futurewateroptions

FOR THE ACT REGION IN THE 21ST CENTURY

ACTEW CORPORATION

FUTURE WATER OPTIONS FOR THE ACT REGION - IMPLEMENTATION PLAN

A summary of the recommended strategy to increase the ACT's water supply

April 2005

ABN 86 069 381 960

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1 Introduction

In April 2004, the ACT Government released: *Think water, act water – a strategy for sustainable water resources management*. The strategy defined actions to achieve sustainability objectives for water use in the ACT out to 2050, including to:

- increase the efficiency of water use; and
- provide a long-term reliable source of water for the ACT and region.

As part of the development of this strategy, ACTEW produced an evaluation report in April 2004: *Options for the next ACT water source*, which identified nearly 30 possible options for a long-term reliable water source for the ACT. It concluded that three options were suitable for more detailed assessment:

- building a new dam on the Cotter River, just downstream of, and thus effectively enlarging, the existing Cotter Dam;
- building a new dam on the Gudgenby River near Mount Tennent, south of Tharwa; and
- transferring water from Tantangara Dam in New South Wales to the ACT.

2 Future Water Options Project

ACTEW initiated the *Future Water Options Project* to examine the three options in detail and to recommend a preferred approach to the ACT Government.

ACTEW established a project team of specialists in water resources management, hydrological modelling, environmental studies, planning analysis, engineering, economics and related areas to conduct this analysis. The project team comprised more than 20 engineers, scientists and other professionals drawn from ACTEW, ActewAGL, other ACT agencies and specialist contractors and consultants. A thorough technical, environmental and planning analysis has been undertaken for each option.

For each option, alternatives have been assessed to determine the optimum proposal. The alternatives have involved different sizes of storages, and different ways of treating and transferring water. They included the Angle Crossing Option (formerly known as the *Virtual Tennent Option*), whereby water allocated from the Gudgenby River is pumped from the Murrumbidgee River to the existing Googong Reservoir instead of building a new storage, and allowing Tantangara water to flow to the ACT along the Murrumbidgee River.

This document summarises the technical, social, environmental and economic implications of the various options, restates the need for additional supply and describes the preferred path to provide a reliable water source for the ACT, for consideration by the ACT Government. Companion reports are available on the many technical studies that informed the analysis, individual reports on each of the three broad options and their alternatives, and a final report to the ACT Government of which this is a summary. For further information and references, refer to the report: *Future Water Options for the ACT Region – Implementation Plan: A recommended strategy to increase the ACT's water supply*.

3 What is a Reliable Water Supply?

Periodic droughts are a characteristic of the Australian climate and landscape. Rainfall and stream flow records for the ACT region highlight eight major droughts (droughts being defined as periods of below average stream flows lasting for 40 months or longer) between 1871 and 2005 – including the current drought, the worst since records began.

As the water supplier for the ACT and Queanbeyan, ACTEW aims to have sufficient water to supply water to the urban areas of the ACT and surrounding region without the risk of running out of water. ACTEW must be able to provide customers with water for household and commercial use, and to maintain public parks and gardens in reasonable condition. Water restrictions are imposed during prolonged droughts to reduce consumption and sustain water supplies.

Based on the measures and indicators of other Australian water utilities, there is currently a consensus that duration of restrictions should occur no more than five per cent of the time. There is also a perception that the ACT community wishes to avoid prolonged imposition of Stage 3 water restrictions or higher. Based on these factors and for the purpose of this report, "a reliable water supply" means that water restrictions would occur for no more than five per cent of the time. This implies restrictions of some sort (stage 1 or stage 2) could be imposed for about one summer every five years, or perhaps one full year every twenty years. Stage 3 or higher restrictions, where sprinklers are not permitted, could occur about one summer every 25 years. Ideally, stage 4 or stage 5 restrictions would never be required, but of course they may be needed in an absolutely catastrophic drought.

Water restrictions inconvenience and cost the community. An economic study has been carried out to quantify these costs in the ACT including to households, businesses, the tourism industry, Canberra's parks and public places, ACTEW and the ACT Government itself. The study found that stage 1 restrictions cost $3.5 million per year, stage 2 cost $16 million per year and stage 3 cost $60 million per year. To provide a perspective on the cost of restrictions, it is estimated that the current drought has so far cost the ACT economy approximately $71 million.

4 Key Planning Variables

New scientific information on climate variation and climate change, plus the implications of natural disasters such as the bushfires of January 2003 and the current prolonged drought and the revision of environmental flow requirements, have necessitated a review of the need for additional water supply.

