# Wyaralong Dam:
## issues and alternatives

**Issues associated with the proposed construction of a dam on the Teviot Brook, South East Queensland**

**2nd edition October 2006**

**Report prepared by**
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**Disclaimer**

*The material presented in this report is our own interpretation of the data and information available publicly. Although professionals in natural and rural systems management we are also affected directly by the proposed Wyaralong Dam due to family ownership of land and a long ancestry in the Boonah district dating back well over a century. The motivation to prepare this report is driven by both professional and personal association and concern with the proposed dam on the Teviot Brook. Although the principle authors are associated with The University of Queensland this report does not and is not intended to represent any view of the university or any other organisation.*

# 1.0 Executive summary

## 1.1 Purpose

South east Queensland is one of the fastest growing regions in Australia, with the population expected to grow by over one million people in the next 20 years. To support this level of growth, new and alternative water infrastructure is needed. A dam at Wyaralong, on the Teviot Brook, an upper tributary of the Logan River, has been chosen as a preferred option for supplying future water needs. The purpose of this report is to highlight the risks associated with constructing a dam at Wyaralong by exposing inadequacies and inconsistencies in the available data that has been used as the basis for the decision.

The main argument proposed is that the Wyaralong dam will not reliably produce the expected yield and will therefore not be a reliable or cost efficient source of water for future urban needs. In addition it is argued that the cost of the proposed dam relative to yield makes it one of the most expensive options currently under consideration for water supply in South East Queensland. These arguments are justified using accessible data from across government agencies and consultants' reports including hydrographical, and rainfall data for the Teviot catchment. Results from our analysis and synthesis of this data are compared with the official reports used to justify the decision to construct a dam at Wyaralong to highlight inconsistency and key issues of concern where further data is urgently required. In conclusion, an alternative scenario is proposed that would provide water without the unacceptable risks and costs of a dam at Wyaralong.

This report has been compiled by Environmental Management professionals. Dr Bradd Witt is a lecturer and researcher at The University of Queensland running courses in both Environmental Management and Environmental Problem Solving, with research experience in rangeland ecology, century scale environmental change and urban-rural relationships and perceptions. Katherine Witt is currently writing a PhD thesis in natural resource governance, with emphasis on property rights and responsibilities and has previously worked within the Department of Natural Resources. Further input has been provided by Wyaralong landholders, with various forms of information, expertise and local knowledge.

In full recognition of the need for further sustainable water resources, we provide alternative scenarios for consideration to provide a sustainable source of water.

## 1.2 Key issues identified in this report

This report raises several key environmental, economic and social issues associated with the proposed dam at Wyaralong. Data are either completely absent, fragmented or at worst contradictory on all of these issues. The key issues identified are:

- **Catchment yield and dam yield**

  The proposed Wyaralong Dam on the Teviot Brook is located in a relatively small catchment with extremely variable rainfall. The Teviot Brook is an ephemeral stream with high natural variability in annual flow. The proposed dam will fail to meet the expected 17,000 ML/yr during normal and expected periods of drought. Large dams are not a suitable drought-proofing strategy as they are the most drought sensitive technology to supply water in areas of variable rainfall.

- **Water Quality**

  Serious water quality concerns are associated with the proposed Wyaralong Dam. These include reported accounts of salinity, pollutants and effluent. Water quality monitoring at the dam site found very high levels of salinity considered unsuitable for domestic use, unsuitable for irrigation of crops and suitable for tolerant stock only.

  Poor water quality would add significantly to the cost required for treatment to make the water from the proposed Wyaralong Dam suitable for urban use. The additional costs of water treatment to provide an acceptable standard for urban use have not been determined. The environmental impacts of releasing saline water into downstream ecosystems must also be considered.

- **Environmental Impacts**

  The Wyaralong Dam would destroy over 1,200 ha and 32 kms of riparian and floodplain ecosystems along the Teviot Brook, most of this is comprised of the Endangered Regional Ecosystem 12.3.3 (*Eucalyptus tereticornis* on alluvial soils). This ecosystem has less than 10% of its pre-European extent remaining today, with recent mapping indicating a remaining extent of only 3%.

  Much of the Wyaralong area is remnant vegetation. The area was identified in the *Draft South East Queensland Regional Plan* as part of a bioregional wildlife corridor, linking areas of State and regional environmental significance. The vital role of this bioregional corridor was disregarded in the amended draft plan. No assesment of the environmental impacts including impacts on environmental flows has been completed.

