



NSW Government

# Meeting the challenges

Securing Sydney's water future

The Metropolitan Water Plan

2004

a NSW Government initiative

# About the Plan

The Plan has been prepared as part of a whole of government process led by the Department of Infrastructure, Planning and Natural Resources.

Other agencies involved (in alphabetical order) are:

- Department of Energy, Utilities and Sustainability
- Department of Environment and Conservation
- Department of Primary Industries
- Independent Pricing and Regulatory Tribunal
- NSW Health
- NSW Treasury
- Sydney Catchment Authority
- Sydney Water Corporation
- The Cabinet Office

## Picture credits

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Recycled water treatment plant (Chapter 4):  
Sydney Olympic Park Authority

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## Meeting the challenges – Securing Sydney’s water future

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# Meeting the challenges Securing Sydney's water future

## Premier's foreword



New South Wales is taking a lead role in meeting the challenge of improved water management in rural areas. But it is now time to turn our attention to water used in urban areas and, in doing that, we must remember that water is a shared resource.

This Plan, *Meeting the challenges – Securing Sydney's water future*, charts our course towards a sustainable and secure water system for people and rivers over the next 25 years. As well as considering the needs of the people of Sydney, it makes a special allowance for water for the environment.

To achieve a sustainable and secure water future, we have carefully weighed up short term considerations – like the current drought we are all struggling with - and longer term considerations such as increasing population pressures and climate change. International and Australian scientific experts have told me that the greenhouse effect is already having an impact on our climate and could even be influencing our current drought. That is why, as a responsible Government, we are thinking about this problem now and working out the best way to share available water into the future.

In this Plan, we move beyond last century's solutions. Building a twelfth dam, as some have suggested, would be an expensive, ineffective response – it would take years to build and even longer to fill, not to mention the damage done to the surrounding farmland and natural areas.

Instead, this Plan includes actions which are cost-effective and sensible. It foreshadows a fundamental shift in how water is used and re-used as part of developing smart and innovative 21st century solutions. These solutions depend not only on Government action. The people of Sydney have already demonstrated that they understand the importance of this scarce resource. Since the water restrictions as part of this current drought were imposed, Sydney's residents and businesses have contributed to saving 10% of water. We all need to embrace new ways of thinking about water use. This Plan is about the Government, business, councils and farmers all doing their bit to secure Sydney's water supply in partnership with the community.

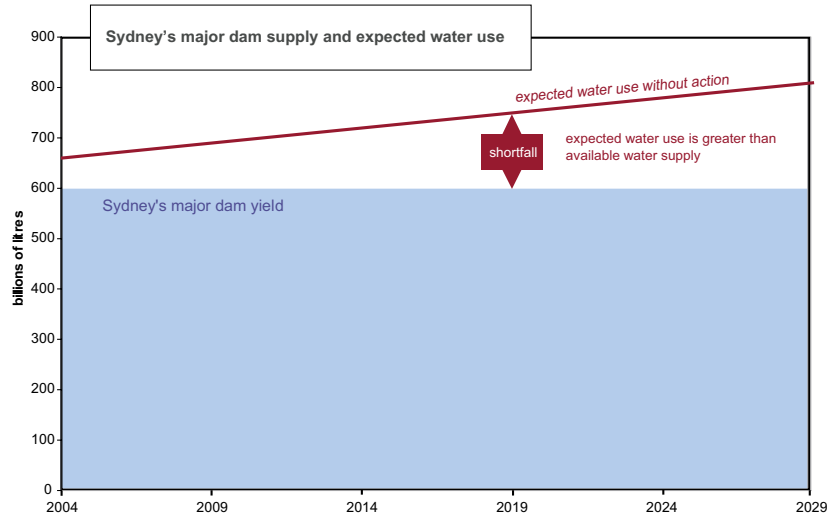
So, I commend to you *Meeting the challenges – Securing Sydney's water future*, the first comprehensive water conservation plan for Sydney for 200 years.

A handwritten signature in black ink, which reads "Bob Carr". The signature is fluid and cursive.

Bob Carr  
Premier of NSW

# Introduction

Sydney is using more water than is sustainable. Looking 25 years ahead, there will be a shortfall between the amount of water that Sydneysiders use and the amount of water provided from the catchments around our city ...unless we make some changes and take action now.



**With no action, the existing shortfall of water needed accommodate population growth will worsen dramatically over the next 25 years. In addition water is required to protect river health.**

This Plan has been developed to make sure that the people of the greater Sydney area have enough water to meet their needs over the next 25 years. It is also the next step in a program to restore the health of the Hawkesbury-Nepean River and the other precious rivers surrounding our city. It recognises that Sydney's future growth and economic prosperity needs secure water resources for people, industry and the environment.

Together, over the last few years the people and businesses of Sydney and the Government have made significant water savings – without this, the situation would be much worse. The Plan will build on a raft of measures and programs already underway.

The Government has evaluated all sensible practical options to supply, save or substitute water. No single option is sufficient by itself. The challenge is determining the timing and sequencing of options to deliver the best social, economic and environmental outcomes for the community. The mix of options identified in this Plan has the best prospects of delivering a cost-effective solution to Sydney's water needs into the future.

The Plan contains a package of new actions that the Government will take which respond to the current drought and give certainty to our water supplies.

As part of its contribution to the partnership with the community in conserving water, the Government will undertake major capital works projects, such as modifying the dams and water supply systems so they can be used to their fullest capacity. As well, the Government will:

- provide information and support to Sydney householders on how they can use water more wisely.
- assist businesses and farmers to reduce their water use and recycle water wherever sensible.



# highlights

## This Plan

- responds to Sydney's worst drought since the 1930s
- foreshadows up to \$1.4 billion worth of new actions to fill the shortfall between demand and supply
- shares water equitably between people, businesses, farmers and the environment
- implements the first stage of a long-term program to improve river health
- helps people, businesses and farmers use water wisely
- shows how the Government will lead by example
- encourages the private sector to find innovative solutions

The Plan sets a course for the next 25 years. By 2014, more will be known about:

- the impact of climate change on weather patterns.
- how much water has been saved and supplied by these new measures.
- the rate at which Sydney's population is forecast to grow from 2014.
- the benefits of water releases to the environment from the Upper Nepean, following the implementation of first phase of the Government's program to improve river health.

Because we will be getting better information on these matters over time, the Plan will be reviewed every five years to update it against new evidence as it is available.

Actions under this Plan will reduce the amount of water required to meet Sydney's water needs, provide water for river health purposes, increase the yield of the existing dams and provide a safety margin to allow for uncertainty.

The Plan also foreshadows options that may need to be adopted if evidence shows shortfalls in coming years due to unforeseen circumstances. The Government will commence investigating some of these actions now, for example, the feasibility of building a desalination plant, so that if such measures are needed in the future, work can begin quickly.

## Principles for managing Sydney's water supplies

In evaluating options and designing the package of actions in this Plan, the Government aimed to:

- minimise the risks of water shortages by diversifying sources of supply
- ensure secure water supplies
- protect and restore river health
- adopt a partnership approach with the community
- provide good quality, cost-effective water supply services
- foster innovation
- increase the efficient use of water
- match the grade of water to its end use
- optimise the use of existing infrastructure
- appropriately target future investment
- make decisions adaptively
- ensure actions are acceptable to the public, affordable, feasible and sustainable.



## The challenge

Sydney is currently experiencing the most severe drought since the 1930s. At the same time, the population is growing by more than 40,000 people each year.

Dam levels fell to 42.6% in early October 2004. The seasonal outlook from the Bureau of Meteorology for September to November 2004 indicates that the probability of the drought breaking remains 50:50.

Sydneysiders have risen to the challenge of the drought. Since mandatory water restrictions came into force on 1 October 2003, they have reduced consumption by 10% against the 10 year average, saving around 63 billion [63,000,000,000] litres of water.

Even with the severity of this drought, the Government has time to implement this Plan to maintain water supplies for Sydney.

If no further demand management strategies or restrictions were implemented, and low runoff into the dams continues, we would have about three and a half years of water left in our current water storage system. Unusually heavy rain would be required across the catchments that feed into the dams in order for the drought to break.