The key planning variables that underlie predictions of future water demands are:

Government Planning Parameters

- Servicing population projections identified in the ACT Government's *Spatial Plan* of 500,000 persons in the ACT by 2032, plus growth in Queanbeyan and the region;
- Meeting the water efficiency targets established in *Think water, act water*, namely reductions in mains water consumption of 12 per cent per capita by 2013 and 25 per cent per capita by 2023;

Natural Environmental Risks

- Accounting for climate variability (the frequency and duration of droughts) and climate change (a trend to higher temperatures and lower rainfall);
- Including reduced inflow to existing reservoirs due to regrowth following the 2003 bushfires;

Factors Set by Government

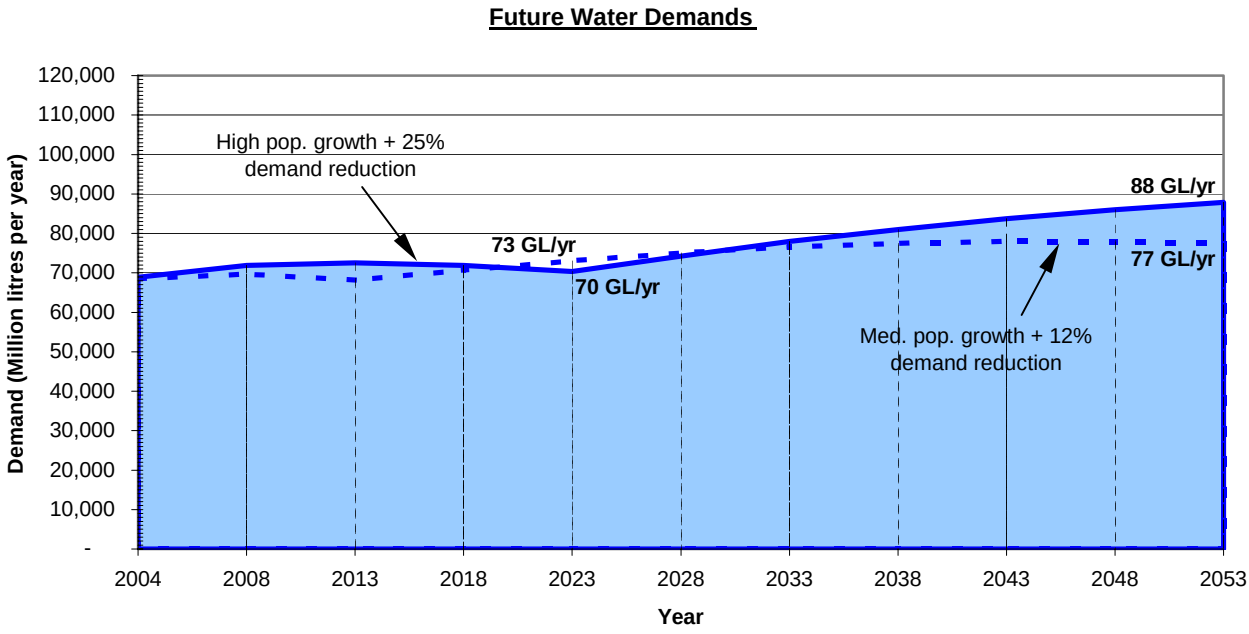
- Including environmental flow requirements between and from the reservoirs at Googong, Corin, Bendora and Cotter to maintain the health of the river ecosystems. Analysis for this study is initially based on the 1999 Environmental Flow Guidelines. These guidelines are under review by Environment ACT with the analysis soon to be completed and finalised in August 2005. In early March, Environment ACT provided to ACTEW an indication of the 'proposed new environmental flows' and these proposed changes have also been modelled separately, to estimate the impacts on future water supply for the ACT; and
- Consideration of acceptable levels for the duration, frequency and severity of water restrictions during times of drought.

5 Likely Future Water Demand

As indicated above, the demand projections and assessment of various future water sources are based on the assumption that the water efficiency targets established in *Think water, act water* will be met. The range of measures to be implemented to meet these targets include education and awareness programs, increased water pricing, rebates for toilets, showerheads, rain water tanks, indoor and outdoor water "tune ups", audits and retrofits for the commercial and government sectors, increased recycling and use of grey water. It also assumes that new suburbs will be much more water efficient than existing Canberra suburbs. The cost to the community to reduce water consumption by 25 per cent by 2023 has been estimated at $300-$400 million, the bulk of it to achieve the last few percentage point reductions.

In the five years 1999 to 2003, the quantity of water supplied to the ACT and Queanbeyan has ranged from 60 to 66 GL per year and as high as 73 GL within the last decade.

To provide "a reliable water supply" in the future, as defined in Section 3, it is estimated that 70 to 73 GL per year will be required by 2023 and 77 to 88 GL per year by 2053, largely depending on the rate of population growth and success with water efficiency programs.



