NSW PARLIAMENTARY LIBRARY RESEARCH SERVICE

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by

Stewart Smith

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EXECUTIVE SUMMARY

Australia, being one of the driest countries on earth, will not be able to escape the pressures of an increasing population and a finite supply of water. Already, Sydney is using 106 percent of the annual sustainable yield of its water supplies. This paper looks at the use of water in Sydney, and the response by water authorities to managing demand. A brief review of water use throughout the State is also presented.

The Sydney Catchment Authority and Sydney Water are the two authorities responsible for the supply of potable water to the Sydney, Illawarra and Blue Mountain areas. The Catchment Authority provides bulk water to Sydney Water, which then retails it to approximately 1.3 million accounts and a population of 4.15 million.

In the Sydney Water service area, the residential sector is the biggest user of water, comprising 61 per cent of total demand. Most of this demand comes from single dwellings, which use an average 825 litres per day, compared to units and apartments which use around 495 litres per day. In regard to residential water use, outdoor water usage is the area of highest consumption (27.3 per cent), followed closely by showers (24.3 per cent).

The safe yield of Sydney's drinking water storages is 600,000 ML/year. The yield is defined as the amount of water that can be withdrawn from a reservoir on an on-going basis with an acceptably small risk of reducing the reservoir storage to zero. Demand has fluctuated around 600,000 ML/year since 1980, despite population increasing by around 700,000 during this time. Sydney's water consumption has been above the safe yield for the last three years and for six of the last ten years.

Daily per capita water use has fallen from 506 litres in 1991 to 416 litres in 2002/03. Demand management targets for water conservation purposes were first included in Sydney Water's 1995 Operating Licence. The current licence has two demand management targets (based on 1990/91 levels). The first is a 2005 target of a 28% reduction in per capita water consumption – 364 litres per capita per day. The second is a 2011 target of a 35% drop in per capita water consumption to 329 litres per day. Sydney Water does not expect the 2005 target to be met.

A review of demand management programs is presented. The most successful demand management programs (in terms of water saved) have been: water recycling at sewerage treatment plants; leakage reduction programs; and the residential retrofit program.

Traditionally, water in urban areas has been supplied through a centralised water reticulation and waste water system. One of the more topical issues in regard to water supply and sewerage infrastructure is that of sustainability and moves towards localised and individual systems. These sustainable approaches and solutions range from simple items, such as rainwater tanks and the better integration of current reticulation systems, to fully independent on-site water systems. Sustainable approaches aim to integrate all elements of urban water services, reducing water use and reusing water wherever possible.

1.0 INTRODUCTION

It is predicted that by 2025, nearly three billion people worldwide will face an acute scarcity of clean, fresh water, and billions more will experience shortages and soaring costs for water.[1] Australia, being one of the driest countries on earth, will not be able to escape the pressures of an increasing population and a finite supply of water. Already, Sydney is using 106 percent of the annual sustainable yield of its water supplies. This paper looks at the use of water in Sydney, and the response by water authorities to managing demand. A brief review of water use across the State is presented and the future of urban water supplies is explored.

2.0 HISTORY OF SYDNEY'S WATER SUPPLY SYSTEM

A brief chronological history of Sydney's water supply system is as follows:

- Sydney's original water supply came from the Tank Stream, which emptied into Circular Quay. However, it soon became an open sewer and was abandoned in 1826;
- Convict labour developed Busby's Bore, a four kilometre tunnel from the Lachlan Swamps (now Centennial Park) and ending in the southeastern corner of Hyde Park;
- By 1852 drought and an increasing population created the need for a more permanent water supply. A third water source, the Botany Swamps Scheme, began operating in 1859, but within 20 years the supply of fresh water was depleted;
- Completed in 1888, the Upper Nepean Scheme diverted water from the Cataract, Cordeaux, Avon and Nepean Rivers to Prospect Reservoir via 64 kilometres of tunnels, canals and aqueducts known collectively as the Upper Canal.
- The drought of 1901-1902 brought Sydney close to a complete water famine. After two Royal Commissions into Sydney's water supply, it was agreed to build a dam on the Cataract River. The successive building of Cataract, Cordeaux, Avon and Nepean dams between 1907 and 1935 greatly improved the Upper Nepean Scheme's capacity;
- In the Blue Mountains, construction of the six dams that serve the area commenced in 1905 and concluded with the building of Greaves Creek Dam in 1942;
- A scheme to supply water from the Woronora River to Sutherland and Cronulla in Sydney's south began with the construction of Woronora Dam in 1927 and was completed in 1941;
- An increasing demand for water, combined with a record drought from 1934 to 1942, forced the development of Warragamba Dam. Construction began in 1948 and was completed in 1960;
- In the late 1960s, the then Water Board was concerned that Warragamba Dam might prove inadequate to meet Sydney's water needs by the mid 1970s. Construction of the Shoalhaven Scheme, including the Tallowa Dam on the Shoalhaven River began in 1971 and was completed in 1977. [2]

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1 Cribb, J. "Water Banks to beat scarcity." In *The Australian Local Government Environment Yearbook*, 2004, at 76.

2 Adapted from: Sydney Catchment Authority, *History of Sydney's Water Supply Scheme*, See website URL: http://www.sca.nsw.gov.au/dams/history.html, Accessed March 2004.

2.1 The Sydney Water Supply Institutional Framework

The Sydney Catchment Authority and Sydney Water are the two authorities responsible for the supply of potable water to the Sydney, Illawarra and Blue Mountain areas. The State Government established the Sydney Catchment Authority in response to the *Sydney Water Inquiry*, which investigated a water contamination incident in 1998. The Inquiry recommended that the proposed 'Catchment Commission' be independent of Sydney Water and control the relevant infrastructure including dams, reservoirs and associated land.[3] With the passage of the *Sydney Water Catchment Management Act 1998*, the Authority became operational on 2 July 1999.

The role of the Authority, as outlined in the Act, is:

> (a) to manage and protect the catchment areas and catchment infrastructure works; (b) to be a supplier of bulk water, and
> (c) to regulate certain activities within or affecting the outer catchment area as well as the inner catchment area.

The Authority's main functions are to:

- manage and protect the catchment areas, and the dams, storages and piplelines;
- supply bulk water to Sydney Water, other water supply authorities and direct customers;
- protect and enhance water quality;
- carry out research on catchments generally and on the health of its own catchments in particular; and
- help educate the community about water management and catchment protection.

The water supply system comprises six main components, and how they work and are connected to supply water is shown in Figure one. Bulk water is supplied from the Authority's system of 18 major dams and two diversion weirs, through a network of pipes and canals to 11 water filtration plants. The six components are:

- The Prospect Reservoir System;
- The Upper Nepean Dams and Upper Canal System;
- The Woronora Dam System;
- The Warragamba Dam and Warragamba Pipeline System;
- The Shoalhaven System; and
- The Blue Mountains System.

