AUDITOR-GENERAL'S REPORT

PERFORMANCE AUDIT

Planning for Sydney's Water Needs

The Legislative Assembly
Parliament House
SYDNEY NSW 2000

The Legislative Council
Parliament House
SYDNEY NSW 2000

In accordance with section 38E of the *Public Finance and Audit Act 1983*, I present a report titled **Planning for Sydney's Water Needs: Department of Infrastructure, Planning and Natural Resources, Sydney Water Corporation, Sydney Catchment Authority.**

R J Sendt
Auditor-General

Sydney
May 2005

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Foreword

Reliably supplying water to our State's principal city, Sydney, is a major responsibility for the Government.

The community has been made keenly aware in recent years that inflows have been decreasing, and that Sydney has been using more water than is available. In April 2005 the water in Sydney's storages dropped to 41.5 per cent of their capacity – the lowest level since the construction of Warragamba dam in 1960.

As Sydney continues to develop, it is expected that the demand for water will increase. The way that we use it will need to be sustainable, as it has a direct impact on our economy, our lifestyle and our environment.

In planning for the future the State's water agencies face a range of uncertainties. But the task is vital.

This report informs Parliament and the community on the progress made - and what remains to be done - to ensure a reliable water supply for Sydney.

Bob Sendt
Auditor-General

May 2005

Executive summary

Executive summary

The adequacy of Sydney's water supplies is a significant public health, quality of life, conservation, and economic development issue.

Our audit looked at whether State water agencies had appropriate and adequate arrangements for ensuring a reliable supply of water to meet metropolitan demand requirements. We focused primarily on Sydney's long-term requirements, not the drought being currently experienced.

Audit Opinion

Sydney has been using more water than its storage system can continue to provide. Sydney's water scarcity is not simply a problem related to drought. Sydney's water supplies are increasingly inadequate to meet long-term metropolitan demand requirements.

While it is possible to over use water in the short to medium term, the long-term effect is an increase in water shortages and the need for earlier and more stringent water restrictions.

State water agencies have made significant progress towards integrating all aspects of planning for Sydney's water supply and the *Metropolitan Water Plan 2004* is a comprehensive plan to close the gap between supply and demand.

The *Plan* is based on one specific set of assumptions. If other assumptions are used, the risk of water shortages would be different to that indicated in the *Plan*. Critical areas of uncertainty and risk in relation to Sydney's water include the impact of climate change, population growth, future reductions in water consumption, future savings from recycled water, and the future yield of the water supply. This means that the water agencies need to ensure the way forward is flexible and robust to cope with a range of possible futures.

In looking ahead, much still needs to be done. Despite a necessarily high level of uncertainty and risk associated with the *Plan*, there is no explicit risk management plan. Although risks were considered and an 'adaptive' approach is being followed, planning did not identify or examine a worst-case scenario and there are no assurances in that regard.

We believe that legislative and organisational arrangements relating to Sydney's supply/demand balance need to be further clarified to formalise accountability for its oversight, and responsibilities clarified to ensure the adequacy of supply.

We also believe that State water agencies need to adopt a greater level of transparency and engage with the public more in addressing the water supply/demand balance, recognising that the measures being adopted will have widespread impact.

Recommendations

We recommend that the Department of Infrastructure, Planning and Natural Resources, Sydney Water, Sydney Catchment Authority and related water agencies:

Planning for water security

- continue to develop and integrate all aspects of planning for Sydney's water in accordance in accordance with the principles agreed to by COAG in the *National Water Initiative*. This would incorporate:
  - demand management measures and pricing
  - leakage reduction
  - surface waters, ground water, sewage effluent, grey water and stormwater (page 40)
- improve the monitoring of water use in Sydney, including a review of the socio-economic and environmental merits of increased direct metering - given its capability to influence demand (page 31)
- further evaluate the potential for leakage reduction measures to improve the efficiency of Sydney's water supply system (page 32)

Identifying and managing the risks

- use better practice risk management processes (such as the Australian standard for Risk Management AS/NZS 4360:2004) to develop contingency measures, including those to address worst-case scenarios (page 51)

Ensuring oversight and accountability

- review the legislative and organisational arrangements relating to Sydney's water supply/demand balance to further clarify and formalise:
  - the full set of accountabilities for its oversight and how they are to be integrated
  - responsibilities to ensure the adequacy of supply
  - arrangements to facilitate private sector involvement in recycled water (page 56)
- implement a greater level of engagement of the public in:
  - the development of demand management strategies
  - the reliability of water supply
  - water pricing
  - appropriate balance between demand and supply-side options (page 58)
- publish an information paper to ensure the public has sufficient information on these aspects and publicly release the documents supporting the *Metropolitan Water Plan 2004* and its periodic review (page 58).

Key audit findings

Chapter 1: Introduction

- Sydney's demand for water has remained relatively stable over the past 20 years, even though the population has increased by over 750,000 people. Consumption has been fluctuating around the current yield figure of 600 GL a year, but consumption is projected to increase.
- Sydney's future water demands are likely to increase due to population growth and economic development. Current population estimates by the Department of Infrastructure, Planning and Natural Resources indicate that Sydney will reach almost 4.5 million people by 2011 and 4.9 million by 2021.
- The Sydney Catchment Authority estimates yield using a computer model. When it updates the model to account for the present drought, the yield of the water supply may be found to be considerably less than the 600 GL per year used in planning. The supply of water is likely to be further reduced by the impact of long-term climate change on inflows into dams and the need to increase environmental flows, particularly for the Hawkesbury-Nepean River. The expected increases in the yield, arising from the new supply measures in the Plan, may also be less than assured.

Chapter 2: Planning for water security

- Sydney's shortage of supply is not due to any long-term lack of water in its catchments. Almost all (97%) of Sydney's water has been drawn from its Hawkesbury-Nepean catchment, with most (80%) of that from the Warragamba dam. Relatively little is drawn from its neighbouring Shoalhaven catchment. It lacks adequate facilities to capture and contain this water. But the *Metropolitan Water Plan 2004* will change this. Prior to the *Plan* there was no process to balance water conservation and re-use initiatives, generally proposed by Sydney Water, against supply side options, such as available to the Sydney Catchment Authority.
- The State water agencies are developing a more integrated approach to planning Sydney's water supply. The *Metropolitan Water Plan 2004* does not do this alone. It needs to be interpreted and integrated within the context of a range of other plans and policies, including a number (such as the *Sydney Metropolitan Strategy*) that are still to be developed. There is a need to continue to develop and integrate the planning for Sydney's water supply, preferably in one readily accessible set of documents.
- The *Metropolitan Water Plan 2004* identifies a range of measures designed to close the impending gap between supply and demand. It states that if per capita consumption remains at current levels and nothing is done to reduce demand, we will need to find an extra 200 GL of water each year within 25 years. Significant factors include population growth, drought, climate change and river health.

- However, while the *Plan* is designed to increase water releases to the Upper Nepean, it delays a final decision on releases from Warragamba Dam to further improve the health of the Hawkesbury-Nepean River. Potentially this would increase the gap to a figure in excess of 300 GL of water each year.
- The *Metropolitan Water Plan 2004* plans some increased supply, but places considerable reliance on water conservation programs, higher water prices and some recycling. There is considerable uncertainty associated with demand management measures that rely on consumer behaviour, and on price increases, which also depend on consumer responsiveness.
- Audits undertaken for IPART in 1999 and 2000 first identified that Sydney Water did not appear likely to achieve either the 2004-05 or 2010-11 water conservation targets. In the last five years the total savings from all demand management programs implemented since 1999 was estimated at 29 GL per year, with most savings from detecting and repairing leaks.
- Metering encourages consumers to consider their use of water, partly by allowing them to understand how much they are using. In the longer term it should discourage high use and encourage consumers to adopt more water efficient practices. But a large and increasing proportion of water consumers are not directly metered. Sydney Water has argued that the costs of installing individual meters in existing properties, and the associated billing costs, would be uneconomic.
- The *Plan* recognises the need to bring recycled water into the existing water resource management framework and to review its regulation and guidance to ensure that developments will not create environmental or health problems.

Chapter 3: Identifying and managing the risks

- Despite the considerable uncertainty associated with population projections for Sydney, the *Metropolitan Water Plan 2004* focuses only on the medium population forecast. Although we have been advised that the higher forecast was considered, the *Plan* does not consider how to ensure adequate water should the high forecast eventuate.
- Despite the use of a more conservative approach, there remains a considerable risk that future reductions in water consumption will not materialise. Despite considerable efforts by Sydney Water, demand reduction programs have failed to meet targets set in the past. While Sydney Water now has more experience with such programs, cost and performance estimates are likely to be relatively uncertain, with limited assurance as to the extent or timing of any savings.

- While the new *Metropolitan Water Plan 2004* has placed considerable reliance on the future use of recycled water, Sydney Water has had limited success in this area in the past. Pending the development of the strategy for recycled water, the future of private sector involvement and consumer response, the eventual reductions in demand on Sydney's water supply are necessarily quite uncertain.
- The new supply measures announced in the *Metropolitan Water Plan 2004* should increase the yield. But there is a degree of uncertainty about the ability to regularly pump additional water from the Shoalhaven without increasing storage capacity on the Shoalhaven.

Chapter 4: Ensuring oversight and accountability

- A committee led by the Department of Infrastructure, Planning and Natural Resources is to report annually on the progress of the implementation of the *Metropolitan Water Plan 2004* to the ad hoc sub-committee of Cabinet that approved it. However, as a result of changes in administration over the last decade, no agency has a statutory responsibility to ensure the long-term match of water supply and demand for Sydney.
- The *Metropolitan Water Plan 2004* contains little planning or implementation detail. There has been limited public consultation and transparency associated with the preparation of the *Metropolitan Water Plan 2004*. The supporting detail has not been released. This can in part be attributed in part to the urgent need to develop measures to counter Sydney's falling water supply in a serious drought.

Joint agency response to the performance audit report on Sydney's Water Supply from the Department of Infrastructure, Planning and Natural Resources, Sydney Water and The Sydney Catchment Authority

SUMMARY:

- ⇒ *The Audit Office's report states that the NSW Government's Metropolitan Water Plan is a "comprehensive plan to close the gap between supply and demand."*
- ⇒ *The Metropolitan Water Plan is the first time that a systematic plan has been developed for Sydney's water demands and supply with a long-term horizon.*
- ⇒ *It contains major new initiatives to: manage the current drought; provide new infrastructure for long-term water supplies; increase water recycling; reduce demand; and improve river health.*
- ⇒ *The Plan was developed using a risk-based approach and is explicitly an "adaptive" plan, which will be modified as new information comes to light. The Audit Office commends this as a "flexible and robust" way forward.*
- ⇒ *The Metropolitan Water Plan relies on a mix of actions to reduce demand, and actions to increase supply. Its estimates of water savings from reducing demand are sensible and conservative.*
- ⇒ *The mix of actions is the most cost effective at delivering the water savings and supplies needed to support Sydney's growing population.*
- ⇒ *Management of urban water is necessarily complex. The Audit Office's report recognises the work that has been achieved in clarifying legislative and organisational arrangements and notes that there is more work underway on this.*
- ⇒ *The adaptive nature of the Plan ensures that the community can be confident that the management of Sydney's water supply is undertaken in a robust and comprehensive way.*

THE AGENCIES' DETAILED RESPONSE:

The Department of Infrastructure, Planning and Natural Resources (DIPNR), Sydney Water and the Sydney Catchment Authority (SCA) have reviewed the Audit Office's performance audit of Sydney's Water Supply.

The report found that significant progress has been made towards integrating all aspects of planning for Sydney's water supply. It states that the NSW Government's Metropolitan Water Plan is a "comprehensive plan to close the gap between supply and demand."

Indeed, the Metropolitan Water Plan is the first time that a systematic plan has been developed for Sydney's water supply that contains both actions to augment supply and reduce demand, with a long-term horizon. Its major initiatives are five-fold:

1. ***Drought** – it contains three immediate and new actions in relation to drought planning: accessing deep water at the bottom of dams; investigation of desalination; and investigation of groundwater. Agencies have moved fast to implement these actions. All are on track or ahead of schedule. For example, works to provide access to the deep water at Nepean and Warragamba Dams have been accelerated by six months to bring 30 billion litres of water on line as soon as possible.*
2. ***Infrastructure for long-term water supplies** – the Plan announces shifting the Shoalhaven scheme from its current operation as a drought response measure to being an integral part of long-term water supplies, by pumping when the Shoalhaven River has high flows rather than when the system is in drought. This major supply initiative will yield a substantial addition to Sydney's water supply.*
3. ***Recycling to boost long-term water supplies** – the Metropolitan Water Plan announces major new initiatives for water recycling. The new Western Sydney Recycling Initiative is being planned now, with details to be announced in the Recycled Water Strategy later in 2005.*

4. ***Actions to reduce demand*** *– the Plan contains a suite of actions to cut water consumption by businesses, councils, agencies and householders. Some of these, such as the BASIX scheme and Sydney Water's Every Drop Counts program, have been underway for years and continue to be enhanced. Others, such as the $30 million Water Savings Fund for innovative water efficiency projects, are new and are being established this year.*
5. ***River health*** *– the Plan announces significant new environmental flow regimes to protect the health of the rivers from which Sydney draws its water supplies, subject to adequate water being available.*

The Metropolitan Water Plan is the culmination of years of planning across NSW Government agencies both for drought and for the city's long-term water needs. It represents the final stage of years of consultation with the community, notably through the Hawkesbury-Nepean River Management Forum, on issues related to population growth, supply-side measures, demand management and river health.

While it is pleasing that the Audit Office has recognised the achievements of the Metropolitan Water Plan, some of its specific findings and recommendations are misleading or confused. The report provides a very generalised commentary with no specific alternatives presented and no benchmarkings with other jurisdictions. In many cases, criticisms are implied without any indication of the specific actions sought.

Drought planning

The Audit Office's report does not adequately grasp the distinction between planning for drought and planning for Sydney's long-term water supplies. The Metropolitan Water Plan has a 25 year horizon. Its main aim is to ensure that there is enough water for Sydney over the long term. Within that time, there will be cycles of drought and more normal rainfall patterns. The Metropolitan Water Plan looks at the long-term picture.