ACT and Region Future Water Demand

(Depicts projected unrestricted demand with 2030 climate change)

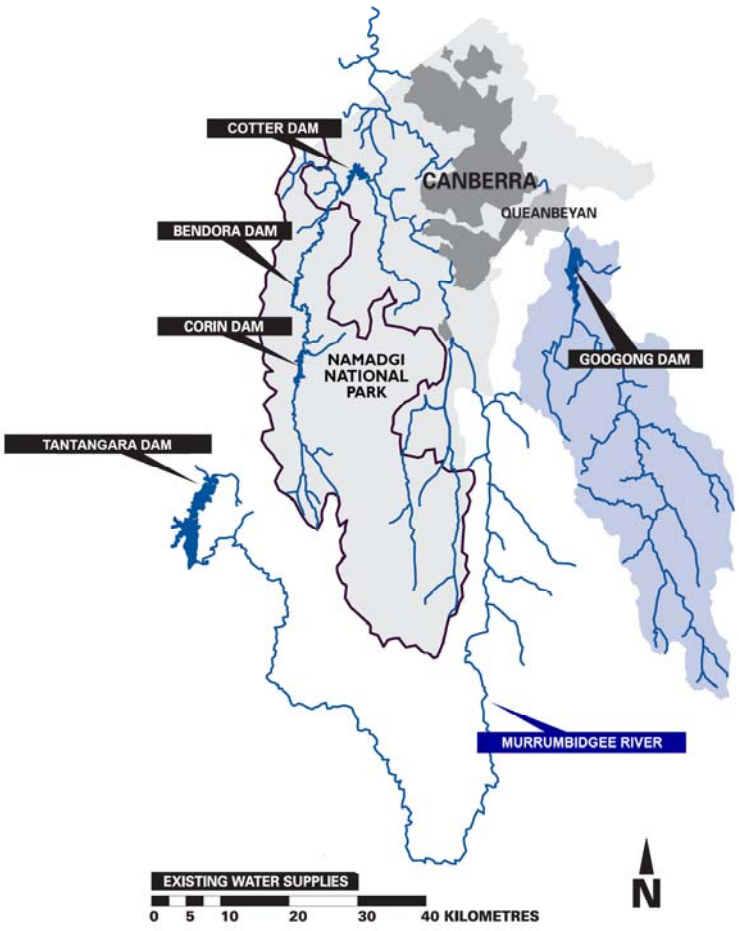
6 Hydrological Model

A sophisticated hydrological model has been developed to predict the response of the existing, and possible future water supplies, to long sequences of future climate (rainfall, temperature, evaporation and stream flow), water efficiency and demand scenarios. The complexity of the model in part reflects the interconnection of ACT storages, for example:

- Corin Reservoir releases to Bendora Reservoir, which in turn either supplies the Mount Stromlo WTP or releases to the existing Cotter Reservoir (see figure below);
- Googong water is used to supply Canberra and Queanbeyan when the Cotter storages fall below a pre-determined level; and
- using Cotter and Googong water incurs pumping costs, whereas using Bendora and Corin water does not.

All these interactions are included in the hydrological model and its operating rules.

The model steps forward a month at a time, and can represent the behaviour of the storages over the 130 years of historical records and also for a 10,000-year synthetic climate record (developed to examine in more detail the effects of climate variability – including more severe droughts than have occurred to date – and possible climate change scenarios).



Canberra's water supply system and the location of Tantangara Dam

7 Need for New Supply

A principal output from the model is the percentage of time the various stages of water restrictions would apply over a 50-year planning period, dependent upon the population projection. These predictions can be compared with the planning target of being in water restrictions for no more than five per cent of the time. In addition, the model produces the long-term average amount of water available (termed the yield) to Canberra and the region. From this, the time at which a new supply is required can be estimated.

Based on the six key planning variables listed in Section 4, the hydrological model shows that the existing reservoir storage levels will become low to very low in periods of drought in the future, even if the target of 25 per cent reduction in per capita mains water consumption is achieved. In the future, it will be more difficult to achieve mains water consumption reductions under a restriction scheme, as meeting the water efficiency targets means there is far less scope to obtain additional reductions in water use. As concluded in ACTEW's December 2004 report to the ACT Government, *An Assessment of the Need to Increase the ACT's Water*

Storage, unless the community is prepared to accept periods of significant water restrictions on a scale unprecedented elsewhere in Australia, there is a need to have additional water supplies in the ACT as soon as possible.

8 Community Views

Over the duration of the *Future Water Options Project* many opportunities have been provided for the community to express values and views on the options. The process has been extensively promoted on the internet and television, radio and print media. The website has also been consistently updated and substantial opportunities for briefings have been provided. As a result , approximately 1500 to 2000 people have had direct contact with the project. Whilst this is a pleasing result, it must be viewed in the context that the outcomes from the project will affect nearly 350,000 people. Therefore, despite the best efforts of the process, the views expressed in this report can only be considered to represent a small percentage of the wider community.