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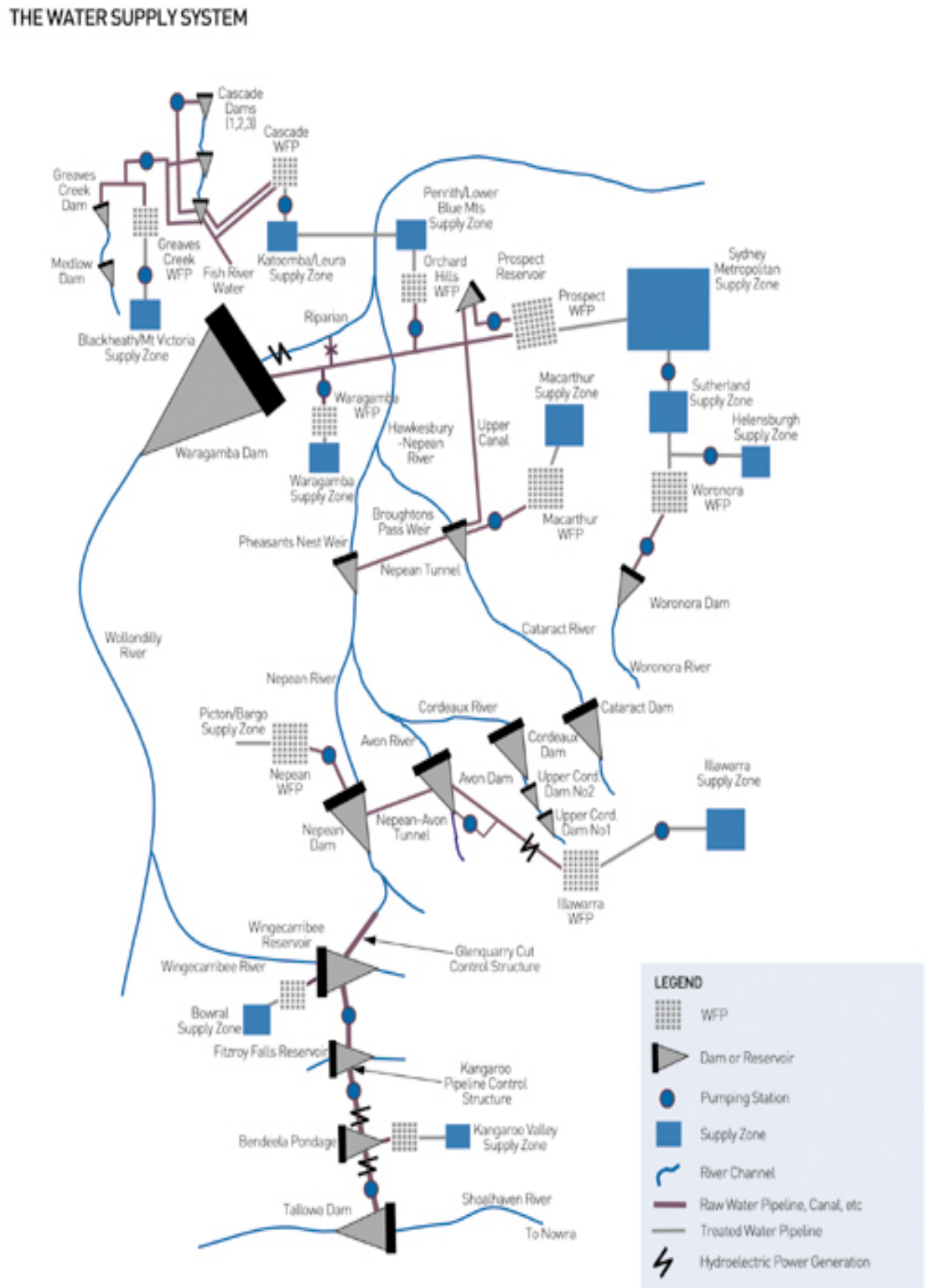
[3] See: Sydney Water Inquiry, *Third Report, Assessment of the contamination events and future directions for the management of the catchment*. October 1998, Commissioner Peter McClellan QC.

Figure One: The Sydney Catchment Authority Water Supply System



Source: Sydney Catchment Authority, *Water Supply Diagram*. See their website: http://www.sca.nsw.gov.au/dams/schematic.html, Accessed March 2004.

Generally the Sydney Catchment Authority supply system can be operated so that the water filtration plants can be supplied with water from several different sources. However, exceptions include:

- Raw water from Nepean Reservoir is the only supply source for the Nepean Water Filtration Plant, which supplies the towns of Picton, Oakdale, Thirlmere, Buxton and Green Hills;
- Parts of the Blue Mountains system cannot be supplied from the main part of the Authority's system.

Transfers from the Shoalhaven system into Wingecarribee Reservoir are important during periods of drought to augment supplies to Sydney, the Illawarra and Wingecarribee supply systems. Current operating rules dictate that pumping from the Shoalhaven system into Wingecarribee Reservoir begins when the total Sydney Catchment Authority system storage level falls to 60%.[4]

In 1995 the Sydney Water Board was corporatised to form Sydney Water, a state-owned corporation under the *State Owned Corporations Act 1989*. Sydney Water purchases bulk water from the Sydney Catchment Authority, and retails it to people living in the Sydney, Blue Mountains and Illawarra areas. Currently Sydney Water provides an average of 1,700 million litres of water per day to approximately 1.6 million accounts and a population of around 4.15 million.

3.0 THE USE OF WATER IN SYDNEY

The water demand breakdown for 2002/03 in Figure 2 below shows that the residential sector is the biggest user of water (61% of total demand). Most of this demand comes from single dwellings, which use an average of 825 litres per day, compared to units and apartments which use around 495 litres per day. The top 20% of residential users account for 40% of total residential demand, with a significant proportion of this higher use in discretionary garden watering.[5]

Water consumed by the residential sector can be divided into two main categories – discretionary and non-discretionary. Non-discretionary water use refers to the use of water for basic needs. Most of the water used for health and hygiene, including cooking, bathing, cleaning and drinking, as well as toilet water, is in this category. Non-discretionary water use is generally assumed to be fairly constant and is not significantly influenced by external factors such as the weather. Discretionary water is less important in terms of meeting basic needs, and includes water use such as water gardens and lawns, swimming pools and washing cars. Discretionary use may fluctuate depending upon a range of factors including weather, income and restrictions on use. It is also thought that price increases may be more likely to reduce some discretionary water consumption.[6]

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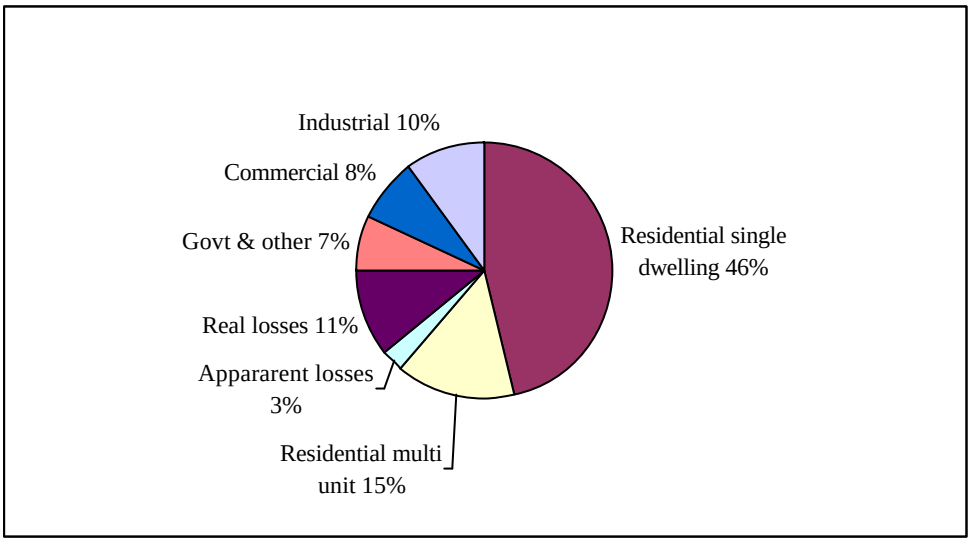
4 Independent Pricing and Regulatory Tribunal, *Review of the Performance Criteria in Sydney Catchment Authority's Operating Licence, Final Report*, Prepared for IPART by SKM, July 2003 at 8.

5 Sydney Water, *ESD Indicators and Environment Plan Report, Sydney Water Annual Report 2003*, at 10.

6 Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 6.