Although the Metropolitan Water Plan is a long term plan, it does contain immediate actions related to the current drought and work on these actions has progressed as follows:

- *Tenders have been called for the main supply and construction contract for accessing deep water at Warragamba Dam. Concept and detail design has been completed, including awarding of a contract for the first stage of activity on refurbishment of the former Megarrity's Creek pumping station. A second deep water pumping station will also be constructed at Nepean Dam and a deep water outlet constructed at the base of Avon Dam. The work on the dams is expected to be completed by 2006, , at a cost of around $120 million, and will add 7 months to Sydney's drought reserves and 30 billion litres of water each year to Sydney's supply.*
- *A $4 million investigation into desalination is well advanced. If it were to proceed, it would provide up to 500 million litres of water per day (around a third of Sydney's daily supply) and could be built within the Sydney region if the drought continues.*
- *A $4 million program of drilling and testing for groundwater is underway at a variety of sites near Avon and Nepean Dams and the Upper Nepean catchment. Ground water could deliver up to an extra 13 billion litres of water each year.*

As well as the supply augmentation measures mentioned above, demand reduction measures such as water restrictions and education campaigns have been successfully used to reduce water consumption during this drought. In fact these measures have resulted in the community saving more than 114 billion litres of water - or a 12.3 % reduction in water consumption - since water restrictions were introduced in October 2003.

The broader range of demand and supply drought response measures reflects the major changes in water resource management that have occurred in managing Sydney's water supply. In previous droughts the only measures available to water authorities were demand reduction measures. A broader approach to drought management is possible because of the work the

Government has undertaken over the past years, before and after the release of the Metropolitan Water Plan. This has opened up a whole new agenda and a range of options on water supply that was previously not available.

This major change means that water agencies are reviewing their drought management plans for Sydney to take into account the new drought management framework. It also means that Sydney has a comprehensive and robust plan to cope with a long term drought in a way that mitigates what would have in the past been more significant customer impacts.

Risk planning

The Audit Office does not appear to fully appreciate the methodology applied to manage the risk of water shortages. To summarise, the methodology that was applied considered

- *population growth;*
- *water savings to be achieved through demand management;*
- *new water supplied through various options; and*
- *future yield of the catchment including climate change.*

When appropriate, a conservative assumption was adopted based on the uncertainties about the projections for a particular factor. For example, a very conservative forecast was adopted for water conservation measures that had not been previously implemented in Sydney. However, a less conservative approach was adopted for programs where we have many years experience, such as for households and business water conservation program across the Sydney region.

This enables development of a robust estimate of future water needs that can over time be accelerated or intensified should assumptions change. This adaptive approach appropriately manages risk and avoids the possibility of over-investment or under-investment ahead of actual need.

The Audit Office believes that the Plan does not identify a "worst case" scenario. On the contrary, it does recognise that the worst short term case is a drought that lasts for several years. The Plan addresses this scenario by providing for the construction of a desalination plant as an emergency measure to augment supply in the event of an extreme drought. All other cases can be managed by the adaptive approach outlined above.

In the long term, the worst case is not a likely scenario – it is not likely that population will trend towards the highest projection, at the same time as climate change results in a massive drop in water yield, at the same time as programs to reduce demand fail, at the same time as a myriad of other factors turn bad. Nevertheless, if this does happen, it will have been identified early. A 25 year timeframe means more time to identify trends and to alter policy settings and programs in response.

The Metropolitan Water Plan is explicitly an "adaptive" plan. This means that the Government has committed to an annual review to check whether the projections made are eventuating, or where corrections are needed along the way. This is exactly the "flexible and robust" way forward recommended by the Audit Office.

The Audit Office's report states that there is no explicit risk management plan such as in accordance with the Australian and New Zealand standard for risk management. The main elements of the Standard for Risk Management (AS/NZS4360:2004) are as follows:

- *establish the context behind the risks*
- *identify, analyse and evaluate the risks*
- *treat the risks*
- *monitor and review*
- *communicate and consult*

The Metropolitan Water Plan:

- *established the context for the water supply requirements;*
- *analysed and evaluated both the long term and drought related water supply risks;*
- *identified the actions required to treat the risks;*
- *established a program of regular review and adaptive response as required; and*
- *has been communicated and was developed following years of stakeholder input.*

The effect of applying the recommended auditing standard would not fundamentally change any of the assumptions or directions in the Metropolitan Water Plan. Instead of embarking on another risk-based planning exercise now, agencies are expending effort on implementing the actions in the current Plan, especially in the context of the current drought.

Actions to reduce water demand

The Audit Office's report points out that the initial predictions for Sydney Water's water savings measures made at the commencement of the program were over-estimated. However, the program was designed to meet very ambitious targets set in Sydney Water's first Operating Licence in 1994. The program designed to achieve the water savings was based on facts known at the time, nationally and internationally, although few cities had implemented a water conservation program anywhere near the size of Sydney's.

Now, after nearly 10 years of experience in implementing a water savings program, considerable knowledge has been gained of the water savings achieved by targeted programs to assist householders and businesses reduce their demand. These programs include:

- *Water efficiency retrofits of more than 260,000 households*
- *Water savings programs for more than 260 businesses and industry*
- *Recycling more than 14 million litres of wastewater per year*
- *Rebates to more than 10,000 households for rainwater tank installations*

Based on this experience, much more accurate projections of water savings from such programs have been included in the current Metropolitan Water Plan. However, the Audit Office does not appropriately acknowledge this.

The Metropolitan Water Plan is not overly reliant on such measures to reduce demand. It does project considerable savings through a suite of specific actions to reduce demand by businesses, councils, agencies, farmers and householders, in recognition that these are highly cost-effective. Indeed, all urban water management plans rely on savings from such programs, given their cost-effectiveness when compared to supply-side options. The demand-sidemeasures incorporated into NSW's Metropolitan Water Plan were chosen because they are generally less costly for individuals and for society as a whole to reduce water consumption than to pay for unnecessary new infrastructure.

Nevertheless, the estimates from water savings incorporated in the Metropolitan Water Plan are sensible and conservative, based on many years' successful experience in delivery of such programs. And as indicated above, if the programs do not achieve their intended savings that Plan can be adapted to accommodate this.

In fact, the mix of water savings measures put in place over time is evolving. As experience increases, particular programs are ramped up or down depending on the water savings achieved for the dollars invested. For example, the Audit Office recommends that further leakage reduction be evaluated building on the significant savings achieved by Sydney Water to date. Since the finalisation of the Audit Office's report, the Minister for Energy, Utilities and Sustainability has announced that, on the recommendation of the Independent Pricing and Regulatory Tribunal (IPART), targets for leakage reduction will be included in Sydney Water's

Operating Licence. Sydney Water's current level of leakage has fallen from 276 megalitres per day (or 17.3 per cent supply) in 1994/95 to 143 megalitres per day or the equivalent of 9.3 per cent of total water supply in 2003/04.

It is also worth noting what has been achieved to date through water savings measures. The Audit Office's report does not give adequate recognition to what has been achieved. There is an implication that reducing demand has had minimal impact. This is not the case. Sydney Water's program has reduced per capita demand for water by 20%. This compares very well with programs internationally, where on average 10% savings have been achieved.

Oversight and accountability

Like most other jurisdictions in Australia and around the world, the legislative and organisational arrangements to manage the water resources for Australia's biggest city with 4.5 million water users has responsibilities shared across operational, regulatory and policy agencies.

Broadly speaking the arrangements for water supply for Sydney are as follows:

DIPNR: allocates water rights on behalf of the Crown through water sharing plans; oversights the demand/supply balance for Sydney's water

SCA: harvests and supplies bulk water and manages the catchments

Sydney Water: treats and distributes water to end users and as regulated by IPART
delivers demand management programs

DEC: regulates environmental impacts of the above.

There is no evidence in the report of a preferable model against which the Sydney model could be benchmarked.

It is also important to note that these arrangements reflect the recommendations of the 1998 McClellan Inquiry which had the powers of a Royal Commission.

However, there is always opportunity to improve coordination and it is pleasing to note that the Audit Office's report recognises the work that has been achieved with the development of the Plan and notes that there is work underway to further clarify the legislative and organisational arrangements.

Specific comments

As well as the key issues outlined above, some specific issues raised in the report would benefit from comment.

First, the Audit Office report refers to the Plan as "delaying a decision on [environmental flow] releases from Warragamba Dam." It should be noted that adequate drinking water must be ensured before environmental flows from Warragamba Dam can be finalised. The Plan states the Government's acceptance of expert advice that additional information is required before these releases can be finalised. The Hawkesbury-Nepean River Management Forum, which spent years undertaking research and consultations,, recommended that flow releases from Warragamba Dam not commence until after 2015, by which time information (such as on the outcome of the new flow releases from the Upper Nepean dams) will be available. The Government has accepted the Forum's recommendations regarding timing of the new flow releases from Warragamba Dam. The extra volume of water required to meet the recommended new environmental flow requirements from Warragamba Dam has been incorporated into the projections for the demand/supply balance in the Metropolitan Water Plan.

Secondly, the report states that there is a degree of uncertainty about the ability to pump additional water from the Shoalhaven "without increasing storage capacity." The ability to regularly pump additional water from the Shoalhaven exists and the proposal is to augment this capacity. Development of pipeline routes is underway and construction of Stage One of the project which will deliver up to 80 billion litres of water a year will begin as soon as 2007. Construction of Stage Two, which would be subject to assessment following the completion of Stage One, aims to deliver an additional 30 billion litres of water each year.

Thirdly, the Audit Office report raises a number of issues concerning data and analysis, but we believe that particular attention needs to be drawn to two issues. The tables relating to recent water consumption and the historical patterns in Warragamba catchment inflows include data which have been used selectively. In the case of inflows, the analysis is that flows have been "steadily declining for years" where the graph itself shows that inflows over the last ninety years has varied greatly between high to low inflows. It is clear that detailed knowledge and statistical analysis shows that there is no long-term decline in inflows.

Another data-related issue is that the report suggests that climate change data should be incorporated into yield forecasting models despite the "absence of firm data." Not only is there an absence of firm data, there is no existing verified data that could be used. The Metropolitan Water Plan describes how the water agencies are working with CSIRO on developing research in relation to climate change that could then be applied for modelling purposes. Therefore it is necessary to take the type of adaptive management approach as outlined above in relation to this matter. When we have better data based on our work with the CSIRO, we will incorporate this into the regular reviews of the Plan that are discussed earlier in this letter.

Thank you for the opportunity to comment on your report. As highlighted by this letter, we believe the Plan for securing Sydney's water supply for the long term and for the current drought is resilient enough to meet the needs of Sydney for now and into the future.

The adaptive nature of the Plan, with regular reviews and updates against progress, ensures that the community can be confident that the management of Sydney's water supply is undertaken in a robust and comprehensive way.

(signed)

Jennifer Westacott *Director-General* *Department of Infrastructure, Planning and Natural Resources*	*Lisa Corbyn* *Chief Executive* *Sydney Catchment Authority*	*David Evans* *Managing Director* *Sydney Water Corporation*

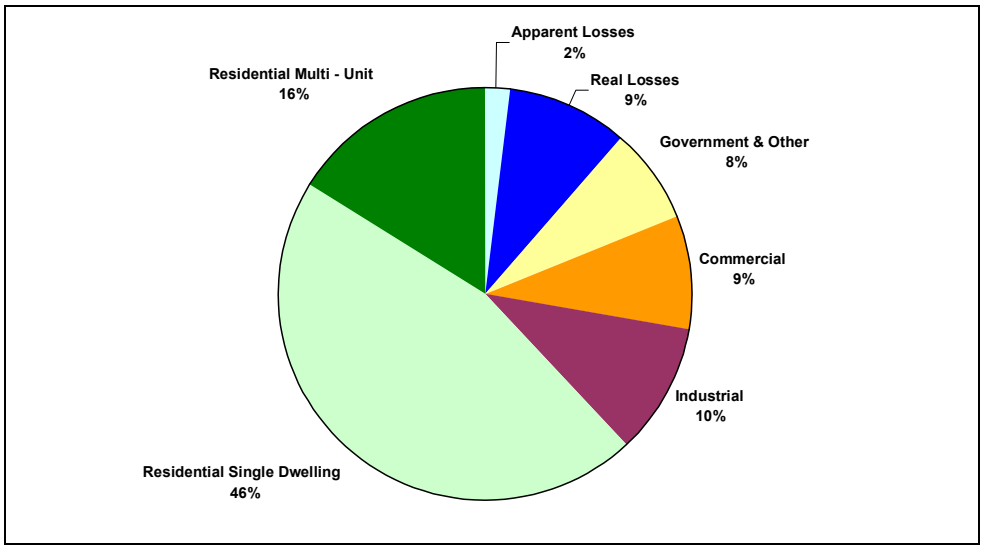
Dated: 27 April 2005

1. Introduction

1.1 Sydney's demand for water

The adequacy of our water supplies is a significant public health, quality of life, conservation, and economic development issue.

Sydney currently uses approximately 600 gigalitres (GL) of water per year, plus or minus 30 GL depending upon seasonal weather conditions. The relative water use by the major customer sectors has changed over time. Continuing population growth and the construction of new housing in the Sydney basin has resulted in increasing demands from the residential sector. Residential use accounts for approximately 62% of the total.