- **Social and cultural impacts**

  The Wyaralong district in the Teviot valley is one of considerable European and Aboriginal cultural heritage significance. Impacts on cultural heritage have been overlooked because properties and places of archaeological significance are not listed on State or National Registers. This reflects the inadequacies of Cultural Heritage legislation and not a lack of heritage significance.

- **Cost Efficiency and distributional equity**

  The proposed Wyaralong Dam is currently estimated to cost $500 million dollars including construction, land acquisition and road reconstruction. Half a billion dollars is a very large investment for a risky dam that is only intended to produce 17,000 ML/yr. When the real cost of the Wyaralong Dam is considered it becomes the worst performing bulk storage option for south east Queensland.

  Full cost recovery and a shift towards user-pays principles in pricing of water have been recognised as essential in contributing to new and more efficient uses of water in Australia. The State, would be subsidising those who benefit from the Wyaralong Dam between $3500 and $4000 per household (not including distribution, treatment and ongoing maintenance). It seems highly unlikely that the beneficiaries of future regional development south of Brisbane would be willing to pay for the full cost of supply through their water charges.

## 1.3 Alternative proposition

Our proposition of an alternative worth serious investigation is that Moogerah Dam which is already constructed and in an adjacent catchment running close to areas of the Teviot Brook, could serve as the water storage facility for safe levels of water harvesting from the Teviot Brook. Boonah Shire already has two dams that have not performed well in periods of less than average rainfall (or even average rainfall in the case of Moogerah). These two water storages (Moogerah and Maroon Dams) could be better utilised for south east Queensland's future water needs by simple and safe water harvesting technologies, or even water recycling technologies.

**To construct a third dam costing half a billion dollars in the same area where two already existing and poorly performing dams exist, defies logic. Alternatives such as water harvesting, off stream storage, and recycling, utilising already existing storages must be fully investigated**.