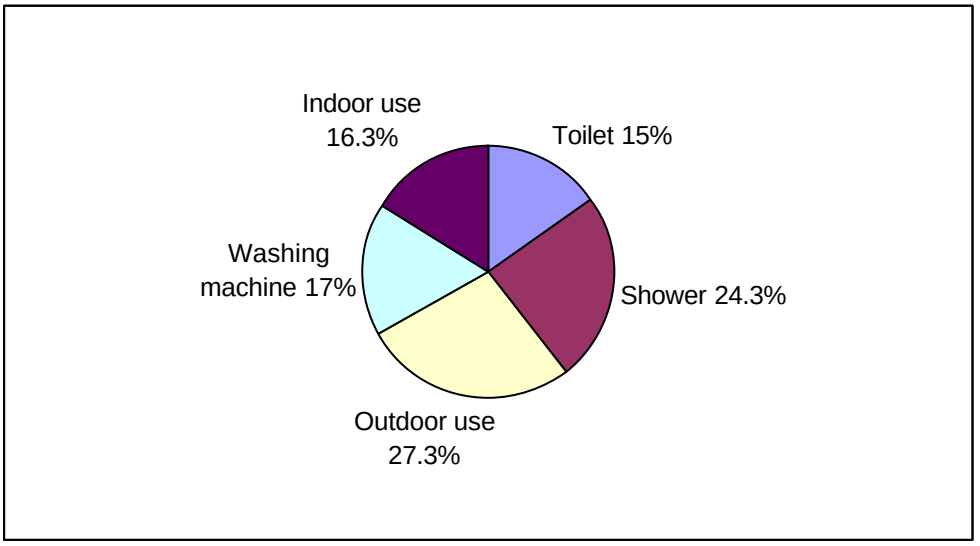
Figure 2: Total Demand Breakdown of Sydney Water Supplies, 2002/03.



Source: Sydney Water, *ESD Indicators and Environment Plan Report, Sydney Water Annual Report 2003*, at 10. Apparent losses include unauthorized consumption and metering inaccuracies.

An analysis of residential water usage by Sydney Water indicates that outdoor water use is the area of highest consumption, closely followed by showers. A breakdown of residential water use is shown in figure 3 below.

Figure 3: Breakdown of Residential Water Use – Sydney Water Corporation



Source: Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 6.

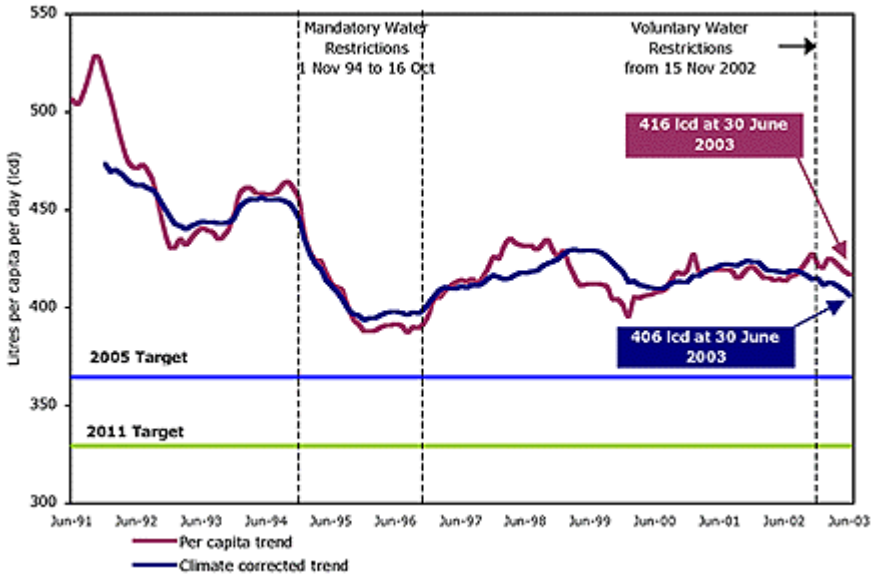
Average residential consumption is 245 kL per annum, with those in houses consuming an average of 285kL per annum and residents in units / flats consuming an average of 179 kL per annum. Over 60% of residential customers use less than 250 kL per annum.[7] Daily per capita water use

[7] Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 6.

has fallen from 506 litres in 1991 to 416 litres in 2002/03. Sydney Water notes that this reduction is due to a combination of factors including: reduced industrial demand; the introduction of user-pays pricing; changes in the housing mix; the introduction of dual flush toilets; and other demand management initiatives.

Demand management targets for water conservation purposes were first included in Sydney Water's 1995 Operating Licence. The current licence has two demand management targets (based on 1990/91 levels). The first is a 2005 target of a 28% reduction in per capita water consumption – 364 litres per capita per day. The second is a 2011 target of a 35% drop in per capita water consumption to 329 litres per day. Sydney Water does not expect the 2005 target to be met, and notes that the single largest factor affecting their ability to meed demand management targets over the last 12 months has been the effect of drought and above average temperatures. It notes that climate corrected water demand has shown a decreasing trend since 2002, and that climate corrected average daily demand was ten litres less than that actually observed. Daily water demand per person, both observed and climate corrected, since 1991 is shown in figure 4 below.

Figure 4: Daily water demand per person (12-month rolling average, litres per day), June 1991 to June 2003

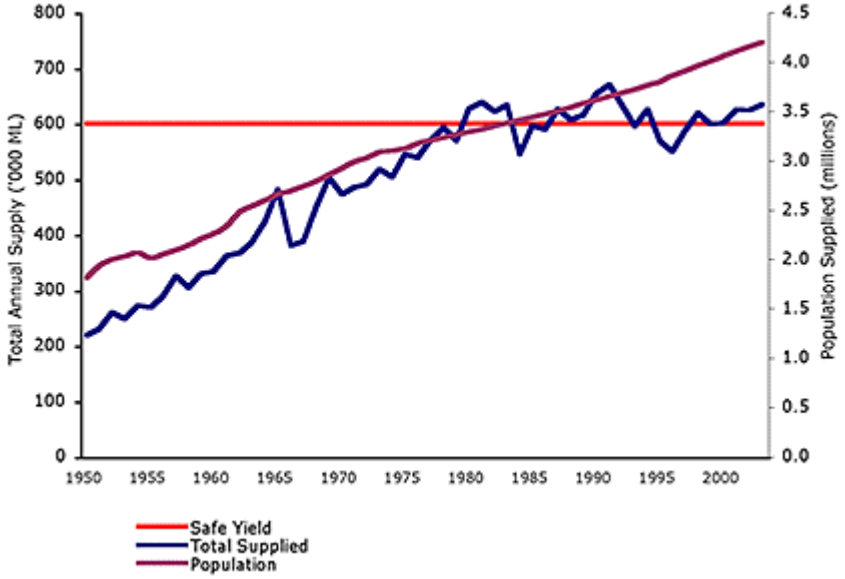


Source: Sydney Water, *ESD Indicators and Environment Plan Report 2003*, at 11.

The safe yield of Sydney's drinking water storages is 600,000 ML/year. The yield is defined as the amount of water that can be withdrawn from a reservoir on an on-going basis with an acceptably small risk of reducing the reservoir storage to zero. Figure five shows that demand has fluctuated around 600,000 ML/year since 1980, despite population increasing around 700,000 during this time. Sydney's water consumption has been above the safe yield for the last three years and for six of the last ten years. Sydney Water notes that whilst it is possible to exceed the yield in the short to medium term, it will ultimately result in an increase in water shortages and the need for earlier and more stringent imposition of water restrictions.[8]

[8] Sydney Water, *ESD Indicators and Environment Plan Report, Sydney Water Annual Report 2003*, at 12.

Figure 5: Total system releases figures since 1950 compared to population growth



Source: Sydney Water, *ESD Indicators and Environment Plan Report 2003,* at 11.