As part of a community consultation program, four community meetings were held in November 2004 to help identify priorities in terms of future water options. In all four meetings, the most important issues perceived by those participating were:

- protection of public health;
- reliable future water supply; and
- effect of new storages on aquatic ecosystems.

The community consultation process was an attempt to gather as much community opinion and feedback as possible. The results have been constructive and helpful with a number of Canberrans and interested NSW residents engaging in debate about the best way to provide a reliable water supply for the ACT and region.

Views were, as expected, diverse, but the process has enabled ACTEW to test many of the ideas being considered. Community consultation has not provided a uniform view, nor was this the expectation, and further debate on the preferred option can be anticipated. It has however, ensured a transparent process informed by community views.

9 Improving the Efficiency of Existing Infrastructure

Even if work were to commence immediately, a new dam could not be built and filled before about 2011. Therefore as part of the overall analysis, initiatives to supplement the ACT's water supply in the interim have been assessed.

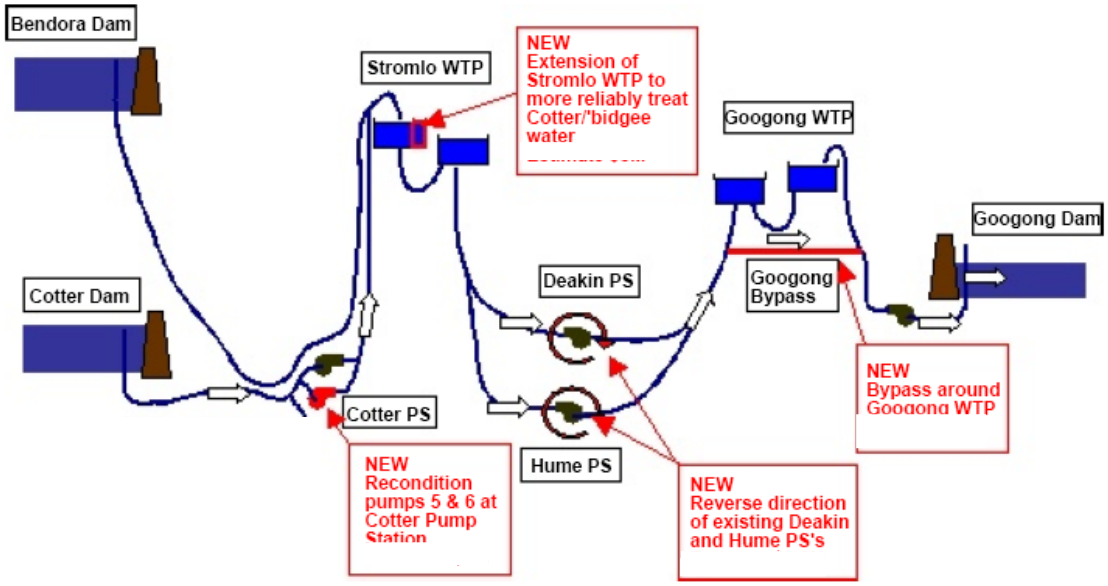
Since the *Future Water Options Project* commenced, the use of the Cotter Reservoir has been initiated, following completion of the new Mount Stromlo WTP. In addition, direct pumping from the Murrumbidgee River is now possible as a drought contingency measure. These measures have increased the amount of water available by up to 50 ML per day.

A second initiative to increase the available supply using the existing infrastructure is to divert water from the Cotter catchment to Googong reservoir via the Mount Stromlo WTP and the existing water mains – referred to as the *Stromlo to Googong Reticulation Transfer*.

There are significant spills from the Bendora and Cotter Reservoirs each year, even during the drought in 2004. The Stromlo to Googong Reticulation Transfer involves capturing a proportion of these spills from Bendora Reservoir via the gravity main to Mount Stromlo WTP, supplemented with water from the Cotter Reservoir. This would enable the water to be transferred via Canberra's existing water mains into Googong Reservoir (bypassing Googong WTP).

The hydrology modelling suggests that up to 12 GL per year could be obtained from the Stromlo to Googong Reticulation Transfer at a modest capital cost of $20 million. While it involves a slightly higher operational cost, this option is expected to boost Canberra's water supply as soon as 2006.

ACTEW has already commenced implementation of this efficiency improvement.



Stromlo to Googong Reticulation Transfer

10 Evaluation of the Cotter Option

Four Cotter Option alternatives were examined: retaining the existing Cotter Dam (4.7 GL); enlarging the existing dam to 45 GL or 78 GL, or constructing a new dam at an upstream site, Coree Dam. The large 78 GL volume dam is the preferred Cotter option.