# 2.0 Introduction and context

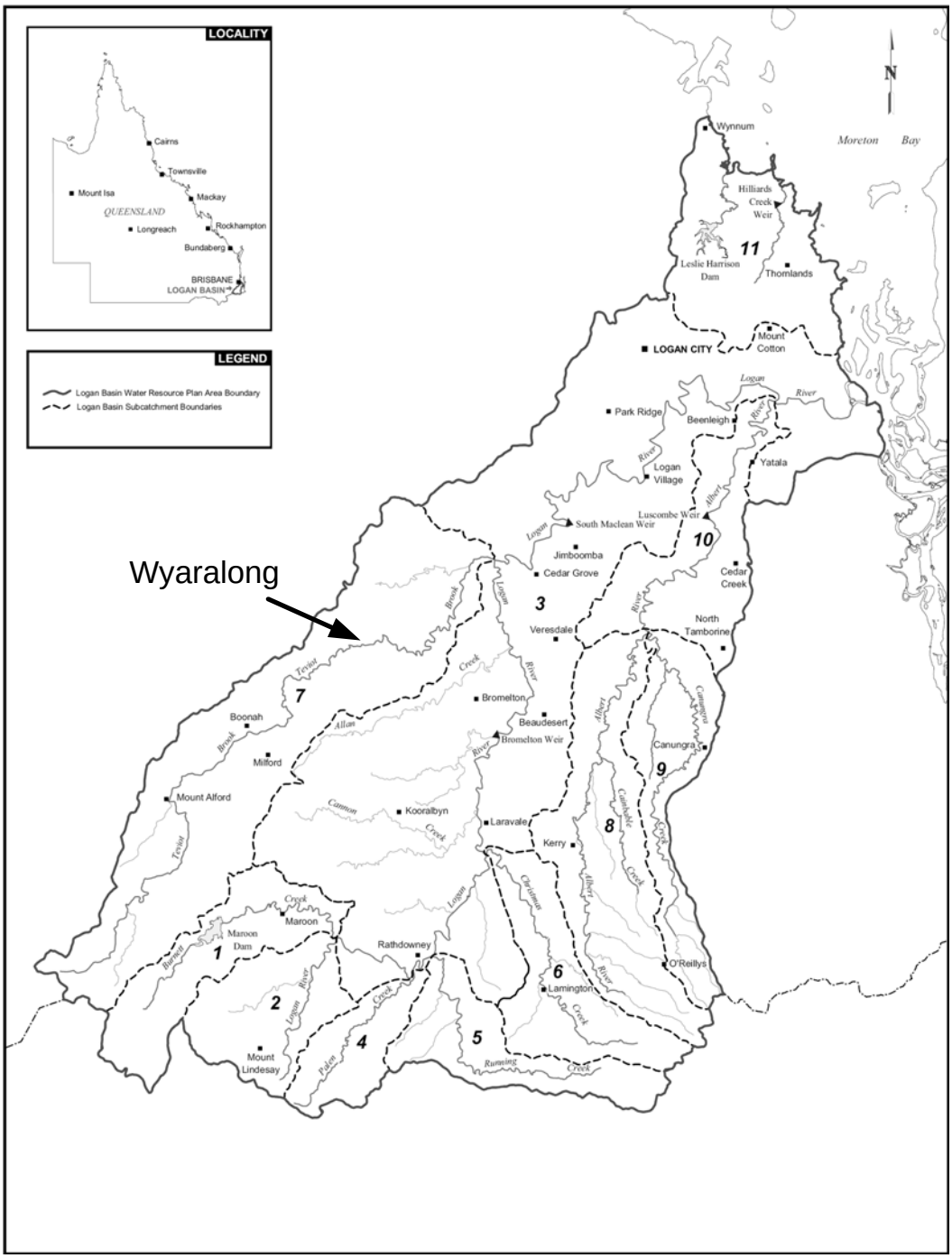
## 2.1 The Wyaralong District

Situated between Boonah and Beaudesert in the Logan River Basin, the district of Wyaralong is named after the historic property and its homestead, once part of the huge Dugandan Station, one of the earliest and largest runs in the Logan region. Following the banks of the Teviot Brook, Wyaralong is a picturesque rural valley that has largely escaped the effects of urban encroachment and associated development. The landscape is gently undulating sandstone hills with fertile creek flats used predominantly for cattle grazing with some crops and forestry. The community at Wyaralong is small but stable, with a high proportion of residents aged 70 or over having lived there for 50 years or more. There is also strong family continuity, with third and fourth generations of land owners now living on and managing the properties.

The Boonah-Beaudesert Road is a popular tourist drive and used regularly by motorcycle clubs because of the area's scenic amenity. The scenic amenity and natural integrity of the area surrounding Wyaralong is the legacy of over 100 years of wise management by the families that have managed the landscape.

## 2.2 The Teviot Catchment

The Teviot Brook has a 533km$^2$ catchment (to the proposed dam wall) and has its headwaters in the western part of the Border Ranges and flows in a north easterly direction to join with the Logan River north east of Beaudesert. The average annual rainfall at Wyaralong is slightly less than 800mm. Average rainfall increases steadily towards the top of the catchment to just less than 950mm per year. Averages however are deceiving, as extreme variability is a feature of rainfall in the catchment. The catchment supports a range of land uses from nature conservation through to intensive animal and plant production and urban development. The landscape is picturesque due to the mountainous terrain in the west and rural agricultural nature of most land use. Details of the catchment's flow and rainfall and water quality issues are discussed in the report. The planned area of the Wyaralong Dam is at a very low altitude (50-60m ASL) in an area that experiences summer temperatures frequently between 37° and 40°c.




**Map 1.** Location of Wyaralong in the Teviot Brook catchment relative to the broader Logan Basin catchment in south east Queensland (Source: NRM&W, 2006)

# 3.0 Key issues of concern

## 3.1 Catchment yield and dam yield

The current proposal for a dam at Wyaralong is based on an optimistic expectation of the capacity for the catchment, and its variable rainfall to consistently provide the yield anticipated for consumption. It will be shown in this section using rainfall and catchment yield data, as well as the parallel experiment that has been running for decades (Moogerah Dam) that figures used to support the construction of the dam are overestimated, as the last 5 years of dry conditions illustrate. This pattern of long periods of drought is to be expected, but is likely to become more common if climate change predictions are correct.

In the recent GHD report (GHD 2006), prepared for the Queensland Government and used in decision making regarding potential dam sites in south east Queensland, inaccurate figures are provided to justify a Wyaralong dam including an expected annual yield from the catchment of 58,400 ML/yr. This average figure sounds impressive and appears in its own right to justify construction of a dam of the lower Teviot Brook. GHD (2006) also assumed an annual average rainfall for the entire catchment of 970 mm/year. The average is approximately 870 mm, some 100 mm per year less than the GHD (2006) value (Figure 1 and Table 1).

