through water wise behaviour.

Drought restrictions were lifted in 2009, but sensible water use practices adopted during the drought are being maintained under the Water Wise Rules (see page 43) and encouraged in other ways. To help, an online water efficient home is available on Sydney Water’s website ([www.sydneywater.com.au](http://www.sydneywater.com.au)).

The interactive tool takes the viewer through each area in the house and garden providing information on Water Wise Rules and promoting available rebates and appliances that can help save water. For instance, in the garden if the viewer positions their cursor over the car, the Water Wise Rule will appear ‘washing vehicles is allowed, but if possible, park on the lawn’.



The tool also calculates how much water and money the viewer can save by being water wise; so if they click on the shower button, a box will appear detailing the ‘WaterFix’ program and how much water and money they could save each year if they take part in the program. A tally of water and money saved and details of the selected programs is provided for the viewer to download.

## Business water savings

Business and industry water use accounts for 20 percent of water used in greater Sydney. Business water efficiency programs running since 2001 are saving over 24 billion litres of water each year.

The business water efficiency program includes:

- Every Drop Counts in Business – working with businesses in greater Sydney to help them cut water use and business costs. Working one-to-one with large water users (those using more than 80,000 litres each day), and helping smaller businesses through targeted programs

- BizFix – retrofitting service to install water efficient devices in business, for example, taps, toilets, and showers
- Online Monitoring Program – online water meter monitoring service for the highest water using businesses.

Information about these programs can be found on Sydney Water’s website at [www.sydneywater.com.au/Water4Life/InYourBusiness/](http://www.sydneywater.com.au/Water4Life/InYourBusiness/).

Apart from these projects, we will also work towards setting up benchmarks for water use in businesses and develop best practice guidelines targeting all sectors.

To further help businesses save water, the NSW Climate Change Fund provides funding to commercial and industrial businesses for water and energy saving projects.



**Almost 420 large water using businesses have joined the voluntary Every Drop Counts Business Program saving around 17 billion litres of water a year.**

## Minimising water lost through leaks

Like all water pipe networks around the world, Sydney's water distribution system has breaks and leaks. Leaks are caused by deterioration of joints and fittings, and by cracks in the pipes caused by ground movement or pressure changes.

Sydney Water is responsible for maintaining the systems that deliver water to the people of greater Sydney. Leak detection and repair is a major priority for Sydney Water, and in 2009–10 water lost through leakage was impressively low and in the top performance band for leakage according to international standards.

Sydney Water's leak reduction programs use the latest methods and technologies to detect and repair hidden leaks and reduce the amount of water lost.

With Sydney Water now investing over \$100 million each year, water lost through leakage has been reduced by around 30 billion litres each year since the program began (that's enough to supply 150,000 average households). This has been achieved through:

- actively detecting and repairing leaks
- reducing pressure in the pipes
- improving response times to main breaks
- placing meters on the pipe system to detect leaks.

For example, in 2009–10 Sydney Water inspected 21,000 km of pipes – laid end to end that's the distance from Sydney to Los Angeles and back. During the year, 100 kilometres of water mains were replaced.



**Sydney Water's leak reduction programs are estimated to be saving 30 billion litres each year.**



**The WaterSmart Farms program is helping farmers improve their water efficiency and reduce nutrient run-off.**

## Government water savings

Although only about four percent of greater Sydney's total water use is by government facilities, it is vital that government leads by example. The *NSW Government Sustainability Policy* sets targets and strategies for government agencies to reduce their water use by 15 percent by 2011.

Thirty four government agency sites and 44 local councils have completed Water Savings Action Plans to promote and achieve water wise use. These include 19 hospitals, five prisons and four education facilities. Cost effective actions identified in the plans will save more than 1.7 billion litres of drinking water.

## Water efficiency on farms

Sydney farmers produce a wide range of fresh produce for local consumption. Crops such as field and greenhouse vegetables, dairy products, flowers, turf and fruit trees have an estimated farm gate value of at least \$450 million and provide significant employment benefits.

The WaterSmart Farms program incorporates education, training and community awareness activities to assist farmers in the lower Hawkesbury-Nepean catchment area to improve their water efficiency and reduce nutrient runoff.

The program is part of the Hawkesbury-Nepean River Recovery Program and receives funding through the Australian Government's Water for the Future program and the NSW Government's Climate Change Fund.

By improving water efficiency on farms it is possible to improve river health, save money and help reduce pressure on drinking water supplies.

“Water use efficiency should be maximised across all sectors irrespective of the level of water storage. This will work to preserve the economic efficiency of supply side investment and will minimise the need for restriction.”

*Community comment,  
Consultation workshop 2009*

## Smart water use becomes our way of life – Water Wise Rules

In addition to the water efficiency programs described above, Water Wise Rules introduced in June 2009 continue to build on the water saving behaviours the people of greater Sydney adopted during the drought.

In 2007, the government announced long-term water saving rules would be introduced once drought restrictions were lifted. Water Wise Rules came into effect once the total dam storage level had remained steady at around 60 percent for 12 months and drought restrictions were lifted.

Water Wise Rules are simple, common sense actions that apply to everyone using drinking water in greater Sydney including residents, businesses, local councils and government agencies. They are:

- all hoses must now have a trigger nozzle
- to avoid the heat of the day, watering is allowed before 10am and after 4pm
- no hosing of hard surfaces such as paths and driveways
- washing vehicles is allowed
- fire hoses must only be used for fire fighting activities.

By improving the efficiency of outdoor water use – not just during drought – we can make better use of our available water supplies. Drought restrictions will continue to be applied as needed in the future to reduce pressure on supplies during drought periods (see Chapter 8).

Water Wise Rules will save an estimated 19 billion litres of drinking water each year. However, current overall water savings since the introduction of Water Wise Rules in mid 2009 are greater than this because people have kept up their water wise behaviours established during the drought.

### Keeping our parks, ovals and open spaces green

Before 2003, at least 4.3 billion litres of Sydney's drinking water was being used to irrigate parks, ovals and open spaces each year.

A number of different water sources are now replacing drinking water for irrigation including recycling, stormwater reuse, greywater recycling, sewer mining and rainwater capture. Now, one billion litres of recycled water a year is being used for urban irrigation, saving our drinking water for drinking.

There are also water efficiency programs available to ensure that whatever the source of water being used for irrigation, it is being used as efficiently as possible. The Irrigation and Landscape Efficiency Project run by Sydney Water under the Hawkesbury-Nepean River Recovery Program aims to save 1.06 billion litres a year of drinking water. This will be achieved by using improved technology, land and site management practices.

Sydney Water is also working with a panel of experts to develop a set of industry guidelines to promote best practice for irrigating parks, ovals and open spaces. It will be a practical guide to the sustainable management of open space turf areas, which includes everything from Stadium Australia to the local neighbourhood park. The guidelines aim to balance various aspects of open space management to achieve the best turf performance all year round.