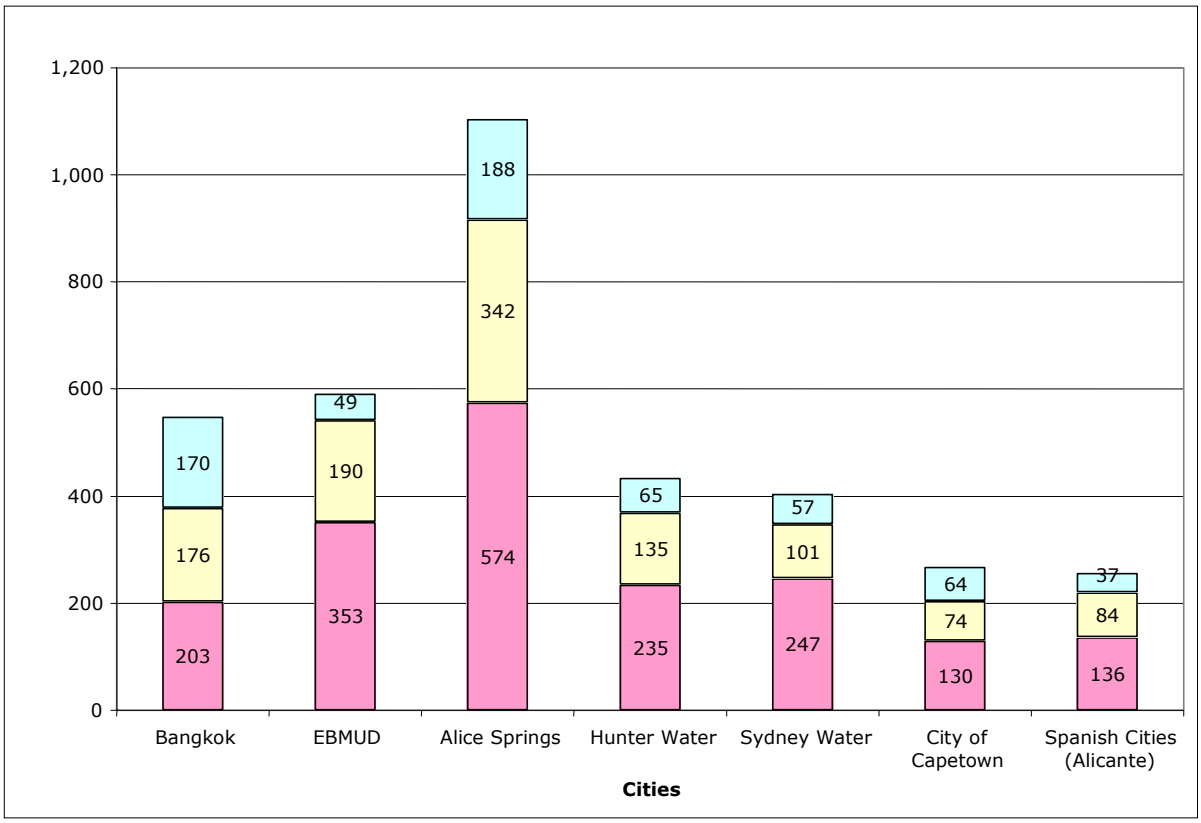


Source: Sydney Water, *Water Conservation and Recycling Implementation Report 2003-2004*.

Sydney's demand for water reflects its climate, socio-economic factors and landscape. Comparisons with other cities need to be approached with caution.

A recent review for Sydney Water compared Sydney's per capita usage with several cities and towns to demonstrate the impact of varying climatic conditions, water supply system, socio-economic factors and topography. The following figure illustrates the significant variations found. Note that Sydney's water usage is amongst the lowest.

Residential, non residential and unaccounted for water per capita demand comparison (litres per capita per day)



Source: Sydney Water, *Sydney's Demand Management in Context – Final Report,* November 2004 (Note EBMUD is the Oakland area, east of San Francisco. Alicante is a Spanish city.)

Key:

Unaccounted for	Non residential	Residential

At the same time, there is a heightened awareness of climate change and the need to restore the health of the rivers that supply Sydney's catchments.

> Rivers are suffering from lack of adequate flows, water consumption is exceeding supply and growth in population remains high. Over the last three years, total urban water consumption for Sydney, the Blue Mountains and Illawarra has been between 624 and 634 GL per year with demand in 2003 exceeding sustainable yield by 34 GL per year. In addition, natural climate variability and global warming has increased the urgency for comprehensive solutions.
>
> **Source:** Hawkesbury-Nepean River Management Forum, *Water and Sydney's Future*, a report to the Ministers for Land and Water Conservation and the Environment, 2003

1.2 Sydney's catchments

Sydney draws its 600 GL per year of water from three separate catchment areas:

- Hawkesbury-Nepean catchment covering approximately 22,000 square kilometres
- Shoalhaven catchment covering approximately 7,300 square kilometres
- Woronora catchment covering approximately 168 square kilometres.

Even though Sydney's catchment areas represent only 4% of the state's land area, they supply water to 60% of the state's population.

Almost all (97%) of Sydney's water has been drawn from the Hawkesbury-Nepean catchment, with most (80%) of that from the Warragamba dam.

Within all these catchments, there are significant demands from other users above and below the dams. These include around 100 GL per year in licenced extractions, plus an unknown amount extracted by landholders adjoining rivers. Other users include regional towns, primary producers and industrial users.

1.3 State water agencies

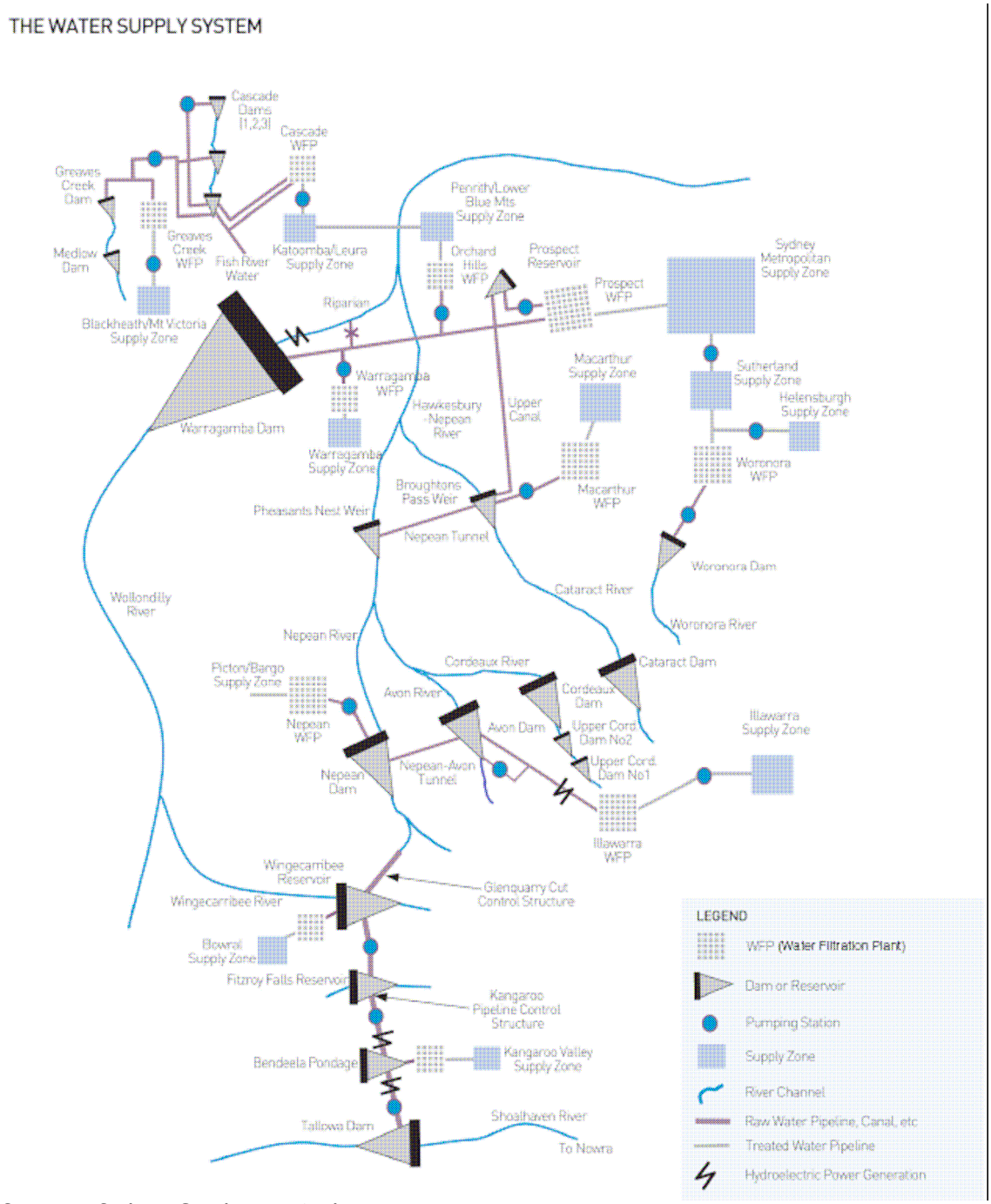
Two agencies are directly responsible for the supply of water to the Sydney, Illawarra and Blue Mountain areas:

- Sydney Catchment Authority manages the catchments and dams and supplies Sydney's bulk water
- Sydney Water's role is to store and supply water, provide sewerage services, provide stormwater drainage systems and dispose of waste water.

Regulatory responsibilities are shared as follows:

- strategic policy advice to Government, coordination of infrastructure, water allocation – Department of Infrastructure, Planning and Natural Resources
- drinking water quality – NSW Health
- environmental protection including water quality – Department of Environment and Conservation
- charges and service levels – Independent Pricing and Regulatory Tribunal (IPART).

The Department of Energy, Utilities and Sustainability promotes water efficiency and has a regulatory and policy role.



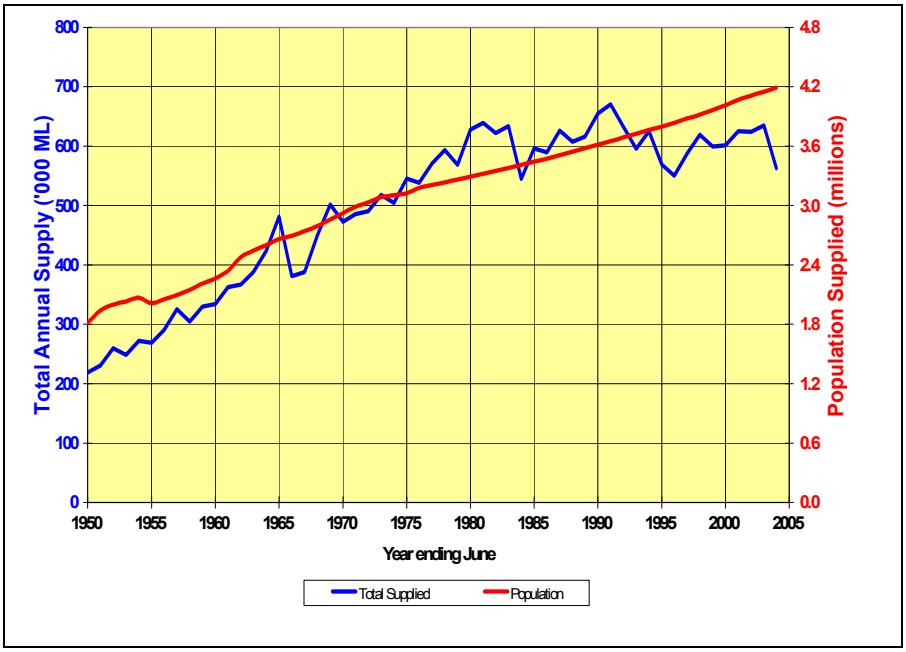
Source: Sydney Catchment Authority

1.4 Emerging gap between demand and supply

Sydney's demand for water has remained relatively stable over the past 20 years, even though the population has increased by over 750,000 people. This has arisen from changes in housing mix and industry rationalisation, pricing reform, improved appliance efficiency and demand management programs.

Sydney Catchment Authority has estimated the yield of Sydney's water storages as 600 GL a 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.

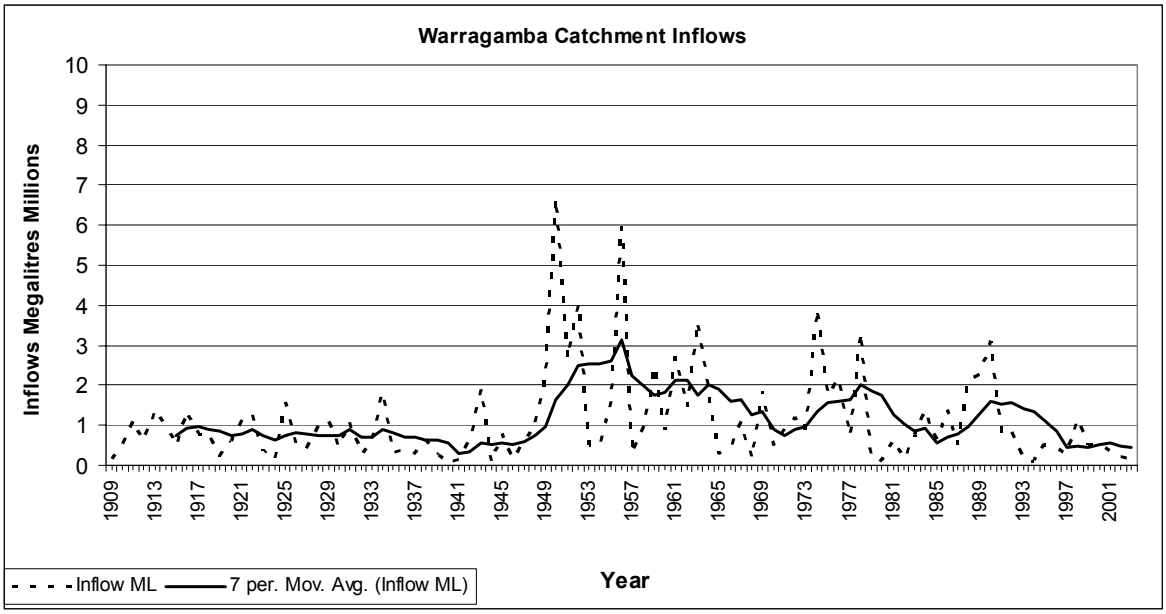
The following figure indicates that Sydney's water consumption has been fluctuating around the current yield figure of 600 GL a year for some years.



Source: Sydney Water, *Water Conservation and Recycling Implementation Report 2003-2004.*

Recent years have highlighted the vulnerability of Sydney's metropolitan water supplies to extreme and prolonged drought. While not frequent, drought is a recurring condition of our climate. At the time of this report, the water level in Sydney's storages had dropped to around 42% of their capacity – the lowest level since the construction of Warragamba dam in 1960.

Moreover, water inflow into the Warragamba catchment has been declining steadily for years, as shown by a graph of inflows over the last century:



Source: Sydney Catchment Authority, 2004

Sydney's future water demands are likely to increase due to:

- population growth
- economic development.