The current drought cycle (entered in the 1990s) being experienced by Sydney is being complicated by climate change. The Government has accepted international scientific opinion regarding the impact that global warming is already having on NSW. The effects in Sydney's water catchment appear to be warmer conditions and less rainfall, with the ongoing consequence that less water will be available for consumption each year on average. This situation has already been observed in south-west Western Australia and measures have been put in place to manage the impacts of climate change. Similar actions now need to be put in place for Sydney.

This means that even when the current drought breaks, the long-term security of our future water supply is uncertain...unless changes are made.

Historically, the response to drought and population growth in Sydney has been to build a major new dam on a relatively undisturbed river. The most recent examples have been the completion of Warragamba Dam in 1960 and the Shoalhaven Scheme in 1977. These have given Sydney an unusual period of very secure water supply at very low cost to the consumer, but with some environmental degradation.

As a result, we have come to regard water as a cheap and bountiful resource.

Many people have only experienced water restrictions for a brief period in the 1990s before the present drought restrictions were introduced. Consequently, despite a willingness to help, the community has limited knowledge about the range of water conservation measures that they could implement.

Critically, the use and management of water could be a key limiting factor on Sydney's future growth and prosperity.

Our main water storages currently supply 600 billion litres each year, averaged over the long term. In each of the past three years prior to this drought, our consumption has exceeded this safe yield by an average of 30 billion litres or 5%. This is due mainly to the dry conditions and the increase in population.

Sydney's population is expected to increase by one million people over the next 25 years or so, which represents an average increase of 110 people

and 40 dwellings every day. If consumption remains at current levels and nothing is done to reduce demand, we will need to find an extra 200 billion litres of water each year within 25 years. We must also take account of the needs of people living in regional centres and towns located within the same catchments that supply water to Sydneysiders, including Nowra and Goulburn.

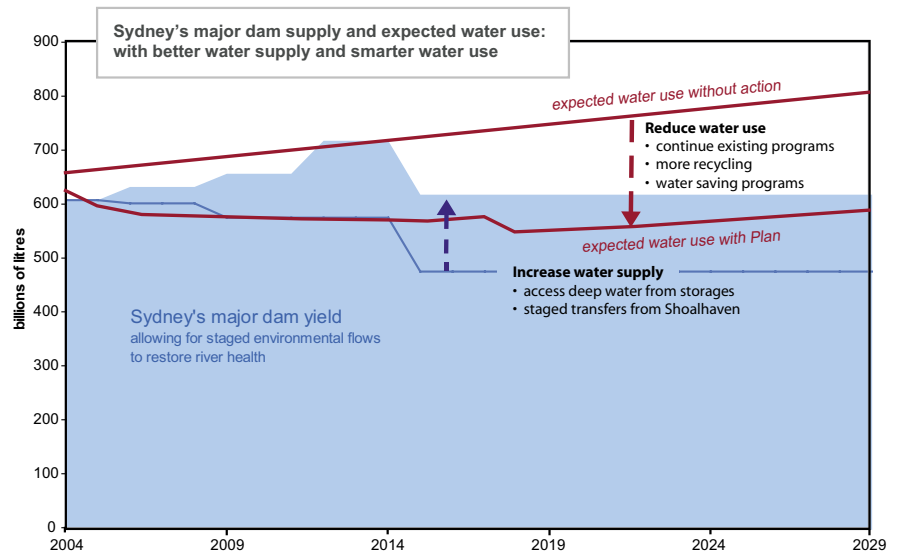
In addition, insufficient water is currently passed through the dams to maintain river health downstream. The Hawkesbury-Nepean River system will require the release of additional water to the rivers for the environment as improved environmental flows to avoid ongoing ecological damage. Without the flows, the river would no longer be the natural asset that it is for our community to use.

The extensive and damaging blooms of aquatic weeds and algae, witnessed around Windsor this year, are indicative of the type of river deterioration that will become more frequent without prompt action. Other impacts we could expect are loss of native fish stocks and habitat for animals such as waterbirds. Economic and social impacts will also flow from impacts on the \$2,000 million (two billion dollars) agriculture, fishing, tourism and recreation industries in the Hawkesbury-Nepean.

Thus, Sydney is faced with four significant factors in planning for future water management:

- population growth
- drought
- climate change
- river health.

This unprecedented combination of factors means finding solutions is challenging. However, the Government is meeting this challenge with the actions, policies and programs announced in this Plan.



**Actions under this Plan will: reduce the amount of water required to meet Sydney’s urban needs; provide water for river health purposes; and, increase the yield of the existing dams, including a safety margin to allow for uncertainty.**

# 2

## Progress to date



Water efficient shower head

Since 1999, the NSW Government has invested \$81 million in one of the largest programs in the world to reduce water demand. This has achieved significant changes to the way we use water in Sydney.

The demand for water has been kept fairly steady over the last 20 years even though the population has grown by 700,000 people. Between 1991 and 2004, Sydney actually reduced per capita demand for water by 20%. Substantial savings were made in the business and industrial sectors. One in every seven households has already participated in programs to reduce their water consumption.

By comparison, best practice 'demand management' programs around the world have achieved around 10% in water savings. Even vigorous programs have not delivered more than 15% in water savings, although some specific, small scale projects in California, Singapore, Israel and Canada have reduced demand for water by up to 30-50%.

We will need to take water conservation measures to new levels in Sydney to meet the future challenges of a secure water supply. Work has commenced but there is greater urgency with the prospect of climate change and population growth.

Population growth is being tackled by new urban design requirements. In July 2004, the Government implemented the BASIX (Building Sustainability Index) scheme. All new houses built in Sydney must reduce their mains-supplied water consumption by 40% compared to the current average for similar sized homes. The same requirement will apply to apartment blocks and other multi-dwelling buildings from February 2005. To meet this target, builders can install water efficient fixtures (such as dual flush toilets), and either install a rainwater tank or connect to a recycled water supply, where it is available. From October 2005, alterations and additions to all dwellings must also comply with BASIX requirements.

Another major initiative is the preparation of a Metropolitan Strategy to guide urban land release, housing, infrastructure and employment needs of greater Sydney over the next 30 years. Water infrastructure and water cycle management are key factors in planning for Sydney's growth – and will feed into the Metropolitan Strategy.

Work is also underway on:

- a new regional plan and other programs to protect the integrity of Sydney's drinking water catchments;
- the urban water reform component of the National Water Initiative;
- national guidelines on water recycling and standards for using reclaimed water.

## working together



### Residents

- Almost 240,000 households (15% of all households) have converted to water efficient products.
- Over 279,000 water efficient products have been installed, saving 4.5 billion litres each year.
- The Government has paid rebates to householders to purchase more than 6,500 water efficient washing machines and install almost 4,000 rainwater tanks.
- Under the BASIX scheme, all new dwellings in Sydney are required to be designed to reduce their mains water consumption by 40 percent compared to the current average. Similar requirements for multiple-dwelling buildings and alterations and additions to existing dwellings will be required from 2005.

### Businesses

- Almost 200 high water-using businesses have reduced their water use, saving 4.3 billion litres per year.
- 4,500 irrigators across NSW have participated in the 'Water Wise on the Farm' program that trains farmers in better irrigation practices.

### Government

- Expanded its program of leak detection, leak repair and mains replacement to record levels.
- Reduced water losses by 15 billion litres in 2003/04.
- More than \$3 million has been invested in community education and awareness of water conservation.

### Recycling

- Sydney currently recycles 14 billion litres of treated sewage effluent every year.
- Rouse Hill is the largest residential recycled water scheme in Australia. 21,800 houses have already been connected and a further 10,500 are planned over the next few years – reducing demand for drinking water by up to 35 per cent per household.

## Increasing water supplies: infrastructure projects

Drought is a natural part of life in Australia. Sydney, like the rest of south-east Australia, is currently in the grip of a severe drought - our worst since the 1930s.

Thanks to the efforts of the community to save water, our dams are still approximately 42.6% full (in early October 2004). Since mandatory restrictions were introduced in October 2003, water use has reduced by 10% against the 10-year average.

Managing drought is about balancing low-cost measures (such as household restrictions) against sensible investments in contingency plans (such as new supply infrastructure) for when they are needed.