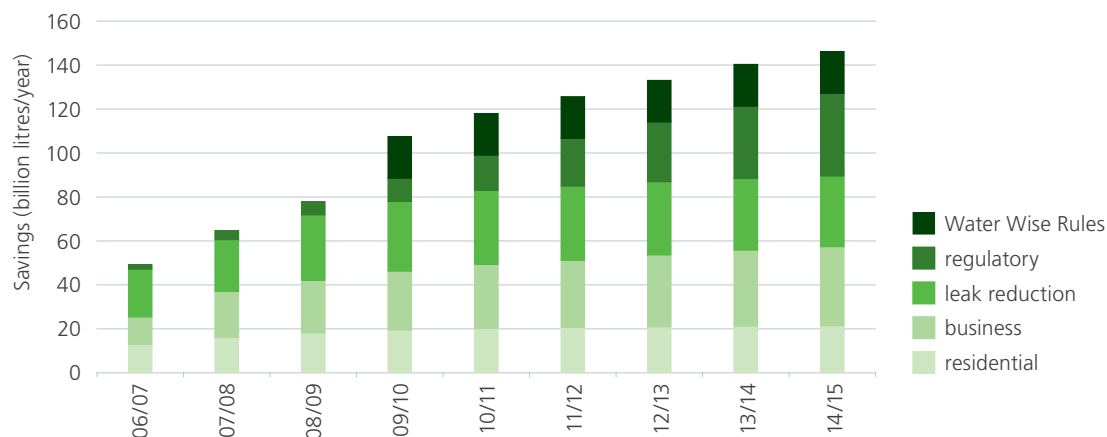


**Stormwater reuse is just one of the many water sources now replacing drinking water for irrigation, helping keep sporting fields like Lindfield Oval green and safe.**

## Our major achievements

- Since the inception of the programs, rebates for over 56,000 rainwater tanks and 186,000 water efficient washing machines have been paid, totalling almost \$50 million and saving 5.4 billion litres of water each year.
- Since 2008, nearly 21,000 dual flush toilets have been installed saving 452 million litres a year.
- 477,000 homes have received a WaterFix since 2000 and nearly 210,000 free Do-it-yourself Water Saving Kits have been given away, saving 10 billion litres and 786 million litres a year respectively.
- Since 2007, over 23,000 households took part in Sydney Water's Love Your Garden program, helping them use water wisely in their gardens and saving about 174 million litres a year.
- The Home Water Action Program has been delivered to over 2,600 people from culturally diverse communities, helping save millions of litres of water (see page 48).
- Almost 420 large water using businesses have joined the voluntary Every Drop Counts Business Program saving around 17 billion litres of water a year.
- Nearly 80 smaller water using businesses have also taken advantage of the Every Drop Counts Business Program saving almost 260 million litres of water each year.
- The Smart Rinse program has installed over 4,200 smart rinse valves in restaurants and cafes saving over one billion litres of water a year.
- 162 large water using businesses have connected to Sydney Water's online monitoring system saving 247 million litres of water a year.
- 106 businesses have taken part in the BizFix amenities retrofit service saving 349 million litres of water a year.
- The NSW Green Business Program has provided funding to seven commercial and industrial water saving projects saving around 100 million litres a year.
- Water Savings Action Plans have been developed for large water using businesses, 34 government agency sites and 44 local councils, identifying cost effective actions to save water.
- Over 310 schools have completed the Every Drop Counts in Schools Program and received rainwater tank rebates.
- WaterSmart Farms program launched in 2009 comprises several projects to help farmers improve water efficiency while maximising their yields. Projects include training events, some with a specific non-English speaking background focus, and water efficiency irrigation, which is a combined training and incentive program.
- The *Draft Reasonable Use Guidelines* for domestic and stock rights water are being finalised and will be publicly exhibited for comment.
- The *NSW Government Sustainability Policy* was released in 2008, which includes targets and strategies for the NSW Government to improve its water efficiency.
- Sydney Water's leak reduction programs are estimated to be saving around 30 billion litres each year through investing \$100 million and inspecting more than 20,000 kilometres of pipes annually.
- Water Wise Rules have saved an estimated 19 billion litres of drinking water since being introduced in June 2009.

## Water efficiency programs: saving 145 billion litres a year by 2015



## What's next

- Water efficiency programs now in place will achieve savings of 145 billion litres a year by 2015. Beyond this, we will continue to implement programs where there are still savings to be made and investigate new ways to improve water efficiency in households, businesses, government, schools and farms.
- Continue to improve water efficiency in households using sensible regulatory tools, for example, through proposals to expand the Water Efficiency Labelling and Standards (WELS) scheme.
- Carry out a study to measure the long-term water and energy performance of rainwater tanks with the aim of identifying potential improvements.
- Trial the use of smart metering technology which will provide households with real time information about their water use through an in-home display.
- Work with Energy Australia to develop a Smart Home to showcase best practice and the latest water and energy saving technologies.
- Collect data on specific water uses in the home (such as toilet flushing, clothes washing and showering) to better forecast demand and target future water efficiency programs.
- Focus the Every Drop Counts Business Program on targeting small to medium water using businesses.
- Continue existing programs to save water from outdoor residential use, businesses, schools and councils.
- Continue to research and monitor global industry directions to ensure that innovations are trialled and incorporated into water efficiency programs.
- Continue to implement the Water for Life *Water Education Plan for greater Sydney 2008–2012*.
- Monitor and analyse the longer-term water savings from the pilot WaterSmart program with a view to expanding the program in the future if initial savings are sustained.
- Continue to implement the WaterSmart Farms program.
- Finalise and implement the *Reasonable Use Guidelines* for domestic and stock basic water rights.
- Investigate setting up a framework to help develop future community education programs and to evaluate and improve existing ones.



Water for life equals  
water for people and  
the environment

Local government stormwater management initiatives help protect the health of our local creeks, such as Quarry Creek, West Pymble and other waterways.



The *Metropolitan Water Plan* recognises the importance of balancing the needs of communities and industry with the need to protect and improve river health.

### Striking a balance

The *Metropolitan Water Plan* is designed to ensure sufficient water for people and the environment – with one not more important than the other. Community consultation on the *2006 Metropolitan Water Plan* revealed strong support in the community for maintaining this balance.

#### Sharing our water among users (water sharing plans)

The government has been developing water sharing plans for the surface water (rivers and streams) and groundwater systems of greater Sydney. These plans protect the basic rights of landholders, enable licensed extraction to be managed under varying climatic conditions, protect water-dependent ecosystems, and enable licence holders to trade their water entitlements on the open market.

The water sharing plans do this by establishing the rules for how water is shared. The rules will also give more certainty to licensed water users about the conditions under which they can extract water from rivers and aquifers – after ensuring that the environment is protected – and about the conditions under which water can be traded.

The *Water Sharing Plan for the Greater Metropolitan Region Unregulated Water Sources* and the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources*, due to commence in late 2010, will ensure that Sydney's drinking water supply and other licensed extractions are balanced and sustainable. Community consultation shows strong support for sharing water – taking into consideration all relevant sectors and regions.

### Water for people

The measures contained in the *Metropolitan Water Plan* provide for a safe, dependable and affordable water supply for greater Sydney now and for the future. Achievements to date – including accessing water deep in dams, recycling, desalination, and reducing demand through water efficiency initiatives – provide water security to at least 2025 while also increasing water for the environment.

However, this security is only achieved with all sectors of the community continuing to play their part by using water wisely and supporting the recycling, river health, and other initiatives within the *Metropolitan Water Plan*. This is why there is a broad community education and capacity building program called Water for Life underpinning the *Metropolitan Water Plan*.

The community feel strongly about the importance of their role in securing Sydney's water supply, which is demonstrated by the Community Planning Principle: ensure government and community take joint responsibility for water management.

#### Involving the community to secure our Water for Life

Engaging and informing the community is an integral component of the *Metropolitan Water Plan*.