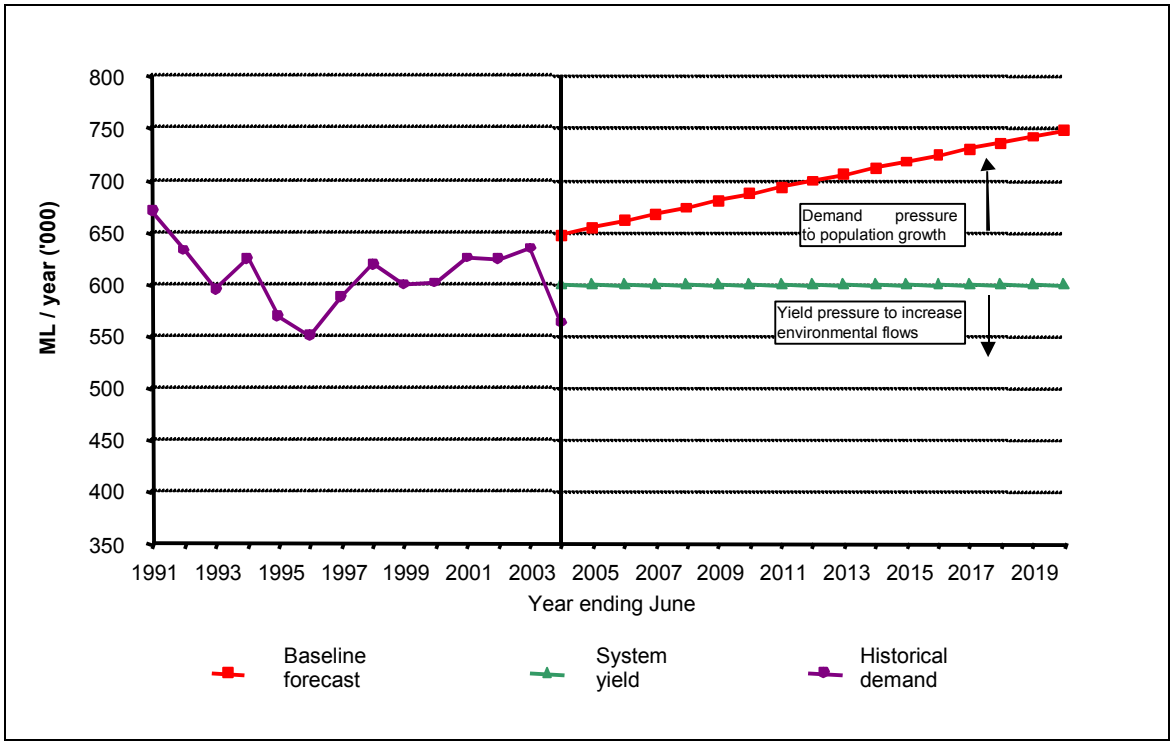
Current population estimates by the Department of Infrastructure, Planning and Natural Resources indicate that Sydney will reach almost 4.5 million people by 2011 and 4.9 million by 2021. This growth will place additional pressure on Sydney's limited water supplies.

The supply of water is likely to be further reduced by:

- the impact of any long-term climate change on inflows into dams
- the need to increase environmental flows, particularly for the Hawkesbury-Nepean River.

As shown in the following figure, it has become apparent that the current system's yield – that is, the amount of drinking water that is available on a sustainable basis – will potentially be overtaken by the projected water demands.

Future demand and supply balance



Source: Sydney Water, *Water Conservation and Recycling Implementation Report 2003-2004*.

While it is possible to exceed the yield in the short to medium term, the long-term effect is an increase in water shortages and the need for earlier and more stringent imposition of water restrictions.

While restrictions are one of the most economical measures for reducing demand, long-term restrictions are not necessarily socially acceptable – affecting amenity, quality of life and property economics.

The Government sought advice through the Hawkesbury-Nepean River Management Forum and the Expert Panel on Environmental Flows, the Water Expert Panel, and the Water Chief Executive Officers' Taskforce. In addition, the Premier has asked the Independent Pricing and Regulatory Tribunal to examine how price structures could be used to reduce the demand for water in Sydney.

In 2004 the Government identified and assessed a set of actions to close the gap by both reducing demand and increasing supply. The result was summarised in a document *Metropolitan Water Plan 2004: Meeting the challenges – Securing Sydney's water future*. The document was released in October 2004, during the course of our audit.

1.5 This audit

This audit has focused on whether there are appropriate and adequate arrangements for ensuring a reliable supply of water to meet metropolitan demand requirements including the existence, adequacy and implementation of:

- a coordinated and strategic approach to ensuring a reliable supply of water to meet metropolitan demand requirements
- identification and analysis of risks relevant to the achievement of objectives
- information systems to support the monitoring and management process
- avenues for stakeholder consultation to assist judgment and enhance transparency
- performance assessment and reporting to ensure measures prove efficient and effective
- oversight and accountability arrangements to clarify responsibilities.

We have not questioned Government policy that may have influenced the selection of specific options to augment water supplies or reduce water usage.

2. Planning for water security

Planning for water security – at a glance

Chapter 2 examines whether State water agencies have a coordinated and strategic approach to ensuring a reliable supply of water to meet metropolitan demand requirements.

We find:

- State water agencies are developing a more integrated approach to planning Sydney's water supply, but there is considerable work yet to be done
- there is considerable uncertainty associated with some of the measures being adopted, particularly those that rely on changing consumer behaviour
- savings from earlier water conservation programs have failed to meet expectations.

2.1 Policy context

Sustainability

Since 1991, NSW environmental legislation has required that development be ecologically sustainable. This means that economic and environmental considerations need to be balanced so as not to disadvantage future generations. A fundamental principle of sustainable development – the precautionary principle - says that, where there is uncertainty about the consequences, decisions should be cautious and should seek to clarify the source of the uncertainty.

In water resources management, this principle means that, if there is a serious risk of environmental damage because of a proposed extraction of water, the decision should ensure that the environment is protected. The principle also applies to a serious risk of failure of public water supply, which would be unacceptable in terms of its social and economic impacts.

In 2000, the Government published the *NSW Water Conservation Strategy*. Key strategies relevant to Sydney's water supply include:

- Government agencies leading by example
- more effective water pricing and valuation
- providing direct financial incentives to encourage water users to invest in conserving water and achieving efficiencies
- improved efficiency of water use within different sectors
- an expanded role for water reuse.

National Water Initiative

In 2003, during one of the worst droughts on record across the country, the Council of Australian Governments agreed to the *National Water Initiative*. The parties agreed that the outcome of urban water reform is to:

- provide healthy, safe and reliable water supplies
- increase water use efficiency in domestic and commercial settings
- encourage the re-use and recycling of wastewater where cost effective
- facilitate water trading between and within the urban and rural sectors
- encourage innovation in water supply sourcing, treatment, storage and discharge
- improve pricing for metropolitan water.

Source: COAG, Inter-Governmental Agreement on the National Water Initiative, 25 June 2004 sect 90

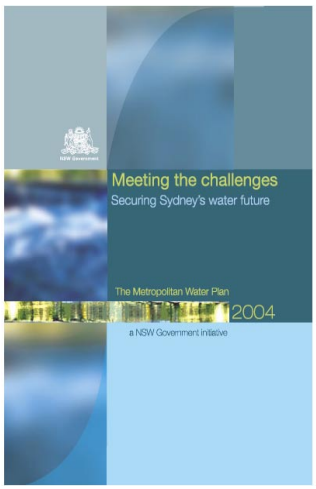
States and Territories agreed to undertake the following actions in regard to demand management by 2006:

- legislation to implement the Water Efficiency Labelling Scheme to be in place in all jurisdictions by 2005
- develop and implement a 'Smart Water Mark' for household gardens, including garden irrigation equipment, garden designs and plants
- review the effectiveness of temporary water restrictions and associated public education strategies, and assess the scope for extending low level restrictions as standard practice
- prioritise and implement, where cost effective, management responses to water supply and discharge system losses including leakage, excess pressure, overflows and other maintenance needs.

Source: COAG, Inter-Governmental Agreement on the National Water Initiative, 25 June 2004 sect 91

Warragamba Dam - mid 2004

2.2 Sydney's *Metropolitan Water Plan 2004*



An interdepartmental committee, building on earlier work by the State water agencies, developed Sydney's first *Metropolitan Water Plan* in 2004, reporting to a special sub-committee of Cabinet.

The *Plan* identifies a number of measures designed to close the impending gap between supply and demand. It states that if consumption remains at current levels and nothing is done to reduce demand, we will need to find an extra 200 GL of water each year within 25 years.

However, while the *Plan* is designed to increase water releases to the Upper Nepean, it delays a final decision on releases from Warragamba Dam to further improve the health of the Hawkesbury-Nepean River. Potentially this would increase the gap to a figure in excess of 300 GL of water each year.

Bridging the gap

In order to bridge a gap of around 300 GL a year, the *Plan* includes measures to both reduce demand and increase supply.

Reducing demand

The *Metropolitan Water Plan 2004* indicates that the demand for water from the storage system will be reduced by:

- requiring all new houses to reduce water use by 40 per cent (and energy use by 25 per cent) under the BASIX planning system
- undertaking detailed planning into the use of recycled water in western Sydney
- requiring government agencies and businesses to prepare water conservation plans and implement measures to save water that are cost effective
- requiring more rapid repairs of burst water mains
- working with the other states and the Commonwealth to implement minimum water-efficiency standards for other appliances and fixtures
- establishing a fund to support new demand management projects
- metering all large agricultural water users and establish a monitoring program for smaller users.

Increasing supply

The *Plan* indicates that the potential supply of water will be increased by:

- modifying dams so that water at the bottom of the dams that is currently unavailable for water supply can be accessed
- pumping water from the Shoalhaven River to Warragamba Dam when the river is in high flow
- undertaking detailed planning and design of a desalination plant as a contingency to enable a plant to be constructed quickly if the present drought continues.

Net effect

The targeted contributions of these measures may be summarised approximately as follows:

Options	Approximate target contribution in 25 years time GL a year
Reducing demand	100
Reducing leakage	40
Recycling	80
Access deep water	30
Shoalhaven transfers	110
Total	360

Note: These are broad estimates that agencies intend to refine with detailed planning in future years.

Benchmark

The Department of Infrastructure, Planning and Natural Resources is also developing a *Sydney Metropolitan Water Sharing Plan* under the *Water Management Act 2000*. It is intended to include a water benchmark that will indicate how much water Sydney residents, businesses and irrigators can sustainably use within the life of the plan.

Water resources

Even though Sydney's catchment areas represent only 4% of the state's land area, they supply water to 60% of the state's population. Almost all (97%) of Sydney's water has been drawn from its Hawkesbury-Nepean catchment, with most (80%) of that from the Warragamba dam. Relatively little has been drawn from its neighbouring Shoalhaven catchment. But the *Metropolitan Water Plan 2004* will change this.

Sydney's shortage of supply is not due to any long-term lack of water in its catchments. It lacks adequate facilities to capture and contain this water. Prior to the *Metropolitan Water Plan 2004* there was no process to balance water conservation and re-use initiatives, generally proposed by Sydney Water, against supply side options, such as available to the Sydney Catchment Authority.

Actions to bridge the gap

The *Metropolitan Water Plan 2004*:

- focuses on a new set of actions to bridge the gap between supply and demand, largely additional to existing agency plans for water
- plans some increased supply, but places considerable reliance on water conservation programs, higher water prices and some recycling
- relies on planning level estimates that are useful for comparing relative cost between options. The methodology appears reasonable for planning level estimates
- maintains current Government policy of not constructing the Welcome Reef Dam or raising the level of Warragamba Dam – we understand that either one of these options would increase Sydney's water supply by two thirds, at a cost per litre lower than many of the options adopted, but with risks to costs and the environment.

Aspects that need further elaboration

Aspects in which the *Plan* is, arguably, not yet comprehensive are where it:

- identifies areas where there is still considerable work to be done, such as in relation to recycling and pricing
- as yet lacks clear sustainable water management goals for water consumption reductions, effluent reuse, stormwater retention, and leak reduction
- contains relatively little discussion regarding water quality from an environmental, recreational, and health perspective as the *Plan* was focused on supply issues
- takes account of but does not incorporate existing plans, such as those of individual water agencies, across the catchments from which Sydney draws its water
- does not explain the basis for the adoption of some measures and the exclusion of others (including their efficiency, effectiveness and attendant risk), although we are aware of analyses
- is not accompanied by an implementation plan, although we have sighted a plan of agency actions
- does not expand on how it will deal with managing growth and climate variability
- is not accompanied by an explicit risk management plan, considering worst case scenarios, although we understand that there was consideration of risks.

We appreciate that the *Plan* was never intended to do all these things as, of necessity, it needed to focus on immediate measures to counter the impact of Sydney's worst drought in many years.

2.3 Sydney Water's *Demand Management Program*

The *Metropolitan Water Plan 2004* relies on significant savings from Sydney Water's *Demand Management Program*.

Such programs aim to limit the amount of water drawn from the water storage system by:

- increasing water use efficiency (such as more water efficient water appliances, outdoor use, irrigation practices)
- decreasing water usage (such as shorter showers, not hosing concrete paths)
- increasing the use of alternative water supplies (such as rain water storage tanks, recycling, storm water storages)
- improved metering
- reducing leakage from the system.

Sydney Water has had such programs for many years including:

- detecting and repairing leaks, currently saving around 11 GL per year
- reducing the water use of over 100 high water-use businesses, saving around 2 GL per year
- encouraging residents to reduce residential indoor and outdoor water use through efficiency programs including installation of water efficient appliances in their homes, saving around 4 GL per year
- promoting re-use of treated effluent for irrigation, industry and non-drinking urban uses, such as the dual reticulation system in the Rouse Hill development area and a recycling program for BlueScope Steel in Wollongong. These are estimated to save around 13 GL of drinking water a year.

Meeting target

In 2003 Sydney Water reported that it would not meet its 2005 demand management target for average conditions because:

- the target is very ambitious to realistically achieve in this time frame
- not being a regulator, Sydney Water does not have sufficient influence over the major drivers of demand and is reliant on voluntary customer participation
- sustained population growth and drought conditions driving up demand beyond original expectations
- delays in the expected implementation of regulatory programs outside of Sydney Water's control, particularly pricing reform and appliance performance standards
- under-estimation of the resource commitment required to successfully manage the planning and implementation of the strategy
- under-estimation of the lead times required to develop and implement some programs
- variation between assumed and actual water savings from some programs
- required diversion of demand management resources into drought management activities.