Given climate change and new unpredictable drought cycles, Sydney needs to diversify its water sources to minimise risk.

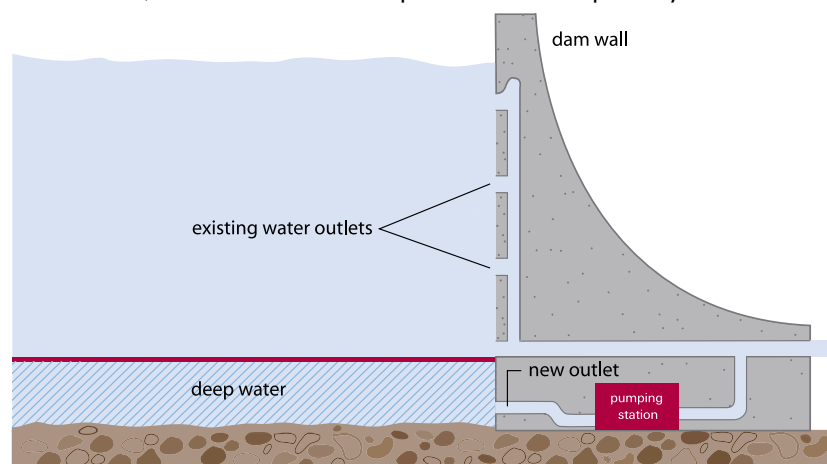
There is no need for a twelfth dam. Another dam would be very costly from a financial and environmental perspective with an estimated cost of over \$2,000 million for Welcome Reef Dam. The same dam would be very shallow with a large surface area, meaning that evaporation rates would be extremely high and increase the potential for toxic blue-green algae outbreaks. It would take nearly 10 years to build and fill under average conditions and up to 30 years if current drought conditions continue. A new dam would not make the most of the existing infrastructure and so it is far more effective to extend our current system as proposed in this Plan.

Opportunities to increase supply through further harvesting of rainwater and stormwater will continue to be explored.

To increase the security of Sydney's water needs during this drought, the Government will bring forward several infrastructure measures to increase Sydney's water supplies.

### Accessing deep water at the bottom of dams

The Government will modify Avon, Warragamba and potentially Nepean Dams (see Map 1) so that water at the bottom of the dams that is currently unavailable for water supply can be accessed. Accessing this deep water will increase Sydney's water supply by an additional six months in the immediate drought and will provide additional accessible storage for the future. This is a relatively cost-effective and feasible means of increasing water supply. Detailed planning for construction of new infrastructure will commence immediately. Total costs of these works by the Sydney Catchment Authority are around \$106 million. Work is expected to be complete by 2006.



Schematic of dam with new outlet and pumping works to access the deep water.

## Increased transfers from Shoalhaven

We can optimise the existing system to increase the capacity of Sydney's water supply.

Sydney's water supply is currently sourced from four river basins – Hawkesbury-Nepean River, Shoalhaven River, Woronora River, and the Macquarie River (Fish River scheme) through a network of major dams and minor reservoirs.

Since the 1970s, in times of drought, Sydney has relied on water pumped from Tallowa Dam on the Shoalhaven River to the Sydney dams.

Early investigations show that more water could be supplied from the Shoalhaven system but in a way that has less impact on the river and people in the Shoalhaven catchment than under current practices. Currently, when there are very high flows, the water runs over the Tallowa Dam. The Government proposes to capture this water by pumping it to Warragamba Dam when the Shoalhaven River is in high flow. In addition to reducing the negative environmental impacts of the current regime of extraction during low-flow periods, the proposal would boost the reliability of the supply to the Shoalhaven community during dry times.

Depending on the findings of technical studies and community consultation, this option could provide between 50 and 80 billion litres of new water supplies for Sydney in the medium term with the construction of Stage 1 infrastructure and up to 110 billion litres in the longer term with the construction of Stage 2 infrastructure. The preliminary capital cost of Stage 1 is expected to be \$250 million. The preliminary capital cost estimate of Stage 2, if implemented, is \$430 million.

New works – including upgrading Tallowa Dam and constructing pipelines and tunnels – will be required to facilitate these water transfers. These works will be constructed in stages (see Map 1) and would allow better use of periodic spare capacity in some dams. The current transfers occur through natural river channels which can disrupt natural ecosystem processes, including important platypus nesting areas, eroding river banks and inundating lands resulting in serious impacts on adjacent local environments and land uses.

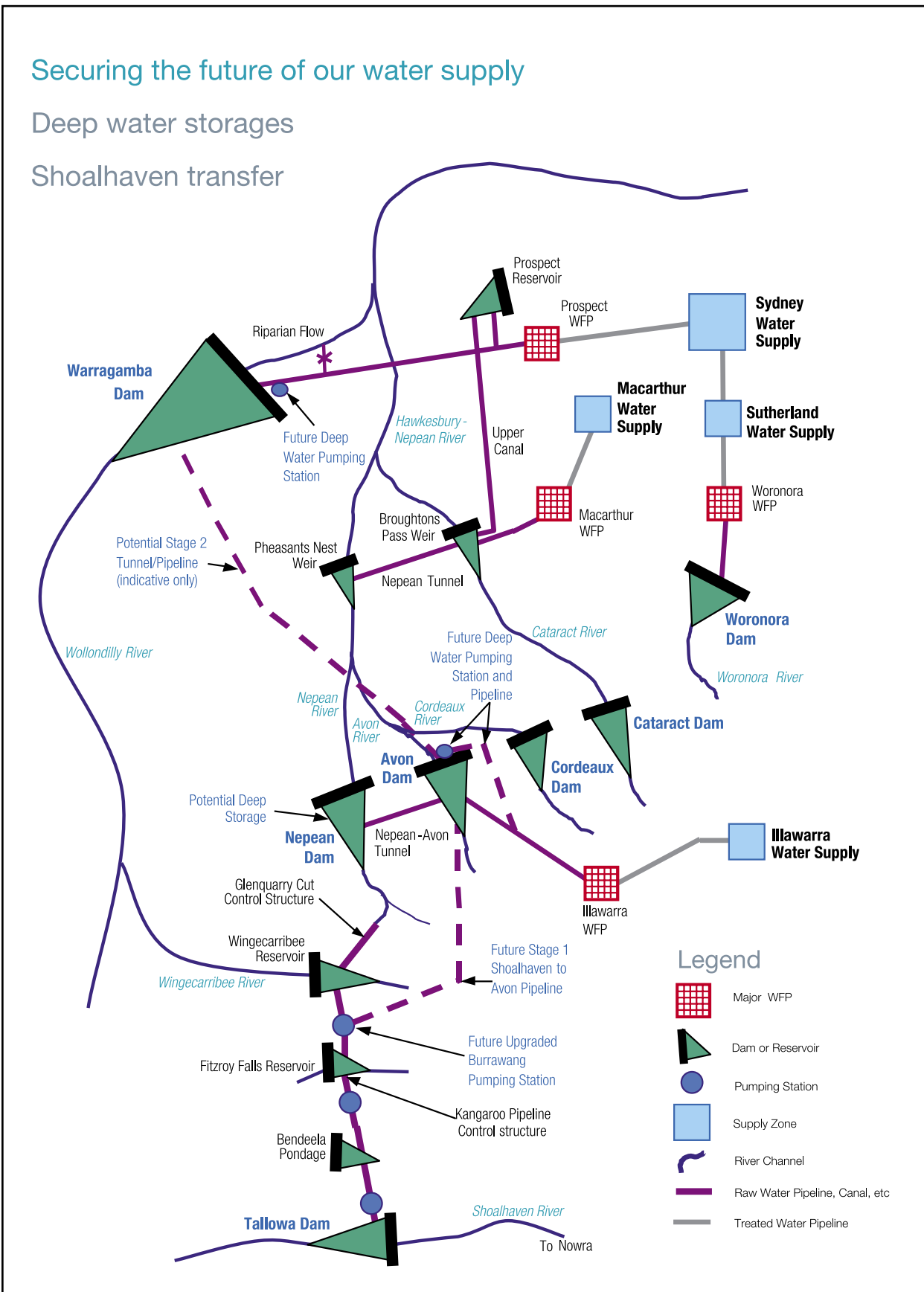


Shoalhaven River near Braidwood

# Securing the future of our water supply

Deep water storages

Shoalhaven transfer



**Map 1: Location of the major infrastructure projects planned as part of the Plan:**

- dams where deep water will be accessed; and
- possible works for transferring more water from the Shoalhaven system.