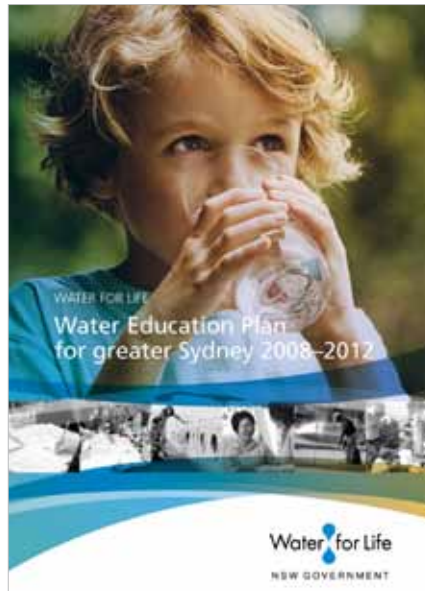
Through the Water for Life Education Program, multi-media communication campaigns, innovative on-the-ground water education projects, training and resources are being delivered across greater Sydney targeting the community, businesses and local government.



The 2009 'Day in the Life of a Water Drop' multi-media education campaign encouraged ongoing water saving efforts and outlined the range of initiatives being carried out under the plan.

The education program focuses on a number of key areas:

- Water for Life campaigns and website to reach the wider Sydney community, encouraging ongoing water saving efforts and letting people know about the range of initiatives being carried out under the plan
- a coordinated capacity building program providing professional learning opportunities, resources and tools, and building a water educators' network to support leading practice water education
- targeted on-the-ground education projects in innovative partnerships to engage different sectors of the community, such as non-English speaking communities, teachers and schools, the property sector, and young adults
- coordinating water education through interagency partnerships and developing and implementing the *Water Education Plan for greater Sydney 2008–2012*.



**The *Water Education Plan for greater Sydney 2008–2012* helps coordinate and support water education across greater Sydney.**

The Water for Life Education Program is managed by the NSW Office of Water with strategic direction and coordination provided by the interagency Metropolitan Water Education Group (members include the NSW Office of Water, NSW Department of Environment, Climate Change and Water, Sydney Water, Sydney Catchment Authority and the Office of the Hawkesbury-Nepean). The NSW Government has provided \$10.5 million from the Climate Change Fund to fund the program from 2005 to 2010.

**Water conservation education for non-English speaking communities**

Research has shown that people from non-English speaking communities are less aware of water saving initiatives and water wise behaviours. To engage people from these communities the Water for Life Education Program has implemented a number of education programs in partnership with the NSW Ethnic Communities Council, Sydney Water and the NSW Department of Environment, Climate Change and Water.

One of the initiatives is the Home Water Action Program. Through the program, bilingual educators have been trained to deliver home water action planning workshops and events. This was an intensive one-to-one program that recruited water ambassadors within the Arabic, Cantonese, Greek, Italian, Korean, Mandarin, Macedonian, Spanish and Vietnamese speaking communities and helped over 2,600 people across these communities to save millions of litres of water.



**Water ambassadors helped deliver the Home Water Action Program to culturally and linguistically diverse communities, saving millions of litres of water.**

## Water for the environment

The *Metropolitan Water Plan* recognises that water sourced from rivers and aquifers to meet the needs of communities and industry must be balanced against the need to reserve enough water to maintain river health and meet environmental needs. The *Water Management Act 2000* gives priority to water for the environment.

Since 2004, extensive work has been undertaken as part of the *Metropolitan Water Plan*, and through water sharing plans, to make sure rivers and aquifers, and the ecosystems that rely on them, receive adequate environmental water and are not overused.

### Coordinating management of the Hawkesbury-Nepean River

To better coordinate management of the Hawkesbury-Nepean River system and reduce complexity in decision-making, the government established the Office of the Hawkesbury-Nepean in 2009.

The role of the office is to:

- provide a one-stop-shop for the community to find out about river health and its management
- help coordinate and implement river management strategies such as aquatic weed management
- provide opportunities for community input into the development of river management strategies
- improve processes for managing in-stream development, for example, jetties and riverbanks works.

### Water for our rivers

The dams for greater Sydney have been built specifically to capture water that can be used for human supply. Recognition of the importance of maintaining some flow down river has resulted in major works to modify dams and weirs to allow for these environmental flow releases.

Environmental flows can help native fish and other species to breed, reduce the growth of weeds, and improve the suitability of the river for swimming and boating. Healthy rivers are also valued and enjoyed for their own sake, and support ecosystems that form a part of the natural landscape.

### Hawkesbury-Nepean environmental flows

There are four dams (Avon, Cataract, Cordeaux and Nepean) and two major water supply weirs (Broughtons Pass and Pheasants Nest) in the Upper Nepean Catchment. In order to release variable environmental flows to protect the downstream health of the Hawkesbury-Nepean River system, works have been completed at the dams and the water supply weirs (see case study this page).

### Environmental flow releases for the Upper Nepean River

As outlined in the *2004 Metropolitan Water Plan*, protecting the health of the Hawkesbury-Nepean River system, through the release of water for the environment, was a priority. It was predicted that without environmental flow releases the health of the river would decline in a number of ways, including fewer native fish species, less diversity of invertebrate animals (such as insect larvae and worms) and increasing floating weeds, which can interfere with the use of the river and crowd-out native plant species.

To enable environmental flow releases from the Upper Nepean dams and ensure the water passed downstream makes it all the way to the ocean, major upgrades to a number of dams and weirs were required.

In 2006, work began on Avon Dam to install new infrastructure to allow the release of variable environmental flows. The variable flow releases mimic natural flows because the amount of water released is linked to the amount of water flowing naturally into the dams. A multi-level off-take also permits the release of water of suitable quality and temperature.

The new flows began from Avon Dam in March 2008.

Similar works at Cataract, Cordeaux and Nepean dams have been completed and new variable flows began on 1 July 2010. Modifications to 10 other weirs on the Upper Nepean River will be completed by the end of 2010. These modifications

allow not only the passage of environmental flows but also free passage by native fish in the river. The total cost of these projects is \$39 million.

An environmental monitoring program is in place to measure changes in the downstream river health to see if these flows are having the desired effect on the river. It is expected that over the next 10 years the new environmental flows will result in increases in the length of the river that is swimmable, navigability by boats and able to be fished.

It is now critical to the success of this initiative that provisions in the water sharing plans continue to protect those environmental releases.



**Water Minister Phil Costa and Member for Mulgoa, Diane Beamer, at the launch of new variable flow releases from Cordeaux Dam.**

### Environmental flows from Tallowa Dam

In mid 2009, new environmental flow arrangements from Tallowa Dam to the lower Shoalhaven River were introduced. The new rules reflect significant community consultation and scientific analysis undertaken to assess river health, economic, and cultural needs. Specifically, they state that:

- when there is a small to moderate inflow into the dam, all of that inflow will be passed through the dam to protect the river
- when there is a high inflow into the dam, for example when there is a heavy rainfall event, 20 percent of the inflow will be passed through the dam to ensure the river still benefits from flow releases that mimic nature, while the remainder is kept in the dam for future use
- special purpose environmental flow releases may also be made from the dam to manage identified river health issues downstream.

### Flows from Warragamba Dam – Sydney’s largest supply dam

In line with adaptive management framework recommended by the Hawkesbury-Nepean River Management Forum (the Forum), the introduction of environmental flows for the Hawkesbury-Nepean river system has been a staged process. This process builds on the knowledge and monitoring of new flows from other dams. With the progressive implementation of flows from the Upper Nepean dams, the next major investment will be in securing long-term environmental flows from Warragamba Dam.