Source: Sydney Water Corporation, *Water Conservation and Recycling Implementation Report 2003-2004*

Future challenge

Although Sydney Water's *Demand Management Program* is extensive and savings have been made, it has not met early expectations and represents a considerable challenge:

- Sydney Water reports that its demand management program is the largest ever delivered by an Australian water utility and one of the largest and most diverse urban demand reduction programs internationally
- most savings in the program have come from detecting and repairing leaks
- the reported savings from business and residential use are a fraction of the savings originally considered possible when Sydney Water was corporatised

- at the time the program was developed there was little experience in Australia upon which to benchmark assumptions and outcomes for such a large and diverse program and very limited international experience that would translate readily to Australian conditions
- as reported in the *Metropolitan Water Plan 2004,* (aside from savings from leakage control), best practice 'demand management' programs around the world have only achieved around 10% in water savings.

2.4 Monitoring water use

Metering encourages consumers to consider their use of water, partly by allowing them to understand how much they are using. In the longer term it should discourage high use and encourage consumers to adopt more water efficient practices.

But a large and increasing proportion of water consumers are not directly metered:

Meters

- multi-residential developments account for around one third of the resident population and will house an increasing proportion of future residents. They use less water per capita, but most multi-residential units are not individually metered
- many non-residential users are either metered in bulk or, if in non-urban areas, able to withdraw water without metering.

There is a cost associated with the introduction of meters. This includes the cost of the meter, the work required to adapt the existing pipes to enable the meter to be installed, and an ongoing cost of reading meters and issuing bills.

Sydney Water has argued that the costs of installing individual meters in existing properties, and the associated billing costs, would be uneconomic.

> Sydney Water has argued that the costs associated with billing tenants directly would be substantial as approximately 500,000 units (about one-third of properties in Sydney) do not have individual meters.
> **Source:** IPART, *Water Demand and Issues Paper,* January 2004 p2.

Sydney Water has proposed that new multi-units be individually metered and that the savings arising from this would be 10% of average multi-unit usage.

New technology

For properties that are metered, generally there is a quarterly reading at the property boundary. But there are limits to understanding how water is used for individual uses. There is recognition that real-time and site-specific end-use metering capability would be likely to improve the capability to influence demand.

More work is needed in testing and validating these systems but the technological capability is improving.

> Until recently, it has been difficult to justify the cost of separate metering. However, as new remote metering technologies emerge and with an increasing focus on water conservation, the cost benefit is changing. A few Australian water authorities have implemented separate metering and report improved water conservation and strong customer support.
>
> Trials of separate metering for selected new multi-residential developments are now proposed as joint projects between Sydney Water and major developers, to commence soon. Savings of over 10% of average usage have been reported in local and international metering studies.
>
> **Source:** Sydney Water Corporation, *Water Conservation and Recycling Implementation Report 2003-2004*

Metering receives little mention in the *Metropolitan Water Plan 2004*. It is part of the research component of Sydney Water's *Demand Management Program*.

Recommendation

We recommend that the Department of Infrastructure, Planning and Natural Resources, Sydney Water and related water agencies improve the monitoring of water use in Sydney, including a review of the socio-economic and environmental merits of increased direct metering - given its capability to influence demand.

2.5 Sydney Water's leakage reduction program

The *Metropolitan Water Plan 2004* relies on significant savings from Sydney Water's leakage reduction program. Leakage rates in Sydney Water's system are around 9%. Sydney Water reports that this is already within the top 30% of major world cities for leakage control performance.

Sydney has 21,000 km of water mains. Sydney Water's active leakage reduction program began in 1999-2000 as a pilot program and 7,000 km of mains are now scanned for leakage each year. To the end of June 2004, over 15,500 km of mains have been scanned and $7 million has been spent on the program.

Sydney Water's overall leakage reduction program includes:

- active leak detection which involves acoustically scanning for leakage and carrying out repairs to the identified leaks
- pressure reductions that could potentially reduce demand and leakage. Sydney Water have reported that the results of a pilot are being assessed. No reduction in actual annual customer demand has been observed, but this has been masked by the implementation of mandatory water restrictions
- speeding up repairs to reduce the overall leakage. Sydney Water aims that leaks are repaired within three days of maintenance crews being notified.

The *Metropolitan Water Plan 2004* outlines increasing expenditure on mains renewal and leak detection and repair activity and expected reductions in the volume of leakage from the trunk main and distribution system. Further, it states that:

> *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.*

The Independent Pricing and Regulatory Tribunal is currently conducting its end of term review of Sydney Water's Operating Licence and is considering and consulting on the additional conditions proposed by the Plan.

Future reductions

A December 2004 review by IPART's consultants concluded that Sydney Water's projected leakage reductions would put it 'in the same ballpark as a number of other Australian water providers with significantly younger networks'. The consultant accepted the Sydney Water forecasts, but considers them to have a high degree of uncertainty (possibly ±50%) until they are validated with more data from years without water restrictions, with normal levels of mains breakage and further results from pressure management trials.

Sydney Water has committed to an extensive leakage reduction program:

- with increasing expenditure on mains renewal and leak detection and repair activity, so all mains will be inspected when leakage levels are above a certain trigger point
- with conditions to be attached to its Operating Licence to require more rapid repairs of burst water mains
- but with a high degree of uncertainty as to the eventual savings in water that will result.

Recommendation

We recommend that Sydney Water further evaluate the potential for leakage reduction measures to improve the efficiency of Sydney's water supply system.

2.6 IPART's review of pricing

The pricing of water and sewerage charges is subject to regulation by the Independent Pricing and Regulatory Tribunal (IPART).

Low price

Although Sydney Water already returns commercial dividends to the Treasury, it is argued by some that the relatively low price of water offers little incentive for water conservation and other water saving initiatives, such as recycling plants.

Little incentive for conservation

> At an average of around $1 per kilolitre, the price of water in Australia, compared with other countries and with other products is very low and as such is not providing any incentive to households for water conservation. It has been possible to keep water prices low because neither the costs of taking the water from the environment nor of protecting the catchments from which it is collected are required to be included in the current 'full cost recovery' pricing regimes.
>
> **Source:** Parliament of the Commonwealth of Australia, *The Value of Water: Inquiry into Australia's management of urban water,* report of Senate Committee December 2002

For the year ending 30 June 2004, Sydney Water charged its residential customers a two-part tariff consisting of a usage charge of $0.98 per kilolitre, and a fixed service charge of $76.55 per annum. For sewerage services, it charged these customers a fixed service charge of $338.54 per annum.

The Tribunal phased in this structure between 1993 and 1995, to replace the existing price structure that was based in part on the value of the customer property being serviced. Its objectives in doing so were to encourage more efficient resource allocation, move towards cost reflective pricing, and send a stronger conservation signal to customers. However, the current price structure was introduced at a time when water scarcity was not as significant a concern as it is today.

In September 2003 the Premier asked IPART to examine how price structures could be used to reduce the demand for water Sydney.

Discouraging high water use

The Tribunal found that the most suitable price structure for Sydney is likely to be a two-tiered variable usage charge and a lower fixed access charge. It saw the advantages of this price structure were that it:

- could potentially be used to send a strong signal about the need to conserve water that particularly targets high water users
- could be set to minimise the number of customers who are required to pay the higher tier usage charge for efficient or non-discretionary water use.

However, it sees some disadvantages associated with this price structure, and limitations on its application. In particular:

- the price structure could only be applied to residential customers whose water usage is individually metered. It would not be suitable for residential customers whose water usage is measured via a bulk meter (such as those living in home units), or non-residential customers
- Sydney Water's revenue could become more variable, while its costs remain largely fixed.

Likely impact

To determine the most likely customer reaction to increasing charges, the Tribunal reviewed various estimates of the price elasticity of demand for water from Australia and other countries. While there was a wide range of estimates, the most relevant of these indicated that a 10 per cent increase in the price of water in Sydney would cause a 1.3 per cent reduction in the total quantity of water used. Based on this finding, and an assumption that a residential customer's water use becomes more elastic as it becomes more discretionary, the Tribunal's modeling assumed that for a 10.0 per cent increase in the price of water:

- low water users will reduce their consumption by between 0.1 and 0.5 per cent
- medium water users will reduce their consumption by approximately 2.0 per cent
- high water users will reduce their consumption by 3.0 per cent.

Source: Independent Pricing and Regulatory Tribunal, *Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin,* July 2004

2.7 Using recycled water

The *Metropolitan Water Plan 2004* has placed considerable reliance on the future use of recycled water – aiming for 60 GL (or around 10% of current water usage) by 2020.

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.

Sydney Water

Sydney Water recycles some water from sewage effluent to meet environmental regulations and as required by its operating licence. The licence also requires Sydney Water to report on its level of reuse to the Tribunal annually, and to meet reuse targets set by the Minister from time to time.

In 2002 Sydney Water's *WaterPlan 21* outlined a number of directions in which to further develop water recycling.

Sydney Water's recycling filtration system at Rouse Hill

Using recycled water can contribute to water conservation where it substitutes for an existing or future water demand from storages. But Sydney Water's schemes have had relatively little effect reducing the level of drinking water Sydney requires from its storages. The amount of effluent reused is around 14 GL per year, but much of this is reused for environmental protection in sewage treatment plants or in effluent disposal schemes. The amount of drinking water saved is a little over 4 GL per year, or around half of one per cent of Sydney's annual demand.

New measures

The *Metropolitan Water Plan 2004* is to supply recycled water to meet the needs of Sydney's growth areas. Under the *Metropolitan Strategy*, new 'green field' 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. The *Plan* estimates that this development could see in excess of 80 GL of recycled water being supplied to the area's new homes, farms and rivers at a preliminary capital cost estimate of $563 million.

Additionally, the BASIX program will require all new developments across Sydney to use 40% less potable water than average household consumption – encouraging the general adoption of recycled water schemes.

Public health, private sector and local government

A large increase in the use of recycled water raises significant issues in relation to public health, private sector involvement and the role of local government.

Over the next 25-30 years, approximately 200,000 detached and 300,000 multi-unit dwellings will be built in the Sydney Water area of operations alone. Over this period many multi-unit buildings will require some form of decentralised treatment and recycling system to satisfy BASIX requirements.

Drinking water and recycled water taps at Rouse Hill

Also, the Government is considering significant private funding and involvement, although in NSW the private sector has previously had very limited involvement in the recycling of wastewater.

> In March 2004 Services Sydney .. intended to compete with Sydney Water for the provision of retail sewage collection services within the Sydney area. Services Sydney's business model involves competing for individual customers principally on the basis that its effluent treatment would be more environmentally friendly than the ocean outfall system used by Sydney Water. The pricing structure is expected to be similar to that of Sydney Water. Services Sydney considers its business model to be commercially feasible. It argues that access to the Services is an essential prerequisite to implementation of its proposal.
> **Source:** National Competition Council, Draft recommendation, 12 August 2004

There is to be significant local government involvement, as it has regulatory responsibility for most alternative supply systems. However, in metropolitan areas where services are supplied by water utilities, local government has had very little involvement in wastewater management.

Review of the regulatory system

The *Metropolitan Water Plan 2004* points to a complete review of the regulatory system:

> 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.
>
> **Source:** *Metropolitan Water Plan 2004: Meeting the challenges – Securing Sydney's water future*

Strategy for recycled water

Additionally, the Department of Infrastructure, Planning and Natural Resources has started work on a strategy for recycled water that will include:

- new governance arrangements to facilitate private sector involvement in recycled water
- a new business model for the development of recycled water plants for new release areas which will include investment from the private sector
- opportunities for further water recycling opportunities including the role of local government in stormwater harvesting.

And on 3 December 2004 IPART was asked to investigate and provide advice on possible pricing principles and alternative arrangements, including possible private sector involvement, for the delivery of water and wastewater services in the greater Sydney metropolitan area.

Impact of *Metropolitan Water Plan 2004*

The *Metropolitan Water Plan 2004* is aiming for a major increase in the use of recycled water:

- this approach is in line with that in other jurisdictions: Victoria is committed to reusing 20% of Melbourne's wastewater by 2010, the Western Australian State Water Strategy is aiming to increase reuse by 20% by 2012, ACT has an objective of achieving 20% recycling by 2013
- recycling has a number of advantages, including an ability to counteract the effects of drought on the supply of drinking water

- in the past, recycling was driven more by the strict environmental controls applying to waste disposal from new area developments, not by the need for water conservation. Recycled water generally costs more than drinking water, but must be priced to compete with drinking water. This 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
- the *Plan* focuses on new 'green field' developments in south west and north west Sydney
- the *Plan* will also consider large-scale water recycling plants to treat waste so it can be supplied in bulk, direct to major users or to existing water storage facilities
- there are considerable challenges in terms of the health, funding and governance aspects of relying on recycled water
- the State water agencies have recognised the need to bring recycled water into the existing water resource management framework and to review its regulation and guidance to ensure that developments will not create environmental or health problems.

2.8 Moving to a more integrated approach

Integrated Urban Water Cycle

Integrated Urban Water Cycle planning refers to planning that is expanded beyond that of the traditional water supply and sewerage system to include the use of once called 'waste waters'. With the inclusion of these, the number of water sources now expands to include surface waters, ground water, sewage effluent, grey water and stormwater.

This ensures that all the urban uses of water are made environmentally, economically and socially sustainable within a total catchment and legislative framework.

The water agencies commenced development of this approach several years ago, focusing initially on rural catchments and townships:

> An important current DLWC initiative which may interest the inquiry is Integrated Urban Water Cycle Planning for water supply, sewage and stormwater, as well as other catchment activities. Such catchment-wide strategic frameworks would be developed within 5 years for each of the 24 major NSW catchments. Each utility would then develop an integrated urban water cycle plan for its water services in accordance with the catchment –wide strategic framework.
>
> **Source:** Department of Land and Water Conservation, *Submission to the Senate Inquiry into Urban Water Management,* July 2001

And in 2002 Sydney Water's *WaterPlan 21* adopted a more integrated approach to its provision of water, wastewater and stormwater services.