Observed stream flow data from 1966-2003, at "The Overflow" near the proposed dam wall are presented in Figure 2. These observations indicate the extreme variability in actual yield from the Teviot Brook catchment ranging from 237,344 ML in 1970/71 to almost nothing (301 ML) in 1994/95. These data demonstrate that the average annual catchment yield since 1966 is 53,360 ML; 5,040 ML less than the value determines by GHD (2006). This discrepancy can only be assumed to be the result of using an incorrect average annual catchment rainfall figure of 970 mm rather than 870 mm in conjunction with an optimistic assumption of catchment yield as a coefficient of rainfall. However, average data are very misleading, and only a useful indicator of potential sites assuming an infinite storage capacity.

Average annual yield data, like average annual rainfall data are misleading as extreme variability between years and decades in actual rainfall is normal and to be expected in Australia. Average rainfall data in Australia is usually skewed by extreme rare wet events. Median rainfall is a better indicator of central tendency, and is always below averages because dry years are more frequent than wet (Table 1). This variability is particularly pronounced for the 'wet season', or summer months, in areas such as south east Queensland which is the period responsible for rainfall capable of producing significant runoff in catchments.

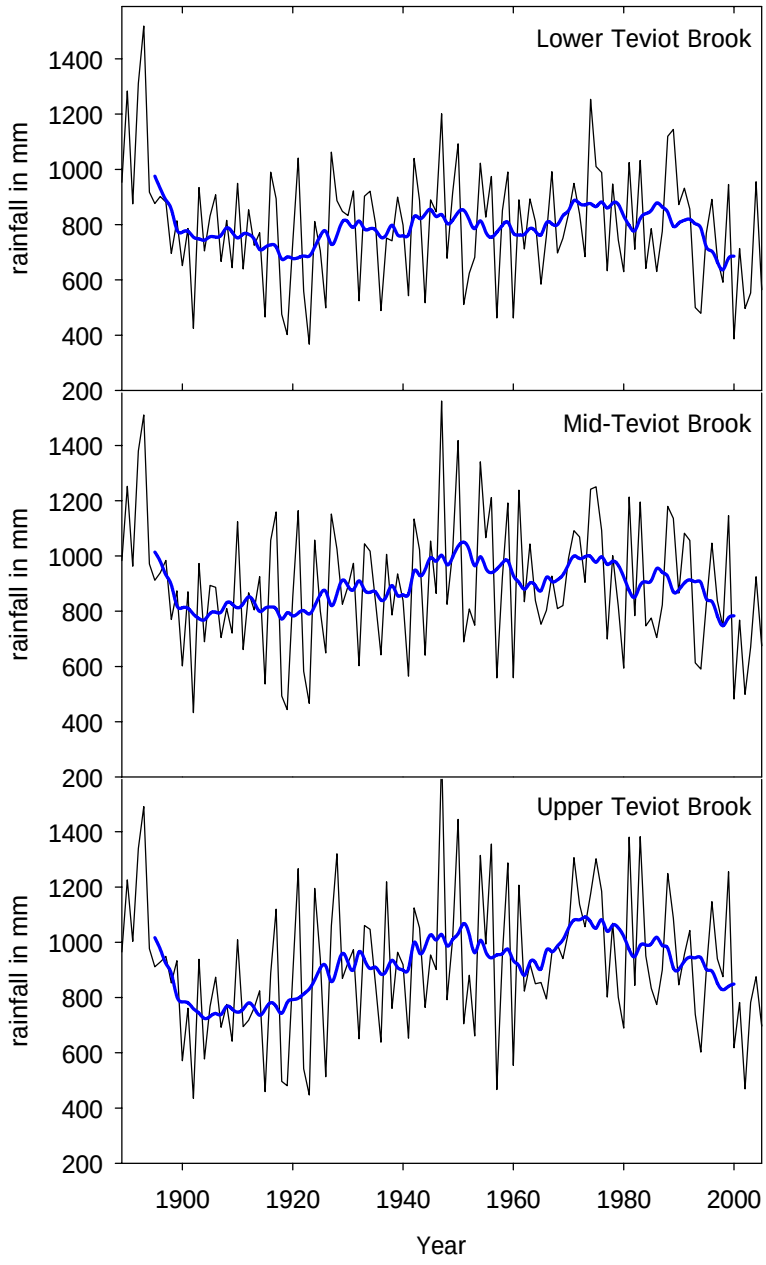



**Figure 1.** Historical rainfall for the Teviot Brook catchment indicating annual totals and a 10 year moving average (blue line) from 1889-2005. Data are derived from publicly available interpolated rainfall records based on a number of nearby Bureau of Meteorology rainfall stations and are available at cost from the DNRM&W.