The large Cotter Dam would better utilise the ACT's most reliable water catchment. It would enhance the habitat for threatened native fish populations, and entail a more straightforward approvals process, given that the catchment is already designated for water supply. The main disadvantages are associated with sediment discharge in the lower Cotter catchment where

damage following the January 2003 bushfires has exacerbated an existing catchment erosion problem.This has necessitated considerable remediation of the catchment and associated water quality problems. With appropriate catchment remediation (which will be required regardless of whether the enlarged Cotter Dam is built or not) and treatment of Cotter water at the new Mount Stromlo WTP, it is expected that these problems would be manageable.

Because of its relatively low elevation, the enlarged Cotter Dam would involve additional operational costs to pump water to the Mount Stromlo WTP.

Artists Impression of an Enlarged Cotter Dam

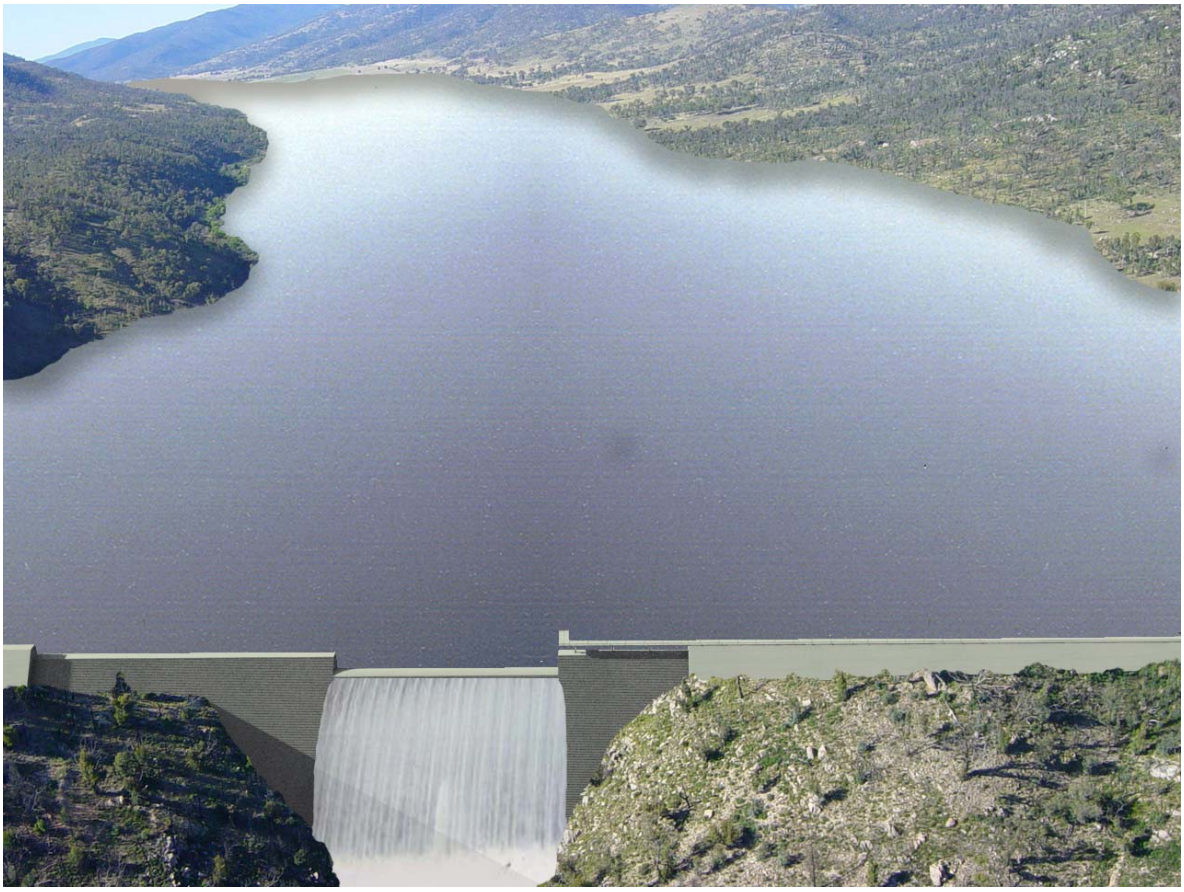
11 Evaluation of the Tennent Option

Four Tennent Option alternatives were examined: constructing small (43 GL), medium (76 GL) or large (159 GL) dams at the site on the Gudgenby River, near Mount Tennent, or implementing the Angle Crossing (formerly Virtual Tennent) Option.

The Angle Crossing Option involves pumping a proportion of the monthly outflow, at about 60 ML per day, allocated from the Gudgenby/Naas catchment via an 18 km pipeline near Angle Crossing on the Murrumbidgee River to Googong Reservoir.