The water agencies have recognised the need to ensure the same approach in planning Sydney's metropolitan water supply:

> Climate change and the need to allocate water for environmental flows will decrease water availability across the Sydney region. To secure water supplies for Sydney's residents and industries over the next 30 years a more integrated and strategic approach to total urban water cycle management is needed.
>
> **Source:** Department of Infrastructure, Planning and Natural Resources, *Sydney Metropolitan Strategy – Ministerial Directions Paper*, May 2004

In 2004 States and Territories agreed in the *National Water Initiative* to adopt a more integrated approach to planning:

> adopt the following principles for determining the most effective and efficient mix of water recovery measures:
>
> a) consideration of all available options for water recovery, including:
>
> - investment in more efficient water infrastructure;
> - purchase of water on the market, by tender or other market based mechanisms;
> - investment in more efficient water management practices, including measurement; or
> - investment in behavioural change to reduce urban water consumption;
>
> b) assessment of the socio-economic costs and benefits of the most prospective options, including on downstream users, and the implications for wider natural resource management outcomes (eg. impacts on water quality or salinity); and
>
> c) selection of measures primarily on the basis of cost-effectiveness, and with a view to managing socio-economic impacts.
>
> **Source:** COAG, Inter-Governmental Agreement on the National Water Initiative, 25 June 2004 sect 79.

Planning framework

The planning framework is now outlined in a range of documents developed in recent years, including:

- *NSW Water Conservation Strategy*
- *NSW Salinity Strategy*
- *NSW Groundwater Quality Protection Policy*
- *State Riverine Corridor Policy*
- *NSW Weirs Policy*
- *Sewage Management Policy*
- *NSW Urban Stormwater Program*
- *State Water Management Outcomes Plan*
- *Draft Regional Environmental Plan 'Sustaining the Catchments'*
- *Catchment Blueprints and Catchment Action Plans*
- *Water Sharing Plans*
- *Metropolitan Water Plan 2004*
- agency programs such as Sydney Water's *Demand Management Program*.

Sydney's *Metropolitan Strategy,* which is to set out how the Government intends to sustainably manage growth and change in Sydney and the Greater Metropolitan Region, is still under development.

More integrated approach

The *Metropolitan Water Plan 2004* needs to be interpreted in the context of a range of other plans and policies, including a number that are still to be developed. Compared to water plans we have seen developed for other major cities, the *Plan* is relatively brief and focused on actions to close a gap in supply and demand.

There is a need to continue to develop and integrate the planning for Sydney's water supply, preferably in one readily accessible set of documents.

Recommendation

We recommend that the Department of Infrastructure, Planning and Natural Resources, Sydney Water, Sydney Catchment Authority and related water agencies continue to develop and integrate all aspects of planning for Sydney's water in accordance with the principles agreed to by COAG in the *National Water Initiative*. This would incorporate demand management measures and pricing, leakage reduction, surface waters, ground water, sewage effluent, grey water and stormwater.

3. Identifying and managing the risks

Identifying and managing the risks - at a glance

Chapter 3 examines how well State water agencies have identified and analysed risks relevant to the achievement of objectives.

We find:

- the risk of water shortages may be more serious than indicated in the *Metropolitan Water Plan 2004*.
- despite a high level of uncertainty and risk associated with the *Plan*, there is no explicit risk management plan.
- although we have been advised that risks were considered and that an 'adaptive' approach is being followed, planning did not identify or examine a worst-case scenario and there are no assurances in that regard.

3.1 Early identification of risks

Early identification and management of risks is integral to good management and should form an early part of program design to assist the water agencies in decision-making.

A significant level of uncertainty and risk applies to efforts to ensure the adequacy of Sydney's water supply. This in turn is likely to affect the cost and effectiveness of such efforts.

Critical areas of uncertainty and risk in relation to Sydney's water include the impact of:

- climate change
- population growth
- future reductions in water consumption
- future savings from recycled water
- future yield of the water supply.

The magnitude of the task ahead in achieving future reductions in water demand and future savings from re-cycled water is illustrated by comparing the targeted amounts with achievements to date by Sydney Water:

Options	Achieved contribution GL a year	Target contribution GL a year
Reducing demand	6	100
Reducing leakage	11	40
Recycling	13	80
Total	30	220

3.2 Climate change

There is a question as to whether climate change impacts have been clearly accounted for.

The *Metropolitan Water Plan 2004* identifies long-term climate change as an important consideration:

- NSW has commissioned research from CSIRO that shows the impacts of climate change on the variability of our climate
- given climate change and new unpredictable drought cycles, Sydney needs to diversify its water sources to minimise risk.

Source: *Metropolitan Water Plan 2004*

Inflows likely to decline

That research by CSIRO indicates that the inflows into Warragamba Dam are likely to decline. However, in the absence of firm data, climate change has not been factored into future estimates of water demand. Nor has it been factored into current estimates of water supply.

> Preliminary investigations into possible future climate change suggest that although rainfall near the coast may increase, rainfall west of the Great Dividing Range may reduce. Thus inflows to Sydney's storage dams may decline. There is also a likelihood that the climate will experience greater variability, with more severe droughts. Firm data is not available and so climate change has not been factored into future estimates of water demand. Nor has it been factored into current estimates of water supply.
>
> **Source:** Sydney Catchment Authority, *Drought Management Plan* 2002.

Despite the absence of firm data, the recent Senate *Inquiry into Australia's management of urban water* stressed that urban water planners should factor this uncertainty of the future water supply into their calculations, as it cannot be assumed that catchments will maintain their current levels of water.

> There is much uncertainty about the effects that climate change will have on rainfall patterns and water supply. However, possible scenarios include the potential for decreased yields from existing water supply catchments; decreases in rainfall; reductions in average volumes of river flow; decreases in run-off; difficulties in maintaining environmental flows; increases in drought severity; and increases in flooding in urban areas due to more intense rainfall flooding on impervious urban surfaces.
>
> Consequently, urban water planners must factor this uncertainty of the future water supply into their calculations, as it cannot be assumed that catchments will maintain their current levels of water. This uncertainty suggests that as a society, we must build in a larger margin for error, or 'fudge factor', when planning our future water supply to allow for these unpredictable changes.
>
> **Source:** Parliament of the Commonwealth of Australia, *The Value of Water: Inquiry into Australia's management of urban water,* report of Senate Committee December 2002 p41.

Impact

The impact of climate change on water demand and water supply could significantly affect the future security of Sydney's water supply. It could also weaken the effectiveness of the *Metropolitan Water Plan 2004*. We have been advised that work is underway to further assess the impact on yield. This needs to be incorporated in forecasting models, despite the absence of firm data.

3.3 Population growth

The *Metropolitan Water Plan 2004* points to population growth as one of the major factors influencing our demand for water.

Population in Sydney is growing much faster than previously predicted, with much of the increase due to overseas migration.

As population projections for Sydney are subject to considerable uncertainty, the Department of Infrastructure, Planning and Natural Resources issues a high, medium and low projection. These figures indicate a range of plus or minus about 5% in the projections over the next 25 years.

Impact

Despite the considerable uncertainty associated with population projections for Sydney, the *Metropolitan Water Plan 2004* focuses only on the medium population forecast. Although we have been advised that the higher forecast was considered, the *Plan* does not consider how to ensure adequate water should the high forecast eventuate.

3.4 Future reductions in water consumption

Future reductions in water consumption rely on consumer behaviour, and on price increases, which also depend on consumer responsiveness.

Changing behaviour

It is important to appreciate that awareness or even attitudes of the community to water use do not necessarily reflect behaviour or translate into action. There may be an increased awareness of water conservation as a result of a campaign, which may emerge from follow-up interviews and surveys, but this may not result in actual reduction of water use.

In the last five years the total savings from all demand management programs implemented since 1999 was estimated at 29 GL per year, with the biggest savings achieved through the Leakage Reduction Program. But Sydney Water has advised that its future demand management program will achieve a reduction many times this amount in the next five years.

Uncertainty

Sydney Water considers the water saving assumptions used in the current program to be quite conservative. The planned saving by 2010-11 increases to 140 GL. Sydney Water has projected a 'pessimistic' increase of at least 115 GL. The most uncertain options are those where it has limited experience. Some of the regulatory and consumer behaviour change options fall into this category including pricing reform, outdoor education and permanent restrictions.

A recent review of the program, commissioned by IPART, supports Sydney Water's overall projection, although it stresses that a high degree of uncertainty is associated with many of the expected savings.

Impact

Despite a more conservative approach, there remains a considerable risk that future reductions in water consumption will not materialise:

- there is considerable uncertainty associated with demand management measures that rely on consumer behaviour, and on price increases, which also depend on consumer responsiveness
- there is limited, but increasing experience in assessing the effectiveness of demand management programs for water
- there remains a question as to whether the risks of achieving individual demand reductions have been adequately identified and assessed. Despite considerable efforts by Sydney Water, demand reduction programs have failed to meet targets set in the past and need close control and monitoring
- while Sydney Water now has more experience with such programs, cost and performance estimates are likely to be relatively uncertain with limited assurance as to the extent or timing of any savings.

3.5 Future savings from recycled water

As discussed earlier, the new *Metropolitan Water Plan 2004* has placed considerable reliance on the future use of recycled water and a strategy is being prepared. Key issues will include:

- avoidance of environmental and health problems
- securing private sector involvement
- the role of local government.

Critical uncertain elements that will influence the adoption of recycled water include:

- the costs per kilolitre of water saving or capacity augmentation/supply substitution – particularly when costs of such alternatives as recycling using 'third pipe' systems or desalination vary with the scale on which they are adopted
- future supply side responses to changes in Sydney Catchment Authority bulk water prices by third parties wishing to offer recycled water as a substitute for water sourced from Sydney Catchment Authority.

  Source: Independent Pricing and Regulatory Tribunal, *Water price restructuring and the role of Sydney's wholesale water price,* report prepared by consultant, April 2004

Even where the regulatory introduction of BASIX is expected to drive the increased use of recycled water, there is a risk that systems could be disconnected after installation to avoid the higher operating costs.

Impact

While the new *Metropolitan Water Plan 2004* has placed considerable reliance on the future use of recycled water, Sydney Water has had limited success in this area in the past. Pending the development of the strategy for recycled water, the future of private sector involvement and consumer response, the eventual reductions in demand on Sydney's water supply are necessarily quite uncertain.

3.6 Future yield of the water supply

The Sydney Catchment Authority uses a computer model to project the long-term supply or yield that can be expected from Sydney's water system.

System yield

The water supply system yield is the amount of water then available on a sustainable basis. Yield depends on the supply's storage capacity, the average volume of inflow, storage losses through evaporation and seepage, the performance criteria used to operate the storages, and the river flow releases made from the storages.

Yield also depends on the level of acceptable risk of running out of water. The greater the risk the community is prepared to take of the dams running out of water, the larger the yield that can be extracted from a storage or river.

The operating licence for Sydney Catchment Authority sets performance criteria for the supply of water that include:

- reliability to be not less than 97% (water restrictions should not need to be applied more often than 30 months in every 1000)
- robustness to be not less than 90% (not more than 10 years in 100 should be affected by water restrictions)
- security to be not less than 5% (the level of operating storage should not fall below 5% more often than 1 month in 100,000 months).

  Source: Sydney Catchment Authority Operating Licence, schedule 2.

Falling yield

In 1995 the yield of Sydney's water sources was estimated to be around 720 GL per year. As a result of the mid 1990s drought, and with more sophisticated computer modelling, the yield was reassessed to be 600 GL per year. The average for the ten years prior to water restrictions being implemented was just over 600 GL per year. This is the figure used in the *Metropolitan Water Plan 2004*.

But the Authority has cautioned that this projection of yield is likely to be reduced:

- when the inflow data from the current drought (1998 onwards) is included in the computer model
- when assumptions made about the effectiveness of water restrictions are re-evaluated following the present drought, particularly as many water conservation measures were in place. If restrictions are less effective in saving water during drought, more water is used and the long term yield is reduced.

And IPART's *Operational Audit of Sydney Water Corporation 2003/2004* cautions that the impact of using more realistic assumptions in the model, that allow for the effects of normal dry and wet climate variations, may see a further reduction in yield.

Demand hardening The difficulty also arises that the community, already saving water through various means, has less capacity to reduce demand in the event of a future drought. This process is known as "demand hardening".

Impact of new supply measures On the other hand, the new supply measures announced in the *Metropolitan Water Plan 2004* should increase the yield. But there is a degree of uncertainty about the ability to regularly pump additional water from the Shoalhaven without increasing storage capacity on the Shoalhaven.

Acceptability of risk The projected yield could also be increased if the community was to accept a greater risk of running out of water. It has been suggested that the reliability criterion in Sydney be reduced from 97 per cent to 95 per cent – as in Melbourne. This could increase the 'yield' of the system from 600 GL per year to 650 GL per year. But the Authority points out that inflows into Sydney's water supply storages are three times more variable than inflows into Melbourne's water supply storages. As more water is withdrawn from the supply there is greater likelihood of reaching the 'emergency' level of 25 per cent of storage with the consequent requirement to implement an emergency supply measure (such as a desalination plant).

3.7 Risk management

There are significant risks associated with the future strategy as it depends on potential climatic change, forecast rates of population growth, the success of recycling and demand management initiatives, uncertainties about the response consumers will make in the ultimate to price reform and how sustained those responses may be.

Consideration of risks Risks were considered in the preparation of the Metropolitan Water Plan 2004 by:

- excluding options that were qualitatively assessed by the interdepartmental committee as having too high a risk (technical, public acceptance, non-delivery, health and safety, system reliability, or institutional)
- identifying likely savings and also 'pessimistic' savings for some options
- projecting future yield based on an acceptable risk of running out of water
- ensuring total estimates (including pessimistic estimates where provided) could cover the projected supply/demand deficit.

But the analysis did not explicitly address the consequences of:

- options including recycling and additional supply options where no 'pessimistic' estimate was provided
- some options failing to meet (even pessimistic) expectations
- the supply/demand deficit being greater than that projected.

Periodic review

The *Metropolitan Water Plan 2004* identifies the need for periodic review:

> 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.
>
> **Source:** *Metropolitan Water Plan 2004: Meeting the challenges – Securing Sydney's water future*

Contingencies

As a contingency, while the *Plan* is designed to increase water releases to the Upper Nepean, it delays a final decision on releases from Warragamba Dam to further improve the health of the Hawkesbury-Nepean River. Potentially this would increase the gap between supply and demand to a figure in excess of 300 GL of water each year.

The *Plan* also foreshadows some options, such as a desalination plant, that may need to be adopted 'if evidence shows shortfalls in coming years due to unforeseen circumstances'.