The *2006 Metropolitan Water Plan* stated that a final regime of environmental flow releases from Warragamba Dam will not be formally set until 2015. Interim flows were to be considered for the period starting 2009 provided sufficient water is available.

For planning purposes, the review of the *2006 Metropolitan Water Plan* used the variable flow regime recommended by the Forum in 2004 for environmental flows from Warragamba Dam beginning in 2018. However, further detailed analysis is required to identify the actual optimal final regime for releases from Warragamba Dam. This work will be completed in the next four years and included in the *2014 Metropolitan Water Plan*.

Implementing new flows from Warragamba Dam will require a major investment in infrastructure to release the range of flows needed. Due to this, and the potentially large volume of water that may be released under a new regime, the decision process must be robust. The investigative work being undertaken during the life of the *2010 Metropolitan Water Plan* to inform the decision is significant.

Subject to sufficient water being available, possible increases in the existing interim environmental flows from Warragamba Dam were foreshadowed in the 2006 plan. However, scientific and technical investigations undertaken for the review have revealed that water availability is not the only consideration.

Water releases will continue from Warragamba Dam for the health of the Warragamba and Hawkesbury-Nepean rivers. These will in part use water ‘banked’ when environmental flows were halved during the recent drought. Due to infrastructure limitations and other considerations, these flows cannot be variable, or significantly different in volume to the flows that have been released from Warragamba Dam for a number of years.

“Maintaining a healthy environment is the ‘vital’ and the ‘basic’ thing. A healthy environment means, and is the result of, good eco balance.”

*Community comment,  
Consultation workshop 2009*

## Caring for our catchments and restoring waterways

Improving and protecting the quality of water in the rivers both upstream and downstream of major water reservoirs is important both for drinking water supply and for maintaining and improving river health.

The Sydney Catchment Authority (SCA) has a key role in managing Sydney's catchments to protect water quality. The SCA's *Healthy Catchments Strategy 2009–2012* sets out the following broad initiatives to protect catchment health and water quality:

- increase adoption of water quality best management practices in rural land uses and activities
- minimise the impact of sewage and stormwater on Sydney's drinking water catchments
- manage lands to contemporary standards to protect and optimise water quality, and to conserve the ecological integrity, and natural and cultural values of the area
- carry out statutory and regulatory operations including compliance and land use planning
- develop and maintain catchment partnerships that support collaborative and sustainable contributions to protect the catchments.

The federally-funded Hawkesbury-Nepean River Recovery Program aims to improve river health by increasing the water available for environmental flows in the river and reducing nutrient loads. The program, which seeks to engage and involve all levels of government with landholders, is being managed by the Office of the Hawkesbury-Nepean, in partnership with NSW agencies.

The release of the NSW Government's *Lower Hawkesbury-Nepean Nutrient Management Strategy* in 2010 brings together the range of projects and programs in a coordinated and targeted manner that are under way to reduce the amount of nutrients entering the river.

Many other organisations are involved in catchment protection actions, including the Hawkesbury-Nepean and Southern Rivers catchment management authorities, local councils, landholders and community organisations.

As reflected in the community planning principle 'restore clean healthy waterways and ensure health of catchments by reducing pollution', this issue, and our management of it, is important to the community.

## Helping fish move up and down rivers

Many types of fish need to move between different parts of rivers to complete their life cycles. Dams and weirs form barriers to this natural fish migration. In some cases, managing river flows can provide appropriate water depths and velocities to enable fish to move across natural features and built structures that would otherwise prevent their passage. In other cases, barriers in the river may need to be modified to allow fish to pass.

A mechanical fishlift has been built at Tallowa Dam on the Shoalhaven River to enable migrating fish to pass up and over the dam wall. It is expected up to 10 native fish species will now re-establish populations in the upper Shoalhaven River (see page 24 for details).

The spillway has also been modified to minimise injury to adult fish moving downstream to breed in the estuary.

Major modifications to water supply dams and weirs in the Upper Nepean are improving natural fish passage in the Hawkesbury-Nepean River system (see case study page 49).



**Monitoring catchment water quality is an important part of the Sydney Catchment Authority's *Healthy Catchments Strategy 2009–2012*.**

## Our major achievements

### Working with people

- Supported wise water use through the Water for Life Education Program campaigns – 84 percent (3.6 million) of people across Sydney are regularly taking action to use water wisely (an increase from 65 percent in 2005).
- Delivered public education campaigns which continue to increase participation in, and understanding of, the elements of the *Metropolitan Water Plan*.
- Developed innovative partnerships to deliver practical education projects tailored to priority sectors of the community. Projects to encourage water saving and reuse targeted people from non-English speaking backgrounds (home water action plans), teachers (school resources), and young adults (events).
- Provided grant funding, training and resources to councils and non-government organisations and supporting delivery of local education projects across greater Sydney.
- Delivering ongoing training and support for local government to help promote the use of greywater, stormwater, and local recycling schemes.
- Integrating key information about the *Metropolitan Water Plan* and how people can play their part into all relevant education programs across government.

### Working for the environment

- From mid 2009, began providing variable environmental flows and downstream fish passage, by modifying Tallowa Dam on the Shoalhaven River.
- Built a mechanical fishlift at Tallowa Dam which is allowing fish to travel up and over the dam wall.
- Completed major modifications to the dams and water supply weirs on the Upper Nepean River to allow for variable environmental flows. Releases began from Avon Dam in 2008 and from Cataract, Cordeaux and Nepean dams in mid 2010.
- Modified 10 irrigation weirs on the Nepean River to allow new environmental flows from the dams to make their way downstream, and to improve fish passage. The project will be complete in late 2010.
- Released a number of important strategies and reports:
  - *Lower Hawkesbury-Nepean Nutrient Management Strategy* in 2010
  - *NSW Diffuse Source Water Pollution Strategy* in 2009
  - *SCA Healthy Catchments Strategy 2009–2012*
  - *Hawkesbury-Nepean River Environmental Monitoring Program – Final Technical Report* in 2009.
- Established the Office of the Hawkesbury-Nepean in 2009 to coordinate management of the river and provide a one-stop-shop for stakeholders. Achievements include:
  - overseeing the implementation of the Hawkesbury-Nepean River Recovery Program to make more water available for environmental flows and reduce nutrients entering the river
  - running a two-day ‘Working together for a healthy river’ workshop that sought stakeholder views on priority river issues and possible solutions
  - examining options for improved aquatic weed management
  - established a stakeholder committee to advise the Office on river health and management issues.
- Sought the public’s comments on draft water sharing plans for greater Sydney.



A healthy river system is vitally important for wildlife such as the Eastern Great Egret.