The phased transfer works proposed by the Government will minimise if not eliminate these impacts. Stage 1 will initially address those issues by eliminating the current transfers between Wingecarribee Reservoir and Nepean Dam along Glenquarry Creek. In addition, the Government will develop a new environmental flow regime for the Shoalhaven River to protect the environment while providing adequate water supply for the Shoalhaven community.

These actions, together with stricter limits on transfers from the Shoalhaven River during low flow periods, is expected to achieve significant environmental benefits and leave more flows in the river for the environment during drought periods.

The proposed Stage 2, if implemented, will increase water supply and eliminate all transfers along the Wingecarribee and Wollondilly Rivers to Warragamba Dam.

The Government has undertaken preliminary investigations and costings which show the benefits of the proposal. We will now commence community consultation and environmental assessment for the proposed transfers and Stage 1 new infrastructure, with a particular focus on protecting the health of the Shoalhaven River and the needs of Shoalhaven community. This will include consultation with the Shoalhaven community and stakeholders. Depending on the outcomes of consultation and assessment, it is expected that construction of Stage 1 of the new infrastructure will commence by 2007 to be completed by 2009.

## Using groundwater

Groundwater, in a broad sense, is all water occurring underground. When rainfall cannot be stored by the soil, it seeps downwards and accumulates in the underlying sediments. These water bearing zones are called aquifers. There are four major types of aquifers: coastal sands, porous (for example, sandstone), alluvial (gravels) and fractured rock (for example, granite). Water accumulates in the spaces between the sediments or cracks in the bedrock. Reserves of groundwater are located in many parts of greater Sydney such as the Botany sand beds where the water is close to the surface.

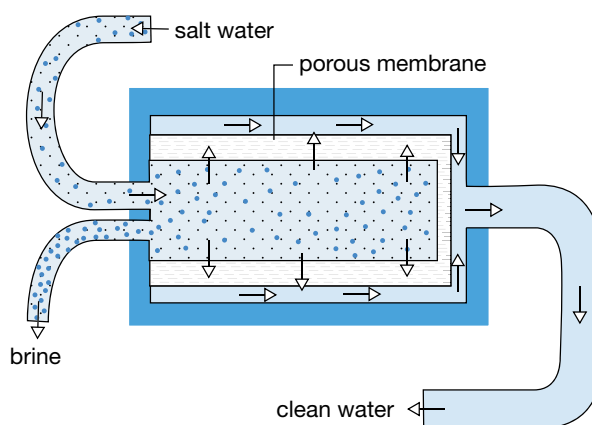
At the householder level, groundwater can be used to water gardens and for other non-drinking purposes. Where groundwater is available, many households are currently doing this, with the Government setting appropriate guidelines.

Another potential source of groundwater in greater Sydney may come from the Sydney and Hawkesbury sandstone aquifers. Quite large volumes may be available but the water is not easily accessible as the sandstone is harder to drill and the water is located deeper down. Preliminary investigations suggest that most groundwater reserves which are close to the existing supply infrastructure do not contain readily accessible water.

Nevertheless, groundwater could potentially be used as a short-term measure in droughts. Four million dollars (\$4 million) will be spent in immediate investigations to establish whether groundwater can usefully provide supply augmentation in droughts. These investigations will both increase our knowledge about groundwater reserves and could provide up to 13 billion litres of water to supplement dam supplies for immediate use.

## Planning for desalination

Desalination is the process of removing salt from seawater (or brackish water) in order to produce drinking water. The reverse osmosis technique involves forcing seawater through a filtration membrane, which has very small pores that allow the water to pass but retain the salt.



**Schematic of reverse osmosis process that can generate drinking water from salty water**

Desalination plants are used in many cities around the world to provide useable water. They do provide a reliable supply and a good quality water and are immune from drought and climate change impacts. While they are currently more expensive and energy intensive than traditional water supply options, research and development is reducing the costs and improving their energy efficiency.

An additional \$4 million has been earmarked for detailed planning and design to ensure that, if the drought continues beyond another two years, a desalination plant for Sydney could be constructed relatively quickly and efficiently. The detailed planning will recommend strategies to minimise environmental impacts. For example, it will examine opportunities to co-locate a desalination plant close to a compatible industrial development so that one can use the by-products of the other; this has been successful with a desalination plant in Florida, USA. The work will also examine other ways to minimise greenhouse impacts such as: using low-emission or renewable energy sources; using waste heat from nearby industries; gaining synergies by combining a desalination plant with a co-generation plant; and using offsets (such as tree planting, as is proposed in Perth) linked to the Government's existing Greenhouse Gas Abatement Scheme

Planning for desalination is a sensible contingency investment by Government for the people of Sydney.

## Climate change and drought

NSW has commissioned research from CSIRO that shows the impacts of climate change on the variability of our climate. The complex cycles that determine our climate on a seasonal basis are shifting. In the shorter term, these cycles include El Niño events - associated with an increased probability of drier conditions and La Niña events - associated with increased probability of wetter conditions. On average, El Niño events are observed every three to eight years. Scientists are continuing to research the way that El Niño – La Niña and other cycles influence our climate. Research to date has shown that there is more than one cycle affecting our climate variability and that these cycles combined with the impacts of global warming and climate change from increased levels of greenhouse gases in our atmosphere could be very damaging.

## highlights

- The Government will invest \$106 million in dam modifications to extract currently inaccessible water at the bottom of Sydney's dams. This measure alone will increase Sydney's water supply by an additional six months and provide additional accessible storage for the future.
- The Government will invest \$4 million to undertake field trials and access groundwater to supplement water supplies.
- At the same time, the Government will invest \$4 million to develop a contingency plan for building a desalination plant if needed in this or future droughts.
- Depending on the outcomes of consultation, construction of Stage 1 Shoalhaven transfer infrastructure is expected to commence in 2007 at a preliminary capital cost estimate of \$250 million. The preliminary capital cost of Stage 2, if implemented, is \$430 million.
- The Government will commission additional research to increase understanding of the effect of climate change on Sydney's water supplies and demand for water in Sydney.

# 4

## Recycling

We waste large volumes of high quality drinking water by using it when drinking water is not needed—for purposes like watering gardens and flushing toilets. We should do all we can to use water from other sources, such as treated wastewater, for such non-drinking uses, where it is available.

Sources of recycled water include:

- sewage effluent
- greywater (for example, water from showers)
- the stormwater that flows off hard surfaces such as roofs and streets

Water recycled from these sources can be treated to an appropriate standard to make it safe and suitable for non-drinking purposes.

Overall, in the last decade, recycled water use in Sydney has increased from 6.2 billion litres per year to 14 billion litres per year. Within the next five years, Sydney Water expects to save additional 8 billion litres through several business and residential recycled water projects at BlueScope Steel, Liverpool Golf Course, Hoxton Park and Rouse Hill Stage Two new release areas and North Head and Malabar sewage treatment plants.

The need for new or redeveloped suburbs to be more self-sufficient with their water usage is a driver of increased recycling. New technologies for recycling water are rapidly developing and becoming cheaper.

Other recycling projects currently being investigated include:

- providing recycled water, through separate pipes for outdoor or toilet flushing uses in new release areas, saving as much as 24 billion litres of water per year
- using recycled water to irrigate farms, saving up to 32 billion litres of river water per year
- releasing up to 40 billion litres of high grade recycled water per year to rivers, in a natural flow pattern, for environmental benefit.

As well as reducing demand for drinking-quality water, these projects can reduce stress on urban streams by capturing some of the water, and nutrients, that would otherwise be discharged from drains and sewage treatment plants.