As noted, Sydney's population of 4.2 million people used 635,000 ML of water in 2002/03. Sydney's population is expected to increase to 4.5 million people by 2011 and almost 4.9 million by 2021, with more than 300,000 new dwellings likely to be needed to cope with this population growth. Sydney Water notes that with this increase in population, combined with a potential downward revision of yield to allow for environmental flows in the Hawkesbury Nepean River, will create a shortfall between supply capacity of around 540,000 ML/year and anticipated demand of 680,000 ML/year, of more than 140,000 ML/year.[9]

Also of considerable importance is the potential impact of climate change due to the enhanced greenhouse effect. For the Australian region it is anticipated that by 2030 there will be:

- A warming of 0.4 to 2.0^{0}C;
- A 10 to 50 per cent increase in days over 35^{0}C;
- Increased potential evaporation;
- Up to 15 per cent less rainfall year round in the south east of Australia;
- More years with serious rainfall deficiencies;
- Up to 15 per cent more summer rainfall on the east coast.

When projected annual changes in rainfall are combined with increases in potential evaporation, a pattern of decreasing water availability emerges for Australia. In years of serious rainfall deficiency, available water will evaporate more rapidly, leading to more severe droughts. Another implication of an increase in temperature and decrease in rainfall is an increase in urban water use.[10]

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9 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 2.

10 Pearman,G. *et al*, "Climate Change and its Projected Effects on Water Resources." In *Water – The Australian Dilemma*, The Australian Academy of Technological Sciences and Engineering, Academy Symposium, November 2003. Pearman is the Chief Scientist, CSIRO Atmospheric Research.

With these water resource constraints looming, in March 2003 the NSW Government released its urban water policy *Changing the Way We Think About Water*. The policy reaffirmed the Government's commitment not to build any new dams, and requires Sydney Water to:

- Continue to invest in demand management, and provide programs to low income households free of charge;
- Work with local councils and industry groups to make water smart buildings compulsory for new developments;
- Provide opportunities to recycle treated wastewater where it is environmentally and economically viable;
- Examine the feasibility of improving demand management by implementing a water efficiency trading scheme.

In an attempt to harness an 'all of government', as well as community and industry involvement in water conservation, the Government has also established three committees to consider aspects of demand management. These are:

- Hawkesbury-Nepean River Management Forum;
- Water Chief Executive Officers Taskforce;
- Water Expert Panel.

The Hawkesbury-Nepean River Management Forum is reviewing the environmental flow requirements needed to maintain river health. The Forum released a progress report in May 2003 which noted that the environmental flow options selected for further investigation could reduce the yield for consumptive purposes within a range of some 546 GL/year to 456 GL/year. The forum also noted that security of supply problems in relation to water supplies for the cities of Wollongong and Nowra and possibly the suburbs in the Sutherland Shire.[11]

The Water Chief Executive Officers Taskforce (Water CEOs), chaired by the Environment Protection Authority (now Department of Environment and Conservation), has the objective to develop and recommend a Sustainable Water Strategy for Sydney. Draft recommendations of the Strategy include:

- Mandate minimum water efficiency performance standards for appliances;
- Mandate appliance rating and labelling;
- Mandate minimum levels of water efficiency in new residential developments;
- Implement permanent low level outdoor water use conditions;
- Obtain a 15% reduction in Government agencies' water use;
- Review water pricing and tariff structures to send stronger conservation price signals to consumers and business;
- Implement mandatory planning controls requiring water fit for purpose approaches in new developments (eg rainwater tanks or recycled water where available);
- Increase business water reuse and recycling;
- Develop incentives for farmers to improve agricultural irrigation efficiency;
- Supply recycled water to irrigators along the Hawkesbury Nepean River to replace

11 Hawkesbury-Nepean River Management Forum, *Progress Report on Stage 3 of the Work Plan*, May 2003, at 21.

current river extraction;
- Introduction of a market based adjustment mechanism.[12]

Already some of these recommendations have been implemented or public debate about their merits promoted. For instance, mandatory minimum levels of water efficiency in new residential developments was announced in September 2003[13]. The Premier has mentioned several times that Sydney residents may have to 'get used' to having permanent low level outdoor water use conditions. In addition, the Government referred an investigation into price structures to reduce the demand for water in the Sydney Basin to the Independent Pricing and Regulatory Tribunal (IPART), due to report by 31 July 2004.

The Water Expert Panel is expected to build on the Water CEOs Taskforce strategy and develop a water balance strategy, due to be presented to the Premier in December 2003.

3.1 Demand Management

Sydney Water has several demand management programs currently in place, covering residential; business; water recycling and water leakage. These are discussed below.

Residential

- Residential indoor retrofit programs: - the 'Every Drop Counts' retrofit program began in January 2000 and offers householders the opportunity to have a plumber visit their house to install water efficient devices. Some 204,595 households have received the service, representing one in seven households. An evaluation of the program shows an average reduction in water use of 20,900 litres per household per annum. The program has: reduced water use by 4,276 ML/year; reduced household utility bills by $30 - $100 per year; and water savings have been shown to be sustained four years after retrofit;
- Outdoor water conservation program – 'Go Slow on the H_2O', this program has been delivered in spring each year since 2000, and is an educational program to promote water efficient gardening and other outdoor water use practices. Discount vouchers for water efficient products and promotional material was distributed to one million households with gardens throughout the Sydney Water operating area;
- Rainwater tank rebate program – research has shown that rain captured on roofs in rainwater tanks can reduce the demand on reticulated water supplies by between 20 and 50 percent, depending on the end uses of the stored water, tank size, roof catchment area and rainfall patterns. The rebate program aims to: assess whether a rebate incentive can stimulate an increase in tank installations; and to encourage tank purchasers to install larger size tanks and to connect them to either their toilets or washing machines. In October 2002 it was estimated that 45,000 properties in Sydney had rainwater tanks. The tank rebate program began in October 2002 and was originally due to expire on September 20 2003, but has been extended to June 2005. As at December 2003 Sydney Water had approved 2,407 rainwater tank rebates.[14] However, the uptake rate

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12 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 4.

13 "Premier Carr announces targets to slash water and energy use in new homes." *Media Release*, Hon Bob Carr Premier of NSW, 18 September 2003. From July 2004, all new homes are required to achieve a 40 per cent reduction in water consumption.

14 "Rainwater Tank Demand Surges as Sydney Embraces Water Conservation." *Media Release*, Sydney Water, 9 December 2003.

of customers connecting their rainwater tank to their toilets and washing machines is only about 4 per cent.

- Water efficient washing machine rebate program – this ran from June 5 2003 to 31 July 2003, and provided a $100 rebate to newly purchased 4A or 5A rated water-efficient washing machines. The aim of the program was to stimulate a permanent increase in consumer take-up of water efficient washing machines. From November 2002 to July 2003 the number of 4A and 5A accredited machines on the market increased from 11 machines to 88. By 8 August 2003 Sydney Water had received 5,862 applications for the $100 rebate;
- Public housing retrofit program – prior to the introduction of user pays tariff pricing in the early 1990s, public housing water consumption was consistent with average residential consumption. Since this time, public housing consumption has remained constant, while average private house consumption has reduced in response to the price signals. Currently the Department of Housing pay the full cost of public housing tenant's water accounts. Sydney Water and the Department of Housing are developing an agreement to retrofit up to 25,000 Department of Housing properties over the next six years. The agreement, still being negotiated, would see Sydney Water provide up to 12,500 retrofits to Department owned residential properties. The Department will then use the financial savings they make as a result of reduced water consumption to finance future retrofits by Sydney Water contractors;
- Residential landscape assessment program – this program, still being developed, aims to provide a garden tune-up and advisory service that targets Sydney's highest outdoor water consumers.