If a dam were to be constructed, a small dam (43 GL) is the preferred Tennent Option that could be enlarged to 159 GL if additional supply were required. A Tennent Dam would diversify the ACT's water supply and increase reliability. The key disadvantages are the damming of an unregulated river, with some damage to the catchment's yellow box woodland and associated fauna (such as bird corridor connectivity). There are social issues resulting from the need to resume all 14 rural lessees and relocate the families involved. The possibility of a Tennent Dam has been known for many years and is reflected in the lease conditions. Catchment remediation would be required to protect water quality.

Although it would contain only 43 GL (compared to 78 GL for the enlarged Cotter Dam) the small Tennent alternative is some $65 million more expensive than the large Cotter alternative, due mainly to the need for road diversions and a new water treatment plant. The advantage of the large Tennent Dam alternative would be that it would provide considerable additional water to the ACT and region and obviate the need for any additional supplies for a long time.



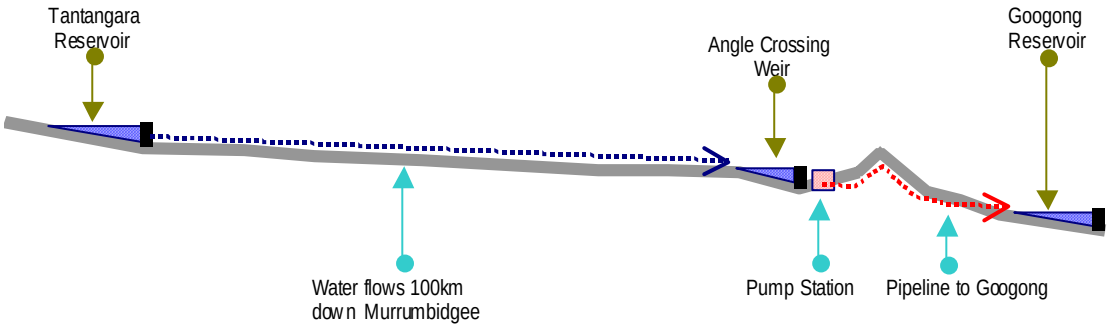
Artists Impression of the Large Tennent Dam, 159 GL

12 Evaluation of the Tantangara Option

As part of the assessment of the Tantangara option, several tunnel and pipeline routes were examined, such as constructing a long tunnel to just upstream of Corin Dam, and constructing a pipeline on the road reserve through the Yaouk Valley to Corin Dam. Another option is to allow up to 20 GL of water each year to flow about 100 km down the Murrumbidgee River to a diversion weir in the ACT. The run of river option would be beneficial to the aquatic habitat of the relevant section of the Murrumbidgee River upstream of the ACT.

The most economical location for a diversion weir would be adjacent to the existing Cotter pumping station, allowing the water to be pumped directly to the Mount Stromlo WTP and on to consumers. An alternative location would be near Angle Crossing, where the water would be pumped to Googong Reservoir, allowing storage and subsequent treatment. The Angle

Crossing location is preferred because the additional storage time in Googong reservoir reduces public health risks from any possible contamination as the water flows down the Murrumbidgee River. This is consistent with the community's preference for minimal public health risk, and complies with the risk management approach of the Australian Drinking Water Guidelines.



Schematic of the preferred Tantangara transfer alternative

From a social perspective there may be some negative effects associated with the Tantangara Option, as essentially the whole of the Upper Murrumbidgee River catchment would become part of the Canberra region's drinking water supply catchment.

There is currently no trading scheme in place in the Murray-Darling Basin to allow the transfer of a NSW water right to the ACT, although this is likely to occur in the foreseeable future under the National Water Initiative. In addition, the ACT would need to negotiate a "water cap" under the auspices of the Murray-Darling Basin Initiative.

These complexities, including the need to purchase water from NSW and the risk that it may not be available in future unforeseen circumstances, mean that the Tantangara option would provide a lower level of security (some "sovereign risk") relative to using only the ACT's controlled water, a concern that was consistently raised during community consultations. This option should be kept under review, as water policy initiatives mature. Having the weir and associated pumps and pipeline in place as part of the Angle Crossing Option would facilitate this options later adoption.

13 Supply Measures

The Angle Crossing Option can be implemented much more quickly than any of the other future water supply options.