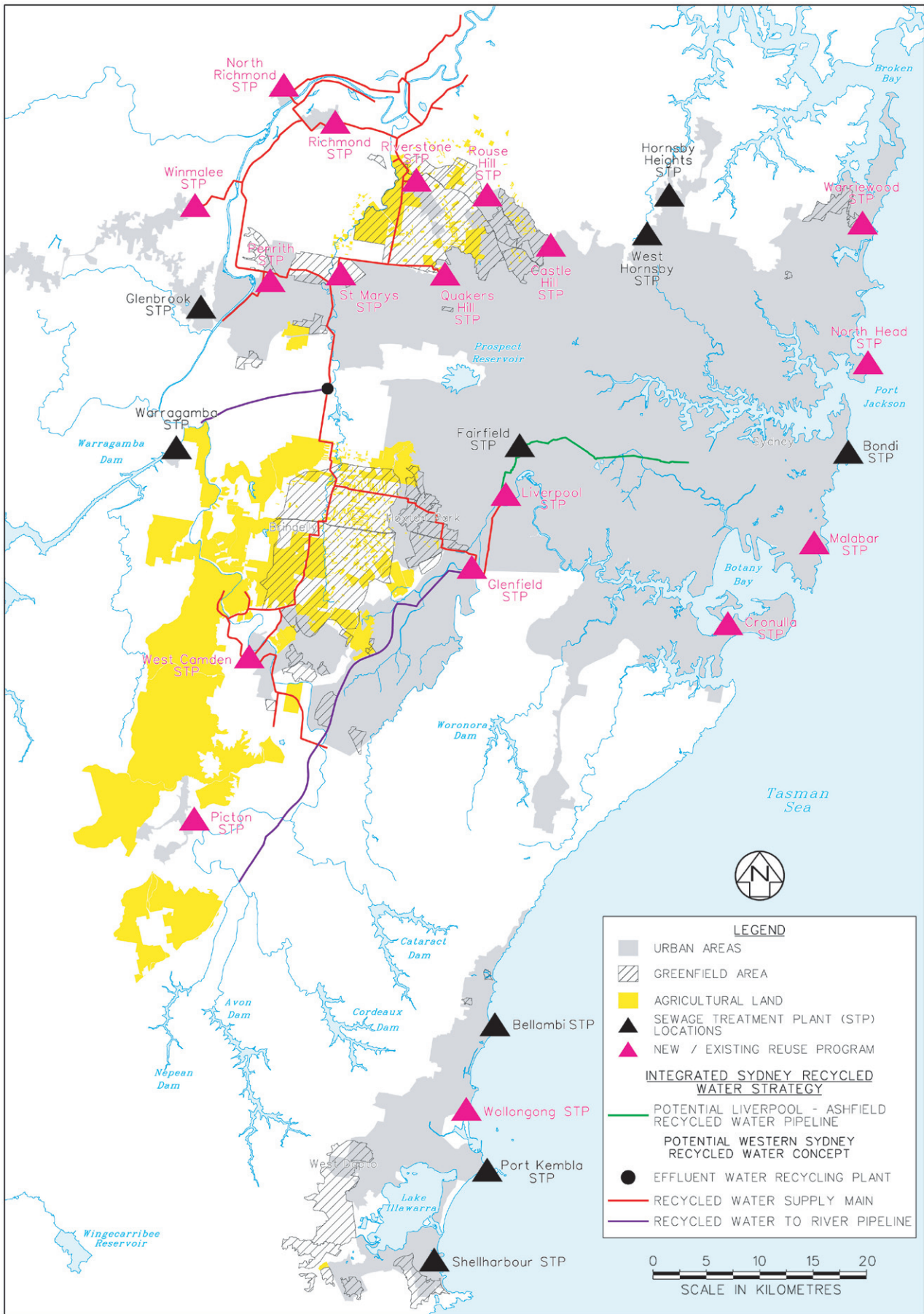
The Government wants to see Sydney's recycling levels reach much greater levels by 2029. Recycling is an integral part of its comprehensive strategy to ensure that the residents and businesses of the greater Sydney area have enough water to meet their needs for at least the next 25 years. It is also a key initiative to restore the health of the Hawkesbury-Nepean River and other river systems around Sydney.

The Government's plan is to supply recycled water to meet the needs of Sydney's growth areas. Under the Government's Metropolitan Strategy, new greenfield development over the next 25 to 30 years will be directed to nominated "growth centres" in south west and north west Sydney. These areas and significant areas of agricultural land are located close to 10 existing wastewater treatment plants, as shown in Map 2. This lends itself to a major water recycling initiative centred on western Sydney which could see in excess of 80 billion litres of recycled water being supplied to the area's new homes, farms and rivers at a preliminary capital cost estimate of \$563 million.

The Government will undertake detailed planning into the construction and operation of a recycled water initiative for western Sydney.



The recycled water treatment plant at Sydney Olympic Park, used to treat sewage and stormwater for reuse for irrigation and toilet flushing



Map 2: Sydney's existing sewage treatment plants [STPs] and potential sewage effluent recycling schemes that will be considered in the *Metropolitan Strategy: Recycled Water*

## highlights

### The Government will:

- undertake detailed planning into the construction and operation of a western Sydney recycling initiative at a preliminary capital cost estimate of \$563 million;
- maximise the beneficial use of recycled water for residential, industrial, agricultural and environmental purposes;
- streamline the regulatory system for water recycling and provide updated standards and information to guide the recycled water industry.

## Making recycling work

The system of laws and policies that Government sets in relation to recycled water needs to keep pace with new applications for recycled water and new treatment technologies. Regulations must set clear rules to protect public health, but not raise unnecessary barriers to innovation by private developers and service providers.

The Government recognises that clear direction is needed for recycling in apartment blocks and other multi-dwelling buildings. Industry also requires guidance on both the regulatory framework for operation of small scale recycled water plants and the quality required for recycled water used for different purposes. As such, the Minister for Health has recently issued guidance on greywater recycling in multi-unit buildings.

To this end, the Government will take the following actions.

- It will ensure that the regulatory system for water recycling manages environmental and health risks and encourages recycling.
- At the same time, the Government will provide clear information to the community on finding and using existing guidance and standards for water recycling. Where a clear need is identified, the Government will review or develop additional guidance or standards.

## Major infrastructure measures

Measure	At 2006	At 2010	At 2020
<b>Increased Shoalhaven transfers</b>		50-80 billion litres	Up to 110 billion litres*
<b>Deep water</b>	30 billion litres	30 billion litres	30 billion litres
<b>Recycling</b>	20 billion litres	22 billion litres	60 billion litres**
<b>Desalination</b>		36.5 billion litres***	36.5 billion litres

\* Assuming that Stage 2 infrastructure is constructed

\*\* Assuming a significant initiative capable of recycling for new developments, agriculture and the environment is constructed in western Sydney

\*\*\* Assuming a 100 megalitre per day desalination plant is constructed

# Reducing demand

## 5.1 Water smart business and government

Water is an essential input to many industries. Together, industry, businesses and government bodies (excluding agriculture) use around 30% of the water available from the Sydney Water system.

The Government's existing Every Drop Counts business program has found that water savings of 10 to 30% – and in some cases even more – can confidently be achieved by businesses. This program will continue to support businesses to become more efficient.

### Demand Management Fund for businesses and councils

Water is typically a low input cost for many businesses. Businesses and councils have good ideas that can save lots of water within their operations, however some of these initiatives can't be justified in the short-term because the financial benefits can take several years to be realised. Water savings achieved within the business sector and in local government will benefit the whole of Sydney. To encourage business and councils to implement more water conservation projects, the Government will establish a new Fund that will help enterprises with projects that make good business sense in the medium term. The Fund will provide \$30 million per annum for demand management to be allocated to the most efficient schemes available. This will be in addition to the existing programs for business demand management already provided by Sydney Water.

### Water efficient government

To ensure that the Government leads the way, all of its agencies will be required to develop and implement water conservation plans and implement cost-effective improvements. This program will start with the biggest water users, for example, 45% of the Government's water use is in the Department of Housing's 46,000 properties; the potential water savings from making water efficiency improvements there are significant. Similarly, large water savings are expected from the program as it is applied to hospitals and correctional facilities. An existing energy-related scheme will be expanded to finance cost-effective water efficiency improvements in government operations. Procurement requirements will also be altered to ensure that agencies purchase only water-efficient products. Until July 2005, \$2.5 million will be set aside to effect water improvement by government agencies.