Business

The 'Every Drop Counts' Business program targets customers in the manufacturing, commercial, hospitality, education and government sectors. The program targets potential participants from the highest water using business sectors and individual high water users within these sectors. The program consists of the following elements: co-operative partnerships; identification of management barriers; identification of technical projects; employee awareness; and corporate citizenship. 144 customers have formally joined the 'Every Drop Counts' Business program, which accounts for nearly 25% of the total business sector water consumption.[15]

Water Recycling

In 1999 Sydney Water developed a Water Recycling Strategy, and based on this work, gazetted a Water Recycling Projection for 2000 – 2005 in May 2000. The projection indicated that the volume of water recycled from the sewerage system would increase by between 4 and 67 ML/day by 30 June 2005. A review of the strategy in 2003 noted that unless required as part of a sewerage treatment plant upgrade, water recycling schemes have been considered a viable public investment if full cost recovery could be achieved through a commercial agreement with recycled water customers. However, the fact that recycled water must often be priced to compete with potable water has limited the scale of the recycled water market that Sydney Water could viably service, and restricted the potential contribution of recycled water as a sustainable water source. A Recycled Water Program is due to be developed during 2003/04, which will indicate what recycled products will be provided to which markets and the schedule for delivering

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15 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 16.

to those markets over the next ten years.[16]

Since 1995, recycled water use has increased from 17 ML/day to 36 ML/day. Increased levels of water recycling during the previous 12 months has been due to: commissioning of stage 2 of the Rouse Hill Development Area, which added a further 7,000 houses to the recycled water supply system; the Gerringong-Gerrroa irrigation recycled water scheme commissioned in August 2002; increased recycled water use at Sydney Water's sewerage treatment plants; and greater irrigation demands for recycled water due to drought conditions. The volume of water recycled will increase by 20 ML/day in 2004, once the BHP industrial recycled water scheme is commissioned. The increase in water recycling has reduced potable water use by an estimated 2,451 ML/year.[17]

Despite these achievements, Sydney still lags behind other capital cities in recycling sewage water. For instance, Adelaide and Brisbane lead the way in recycling sewage, (11 and 6 per cent respectively), while Sydney recycles about 2.3 per cent. Of the large mainland cities, only Melbourne (2.0 per cent) has a lower recycling rate than Sydney.[18]

Leakage Reduction

Sydney Water notes that water leakage is a worldwide problem, with reticulated water leakage rates varying from 4% of demand in very well maintained systems, to 60% of demand, which occurs primarily in third world countries. Sydney Water currently has a leakage rate of 10.7% of demand, or 188 ML/day.[19] Reviews of various Australian water supply systems show a wide variation in leakage rates, varying from 7% to 35% of average annual demand, with an average of 18%.[20] As a comparison, Melbourne has a leakage rate of 8%[21], and Adelaide 7%.[22]

The Sydney Water leakage reduction program includes: active leak detection; pressure management; speed of repairs; and asset management. Sydney Water estimates that a sustainable reduction in leakage of 60 ML/day can be achieved through leak detection and repair. In late

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16 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 23.

17 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 24.

18 "NSW tops the national ladder for wasting water." in *The Sydney Morning Herald*, 30 March 2004. The article quotes figures from Dr John Radcliffe, Australian Academy of Technological Sciences and Engineering.

19 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 26.

20 Queensland Department of Natural Resources, *Improving Water Use Efficiency in Queensland's Urban Communities*, 2000, at 93. See: http://www.nrm.qld.gov.au/compliance/wic/pdf/reports/urban_wateruse/07_leakage_red.pdf, accessed February 2004.

21 Victorian Government, *Planning for the future of our water resources. Discussion Starter*, June 2001, at 14. See http://www.watersmart.vic.gov.au/downloads/Discussion_Starter.pdf, accessed February 2004.

22 SA Water, *SA Water Loss Fact Sheet*, see SA Water website, http://www.sawater.com.au/our_water_system/index.html, Accessed February 2004.

2003, with the introduction of water restrictions, the Corporation received adverse publicity about the leakage rate of its reticulation system. On 29 January 2004 the Corporation announced a 35 percent increase in funding to its program to upgrade and replace leaky water mains across its operating area. Sydney Water stated:

> The $10 million additional funding for the Mains Replacement Program brings to $38 million the amount being spent this financial year to replace mains in Sydney Water's 21,000 kilometre network of pipes. The increase would bring the total investment in leak detection and water main repairs and replacement to $74 million this financial year. This decision to reallocate funds to the mains renewal program by Sydney Water's Board will allow for an additional 19 kilometres of new mains to be laid.
>
> Sydney Water's Active Leak Reduction program, has seen Sydney Water inspect more than 40 percent of the water delivery network between 1999 and June 2003.
>
> This year, nearly $3 million has been allocated which will allow for 7,000 kilometres of mains to be inspected. At this rate, the entire water network will be checked every three years.[23]

The most successful demand management programs (in terms of water saved) have been: water recycling at sewerage treatment plants; leakage reduction programs; and the residential retrofit program. Estimates of the cost of the programs and water saved are shown in table 1 below.

Table 1: Sydney Water's expenditure on demand management and savings achieved.

Program	98/99 ($m)	99/00 ($m)	00/01 ($m)	01/02 ($m)	02/03 ($m)	Total outlay ($m)	Estimated savings (GL)
Residential	0.05	4.23	10.95	6.52	7.80	29.55	7.25
Business		1.15	1.0	0.46	1.80	4.41	1.88
Leakage reduction		0.30	1.00	2.37	1.90	5.57	10.22
Recycled water					0.23	0.23	14.57
Other		0.45	1.41	1.99	0.80	4.65	
Total	0.05	6.13	14.36	11.34	12.53	44.41	33.93

Source: Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 9.

4.0 RESPONDING TO DROUGHT

Sydney Water notes that its drought management plans are based on a five phase response strategy, where mandatory water restrictions come into force when total storage levels fall to 55% of capacity. Table 2 below shows these drought phases and the corresponding water restrictions.

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[23] Sydney Water, "35 percent funding boost to reduce leaking water mains." *Media Release*, 29 January 2004.

Table 2: Drought and Sydney Water Water Restrictions

Drought Phase	Restrictions	Total Storage Level (%)	Demand Reduction Level	Targeted Demand Reductions
1	None	> 65		
2	Voluntary Restrictions	65		
3	Level 1 Mandatory Restrictions	55	Level I	7%
	Level 2 Mandatory Restrictions	45	Level II	12%
		40	Level III	20%
	Level 3 Mandatory Restrictions	35	Level IV	30%
4	Level 4 Mandatory Restrictions	25	Level V	50%
5	Recovery			

Source: Sydney Water, Water Conservation and Recycling Implementation Report 2002 – 2003, at 77.

An outline of the restrictions is as follows:

- **Voluntary restrictions:** - apply to residential customers and involve: no use of sprinklers or watering systems between 8:00am and 8:00pm; no hosing of hard surfaces at any time.
- **Level 1 Mandatory Restrictions:** - apply to all Sydney Water customers (residential, business and government) and involve: no use of sprinklers at any time (excludes drip irrigation); no hosing of hard surfaces and vehicles at any time; exemptions may apply to some business, government and recycled water use.
- **Level 2 Mandatory Restrictions:** apply to all Sydney Water customers and involve: no use of sprinklers at any time; no hosing of hard surfaces and vehicles at any time; hand held hoses for garden watering only 2 days each week. Exemptions available for businesses, government and recycled water use will be reviewed based on savings achieved in Level 1.

On 11 September 2003 Sydney Water announced that Level 1 mandatory water restrictions would be introduced on 1 October 2003. It noted that the last time mandatory water restrictions were implemented was in November 1994, and remained in place until October 1996. Fines of $220 apply to those caught not heeding the restrictions.

Currently level 3 and 4 restrictions have not been defined. Sydney Water notes that it is difficult to define these restrictions before a review of the demand reductions achieved from level 2 restrictions. However, as an indication of what these restrictions may involve, Goulbourn City Council (now Greater Argyle Council) implemented level four water restrictions on 1 March 2003. Their restrictions were:

Residential

- All hoses to be disconnected;
- Lawns – town water banned;
- Gardens – town water banned;
- Hosing driveways, pavements, walls and roofs – town water banned;
- Car washing – town water banned.