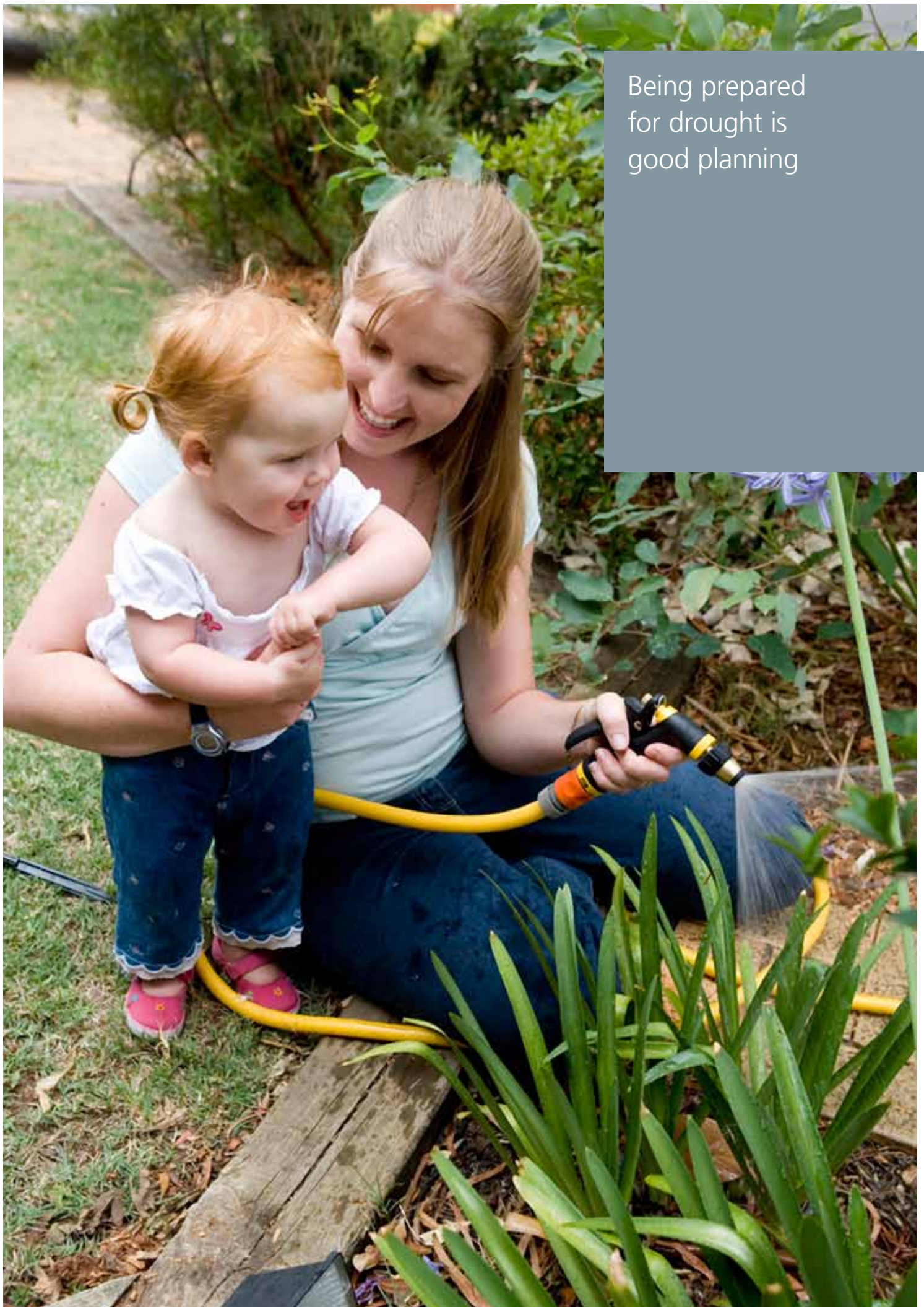
## What's next

- Commence the *Water Sharing Plan for the Greater Metropolitan Region Unregulated Water Sources* and the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources*, expected to occur late in 2010.
- Continue to deliver, through the Water for Life Education Program, multi-media communication campaigns, innovative on-the-ground water education projects, training and resources across greater Sydney targeting the community, businesses and local government.
- Engaging the community in water management issues through innovative and interactive displays at the new exhibition area of the Warragamba Visitor Centre to be opened in 2010.
- Continue to monitor, assess and report on the effectiveness of the new environmental flow rules for Tallowa Dam in the Shoalhaven, the Upper Nepean dams, and weirs on the Nepean River.
- Undertake further work to identify the optimal final environmental flow rules for Warragamba Dam and the Hawkesbury-Nepean River. This work will be completed to enable announcement of the environmental flow rules in the *2014 Metropolitan Water Plan*.
- Continue to implement the:
  - *Lower Hawkesbury-Nepean Nutrient Management Strategy*
  - *NSW Diffuse Source Water Pollution Strategy*
  - *SCA Healthy Catchments Strategy 2009–2012*
  - catchment protection actions.
- Continue interim environmental flow releases from remaining dams until longer-term releases are decided and implemented.



Major upgrades to a number of weirs on the Nepean River not only allow passage of new environmental flows but also help native fish move up and down the river.

Being prepared  
for drought is  
good planning



Drought restrictions will remain an important, effective and relatively low cost tool for responding to future droughts.



As a result of measures already adopted under the *Metropolitan Water Plan*, the probability of dam storages falling to critical levels during the life of the 2010 plan has been greatly reduced.

However, should extended drought conditions occur in the future, we have a number of measures we can implement that will slow the rate of decline of our water supplies.

## Drought readiness

Extreme drought conditions are rare but as the past decade shows circumstances can change quickly and rainfall can vary substantially. That is why it is vitally important that the *Metropolitan Water Plan* remains flexible so it can respond if extreme drought develops.

When drought conditions occur in the future, we have a number of options available that can be implemented with relatively short lead times. This will slow the rate at which Sydney's total dam storage level drops. These include: drought restrictions, increasing water transferred from Tallowa Dam by lowering the minimum drawdown, groundwater extraction, voluntary water use targets, upscaling the desalination plant, and decreasing environmental flow releases from dams. Pricing is also being examined as a potential tool for managing demand during a drought.

These measures build on other elements of the *Metropolitan Water Plan* including, dams, recycling, desalination and water efficiency.

## Drought restrictions

Drought restrictions will remain an important, effective, and relatively low cost tool for responding to future droughts.

While drought restrictions do impose some costs on the community (for example, inconvenience and adverse impacts on gardens and playing fields) and on some industries, the community consultation phase of the review of the *2006 Metropolitan Water Plan* and recent surveys indicate a high level of support for drought restrictions.

Restricting outdoor water use was a key element in securing greater Sydney's water supply during the recent drought. Overall, the community responded very positively. Between the introduction of Level 1 restrictions in October 2003 and the introduction of Water Wise Rules to replace Level 3 restrictions in June 2009, it is estimated that restrictions achieved total water savings of about 575 billion litres. This is more than the amount of water greater Sydney used in 2009–10.

Based on greater Sydney's long-term average water use of 600 billion litres each year it is estimated that reductions in drinking water demand from each of the three levels of restrictions were:

Level 1 (from October 2003) – 12 percent

Level 2 (from June 2004) – 16 percent (additional four percentage points on Level 1)

Level 3 (from June 2005 to June 2009) – 17 percent (additional one percentage point on Level 2)

Effectively communicating and enforcing drought restrictions was critical to achieving these significant reductions in water use.

The community has made it clear that it is prepared to play its part in managing Sydney's water supply in an ongoing way. For example, recent surveys of Sydney Water customers show 85 percent support for the Water Wise Rules.

“Better to keep restrictions simple and consistent.”

*Community comment,  
Consultation workshop 2009*

## Revised drought restrictions

Mandatory drought restrictions were lifted in mid 2009 and permanent Water Wise Rules introduced when Sydney's total dam storage had been around 60 percent for 12 months. Consistent with the *2006 Metropolitan Water Plan*, drought restrictions were then reviewed.

The review considered their effectiveness during the recent drought, projected future savings (especially in light of permanent savings through Water Wise Rules) and impacts on the community, industry and the environment.

A revised mandatory restrictions regime has been developed, made up of two levels commencing at around 50 percent and 40 percent of Sydney's total dam storage levels. The new restrictions are based on the water saving measures under the Water Wise Rules and allow people and business to continue to use water efficiently, while achieving similar savings.