### Water efficient councils

Councils supplied by Sydney Water Corporation will also be required to prepare water conservation plans by March 2006. They will be required by September 2007 to implement cost effective water efficiency measures, for example installing water efficient taps, showers and toilet flushing systems, in all of their buildings and public facilities. Councils will be eligible to apply to the Demand Management Fund for assistance.

### Water efficiency measures for businesses

A new program will be introduced to drive water efficiencies in Sydney's businesses. Identified commercial and industrial businesses will be required to prepare water conservation plans by March 2006 and to implement cost-effective measures to improve water efficiency by September 2007.

Initially the program will target the top 200 water-using businesses in the Sydney metropolitan area where large volumes of water savings are likely, and if successful, may be rolled out to other businesses over time. It is estimated that an average of 20% water savings can be made using this approach.



Replacing a section of water main to help with leakage reduction



## Reducing leakage in the system

Sydney has 21,000 km of water mains. Over 7,000 km of mains are inspected and repaired every year saving 15 billion litres of water. Within the next four years, the Government will reduce leakage in the system by a further 6.8 billion litres. Government will spend \$82 million per year on mains renewal, leakage detection and repair. In consultation with the Independent Pricing and Regulatory Tribunal, Sydney Water's Operating Licence will have additional conditions attached. These will require more rapid repairs of burst water mains. In addition, all mains will be inspected at least once every three years.

## 5.2 Water smart living

The water conservation efforts of Sydneysiders have kept demand steady over the past 20 years. This is a substantial achievement. But we can go further while still maintaining our quality of life.

Sydney's 1.5 million households (with 4.2 million people) used 387 billion litres of water in 2002/03. Collectively, households are the largest consumers of water in Sydney.

The average household demand in Sydney is 290 000 litres per year. This compares favourably with Adelaide, Brisbane and Canberra.

### Labelling and performance standards

To ensure consumers have information about the water efficiency of the appliances and fixtures they purchase, by 2005, the Government will require manufacturers and retailers to display a label indicating their level of water efficiency on appliances such as toilets, showerheads, clothes washers and dishwashers.

Similarly, by 2005, the Government together with industry associations will develop a 'Smart Water Mark' for household gardens, including garden plants, designs and irrigation equipment and implement this new labelling scheme.

From 2005, it will no longer be possible to buy toilets that are not water-efficient. The Government will continue to work with the other states and the Commonwealth to implement minimum water-efficiency standards for other appliances and fixtures.

### Partnering with the community

The key to meeting Sydney's water needs in the future is for the Government and the community to share ownership of the problem and the solution.

The Government has funded a range of education programs on ways to save water. These campaigns have improved awareness of issues and greatly improved the success of water saving programs and regulations. Programs implemented to date include the drought-related 'Go Slow on the H<sub>2</sub>O', specialised schools programs by Sydney Water, the NSW Government's 'It's a Living Thing' campaign and 'Water Wise on the Farm' to train farmers in better water efficiency practices.

The Government will now roll out a new water education plan for NSW to maintain and increase awareness of water conservation.

### Continue support for water-conscious householders

The Government will continue to support householders who want to install devices that will help them save water in their bathrooms and kitchens. The subsidised retrofit program will continue to be offered for existing dwellings served by Sydney Water Corporation. The aim is to extend the installation of water efficient devices to remaining Sydney homes, including a substantial number of public housing properties. The subsidy will mean, at most, owners will pay \$22 for the retrofit. The service will continue to be available at no cost to holders of pensioner and other identified concession cards. For an average

## highlights

**To ensure wise use of water by households, business and government, the Government will:**

- **implement a water labelling and standards scheme for appliance and fixtures, to help consumers make water-efficient choices**
- **introduce new requirements to ensure that business and industry improves their water efficiency performance**
- **require all government agencies, starting with the larger water users, and councils to become water efficient**
- **extend subsidies for installation of water efficient showers and other fittings**
- **continue subsidies for installation of rainwater tanks in existing homes until July 2008**
- **from 1 July 2007, require that dwellings in Sydney are water-efficient at point of sale**
- **spend a record \$82 million per year to reduce leakage in the mains water supply system and include new leak reduction conditions in Sydney Water Corporation's Operating Licence**
- **extend BASIX to entire neighbourhoods in new release areas.**

family using electricity for water heating, the retrofit saves around \$21 per year in water charges and around \$35 per year in electricity charges, so the payback period for a householder undertaking a retrofit is short.

The rainwater tank rebate program will continue until July 2008 in Sydney Water Corporation's area of operations. Householders whose homes were built or approved prior to the implementation of the BASIX scheme in Sydney (July 2004 for houses and February 2005 for apartments and other multi-unit dwellings) will be eligible for the rebate if they install a rainwater tank before July 2008.

### Guarantee water efficiency in remaining homes

While Government's subsidised water-efficiency retrofit program will capture many dwellings, it is important that all homes in Sydney are efficient so that maximum water savings can be achieved. From 1 July 2007, a minimum level of water efficiency will be required when a dwelling is sold. The efficiency level required will be at least equivalent to that which can be achieved by installing low-flow showerheads, tap fittings and toilet flush arrestors. To minimise household compliance costs, the community are encouraged to participate in the Sydney Water Corporation's retrofit program whereby these devices will be supplied and installed in their homes for only \$22.

### Moderate use of river and groundwater accessed directly by householders

Water accessed by households from adjacent rivers or underlying aquifers can usefully replace a certain portion of Sydney's high grade drinking water. However, as with all types of water, it is a valuable resource and should be used with care. In some parts of Sydney, a proliferation of households accessing water from adjacent rivers and aquifers could place an additional and unacceptable environmental stress on the rivers during drought. The terms and conditions under which householders can use water they access directly from rivers and aquifers in metropolitan areas will be clarified as part of guidelines on reasonable use that Government will develop by 2005.

### Homes in greenfields land release areas

Since July, the Government has required that all new houses reduce water use by 40 per cent and energy use by 25 per cent under the BASIX planning system.

The Government will extend BASIX to entire neighbourhoods in new release areas enabling developers and planners to consider installing communal water systems.

This has already been achieved at Rouse Hill, in Sydney's north west, where residents can use recycled water for gardens and other non-drinking uses through special third pipes.



Market garden

## 5.3 Smarter water pricing

The Independent Pricing and Regulatory Tribunal has recently provided a report to the Government which outlines:

- introduction of a two-tier price structure in Sydney, so that households will be charged a higher price for the water they use above a certain reasonable volume;
- reduction of the fixed component of household water bills, so that consumers are likely to have a stronger motivation to reduce the variable part of the water bill which is directly related to the volume of water they use.

Some experts argue that water has historically been undervalued.

The Government recognises that a change in the pricing structure for water supplied to Sydney's urban users – both households and businesses – can help reduce the demands on our finite supplies.

The Government will consider the water price reforms suggested by the Tribunal for Sydney. The price reforms are designed to send important signals to the community about the true value of water. The Government will ensure that programs are in place to protect low income and large families and people with special needs.

## 5.4 Doing more with less on the farm

The agricultural sector is the second highest consumer of water in the greater Sydney area, using approximately 100 billion litres of river water per year. Improving efficiency can both reduce the amount of water used and farmers' costs.

### Water Wise on the Farm

Simple changes in irrigation practices and knowledge can improve water efficiency. About 4,500 irrigators across NSW have participated in the "Water Wise on the Farm" program that trains farmers in better irrigation practices. Farmers who participated have typically increased their water efficiency by 25%. The program has developed communications tailored for the diverse cultural and linguistic backgrounds of greater Sydney's farmers.

### Metering water use

To reduce inefficient water use and allow effective management of river flows, farmers need to know how much water they are using. The Government is rolling out a metering program to all large agricultural water users and a monitoring program for smaller users in the Sydney area. This program will be completed by 2007.