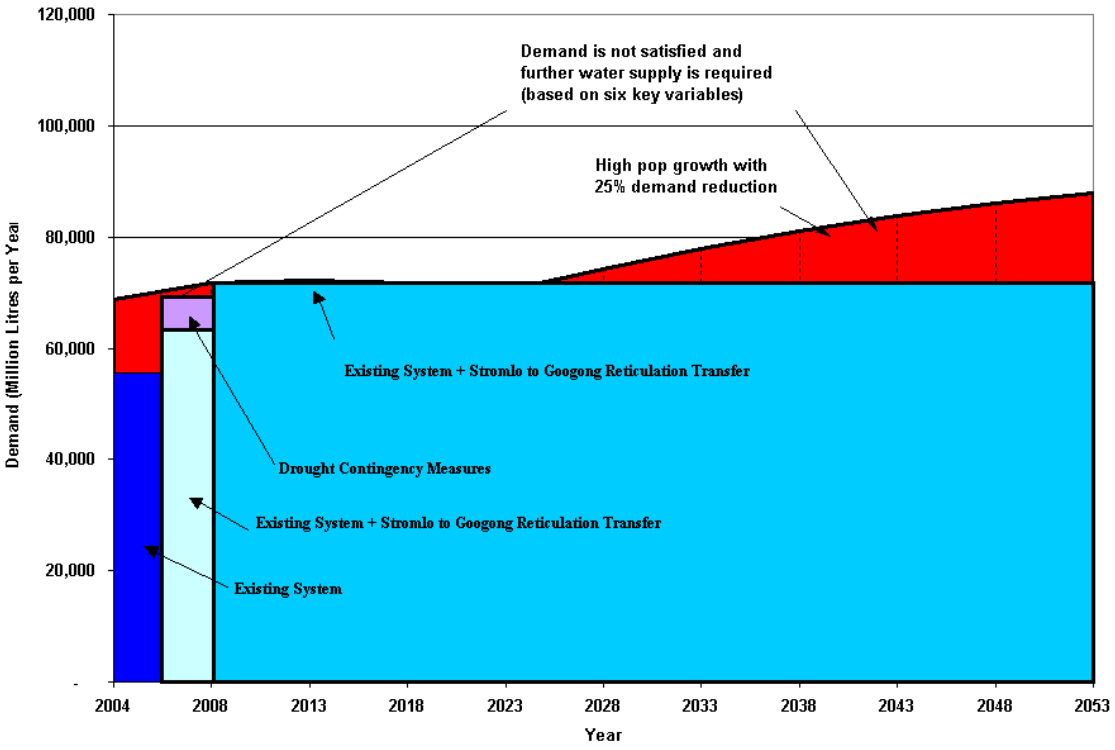
13.1 Angle Crossing Option (formally known as the Virtual Tennent Option)

The Angle Crossing Option (Virtual Tennent) involves the transfer of water that notionally would have been stored in a Tennent Dam if it existed, from the Murrumbidgee River into the Googong Reservoir via a weir, pump and pipeline. Several sites have been examined to determine the best location for a weir and pump, with a weir near Angle Crossing being the preferred site.

Two pumping rates, at 60 and 180 ML/day, have been modeled ensuring the lower flows in the Murrumbidgee River are preserved for environmental purposes. All flows lower than this would not be extracted.

The expected annual water harvest from these two pumping rates, based on proposed operational rules and subject to environmental constraints, would be about 12 GL and 17 GL respectively. The capital cost for the 60 ML/day option would be about $35 to $40 million, compared to $65 million for the 180 ML/day option. In addition a larger pumping station would be needed for the higher pumping rate. Taking all of these factors into account, the 60 ML/day pumping rate is the preferable solution. This option could be operational in two to three years assuming twenty months of construction.

Based upon the six variables, in combination with the Stromlo to Googong Reticulation Transfer and the proposed new environmental flow guidelines, the Angle Crossing Option should provide sufficient reliable water for the ACT and region until about 2023. At this time additional supply would then be required. This is shown when the red line (which is the water used by Canberra and the region) is above the various blue yield lines – the water available to the city (as a long term average).



Additional supply to meet future water demand

14 Recommendations

Because of the availability of the Stromlo to Googong reticulation transfer, it is now possible to initiate a strategy for water supply for the ACT and region that was not previously available. That strategy is a phased one, which would:

(a) require the immediate building of the infrastructure necessary to provide a reliable water supply for a substantial period ahead; and

(b) allow sufficient time to deliver any of the bigger infrastructure options, if necessary, in the light of more definite information.

Consistent with this strategy, ACTEW recommends the following.

1. ***It is recommended that*** *implementation of the option to pump water from the Murrumbidgee River near Angle Crossing to Googong Reservoir (formerly known as the Virtual Tennent Option) commence immediately.*

2. ***It is recommended that***

(i) *the remaining options of an enlarged Cotter Dam to 78 GL, a small (43 GL) or a large (159 GL) Tennent Dam and transferring water from Tantangara Dam down the Murrumbidgee River into the ACT be retained as future viable options; and*

(ii) *ACTEW be ready to implement one of these options without delay, if required, through the development of a work program, implementation of formal processes for regularly reviewing the six assumptions, and completing analysis, design and other relevant technical studies for an approval process.*

3. ***It is recommended that*** *additional technical analysis be undertaken for the each of the dam options, including refining the dam design, further detailed examination of pipeline routes and additional examination of the benefits of building a new water treatment plant near the Tennent Dam versus transferring water from the Tennent Dam into the Mt Stromlo water treatment plant.*

14.1 Immediate Action

Based upon the six assumptions, the Angle Crossing Option, together with the soon to be implemented Stromlo to Googong Reticulation Transfer, it is expected that the ACT would have a reliable water supply until about 2023 without the need for prolonged restrictions. It is anticipated that water pumped near Angle Crossing would be allocated from the Gudgenby catchment.