The exact timing for introducing drought restrictions will be influenced by Sydney's total dam storage level, predicted weather patterns, the season, and demand forecasts. By using drought restrictions as our first response we can slow the rate at which the total dam storage level decreases, increasing the probability that the drought will break before other drought response measures are needed.

## How we would respond to rare and extreme drought

The recent extended period of severe drought has provided us with a good understanding of the effects of drought on our water supply and demand.

Should rare and extreme drought conditions occur in the future we are well placed to respond by implementing options such as groundwater extraction and upscaling the desalination plant to increase supply, both of which have relatively short lead times.

### Temporarily increasing transfers from Tallowa Dam in the Shoalhaven

As outlined in Chapter 3, under the new operating rules for transferring water from Tallowa Dam in the Shoalhaven, water transfers will begin when Sydney's total dam storage level falls below 75 percent but only while the storage level of Tallowa Dam is above its minimum operating level of minus one metre from full supply level (see page 24 for further details).

However in severe drought, the minimum operating level for transferring water from Tallowa Dam to Sydney can be lowered to minus three metres. Operating the dam at this level means more water can be supplied to Sydney if it is needed while still ensuring the Shoalhaven community's water supply is secure and the health of the lower Shoalhaven River system is maintained with ongoing environmental flows.

## Tapping into groundwater supply

The *2006 Metropolitan Water Plan* identified that if Sydney entered severe drought, several borefields could be built to tap into underground water sources (groundwater). In November 2006, as drought conditions worsened, the decision was made to further investigate potential borefield sites in Kangaloon in the Southern Highlands, Leonay near Emu Plains and Wallacia near Warragamba.

Extensive testing, engineering design, environmental assessment and community consultation was undertaken. However, with Sydney's total dam storage level consistently around 60 percent and construction of the desalination plant under way, further development of the borefields was shelved in 2008.

To ensure groundwater extraction can begin as quickly as possible if severe drought conditions return, planning approval is being sought now for the future construction of the borefield at Kangaloon. If needed during severe drought, the borefield could operate for three years then be turned off to allow the aquifers to recharge. The amount of water extracted during a three-year pumping cycle represents about 10 percent of the estimated total aquifer storage.

A decision to proceed with construction of the borefield will be made in the event that Sydney's total dam storage falls to a level consistent with severe drought and with regard to seasonal weather outlooks and demand at that time.



Lake Burragorang floor exposed during the recent drought. In early 2007, the lake, formed by Warragamba Dam, dropped to an all-time low of 32.5 percent.

## Implementing voluntary water use targets

While recent drought restrictions were imposed only on outdoor water use, preliminary analysis has found that about half the total reduction in demand occurred indoors. This suggests people are willing to restrict their water use above and beyond the regulatory measures imposed by drought restrictions.

Implementing voluntary water use targets involves setting a daily per-person maximum water use target. For example, in the recent drought in south eastern Australia, Melbourne set a voluntary personal water use target of 155 litres per-day and averaged 149 litres per-person per-day over 2009–10\*. Under Level 3 drought restrictions over 2008–09, Sydney's water use averaged 198 litres per-person per-day.

The benefit of introducing a voluntary water use target is that it provides people with some choice in how they make savings – be that indoor or outdoor. By the time voluntary water use targets would be considered, the new Level 2 outdoor drought restrictions would already be in place.

Recent community engagement on the *Metropolitan Water Plan* indicated general support for voluntary water use targets during severe drought.

While personal use targets have been effective in other areas of Australia, research will be undertaken to confirm the likely water savings, costs, and community attitudes to using voluntary water use targets in greater Sydney.

\*This was achieved when dam levels in Melbourne were extremely low and it was several years until infrastructure options to augment supply would become available.

## Could increasing the price for water during drought be a tool for managing demand?

The Independent Pricing and Regulatory Tribunal (IPART) is responsible for setting the prices of water and sewerage services in greater Sydney. Water prices are set to recover the costs of providing a secure supply.

During past droughts in the Sydney region, drought restrictions have been used successfully to signal water scarcity and reduce demand. However, investigations are under way to examine whether pricing might be an appropriate tool for managing water demand in future drought periods.

Scarcity pricing links the price of water to its relative availability. Under this approach, the price of water would be higher when water supplies are low, sending a message about the value of scarce water.

Scarcity pricing is being considered through the work of the Council of Australian Governments in urban water reform. In addition to this, the National Water Commission, Productivity Commission, Business Council of Australia and other bodies have recently undertaken research into scarcity pricing principles. IPART has also indicated that it will consider scarcity pricing as part of its next price review for the Sydney Catchment Authority to be completed in 2012.

The introduction of usage based pricing in Sydney in 1990 demonstrated that price can be used as a tool to manage water demand. However, water pricing is a complex issue and substantial work is needed before scarcity pricing could be considered for use in the Sydney region. Whether scarcity pricing would have the desired impact and how it would impact on investment in other water sources (such as recycled water) are important considerations. Critically, any approach adopted would make sure that essential water supply is affordable for all households.

The outcomes of investigations will be examined, as part of an evaluation of scarcity pricing and other drought response measures, prior to the 2014 review of the *Metropolitan Water Plan*.

## Upscaling the desalination plant

Sydney's desalination plant was planned and designed to be readily upscaled should water supplies need a significant boost in the future. In the unlikely event that Sydney experiences a rare and extreme drought, a decision could be made to double the capacity of the desalination plant from 90 billion to 180 billion litres a year (producing up to 30 percent of our current water supply needs). The plant would take about two years to upscale.

Over the longer term, the upscale option could be used to bolster supply in response to increasing demand from a growing population, but this would be evaluated along with the range of options available at the time of the decision.

## Reducing environmental flows

While reducing water allocations for environmental flows would effectively keep as much water as possible in the dams, environmental flows are of great benefit to the health of rivers in low flow periods. As such, reducing environmental flows would only be considered during rare and extreme drought.

Community consultation has indicated strong opposition to reducing environmental flows during drought. This is captured in the community planning principle: ensure enough water to meet both environmental and human needs – one not more important than the other.

Monitoring and analysis of existing environmental flows will continue in order to determine what modifications might be appropriate to save water and protect our rivers during severe drought.

## Our major achievements

- Completed major infrastructure upgrades at Warragamba and Nepean dams to allow access to deep water in the dams if required during drought (see page 25).
- In line with the *2006 Metropolitan Water Plan*, the decision to construct the desalination plant was made to respond to severe drought, when Sydney's total dam storage level was approaching about 30 percent.
- Delivered the desalination plant on time and \$89 million under budget.
- Introduced Water Wise Rules on 22 June 2009 once Sydney's total dam storage level had been around 60 percent for 12 months to make water wise use our way of life.
- Carried out a review of drought restrictions following the introduction of Water Wise Rules. A revised mandatory drought restrictions regime has been developed, consisting of two levels and commencing at around 50 percent and 40 percent of Sydney's total dam storage level respectively.
- Undertook extensive testing, engineering design, environmental assessment and community consultation to ensure readiness to construct a borefield at Kangaloon in the Southern Highlands in the event of severe drought conditions.
- Undertook extensive testing and environmental assessment into potential borefield sites at Leonay and Wallacia in Sydney's west. (Further development of the Kangaloon and western Sydney borefields was shelved in 2008.)