Business:

- Pools & spas - (Ancillary to business, motel)- town water topping up & filling banned;
- Public gardens (excluding Belmore Park)- town water banned;
- Landscaping to building & properties - town water banned;
- Fountains - town water banned;
- Nurseries, market & commercial gardens - Sprinklers/hand watering limited to one hour per day;
- Active playing surfaces - sprinklers/hand watering limited to one hour per day;
- Brick cleaning, carpet cleaning, pest control, painting preparation - high pressure cleaners permitted - must demonstrate 50% recycling capability;
- Paved public areas - washing for health & safety reasons - bucket only;
- Vehicles - washing for health & safety reasons - bucket only;
- Car washing and detailing - Must submit a water management plan;
- Car yards - one wash per week;
- Earthworks - town water banned - recycled water available;
- Building / Construction / Maintenance - Hoses banned - bucket only[24]

Sydney Water and the Sydney Catchment Authority have formed a joint Drought Management Committee, which advises the Minister for Sydney Water on mandatory restrictions. Investigations by the Committee suggest that even a 20% demand reduction will be difficult to achieve. It is also noted that the emphasis on restrictions is primarily on outdoor discretionary water use. The introduction of permanent outdoor water usage conditions, alternative supplies for garden watering and other outdoor demand management initiatives will harden outdoor water demand. This means that it will be more difficult to reduce demand in times of drought and may require more stringent restrictions to be invoked to achieve required demand reductions or the introduction of additional contingency supplies during drought.[25]

A Drought Expert Panel has also been formed with representatives from Sydney Water, the Sydney Catchment Authority, and the Department of Infrastructure, Planning and Natural Resources. The Panel was established to identify and assess alternative water supply options that can be progressively implemented as the current drought enters the 'Emergency Phase'. The Panel has identified over 30 alternative supply options and ranked these according to cost, timeliness, feasibility, implementation risk and long term fit. The three main options that are likely to supply the quantities of water needed to maintain supply are:

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24 Goulburn City Council, "Level Four Water Restrictions." *Media Release*, 3 March 2003. See http://www.goulburn.nsw.gov.au/news/1046644586_12065.html, accessed February 2004.

25 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 79.

- Use of available water in the 'dead storages' (the zone which lies below the available outlets of the dams). There is approximately 241,000 ML in the dead storages in Warragamba, Nepean and Avon dams. While the water quality is expected to be poor, it represents an additional 10% storage;
- Accessing groundwater;
- Desalinisation – this presents the only long term large volume alternative source of water. However, there are significant environmental and financial constraints relating to the operating costs of the plant, the energy used and the brine discharge.[26]

4.1 Augmenting Sydney's Water Supplies

With the onset of drought and water restrictions, public debate on permanently augmenting Sydney's water supply invariably arises. The most controversial way of doing this is to build a new dam on the upper Shoalhaven River, at a location called Welcome Reef. An environmental impact statement was released to this effect in March 1980, and for over 30 years successive State Governments have been buying land in the area with the intention of building the dam. Water from the dam would be sent downstream to Tallowa Dam, which was built in the 1970s. From there, it would be pumped up the escarpment into metropolitan dams as does water from Tallowa Dam presently. The full capacity of the proposed dam is 2680 gigalitres – 600 billion litres more than stored in Warragamba Dam.

However, recent modelling for the Independent Expert Panel, chaired by Mr Bob Wilson, has indicated that the Welcome Reef Dam is not the panacea for Sydney's water supply that many are claiming. For instance, the surface area of the proposed dam would be more than 15,000 hectares, much greater than Lake Burragorang, resulting in significant evaporation. Assuming there is no evaporation at Welcome Reef and no water is allowed to travel down the Shoalhaven River while it is filling, it would take about a decade for the dam to fill. Bob Wilson was reported as saying: "It's not a wise place for a dam because it hasn't got a high rainfall. It would ruin some lovely landscapes and it would ruin the gorge country from Welcome Reef down to the existing Tallowa Dam. It will devastate the Shoalhaven River valley. The tourist and fishing industries rely on that river, as does the city of Nowra."[27]

Already, water quality in the lower Shoalhaven River, downstream from Tallowa Dam, is poor, with less than 25 per cent of samples meeting the criteria for aquatic ecosystems. A report by the NSW Department of Land and Water Conservation noted:

> Construction of the proposed Welcome Reef Dam on the upper Shoalhaven River would severely affect the frequency of spills from Tallowa, the quantity of downstream flows and the ecological health of the Lower Shoalhaven River.[28]

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26 Sydney Water, *Water Conservation and Recycling Implementation Report 2002 – 2003*, at 81.

27 "Filling dam would dry up river for a decade, says expert." in *The Sydney Morning Herald*, 15 November 2003.

28 NSW Department of Land and Water Conservation, *Stressed Rivers Assessment Report, Region: South Coast, Catchment Shoalhaven*. August 1999 at 39.

As noted, it is current Government policy not to build the Welcome Reef dam, and in fact with the passage of the *National Parks And Wildlife Amendment (Transfer Of Special Areas) Act 2001*, new natures reserves have been declared on land originally bought for the dam.

5.0 WATER SUPPLY IN RURAL AND REGIONAL AREAS

In NSW in 2001/02 there were 129 water utilities, comprising:

- 3 metropolitan utilities (Hawkesbury Council, Hunter and Sydney Water Corporations); and
- 126 non-metropolitan Local Water Utilities (LWUs).

Of the 126 non-metropolitan Local Water Utilities, 107 were responsible for both water supply and sewerage, eight for water supply only and 11 for sewerage only. The total annual water consumption for the LWUs was 337,000 ML, with total water and sewerage turnover of $736M and current replacement value of assets was $9,800M. The utilities served 1.73 million people.[29]

In January 2004 the Government announced that water levels in rural and regional dams were at 38 per cent of capacity. Two communities, Carters Opal Fields near Walgett and Bribbaree near Young are having water carted to meet their residents' basic needs, and 42 towns across the State have water restrictions in place. Storage levels by region are presented below:

- Murray Valley – dam levels are at 52.9 per cent of capacity;
- Lower Darling Valley – dam levels at Menindee Lakes are at 2 per cent;
- Murrumbidgee Valley – dam levels are at 49.2 per cent;
- Lachlan Valley – dams are at 15.8 per cent;
- Macquarie Valley – dam levels are at 30.2 per cent;
- Namoi Valley – dam levels are at 14 per cent;
- Gwydir Valley – dam levels are at 12 per cent;
- Border Rivers – dam levels are at 26.8 per cent
- Bega River – Brogo dam is near full;
- Casino area – Toonumbar Dam is at 31 per cent (compared to about 18 per cent 12 months ago).[30]

In July 2003, in announcing the release of a water supply and sewerage performance monitoring report by local water utilities, a media release by Minister Sartor noted that in the 11 years to 2001/02, country households have slashed their average water consumption by 90,000 litres per year, from 330,000 litres to 240,000 litres.[31] However, closer examination reveals that annual average residential water consumption fell to 220,000 litres in 1996/97, and has since climbed up to 240,000 litres in 2001/02, a consumption level not experienced since 1994/95. Figure six below shows annual average consumption in the local water utilities since 1991.