This project will need to be completed in close co-operation with NSW agencies and the Greater Queanbeyan Council. It is estimated this will cost in the vicinity of $35 to $40 million and be completed within two to three years.

14.2 Future Actions

The Angle Crossing Option allows a much better decision to implement, if needed, one or more of the larger infrastructure options later because better experience and knowledge will be available about whether the six key assumptions are actually working in practice.

It should be recalled that the Future Water Options project commenced with three options, but this was further expanded to some 26 alternatives once a variety of ways of delivering each of the options was developed. In addition, many other suggestions were brought to the attention of the project team and considered. This process also encouraged people to look at the way the current water supply system is operated and to examine more efficient ways of delivering water. The development of the reticulation transfer option was a result of this process and provides a relatively cheap way to increase the amount of water available to Canberra and the region.

There are many different scenarios that could eventuate over the next 15 years. For example:

a) if high population growth together with climate change and significant bushfire impacts were to occur, the next preferred option would likely be to build the large Tennent Dam. If a lower population growth were to occur, or if climate change and the bushfire impacts are not as severe as is currently thought an enlarged Cotter Dam would most likely be preferred. The ACT's population growth over the past year was about 0.2 per cent and if this were to continue there may not be a need for additional water at all. One of the virtues of making the next decision in some 15 years is that this will bring the Tantangara Option into play. When a robust water trading scheme is established in the Murray-Darling Basin transferring water from Tantangara to Googong Reservoir becomes more viable due to its low cost and the environmental benefits that would be gained in the Murrumbidgee River;

b) considering the water efficiency program, if larger savings are obtained more quickly, again there may not be a need for additional water supply. On the other hand, if the efficiency targets are not met and population growth occurs more quickly than per capita water reduction, there would be a need for a large Tennent Dam;

c) between now and 2023, it is likely that three more reviews of the environmental flow guidelines will occur. As a better understanding of river ecology is obtained through the monitoring and management of environmental flows, the volume and type of flows are also likely to change;

d) it is likely that permanent water conservation measures will be introduced into the ACT. This will require that the ACT's water restriction scheme is also reviewed.

The analysis undertaken for this project has provided the tools and knowledge so that a decision on the next supply option, if needed, can now be made more quickly.

14.3 Future Analysis

Additional technical analysis should be undertaken for each of the dam options, including refining the dam design, further detailed examination of pipeline routes and additional examination of the benefits of building a new water treatment plant near the Tennent Dam versus transferring water from the Tennent Dam into the Mt Stromlo Water Treatment Plant.

The Cotter catchment has been significantly impacted by the 2003 bushfires. Careful management and appropriate monitoring is required to ensure that the catchment is able to supply high quality water for use in the ACT and region.

The Naas and Gudgenby provide the next best water supply catchments for the ACT based on the analysis presented in this report and previously in ACTEW's report of the larger list of options. The site needs to be preserved as a future water source. There are some environmental values that could be protected and enhanced. There are significant yellow box grassy woodlands that could be improved and better wildlife corridors can be provided over the next several years to provide a better catchment from an environmental perspective, as well as positioning the catchment as a future water supply. This approach is consistent with the National Capital Plan. In undertaking this rehabilitation, however, the future inundation areas need to be identified to ensure they are protected. Better wildlife corridors, and improvements to the yellow box woodland should occur above the proposed high water mark of the large Tennent Reservoir.

There are 14 rural lessees in the catchment of the proposed Tennent Dam. There are some inconsistencies in the conditions and terms of the leases. It is recommended that the existing leases are reviewed and a more common approach taken.

There are also residual cultural heritage uncertainties. A detailed analysis of the Naas Valley and areas affected by the Tantangara option would contribute to filling gaps in current knowledge. Further consultation with Aboriginal groups should be done as part of this exercise.

The Tantangara Option should be kept under review, as water policy initiatives mature. Having the Angle Crossing weir and associated pumps and pipeline in place would facilitate its later adoption, as the major infrastructure would be in place. ACTEW will continue to participate and support actions under the National Water Initiative including the development of a robust water trading scheme. In addition, ACTEW will continue to contribute to the development of an ACT water cap.