## What's next

- Continue to investigate new water sources to secure greater Sydney's water needs.
- Continue to investigate new ways to manage the risks of high impact drought.
- Ongoing research to confirm the likely savings and costs of setting voluntary water use targets in the event of rare and extreme drought.
- Ongoing research and analysis to determine potentially appropriate modifications to environmental flow rules during rare and extreme drought conditions.
- Continue research into the potential impacts of climate change on greater Sydney's water supply.
- The outcomes of investigations into scarcity pricing and other drought response measures will be examined prior to the 2014 review of the *Metropolitan Water Plan*.



A new pumping station at Nepean Dam allows access to deep water and helps secure supplies to the Illawarra during drought.



During the height of recent drought dam storage levels dropped to record lows. Being prepared for severe drought in the future is a key element of the *2010 Metropolitan Water Plan*.

## Summary of actions under the Metropolitan Water Plan

A range of commitments has been made under the *Metropolitan Water Plan*. Some of these commitments date back to the first plan, others are new additions under the 2010 plan. The following progress report is a summary of these actions and indicates how we are progressing towards achieving them. Actions in **bold** are new initiatives under the 2010 plan. The community planning principles developed during the review of the *2006 Metropolitan Water Plan* underpin the way in which this plan is delivered.

Action	Status			
	Completed	On-track	Ongoing	Delayed
<b>An adaptive plan</b>				
Report annually on <i>Metropolitan Water Plan</i> progress			▲	
Undertake periodic reviews of <i>Metropolitan Water Plan</i>			▲	
Establish licensing framework to enable the private sector to provide water supply and services	✓			
Establish third party access regime to enable private sector access to water infrastructure services	✓			
Establish Codes of Conduct to support <i>Water Industry Competition Act 2006</i> (WICA)		■		
IPART to conduct information sessions with local government and relevant industry groups on the WICA licensing regime and access regime	✓			
Undertake a climate change research project on impacts to Sydney's supply and demand		■		
Continue research into the potential impacts of climate change on greater Sydney's water supply			▲	
Continue to investigate new water sources to secure greater Sydney's water needs			▲	
<b>Dams</b>				
Complete the accessing of deep water at Warragamba and Nepean dams	✓			
Complete work to improve reliability of supply for the upper Blue Mountains		■		
<b>Continue work on the rehabilitation and or replacement of the Upper Canal water supply transfer system from the dams in the Upper Nepean Catchment to Sydney</b>		■		
Comprehensively investigate Shoalhaven water transfer options	✓			
<b>Review factors relating to the timing of the augmentation of the Shoalhaven water transfers system with a view to having an augmented system operational around 2025</b>		■		
<b>Recycling</b>				
Build the new recycled water scheme to supply large industrial users in the Camellia and Smithfield areas		■		
Commission Pennant Hills and Kogarah local recycling schemes	✓			
Increase industrial recycling at Kurnell, Botany and Wollongong	✓			
Increase recycling to homes in Rouse Hill, Hoxton Park and Ropes Crossing		■		
Issue contracts for recycling to industry in Rosehill/Camellia area	✓			
Provide recycled water to North West and South West growth sectors		■		
Increase the volume of recycled water to 70 billion litres a year by 2015		■		
<b>Enhance the interactive recycling map to include all recycled water projects in greater Sydney as part of a comprehensive database to monitor progress towards our recycling targets and educate the public about projects in their area</b>		■		
Investigate agricultural recycling opportunities		■		
Provide recycled water to irrigators near West Camden	✓			

Action	Status			
	Completed	On-track	Ongoing	Delayed
<b>Consider the water needs and patterns of irrigators when developing future recycled water schemes by Sydney Water</b>			▲	
Issue contract for the Replacement Flows Project at St Marys under Urban Sustainability Program	✓			
Implement a new Sewer Mining Policy to make future sewer mining agreements between Sydney Water and non-government organisations easier	✓			
Amend planning legislation to simplify approval of small recycling plants	✓			
Further refine the regulatory framework and guidelines for recycled water, with a specific focus on facilitating stormwater recycling		■		
Undertake regulatory reform, supported by training and education programs, to make greywater recycling easier for householders in single dwellings	✓			
Through the \$80 million Urban Sustainability Program, provide grants to councils for stormwater harvesting and other measures designed to save water and protect the environment under the City and Country Environment Restoration Program		■		
Finalise NSW Government funding for the Caltex and Continental Carbon project at Kurnell so this project can proceed*				●
Continue to support cost-effective local-scale recycling and stormwater projects across the greater Sydney region		■		
Provide financial assistance to recycling projects through the NSW Climate Change Fund		■		
<b>Desalination</b>				
Complete the desalination plant and pipelines	✓			
Sign contract for 100% renewable energy to offset the power needs of the desalination plant	✓			
Commission desalination plant and run for a two-year 'defects correction period' which will end in mid June 2012		■		
Develop desalination plant operating regime as part of development of the 2010 Metropolitan Water Plan	✓			
<b>Water efficiency</b>				
Deliver the WaterSmart Sydney pilot residential program to encourage wise water use.	✓			
Double the rebate for internally connected residential rainwater tanks	✓			
Implement water savings programs for gardens	✓			
Increase the threshold for BASIX for alterations and additions	✓			
Install water efficient devices in 500,000 homes by 2008	✓			
Investigate measures to improve water efficiency of existing homes		■		
Investigate ways to roll out individual metering to new multi-residential properties		■		
Make an additional 50,000 Department of Housing residential dwellings water efficient	✓			
Pilot programs for individual metering for apartments	✓			
Provide rebates for efficient washing machines under the NSW Climate Change Fund	✓			
Roll out a single flush toilet replacement program	✓			
Release the NABERS HOME water rating tool by mid 2006	✓			
<b>Trial the use of smart metering technology which will provide customers with real time information about their water use through an in-house display</b>		■		
<b>Work with Energy Australia on a Smart Home which showcases both current best practices and the home of tomorrow for water and energy saving technologies</b>		■		
<b>Collect data on water end uses in the home (such as toilet flushing, clothes washing and showering) to better forecast demand and target future water efficiency programs</b>		■		