Drought response

Sydney Water's *Drought Response Management Plan 2002-2012* identifies a number of short-term options, including the use of desalination. It is also intended to progressively introduce restrictions as storage levels drop.

Restrictions	Total storage level (%)	Demand reduction level	Targeted demand reductions
Voluntary restrictions	65		
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%
Level 4 Mandatory Restrictions	25	Level V	50%

The estimated yield of Sydney's water system is based on achieving the targeted reductions in use, including those that that extend to 50%.

But the *Drought Response Management Plan* is only directed at the more immediate risks of drought. It does not indicate the planned response to worsening levels of drought (Levels III, IV, and V above) and such a situation has not previously occurred.

Following the onset of drought, a *Drought Expert Panel* was established to identify and assess alternative water supply options that can be progressively implemented as the drought enters the Emergency Phase. The Panel has been assessing the impact of a continuing drought on storage levels under a range of scenarios (including the worst case scenario of zero inflows and failure to achieve the higher level demand reduction targets) to determine the time available in which to activate the contingency options.

The Panel has identified over 30 alternative supply options and ranked these according to cost, timeliness, feasibility, implementation risk and long term fit. These options are all undergoing further investigation.

Sydney Water and the Sydney Catchment Authority have been revising their planning and intend to update the *Drought Response Management Plan*. When completed, it should outline the planned response to worsening levels of drought. This needs to be clear and transparent and the results of periodic review need to be published.

Longer-term risk management

Despite a high level of uncertainty and risk, and advice that risks have been considered, there is no explicit risk management plan for Sydney's longer-term supply. The risk of water shortages may be more serious than indicated in the *Metropolitan Water Plan 2004*. Although risks were considered and an 'adaptive' approach is being followed, planning did not identify or examine a worst-case scenario and there are no assurances in that regard.

'Adaptive management'

'Adaptive management' commonly means that the state of the system and the impacts of changes are monitored and assessed to ensure continual movement toward desired performance. It does not generally involve risk assessment, which facilitates pre-emptive action. Therefore 'adaptive management' is not a term generally used to address unexpected or unforeseen changes or shocks to the system. However, a system that has "adaptive capacity" has the ability to absorb such shocks and stresses without major disturbance to its functioning. Highly adaptive systems have redundancy, multiple operational pathways and are not generally operating to full capacity. This suggests that a method of assessing and quantifying the "adaptive capacity" of the complete system, its function and the controls that act upon it (physical, procedural, economic, legislative and social) is needed to ensure sustainability.

Using a scenario approach

Water resource planners in the UK use a scenario approach to ensure their strategies are sufficiently robust to deal with a range of scenarios.

Water resources for the future – a strategy for England and Wales

The twin-track approach recognises the value of water in the environment, and therefore seeks the efficient use of existing water resources. However, it recognises also that development of new water resources may be necessary, and that such development must be planned in advance so that it is ready when the water is needed.

In looking ahead, we must acknowledge explicitly the uncertainties that are associated with many of the factors that affect water resources management. This means that we must identify a way forward that is flexible and robust to a range of possible futures.

To do this, we need to understand the implications of the different changes that could happen. For this reason, we have taken a scenario approach, looking at the different ways that society may use and value water in the future.

One of the keys to a successful adaptation strategy is to ensure that it is sufficiently flexible to deal not only with current scenarios but at least to some extent with events that are less likely.

Experience in recent decades indicates that 15 to 20 years might elapse from the initiation of a large water resources scheme (such as a reservoir) to its readiness for use, of which only some five years would be construction time. Any significant scheme deserves major public scrutiny, but it would reduce uncertainty if some way of accelerating the process could be found.

Source: (UK) Environment Agency, *Water resources for the future – a strategy for England and Wales*, March 2001

Documenting the process

At issue is the thoroughness and relevance of the risk analysis process, including assessment of the significance of risks, the likelihood of their occurring and determination and timeliness of needed actions. Conclusions may have been reached without fully considering external risks such as climate change, consideration of risks associated with demand management measures and supply measures, socio-economic and environmental impact assessment, and assessing of funding options (including private provision of public infrastructure).

Documenting each step of the risk management process is important to:

- demonstrate to stakeholders that the process has been conducted properly
- provide evidence of a systematic approach to risk identification and analysis
- enable decisions or processes to be reviewed
- provide decision makers with a risk management plan for approval and subsequent implementation
- provide an accountability mechanism and tool.

Source: Standards Australia, AS/NZS 4360:2004 Risk Management Guidelines

Better practice risk management processes would include:

- develop and model a series of "worst-case" scenarios for cumulative areas of uncertainty associated with water management (e.g. reduced stream flows, increased drought sequences, high population growth, reduced demand management program effectiveness)
- develop a method of assessing and quantifying the "adaptive capacity" of the complete system, its function and the controls that act upon it (physical, procedural, economic, legislative and social)
- use the results of the "worst case" scenarios and adaptive capacity of the system in a risk assessment and prioritisation planning process
- develop a more comprehensive framework to evaluate the impacts of actions by all agencies on the sustainability of the integrated system.

Recommendation We recommend that the Department of Infrastructure, Planning and Natural Resources, Sydney Water, Sydney Catchment Authority and related water agencies use better practice risk management processes (such as the Australian standard for Risk Management AS/NZS 4360:2004) to develop contingency measures, including those to address worst-case scenarios.

4. Ensuring oversight and accountability

Ensuring oversight and accountability – at a glance

Chapter 4 examines oversight and accountability arrangements, including who is responsible, how we would know if the measures to restore Sydney's demand/supply balance were working, and how much the public have been involved.

We find:

- the *Metropolitan Water Plan 2004* contains little planning or implementation detail
- there has been limited public consultation and transparency associated with the preparation of the *Metropolitan Water Plan 2004*, due in part to the urgent need to develop measures to counter Sydney's falling water supply in a serious drought
- as a result of changes in administration over the last decade, no agency has a statutory responsibility to ensure the long-term match of water supply and demand for Sydney.

4.1 Monitoring performance

Sydney's impending water shortage may have been evident years ago, as:

- the capacity of the storage system has not changed and the yield estimate of 600 GL figure is based on inflow experience to 1998
- audits undertaken for IPART in 1999 and 2000 identified that Sydney Water did not appear likely to achieve either the 2004-05 or 2010-11 water conservation targets.

Requirements

We looked to see:

- how we would know if the *Plan* is working (especially measures to reduce demand). Where is the plan of who will do what by when. Where is the information system to gauge the efficiency and effectiveness of the *Plan* and to whom will the information be provided
- have clear objectives and monitoring mechanisms been developed for each sub program. What performance measures have been established? How will the adaptive management of environmental flows be incorporated, given the likelihood of shifts due to climate change? Will progress be publicly reported at least annually
- who has the responsibility for managing the demand/supply balance. Who assesses the risks. Who follows through to review the progress of programs and performance in the context of the overall demand/supply balance. Who plans for what to do if some of these programs look like failing to reach expectations.

What we found

The *Metropolitan Water Plan 2004* contains little planning or implementation detail. The Department of Infrastructure, Planning and Natural Resources is to monitor overall implementation of the actions contained in the *Plan*.

IPART is looking at the inclusion of various targets for water efficiency, recycling and leakage-reduction in the Operating Licence. But we could find no overall performance-reporting framework to monitor the various components of Sydney's water supply and demand, so as to ensure an efficient and effective balance is maintained.

4.2 Accountability

Water reforms

In 1994 the Council of Australian Governments agreed on the need for institutional reform in relation to water, including:

- governments would develop administrative arrangements and decision-making processes to ensure an integrated approach to natural resource management
- as far as possible, the roles of water resource management, standard setting and regulatory enforcement and service provision be separated institutionally
- that the arrangements in respect of service delivery organisations in metropolitan areas in particular should have a commercial focus, and whether achieved by contracting-out, corporatised entities or privatised bodies this be a matter for each jurisdiction to determine in the light of its own circumstances

Source: Council of Australian Governments, Communique issued 25 February 1994

Organisational change

The response by the NSW Government included:

- the development of catchment planning committees
- establishing water regulation as a major function of IPART
- corporatising the Sydney Water Board so it would operate along commercial lines.

In 1999, responding to the cryptosporidium incident, the Government transferred Sydney Water's system of dams and reservoirs to the Sydney Catchment Authority. The transfer split Sydney Water's water delivery network, placing responsibility for bulk water delivery with the Sydney Catchment Authority. As a result, the two organisations share many physical interfaces and must closely co-ordinate their day-to-day operations.

Coordination

Overall water policy is coordinated through a *Water CEOs Committee*. This is a committee of public sector chief executives involving Agriculture, Cabinet Office, Energy Utilities and Sustainability, Environment and Conservation, Fisheries, Infrastructure, Planning and Natural Resources, Sydney Catchment Authority, Sydney Water, and Treasury, with Health having observer status.

In 2004 the Government assigned the role of planning, coordination and prioritisation of the provision of infrastructure for water and sewerage to the Department of Infrastructure, Planning and Natural Resources.

A *Metropolitan Water Senior Executives Committee* with CEO representation, led by the Department of Infrastructure, Planning and Natural Resources, completed the *Metropolitan Water Plan 2004*.

The committee is to report annually on the progress of the implementation of the *Metropolitan Water Plan 2004* to the ad hoc sub-committee of Cabinet that approved the *Plan*.

Accountability

While the Department of Infrastructure, Planning and Natural Resources leads this activity, no agency has a statutory responsibility to ensure the long-term match of water supply and demand for Sydney.

As a result of organisational changes over the last decade:

- the Minister for Infrastructure and Planning, and Minister for Natural Resources plans and controls access to water through the Department of Infrastructure, Planning and Natural Resources under the *Water Act 1912* and the *Water Management Act 2000*
- the Minister for Energy and Utilities controls water distribution through Sydney Water under the *Sydney Water Act 1994*
- the Minister for the Environment controls supply of water through the Sydney Catchment Authority.

The legislative and regulatory framework for the complete water cycle is complex and incomplete. For example, the Department of Infrastructure, Planning and Natural Resources has the power to limit the amount drawn from a river, but no one presently has the power to limit the amount withdrawn from a town water supply. There is no urban water equivalent of the *Energy Administration Act 1987* 'to promote the most cost-effective long term match of energy supply and demand' or *Electricity Supply Act 1995* 'to establish a competitive retail market in electricity'.

And accountability for the success of demand management measures, critical to the *Metropolitan Water Plan 2004*, is split between agencies:

- the Department of Energy, Utilities and Sustainability has assumed responsibility for managing the new demand management fund in the *Metropolitan Water Plan 2004*
- Sydney Water continues to operate its own demand management program.

Recommendation

We recommend that the water agencies review the legislative and organisational arrangements relating to Sydney's water supply/demand balance to further clarify and formalise:

- the full set of accountabilities for its oversight and how they are to be integrated
- responsibilities to ensure the adequacy of supply
- arrangements to facilitate private sector involvement in recycled water.

4.3 Transparency

Transparency is particularly necessary in a system:

- that involves the need for assessors to exercise judgment in the assessment process
- that involves trade-offs between options from a sustainability perspective
- where the costs of demand management programs are not always met by Sydney Water. Customers may incur costs directly, for example by paying for water efficient appliances and their installation. Customers also bear the cost of any loss of service
- where a development has the potential to significantly impact on people or the environment, or where the effect of a poor decision will lead to significant irreversible environmental impacts.

Public involvement and participation

One of the principal objects of the *Environmental Planning and Assessment Act 1979* is to increase opportunities for public involvement and participation in planning and assessment. Public participation is consistent with enhancing transparency.

There was public consultation associated with the Hawkesbury-Nepean River Management Forum, although this was focused on the provision of environmental flows.

There are some further examples of public consultation. We understand that Sydney Water has had an extensive customer research program. IPART's reviews are open and transparent and IPART has requested that Sydney Water and the Sydney Catchment Authority conduct some community research for the reviews of their operating licences.

Other jurisdictions generally engage in more extensive consultation. For example:

> The ACT Government worked with ACTEW Corporation and with input from the community and experts to develop the *Think water, act water* strategy.
>
> A draft strategy was released for public comment from 21 November 2003 to 16 February 2004.
>
> Community involvement has been through a community reference group, focus groups, presentations at community, business and industry group meetings, displays at public events, a community water summit – *Our Water Future – Beyond the Drought and Water Restrictions* in August 2003 and two public meetings held in February 2004.
>
> Feedback received from the community during these processes has been considered along with public submissions on the draft strategy to develop the final strategy.
>
> **Source:** Australian Capital Territory Government, *Think water, act water,* April 2004

Metropolitan Water Plan 2004

Public consultation and transparency associated with the preparation of the *Metropolitan Water Plan 2004* have been limited. This can in part be attributed in part to the urgent need to develop measures to counter Sydney's falling water supply in a serious drought.

Material supporting the *Metropolitan Water Plan 2004*, the assumptions made and the basis for decisions has not been publicly released. We were advised that the *Metropolitan Water Senior Executives Committee* kept an action list but no minutes of its meetings. The latter would generally be expected, especially to comply with the *State Records Act 1998*.

Recommendation

We recommend that the Department of Infrastructure, Planning and Natural Resources, Sydney Water, Sydney Catchment Authority and related water agencies implement a greater level of engagement of the public in:

- the development of demand management strategies
- the reliability of water supply
- water pricing
- appropriate balance between demand and supply-side options.

This needs to include publication of an information paper to ensure the public has sufficient information on these aspects and public release of the documents supporting the *Metropolitan Water Plan 2004* and its periodic review.

Appendices

Appendix 1 Terms used in this report

Demand hardening	The diminished ability or willingness of customers to reduce demand during a supply shortage.
Demand management	Measures and policies implemented to influence the demand (for water and related services) usually to reduce or maintain demand in line with available supplies or system capacities.
Drought	For the purposes of drought response planning for Sydney Water's supply, drought is defined as 'a period of time when the water stored in the reservoirs, and anticipated or forecasted inflows, are considered to be insufficient to meet current and/or future unrestricted demand'.
Gigalitre (GL)	One billion litres
Grey water	Those components of waste water that do not come from a toilet or urinal.
IPART	Independent Pricing and Regulatory Tribunal
Mandatory restrictions	A set of water use conditions which are policed and penalties can be issued for non-compliance.
Total water cycle management	Recognises water, wastewater and stormwater as three inter-related aspects of one common water cycle and adopts an integrated approach to planning of water, wastewater and stormwater systems.
Unaccounted for water	Water that is lost from the system through leakage and used for operational purposes such as flushing. It is not metered and accounts for 2-3% of the total supply.
Voluntary restrictions	Suggested water saving conditions that the public can choose to comply with. They will not be policed and no fines will be issued for non-compliance.
Yield	The rate at which water can be drawn from a water resource on a sustainable basis.