### Options for the future

- Irrigators in the Hawkesbury-Nepean area will be able to continue trading water, which encourages water to be used where it is most highly valued. The Government will examine and eliminate any unnecessary barriers to the trading system.
- The Government will examine the costs and benefits of encouraging farmers to use recycled wastewater where farms are close to sewage treatment plants. This would give farmers more secure water supplies and reduce the levels of nutrients discharged to rivers.
- The Government will examine and consult about options for equitably using "basic rights" water (where landholders can harvest a proportion of water that runs off their property and/or extract water for domestic purposes from a river adjoining their property or aquifer underlying their property).
- The Government will examine the feasibility of rebates to encourage farmers to replace inefficient irrigation sprinklers.

## highlights

- **By 2007, the metering and monitoring program for agricultural water users in the Sydney area will be complete.**

# 6

## Protecting the environment

The rivers supplying Sydney have been dammed to provide us with drinking water and this has caused unavoidable ecological impacts.

We have clear evidence that the health of the rivers around Sydney is under threat. The Hawkesbury-Nepean River is showing the signs of substantial environmental stress, such as weed infestation, algal blooms, and deteriorating fish production. Some tributaries of the Hawkesbury-Nepean – such as the river below Avon Dam – are particularly stressed because the natural streamflows have been disturbed to a great extent.

Poor river health will impact on the tourist, agriculture, fishing and recreation industries in the valley of the Hawkesbury-Nepean. These industries are currently generating more than \$2,000 million each year. The Shoalhaven River also has substantial fishing, tourist and recreation industries.

The health of Sydney's river systems impacts on the ability of Sydney to secure a high quality water supply. The Government is committed to protecting and restoring the environmental values and health of Sydney's river systems.

A key factor in ensuring the health of a river and the living things that depend on it is the volume and variability of its streamflow.

Much government and community effort is already being spent on improving the health of the rivers. For example:

- In 2003/04, the Sydney Catchment Authority released 58.2 billion litres of water from its dams to the Hawkesbury-Nepean, Woronora and Shoalhaven rivers, as environmental flows, to help protect the ecosystems and industries that depend on these rivers.
- Government agencies are implementing extensive programs to improve the health of the catchments and ensure high quality bulk drinking water.
- The Sustaining the Catchments Regional Environment Plan (which applies to the areas above the dams) will be gazetted by the end of the year, ensuring that developments do not have adverse impacts on the quality of our drinking water catchments.
- Specific on-river initiatives such as weed harvesting will continue.
- Nutrient discharges will continue to be reduced through licensing, pollution offset schemes, recycling and stormwater management and education.



Overgrowth of the waterweed *Salvinia* in the Hawkesbury River, near Windsor, July 2004. A boom is in place to hold back the weed



Looking upstream to Avon Dam and beyond to the reservoir

## highlights

- **The Government will implement new environmental flow regimes in the Hawkesbury-Nepean River, Woronora River and the Shoalhaven River, starting with Avon Dam.**
- **To enable environmental flow releases to be made, new outlet works will be built at dams and weirs, starting with Avon Dam.**
- **There will be ongoing monitoring to ensure that the environmental releases are effective before works are built at successive dams and a decision is made about environmental flows from the largest dam (Warragamba).**



## Further environmental flows

A key factor in ensuring the health of a river and the living things that depend on it is the volume, quality, timing and pattern of water flowing down it. On rivers with large dams, natural flows can be mimicked by releasing water captured in the reservoirs during periods of low flow and some of the water during periods of moderate to high flow.

The Hawkesbury-Nepean River Management Forum has considered the best type of environmental flow regime for the Hawkesbury-Nepean, Shoalhaven and Woronora rivers, taking account of the complex interplay of environmental, social and economic factors. It concluded that improved environmental flow regimes would give greater protection to the rivers and their associated ecological communities.

If no new regimes are introduced, the rivers would continue to deteriorate. In the Upper Nepean River, this would probably mean that, soon, native fish would be reduced to just one species, only one twentieth of the river length would be suitable for swimming and that, due to overgrowth of waterweeds, there would be a reduction in the length of the river that would be suitable for boating (see 'Business as Usual - 2021' in Figure 1).

The Government recognises that improving the health of the Hawkesbury-Nepean system requires new environmental flow releases from a number of Sydney's water supply reservoirs.

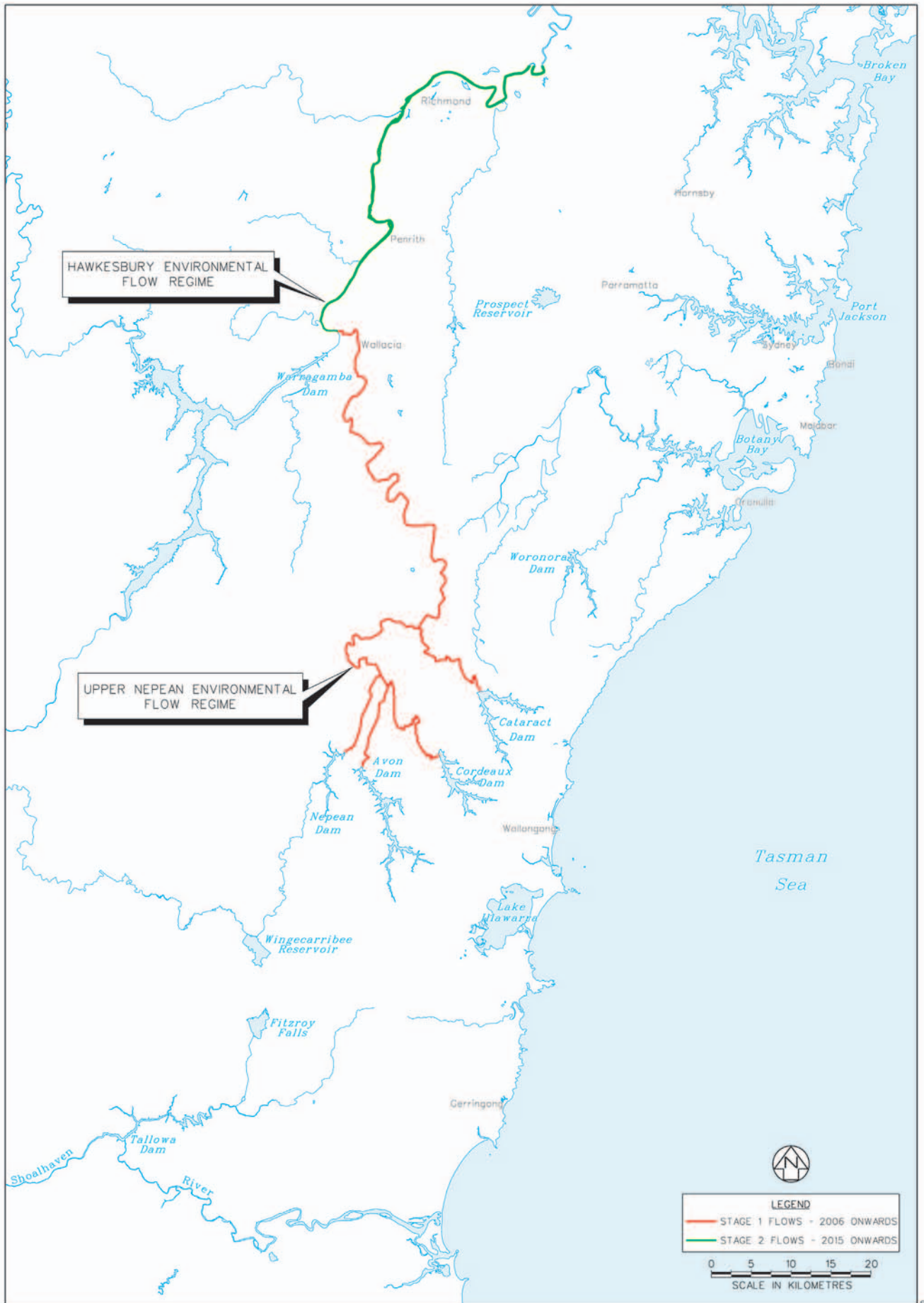
As the first phase of a new regime in the Upper Nepean system, 6 billion litres of water will, in average years, be released from Avon Dam specifically for environmental purposes. Improved outlet works are needed at the dam, and at several downstream weirs, to allow these environmental releases to be made, and these will cost \$7.75 million to build. The Government will progressively implement new environmental flow regimes of approximately 26 billion litres at Cataract, Cordeaux and Nepean dams from 2010. The new flow regimes for the Upper Nepean rivers will be as recommended by the Hawkesbury-Nepean River Management Forum.