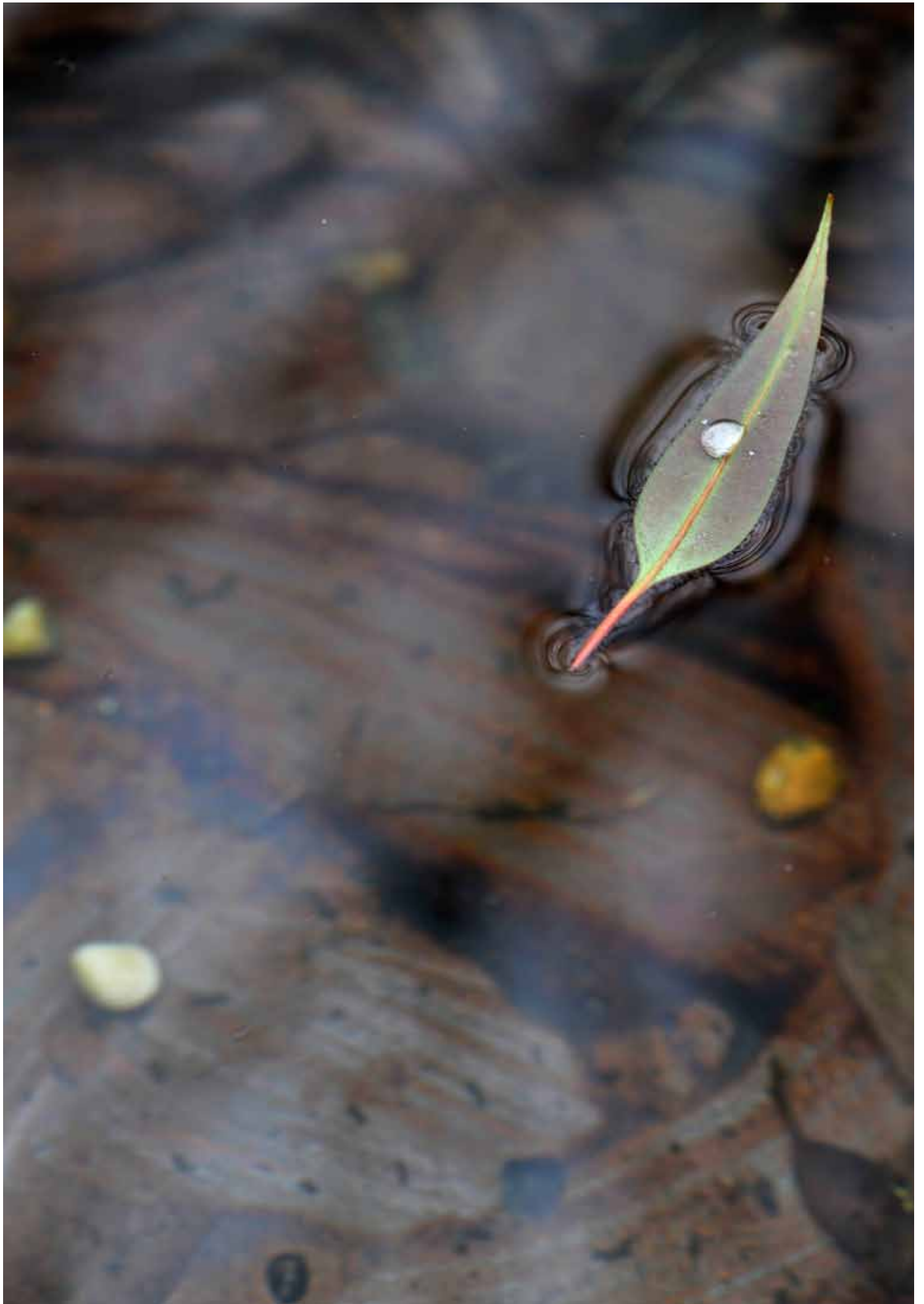
Action	Status			
	Completed	On-track	Ongoing	Delayed
<b>Undertake monitoring and analysis into the longer-term water savings achieved as a result of the pilot WaterSmart program with a view to expanding the program in the future should the initial savings be sustained</b>		■		
Continue the new \$30 million NSW Climate Change Fund Green Business Program to save water and energy		■		
Continue to expand the Every Drop Counts business program			▲	
Investigate options to ensure water efficient design of new commercial buildings and industrial facilities		■		
Pilot DIY programs for small to medium businesses		■		
Top water using businesses to develop and implement Water Savings Action Plans	✓			
Provide rebates for school rainwater tanks		■		
Roll out smart monitoring and leakage reduction in schools	✓			
Audit targeted Government sites	✓			
Local councils develop and implement Water Savings Action Plans	✓			
Finalise Government Procurement Guidelines	✓			
Government agencies develop and implement Water Savings Action Plans	✓			
Publish policy on sustainable water use by Government	✓			
Commence long-term Water Wise Rules when drought restrictions are lifted	✓			
Continue to develop and pilot new programs to improve water efficiency			▲	
Implement the Water Efficiency Labelling Standards (WELS) scheme and extend to other appliances			▲	
<b>Monitoring study to measure the long-term water and energy performance of rainwater tanks with the aim of identifying potential improvements</b>		■		
<b>Investigate the options of setting up a Valuing Water Framework approach that may be used to develop future community education programs and to evaluate and improve existing ones</b>		■		
Continue active leak detection and pressure management			▲	
Develop and establish <i>Reasonable Use Guidelines</i> for the take of water under domestic and stock rights from surface water and groundwater sources**				●
Deliver a new \$3 million farm watering efficiency program		■		
Implement a new efficient irrigation scheduling project for farmers		■		
Implement metering and water use monitoring of irrigators		■		
Educate and train farmers under the WaterSmart Farms project			▲	
<b>Water for life – People (education and empowerment)</b>				
Deliver progress reports on the <i>Water Education Plan for greater Sydney 2008–2012</i>			▲	
Build on practical education projects tailored to culturally and linguistically diverse communities			▲	
Build the knowledge, skills and ability of educators to deliver leading practice water education			▲	
Deliver innovative partnerships to engage priority sectors of the community and continually improve water education			▲	
Implement programs to engage the community in the review of the <i>Metropolitan Water Plan</i> and build awareness of its initiatives and to encourage wise water use			▲	
<b>Water for life – Environment</b>				
Commence new environmental flow regime for Avon River	✓			
Implement monitoring of new flows from Avon Dam			▲	
Implement improved environmental flow releases at Woronora Dam, including high flow contingent release	✓			



Action	Status			
	Completed	On-track	Ongoing	Delayed
Complete the modifications to Tallowa Dam to allow fish passage and to improve the quality, volume and pattern of water releases	✓			
Start the new environmental flow releases from Tallowa Dam once all water restrictions in Sydney are lifted and the infrastructure is completed	✓			
Modify Nepean, Cataract and Cordeaux dams and Pheasants Nest and Broughtons Pass water supply weirs to allow new environmental flows to be released	✓			
Modify weirs downstream of the Upper Nepean Dams in the Nepean River to allow flow and fish passage		■		
Start the new environmental flow releases from Cataract, Cordeaux and Nepean dams, and downstream weirs by 2010	✓			
<b>Undertake investigations to enable a decision on a new flow regime for Warragamba to be included in the 2014 Metropolitan Water Plan</b>		■		
Continue the interim environmental flow releases from Warragamba Dam until longer term releases are decided and implemented		■		
Continue to coordinate the development and implementation of catchment protection actions			▲	
Develop and implement <i>Lower Hawkesbury-Nepean Nutrient Management Strategy</i> to manage pollutants entering the waterways		■		
Establish the Office of the Hawkesbury-Nepean	✓			
Improve integration of Hawkesbury-Nepean river health monitoring – considering environmental flows, river health and recycling initiatives			▲	
Publish report on river health monitoring for the Hawkesbury-Nepean	✓			
Develop water sharing plans for surface and groundwater sources for greater Sydney		■		
<b>Drought response</b>				
Review drought restrictions once lifted and develop a revised mandatory restrictions regime	✓			
Publish reports on the investigations at all identified groundwater locations and consult the community about potential groundwater use and borefield construction	✓			
Complete the groundwater investigations at Kangaloon and Leonay	✓			
Complete the groundwater pilot testing program at Leonay	✓			
Continue to investigate new ways to manage the risks of high impact drought			▲	
<b>Research the likely savings and costs of setting voluntary water use targets in the event of rare and extreme drought</b>		■		
<b>Research and analysis to determine potentially appropriate modifications to environmental flow rules during rare and extreme drought conditions</b>		■		
<b>Investigations into scarcity pricing and other drought response measures to be examined prior to the 2014 review of the Metropolitan Water Plan</b>		■		

\* A preferred contractor has been selected and the contract is expected to be signed in late 2010. Work will start in 2010 and is expected to be completed by mid 2012.

\*\* *Reasonable Use Guidelines* developed and will be publicly exhibited.



The *2010 Metropolitan Water Plan* builds on the significant achievements of past plans to secure greater Sydney's water supply for people and the environment.

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