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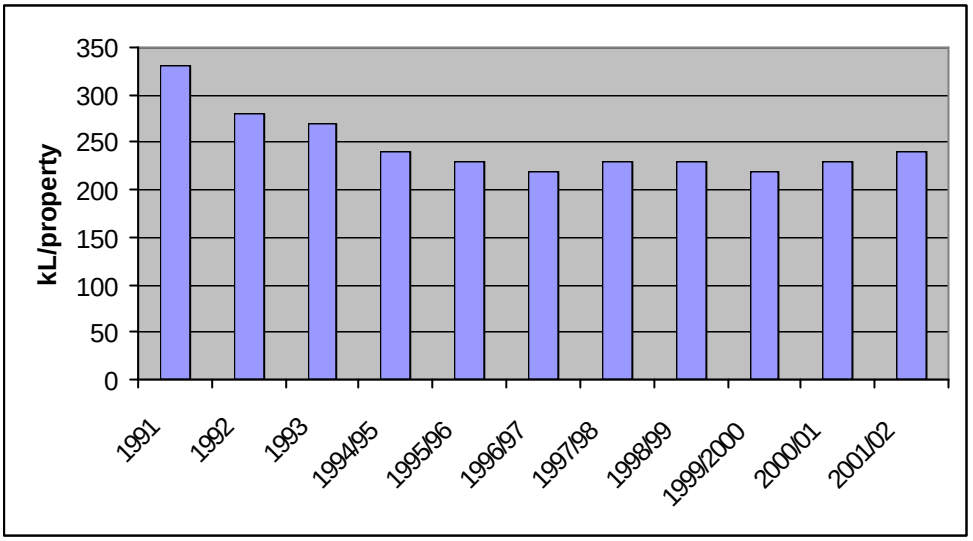
29 New South Wales Government, Ministry of Energy and Utilities, *2001/02 NSW Water Supply and Sewerage, Performance Monitoring Report*, 2003.

30 Hon Bob Carr MP, Premier of NSW, "Rural Water Supplies Plunge to 38 per cent." *News Release*, 9 January 2004.

31 Hon Frank Sartor, Minister for Energy and Utilities, "Country NSW heeds call to save water: Minister." *Media Release*, 31 July 2003.

Figure 6: Annual Average Water Consumption (k/L per property) for 126 non-metropolitan Local Water Utilities



Source: New South Wales Government, Ministry of Energy and Utilities, *2001/02 NSW Water Supply and Sewerage, Performance Monitoring Report*, 2003, at xxxviii.

Reuse of recycled water was carried out by 41 per cent of local water utilities, mostly for agriculture. In total, for all treatment works, about 13 per cent of effluent was recycled, whilst 17 utilities recycled over 50 per cent of their effluent.[32]

6.0 WATER PRICING

In December 2003 the Independent Pricing and Regulatory Tribunal (IPART) released an Issues Paper into water pricing to reduce the demand for water in the Sydney area. The Tribunal noted that it was only in 1992 that water pricing comprised a mixture of components including: property based charges; pre-paid water allowances; fixed charges and usage charges. In 1993 the Government Pricing Tribunal (the predecessor to IPART) conducted an inquiry into the pricing of water. Key recommendations that have been implemented since that inquiry include:

- Two-part tariffs, incorporating a fixed component and a component that varies with usage;
- Cost reflective pricing – linking prices paid by customers to the cost of service delivery;
- The removal of cross-subsidies between different customer classes and types of services;
- Removal of property value based charges in favour of user based charges for all services; and
- Removal of all pre-paid water allowances.[33]

IPART then canvassed two key economic principles that impinge on water pricing. The first is efficiency and marginal costs. This economic theory suggests that the efficient price for a given

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32 New South Wales Government, Ministry of Energy and Utilities, *2001/02 NSW Water Supply and Sewerage, Performance Monitoring Report*, 2003, at xvi.

33 Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 7.

product equals its marginal costs – which is the cost of producing an additional unit of that product. For water, the theory assumes that people will consume more and more water until the price of additional water outweighs the benefits. In its calculations, the Tribunal uses long run marginal costs, which also reflects the costs of capital investments that will be needed to augment supply, as well as incorporating environmental, social and political factors. IPART noted the difficulty in calculating the long run marginal costs of water supply due to the number of variables involved. However, of greater importance, it noted debate about whether customers respond to average or marginal prices. In terms of average prices, this approach assumes that customers look at the total of their periodic bills and decide whether to use more or less water on the basis of this one (average) price signal, rather than breaking their bill down into components and considering the marginal price effects. Preliminary modelling by IPART suggests that if customers respond to marginal prices, then the impact of alternative price structures on water consumption may be substantial. If customers respond to average price structures, changes in demand are likely to be relatively subdued.[34]

The second economic principle canvassed by IPART was that of price elasticity of demand. This measures the percentage change in quantity demanded (eg, quantity of water used) which is brought about by a change in price. Where a small change is price results in a large change in quantity demanded, demand is said to be elastic. Where a small increase in price has little to no demand, demand is said to be inelastic. After reviewing Australian and international research into the price elasticity of demand for water, for their economic modelling IPART has assumed that for residential customers in response to a 1.0 per cent increase in the average price of water: low water consumers will reduce their water consumption by between 0.01 and 0.05 per cent; medium water users will reduce their consumption by approximately 0.2 per cent and high water users by 0.3 per cent.

IPART then outlined three possible water pricing scenarios, but notes that the prices quoted are unlikely to be applicable when the Tribunal next sets prices in 2005. The scenarios were:

- Scenario 1: a higher usage charge offset by a removal of the fixed access charge, so that customer water bills are more directly linked to the amount of water used;
- Scenario 2: an 'inclining block tariff', where customers initially pay a low (tier 1) usage charge, but then pay a higher (tier 2) usage charge after a usage quantity of 400 kilolitres per annum is reached;
- Scenario 3: the same structure as scenario 2, but the tier 2 charge applies after consumption of 300 kL/pa.

Table 3 summarises the analysis of the three scenarios.

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34 Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 22.

Table 3: Summary of the three IPART scenarios

Scenario	Fixed access charge	Tier 1 usage charge	Tier 2 usage charge	Step quantity	Effect on total water consumption	
					Average price response	Marginal price response
Current prices	$76.55	0.98	n.a	n.a	n.a	n.a
Scenario 1 – Increased usage pricing	$0.00 (-100%)	$1.30/kL (+33%)	n.a	n.a	-9.65 GL/pa	-24.35 GL/pa
Scenario 2 – Inclining block tariff	$57.41 (-25%)	$0.98/kL	$1.75/kL	400 kL	-9.84 GL/pa	-25.24 GL/pa
Scenario 3 – Inclining block tariff	$57.41 (-25%)	$0.98/kL	$1.45/kL	300 kL	-8.85 GL/pa	-24.93 GL/pa

Source: Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 19. Total water consumption includes the effect on both residential and non-residential customers.

Whilst all three scenarios may result in broadly similar savings in water consumption, the price impacts on customers differ significantly. Scenario 1, with removal of the fixed charge, results in significant savings to customers with low levels of water consumption and comparatively more modest increases in price for high volume water users. Scenario 2, an inclining block tariff with a 400 kL/pa step point, results in modest bill reductions for the majority of consumers, including many with above average consumption, but significant increases for very high volume water users. Scenario 3, an inclining block tariff with a 300 kL/pa step point, also results in bill reductions for the majority of customers but increased bills would affect a greater proportion of customers than scenario 2.[35]

The Tribunal was also required to consider the use of a wholesale step price for the bulk water purchased by Sydney Water from the Sydney Catchment Authority. Under this price structure, Sydney Water would pay:

- A tier 1 price for the first block of its water consumption up to the step quantity which would be set at the sustainable yield of the catchment;
- A higher price – the tier 2 price, for consumption above the step quantity.

[35] Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 20.

The tier 2 price could effectively act as a 'penalty' price if it is set at a level which precludes Sydney Water earning a commercial return on the retail sale of water purchased above the step price. In effect, the use of a tier 2 price opens up a market for demand management and supply augmentation where these can deliver water or water savings below the tier 2 price. IPART noted that increasing the financial incentive for Sydney Water to engage in water conservation acknowledges that it has a unique position in the market for estimating the costs and likely effectiveness of water conservation strategies. Some key areas identified where Sydney Water is likely to have an advantage for water conservation include:

- Targeting and reducing water delivery leakage;
- Reducing water usage in sewerage treatment processes;
- Conducting customer education and water use reduction targeting; and
- Implementing water restrictions.