Appendix 2 About the audit

Objective

We examined the adequacy of arrangements to ensure a reliable supply of water to meet metropolitan demand requirements for Sydney.

Scope and focus

The agencies chiefly involved in the supply of water to Sydney are the Sydney Catchment Authority, Sydney Water Corporation and the Department of Infrastructure, Planning and Natural Resources.

This audit has focused on whether there are appropriate and adequate arrangements for ensuring a reliable supply of water to meet metropolitan demand requirements.

We have not questioned Government policy that may have influenced the selection of specific options to augment water supplies or reduce water usage.

Criteria

In judging the efficiency, effectiveness and economy of arrangements in place, we looked for:

- a coordinated and strategic approach to ensuring a reliable supply of water to meet metropolitan demand requirements
- identification and analysis of risks relevant to the achievement of objectives
- information systems to support the monitoring and management process
- avenues for stakeholder consultation to assist judgement and enhance transparency
- performance assessment and reporting to ensure measures prove efficient and effective
- oversight and accountability arrangements to clarify responsibilities.

Audit approach

We acquired subject matter expertise through:

- interviews and examination of relevant documents including guidelines, reports, studies, strategies and reviews relating to the supply of water, with focus on the current arrangements and situation plus sufficient history to understand how the present circumstances have arisen
- discussions with relevant staff of State water agencies
- discussions with representatives of key stakeholders groups
- comparisons where appropriate with other States and countries
- government and best practice guidelines relevant to the above.

This was supplemented with assistance from an external subject matter expert who reviewed the audit plan, scope and criteria, overall findings and draft report.

Cost of the audit

Including printing and all overheads, the estimated cost of this audit is $180,000.

Acknowledgements As the audit topic was regarded as sensitive by those agencies most directly involved, cooperation and assistance was at times difficult to secure.

However, we gratefully acknowledge the co-operation and assistance provided by representatives of the Sydney Catchment Authority, Sydney Water Corporation, the Department of Infrastructure, Planning and Natural Resources, Independent Pricing and Regulatory Tribunal, Department of Energy, Utilities and Sustainability, Department of Environment and Conservation, NSW Health and central government agencies.

We were also assisted by discussions with a number of external bodies including the Total Environment Centre, Nature Conservation Council of NSW, and Hawkesbury-Nepean Catchment Management Authority.

Audit team Our team leader for this performance audit was Chris Yates. Direction and quality assurance was provided by Sean Crumlin.

Performance Audits by the Audit Office of New South Wales

Performance Auditing

What are performance audits?

Performance audits are reviews designed to determine how efficiently and effectively an agency is carrying out its functions.

Performance audits may review a government program, all or part of a government agency or consider particular issues which affect the whole public sector.

Where appropriate, performance audits make recommendations for improvements relating to those functions.

Why do we conduct performance audits?

Performance audits provide independent assurance to Parliament and the public that government funds are being spent efficiently and effectively, and in accordance with the law.

They seek to improve the efficiency and effectiveness of government agencies and ensure that the community receives value for money from government services.

Performance audits also assist the accountability process by holding agencies accountable for their performance.

What is the legislative basis for Performance Audits?

The legislative basis for performance audits is contained within the *Public Finance and Audit Act 1983, Part 3 Division 2A*, (the Act) which differentiates such work from the Office's financial statements audit function.

Performance audits are not entitled to question the merits of policy objectives of the Government.

What conducts performance audits?

Performance audits are conducted by specialist performance auditors who are drawn from a wide range of professional disciplines.

How do we choose our topics?

Topics for performance audits are chosen from a variety of sources including:

- our own research on emerging issues
- suggestions from Parliamentarians, agency Chief Executive Officers (CEO) and members of the public
- complaints about waste of pubic money
- referrals from Parliament.

Each potential audit topic is considered and evaluated in terms of possible benefits including cost savings, impact and improvements in public administration.

The Audit Office has no jurisdiction over local government and cannot review issues relating to council activities.

If you wish to find out what performance audits are currently in progress just visit our website at www.audit.nsw.gov.au.

How do we conduct performance audits?

Performance audits are conducted in compliance with relevant Australian standards for performance auditing and operate under a quality management system certified under international quality standard ISO 9001.

Our policy is to conduct these audits on a "no surprise" basis.

Operational managers, and where necessary executive officers, are informed of the progress with the audit on a continuous basis.

What are the phases in performance auditing?

Performance audits have three key phases: planning, fieldwork and report writing.

During the planning phase, the audit team will develop audit criteria and define the audit field work.

At the completion of field work an exit interview is held with agency management to discuss all significant matters arising out of the audit. The basis for the exit interview is generally a draft performance audit report.

The exit interview serves to ensure that facts presented I in the report are accurate and that recommendations are appropriate. Following the exit interview, a format draft report is provided to the CEO for comment. The relevant Minister is also provided with a copy of the draft report. The final report, which is tabled in Parliament, includes any comment made by the CEO on the conclusion and the recommendations of the audit.

Depending on the scope of an audit, performance audits can take from several months to a year to complete.

Copies of our performance audit reports can be obtained from our website or by contacting our publications unit.

How do we measure an agency's performance?

During the planning stage of an audit the team develops the audit criteria. These are standards of performance against which an agency is assessed. Criteria may be based on government targets or benchmarks, comparative data, published guidelines, agencies corporate objectives or examples of best practice.

Performance audits look at:

- processes
- results
- costs
- due process and accountability.

Do we check to see if recommendations have been implemented?

Every few years we conduct a follow-up audit of past performance audit reports. These follow-up audits look at the extent to which recommendations have been implemented and whether problems have been addressed.

The Public Accounts Committee (PAC) may also conduct reviews or hold inquiries into matters raised in performance audit reports. Agencies are also required to report actions taken against each recommendation in their annual report.

To assist agencies to monitor and report on the implementation of recommendations, the Audit Office has prepared a Guide for that purpose. The Guide, *Monitoring and Reporting on Performance Audits Recommendations*, is on the Internet at www.audit.nsw.gov.au/guides-bp/bpglist.htm

Who audits the auditors?

Our performance audits are subject to internal and external quality reviews against relevant Australian and international standards. This includes ongoing independent certification of our ISO 9001 quality management system.

The PAC is also responsible for overseeing the activities of the Adit Office and conducts reviews of our operations every three years.

Who pays for performance audits?

No fee is charged for performance audits. Our performance audit services are funded by the NSW Parliament and from internal sources.

For further information relating to performance auditing contact:

Stephen Horne
Assistant Auditor-General
Performance Audit Tel (02) 9275 7278
email: stephen.horne@audit.nsw.gov.au

Performance Audit Reports

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
65	Attorney General's Department	*Management of Court Waiting Times*	3 September 1999
66	Office of the Protective Commissioner Office of the Public Guardian	*Complaints and Review Processes*	28 September 1999
67	University of Western Sydney	*Administrative Arrangements*	17 November 1999
68	NSW Police Service	*Enforcement of Street Parking*	24 November 1999
69	Roads and Traffic Authority of NSW	*Planning for Road Maintenance*	1 December 1999
70	NSW Police Service	*Staff Rostering, Tasking and Allocation*	31 January 2000
71*	Academics' Paid Outside Work	*Administrative Procedures* *Protection of Intellectual Property* *Minimum Standard Checklists* *Better Practice Examples*	7 February 2000
72	Hospital Emergency Departments	*Delivering Services to Patients*	15 March 2000
73	Department of Education and Training	*Using Computers in Schools for Teaching and Learning*	7 June 2000
74	Ageing and Disability Department	*Group Homes for People with Disabilities in NSW*	27 June 2000
75	NSW Department of Transport	*Management of Road Passenger Transport Regulation*	6 September 2000
76	Judging Performance from Annual Reports	*Review of Eight Agencies' Annual Reports*	29 November 2000
77*	Reporting Performance	*Better Practice Guide* *A guide to preparing performance information for annual reports*	29 November 2000
78	State Rail Authority (CityRail) State Transit Authority	*Fare Evasion on Public Transport*	6 December 2000
79	TAFE NSW	*Review of Administration*	6 February 2001
80	Ambulance Service of New South Wales	*Readiness to Respond*	7 March 2001
81	Department of Housing	*Maintenance of Public Housing*	11 April 2001
82	Environment Protection Authority	*Controlling and Reducing Pollution from Industry*	18 April 2001
83	Department of Corrective Services	*NSW Correctional Industries*	13 June 2001
84	Follow-up of Performance Audits	*Police Response to Calls for Assistance* *The Levying and Collection of Land Tax* *Coordination of Bushfire Fighting Activities*	20 June 2001

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
85*	Internal Financial Reporting	*Internal Financial Reporting including a Better Practice Guide*	27 June 2001
86	Follow-up of Performance Audits	*The School Accountability and Improvement Model (May 1999)* *The Management of Court Waiting Times (September 1999)*	14 September 2001
87	E-government	*Use of the Internet and Related Technologies to Improve Public Sector Performance*	19 September 2001
88*	E-government	*e-ready, e-steady, e-government: e-government readiness assessment guide*	19 September 2001
89	Intellectual Property	*Management of Intellectual Property*	17 October 2001
90*	Intellectual Property	*Better Practice Guide* *Management of Intellectual Property*	17 October 2001
91	University of New South Wales	*Educational Testing Centre*	21 November 2001
92	Department of Urban Affairs and Planning	*Environmental Impact Assessment of Major Projects*	28 November 2001
93	Department of Information Technology and Management	*Government Property Register*	31 January 2002
94	State Debt Recovery Office	*Collecting Outstanding Fines and Penalties*	17 April 2002
95	Roads and Traffic Authority	*Managing Environmental Issues*	29 April 2002
96	NSW Agriculture	*Managing Animal Disease Emergencies*	8 May 2002
97	State Transit Authority Department of Transport	*Bus Maintenance and Bus Contracts*	29 May 2002
98	Risk Management	*Managing Risk in the NSW Public Sector*	19 June 2002
99	E-Government	*User-friendliness of Websites*	26 June 2002
100	NSW Police Department of Corrective Services	*Managing Sick Leave*	23 July 2002
101	Department of Land and Water Conservation	*Regulating the Clearing of Native Vegetation*	20 August 2002
102	E-government	*Electronic Procurement of Hospital Supplies*	25 September 2002
103	NSW Public Sector	*Outsourcing Information Technology*	23 October 2002
104	Ministry for the Arts Department of Community Services Department of Sport and Recreation	*Managing Grants*	4 December 2002
105	Department of Health Including Area Health Services and Hospitals	*Managing Hospital Waste*	10 December 2002

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
106	State Rail Authority	*CityRail Passenger Security*	12 February 2003
107	NSW Agriculture	*Implementing the Ovine Johne's Disease Program*	26 February 2003
108	Department of Sustainable Natural Resources Environment Protection Authority	*Protecting Our Rivers*	7 May 2003
109	Department of Education and Training	*Managing Teacher Performance*	14 May 2003
110	NSW Police	*The Police Assistance Line*	5 June 2003
111	E-Government	*Roads and Traffic Authority Delivering Services Online*	11 June 2003
112	State Rail Authority	*The Millennium Train Project*	17 June 2003
113	Sydney Water Corporation	*Northside Storage Tunnel Project*	24 July 2003
114	Ministry of Transport Premier's Department Department of Education and Training	*Freedom of Information*	28 August 2003
115	NSW Police NSW Roads and Traffic Authority	*Dealing with Unlicensed and Unregistered Driving*	4 September 2003
116	NSW Department of Health	*Waiting Times for Elective Surgery in Public Hospitals*	18 September 2003
117	Follow-up of Performance Audits	*Complaints and Review Processes (September 1999)* *Provision of Industry Assistance (December 1998)*	24 September 2003
118	Judging Performance from Annual Reports	*Review of Eight Agencies' Annual Reports*	1 October 2003
119	Asset Disposal	*Disposal of Sydney Harbour Foreshore Land*	26 November 2003
120	Follow-up of Performance Audits NSW Police	*Enforcement of Street Parking (1999)* *Staff Rostering, Tasking and Allocation (2000)*	10 December 2003
121	Department of Health NSW Ambulance Service	*Code Red:* *Hospital Emergency Departments*	15 December 2003
122	Follow-up of Performance Audit	*Controlling and Reducing Pollution from Industry (April 2001)*	12 May 2004
123	National Parks and Wildlife Service	*Managing Natural and Cultural Heritage in Parks and Reserves*	16 June 2004
124	Fleet Management	*Meeting Business Needs*	30 June 2004
125	Department of Health NSW Ambulance Service	*Transporting and Treating Emergency Patients*	28 July 2004
126	Department of Education and Training	*School Annual Reports*	15 September 2004

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
127	Department of Ageing, Disability and Home Care	*Home Care Service*	13 October 2004
128*	Department of Commerce	*Shared Corporate Services: Realising the Benefit including guidance on better practice*	3 November 2004
129	Follow-up of Performance Audit	*Environmental Impact Assessment of Major Projects (2001)*	1 February 2005
130*	Fraud Control	*Current Progress and Future Directions including guidance on better practice*	9 February 2005
131	Follow-up of Performance Audit Department of Housing	*Maintenance of Public Housing (2001)*	2 March 2005
132	Follow-up of Performance Audit State Debt Recovery Office	*Collecting Outstanding Fines and Penalties (2002)*	17 March 2005
133	Follow-up of Performance Audit	*Management of Intellectual Property (2001)*	30 March 2005
134	Department of Environment and Conservation	*Managing Air Quality*	6 April 2005
135	Department of Infrastructure, Planning and Natural Resources Sydney Water Corporation Sydney Catchment Authority	*Planning for Sydney's Water Needs*	May 2005

* Better Practice Guides

Performance Audits on our website

A list of performance audits tabled or published since March 1997, as well as those currently in progress, can be found on our website www.audit.nsw.gov.au

If you have any problems accessing these Reports, or are seeking older Reports, please contact our Executive Officer on 9275 7220.