In periods of extreme drought, the Government maintains the power through the Water Management Act to change priorities and reduce environmental flows to protect the community.

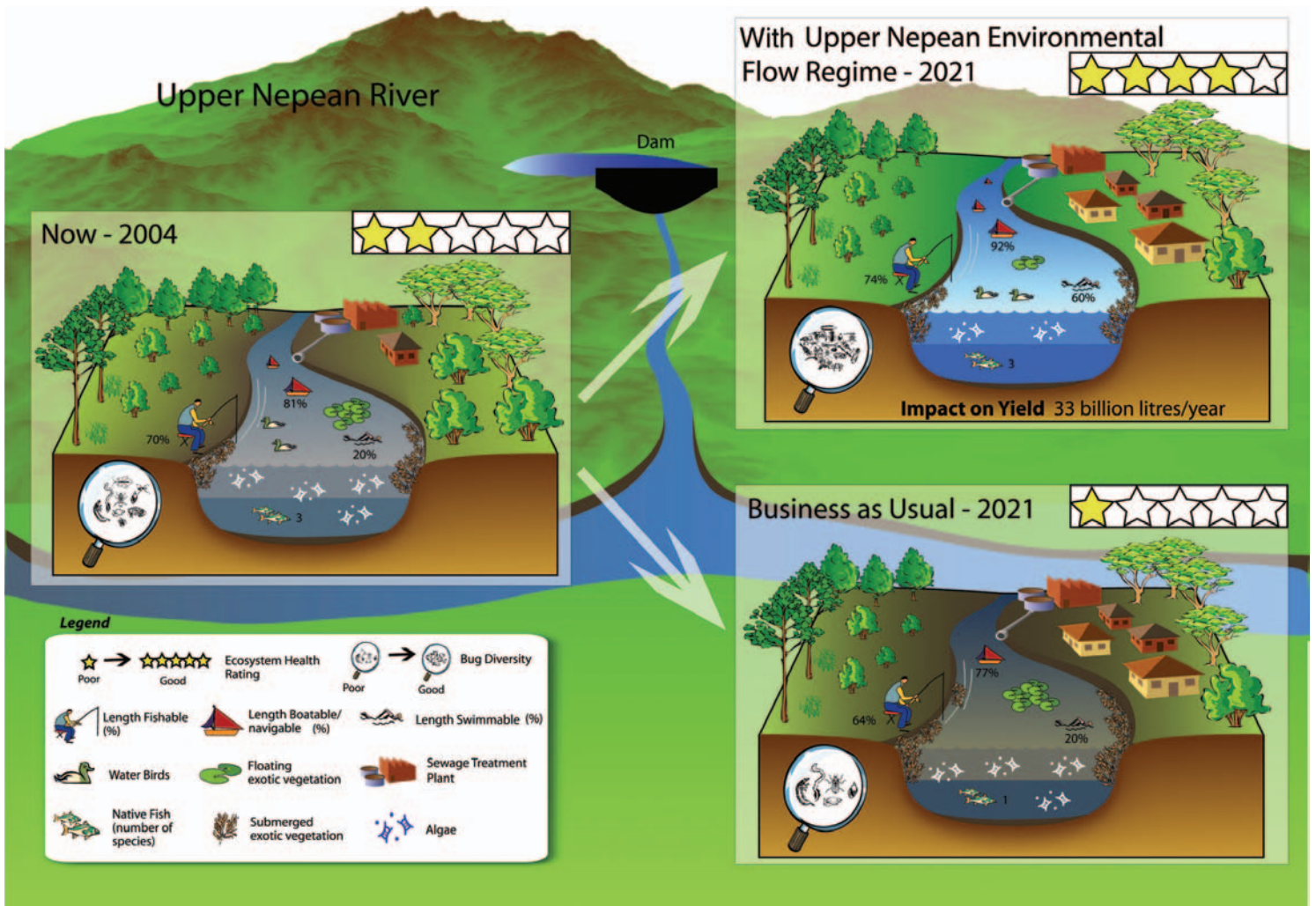
Altogether, the new works required at these four dams and at downstream weirs, to allow these environmental releases to be made, will cost approximately \$31 million to build.

By 2015, the Government will have the information needed to decide the environmental flows to be provided to the Hawkesbury River from Sydney's largest dam – Warragamba. This decision will be based on monitoring of the outcomes of the new Upper Nepean flow regimes, evaluation of the success of this Plan in reducing demand for water and the recommendations of the Hawkesbury-Nepean River Management Forum. In the meantime, the Government will increase the current interim flows from Warragamba Dam from 2009 if there is sufficient water available to support both the needs of the population and the rivers. This approach will provide benefits to the river as soon as possible.

Wollondilly River near "Jooriland"



Map 3: River reaches expected to benefit from the new environmental flow regimes to be implemented at Upper Nepean dams, starting with Avon Dam, and proposed for the Hawkesbury by additional releases from Warragamba Dam after 2015



**Figure 1: The current condition of the Upper Nepean River system compared to what might be expected in 2021 with and without the Government's new environmental flow regime**

**In 2021, for business as usual, we could expect declines in the numbers of native fish species and reductions in the length of river that is navigable and fishable.**

**However, with the new environmental flow regime in place, improvements are expected in the length of river that is swimmable (40%), navigable (11%) and fishable (4%), reduction in weed infestations and at least a maintenance of the current number of fish species.**

The new environmental flow regime will deliver real ecological, social and economic benefits to the Hawkesbury-Nepean and the communities who live in the catchment. It is difficult to quantify all of these benefits, however, in the next 20 years, a new flow regime involving the four Upper Nepean dams (see Map 3) is expected to lead to significant environmental improvements in the Nepean River. Figure 1 shows that these improvements include:

- an increase in the number of fish species present;
- a substantial increase in the length of the river that would be navigable by boat; and,
- a substantial increase in the length of river that would be safe for swimming.



## A plan for sharing the water

Sydney faces a challenge - sharing the limited amount of water and financial resources - to balance competing demands for water.

The need to balance the water requirements of households, business, industry, agriculture and river health is not unique to Sydney. Plans which share water between users and rivers have been developed elsewhere in NSW, and in other states and territories across the nation.

To implement the sharing arrangements in this Plan, the Government will develop a single water management plan to coordinate the management of the region's water resources.

The Government will develop a Sydney Metropolitan Water Sharing Plan under the Water Management Act 2000. The plan will secure the share of the water available for urban and rural consumption as well as protect the new environmental flow regimes and provide a legal framework for the implementation of many of the measures approved under this Plan.

The plan will identify the total amount of water available for all users in the rivers that provide water for Sydney, including the Hawkesbury-Nepean and Shoalhaven Rivers. It will allocate shares of this water for:

- environmental flows;
- consumption by Sydney's residents and businesses; and
- irrigators.

The plan will include a **water benchmark** which indicates how much water Sydney residents, businesses and irrigators can sustainably use within the life of the plan.

The plan will be based on the results of the community consultations undertaken by the Hawkesbury-Nepean River Management Forum. The Catchment Management Authorities will complete this work through targeted community discussions.



## Summing up

This Plan outlines the course that the Government will follow as a 25 year plan for water use and supply in Sydney. It is a balancing act between having enough water in the short term and ensuring we manage our water resources sustainably in the longer term. This means increasing water supplies as well as reducing demand for water. Sharing water between the environment and water users is an important outcome of this Plan, as well as developing a comprehensive water recycling scheme.

Overall, this Plan is the cornerstone to Sydney becoming a sustainable and water sensitive city.

### Need more information?

Various supporting documents that provide further information on this Plan are available on-line via [www.dipnr.nsw.gov.au](http://www.dipnr.nsw.gov.au)

Contact your local Department of Infrastructure, Planning and Natural Resources office or The Information Centre, Ground Floor, 20 Lee Street, Sydney NSW 2001.

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Note: This information does not constitute formal legal advice. Please seek specific advice from the Department of Infrastructure, Planning and Natural Resources as required.