The flexibility created by the introduction of a tier 2 wholesale step price allows the Tribunal at future price determinations to increase or decrease the incentive placed on Sydney Water, based on an assessment of its performance at achieving demand management and sourcing alternative water supply such as recycled water.[36]

7.0 THE FUTURE OF WATER SUPPLY

In 1994 Sydney Water, (then the Water Board) funded four environment groups to critically review aspects of the organisation's water and wastewater management. The result, *The Sydney Water Project*, recommended what were, at the time, some far reaching actions for Sydney Water. Today, some ten years later, many of the recommendations are now accepted as 'commonplace'. Recommendations of what actions Sydney Water should pursue over the next decade (ie from 1994) from the Project included:

- No inter-basin transfers to augment supply;
- Cessation of planning for new water supply dams or augmentation of existing dams;
- Sewer mining and other re-use schemes to provide alternative supplies;
- Water efficiency and other conservation measures for domestic and commercial customers;
- Dual reticulation and onsite stormwater retention for new developments;
- Water audits and retrofitting for existing buildings;
- Reducing the volume of sewage flows;
- Greater capture of biosolids;
- Moves to localised (decentralised) systems and individual systems;
- Prototypes of preferred systems in greenfield and urban renewal projects that promote the recycling of water and community self-sufficiency in water supply.[37]

As noted, many of the above recommendations have been implemented by Sydney Water, and the Government has stated its policy that no new dams will be built. However, inter-basin

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36 Independent Pricing and Regulatory Tribunal of New South Wales, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin. Issues Paper*, 2003, at 42.

37 Sydney Water Project, *A New Course for Sydney Water. The Final Report of the Sydney Water Project*, 1994, at 100.

transfers are still carried out (notably from the Shoalhaven River to the Sydney catchment), especially during periods of drought. The *Sydney Water Project* recommended that inter-basin transfers should not be used to augment supply for the following reasons:

- They permit the unsustainable use of the resource;
- The continued reliance upon dams discourages the development of ecologically sustainable initiatives, such as demand management and effluent re-use;
- Increased opportunities for pest species to extend their distribution into previously unaffected areas;
- Periodic release of large volumes of water to the waterways connecting the catchments has adverse ecological impacts on them;
- Reduced river flow in the catchment of origin could result in environmental impacts;
- Reduced river flow in the catchment of origin may disadvantage those whose livelihoods depends on the maintenance of a healthy riverine ecosystem (such as the commercial fishing industry);
- Inter-basin transfers have the potential to encourage ecologically unsustainable urban growth in the receiving catchment.[38]

One of the more topical issues in regard to water supply and sewerage infrastructure is that of sustainability and moves towards localised and individual systems. This was a key area of investigation for the Legislative Assembly Standing Committee on Public Works inquiry into urban water infrastructure. The Committee compared the traditional centralised water reticulation and waste water systems to alternative technologies. It was noted that alternative approaches and solutions range from simple items, such as rainwater tanks and the better integration of current reticulation systems, to fully independent on-site water systems. Alternative approaches aim to integrate all elements of urban water services, reducing water use and reusing water wherever possible. Generally, they aim to deliver the water service as close as possible to the source, to be more localised in nature, without extensive transport networks, and hence benefit from reduced pipeline costs.[39]

The Committee, in evaluating the performance of traditional centralised systems against alternative systems, noted the advantages and disadvantages for both as follows:

Table 4: The Comparative Advantages and Disadvantages of Traditional and Alternative Water Systems.

Traditional - Centralised	
Advantages	**Disadvantages**
Public health protection	Heavy initial capital costs
Freedom from householder responsibility	Built-in inflexibility; risks form changes in growth forecasts; not responsive to rates of development.
Known performance	Environmental problems

38 Sydney Water Project, *A New Course for Sydney Water. The Final Report of the Sydney Water Project*, 1994, at 70.

39 NSW Legislative Assembly Standing Committee on Public Works, *Interim Report on Urban Water Infrastructure*, Report No 52/11, December 2002, at 16.

Predictable costs	Existing ratepayers pay for future use.
	Wasteful of a valuable but limited resource.

Alternative - Decentralised	
Advantages	**Disadvantages**
Flexibility: build as you need, pay as you go.	Community uncertainty
Less capital upfront	Limited performance information
Reduces forecasting risk	Public health questions
Environmental protection	
Full utilisation of valuable but limited resource.	

The Standing Committee on Public Works was 'swayed' by the advantages of alternative systems, and agreed with the CSIRO's observation of the important role of alternative approaches in delivering urban water sustainability. CSIRO noted:

> The introduction of more diversity in the configuration of systems by embracing new technologies and techniques, and ensuring that there is more integration and greater interaction between water services will lead to more socially acceptable and environmentally friendly outcomes. This new approach based on decentralisation and integration is put forward as a key to moving forward along the path to sustainable development.[40]

The Committee concluded that if sustainability is one of society's underpinning values, a new paradigm for urban water for the 21st century needs to be set in train. The key characteristics of this new urban water paradigm are integrated urban water management and a closed loop system. Traditionally we have installed a 'once through system', which involves taking water from a dam, using it once, and then disposing of it. By contrast, the objective of the closed water system is to reduce the net total loss of water from the system. For instance, stormwater could be used as a source of supply for non-potable uses, resulting in a reduced demand for potable supply. Alternatively, wastewater could be reused on site and stormwater used for riverine environmental flows. Similarly, the objective of the integrated urban water management approach is to take a holistic view of the system. The concepts of integrated water management and a closed loop system can be used together to provide a sustainable urban water system.[41]

The Committee noted that whilst existing large scale centralised systems as they operate are unsustainable, they will continue to be an integral part of the provision of water services in urban areas for some considerable time. This is because: the systems are already in place and represent a considerable investment; much of the infrastructure still has considerable operating life; and finally, these systems can, with the addition of some alternative solutions, be made to operate

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40 NSW Legislative Assembly Standing Committee on Public Works, *Interim Report on Urban Water Infrastructure*, Report No 52/11, December 2002, at 25.

41 NSW Legislative Assembly Standing Committee on Public Works, *Interim Report on Urban Water Infrastructure*, Report No 52/11, December 2002, at 25. Evidence of Dr Andrew Speers, CSIRO, to the Committee.

more sustainably. However, the Committee concluded that the focus now has to move to adopting more sustainable approaches, and that the challenge lies in how to create the right circumstances and give the right signals to ensure that this happens as soon as possible. The Committee identified a number of issues that will need to be addressed and resolved for change to occur. These were:

- Health – a critical issue, requiring health regulators to be proactive in assessing alternative approaches;
- Strategic policy focus – the large number of government agencies involved in delivering water services across the State has led to confusion and undermined coordination. Strategic forward planning is required;
- Research – to expand the knowledge of alternative systems so that informed balanced evaluations can be made.[42]

8.0 CONCLUSION

Sydney has a finite supply of water, with a sustainable yield from its catchment sources of 600,000 ML per year. However, this yield may be reduced with the introduction of greater environmental flows for the Hawkesbury-Nepean River. Whilst the supply of water is static or potentially decreasing, the population of Sydney is increasing at a rate of around 50,000 people per year. To avert a water supply crisis in the longer term it is evident that the amount of water consumed per capita needs to be reduced, or a new dam built. Sydney Water has in its operating licence two benchmarks to reduce per capita water consumption. It is unlikely the first benchmark in 2005 will be met, and considerable work will need to be done to achieve the 2011 benchmark of a 35 per cent drop in per capita water consumption.

With a finite supply of water, we need to 'think smarter' about managing the urban water cycle. Modern concepts of urban sustainability point to greater integration of reticulated potable water, waste water and stormwater. How these three resources are best utilised will vary according to locality and community. It is evident that government leadership and a strong community partnership is required for sustainable urban water management to come to fruition.

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42 NSW Legislative Assembly Standing Committee on Public Works, *Interim Report on Urban Water Infrastructure*, Report No 52/11, December 2002, at 27.

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