**Table 1** Comparison of average and median annual rainfall across the Teviot Brook catchment for 1960-2005 data

| Site | Average annual rainfall (mm) | Median annual rainfall (mm) | difference (average – median) |
|---|---|---|---|
| Lower Teviot Brook | 785 | 772 | 13 |
| Mid – Teviot Brook | 886 | 836 | 50 |
| Upper Teviot Brook | 943 | 911 | 32 |
| Overall catchment | 870 | 833 | 37 |

Extreme variation in yield from the Teviot Brook (Figure 2) indicates how rare significant flow events that exceed the dam's capacity are to be expected. The impact of this on environmental flows for the Teviot, and Logan catchment if a dam is constructed will be discussed below (Section 3.3). The variability in yield also demonstrates why using average yield values leads to overly optimistic expectations of a dam on the Teviot Brook to provide a reliable yearly extraction of 17,000 ML. The actual yield from the catchment is below the average yield cited by GDH of 58,400 ML two out of three years (65%) for the almost 40 year long record. Indeed the difference between average and median in yield data is very high with median (as a better indicator of 'normal' catchment yield (Logan Basin Technical Advisory Panel, 2006) only 31,821 ML per year. Put simply, a few extreme rainfall events will fill the dam and provide flow beyond the wall, but the majority of years will only provide water to the storage with no environmental flow.

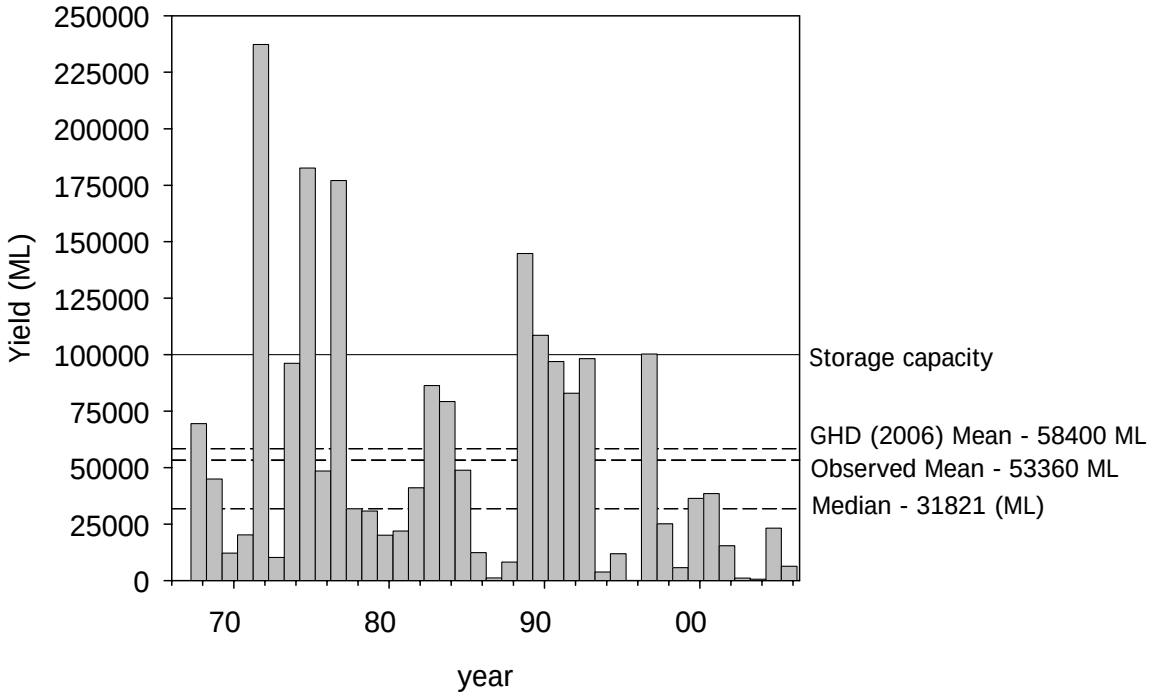



**Figure 2.** Observed catchment yield from "The Overflow" on the Teviot Brook 1966/7-2004/5 (source NRMW 2005 web site) in comparison to the average catchment yield cited by GHD (2006) and the median of the observed data. Storage capacity of the proposed Wyaralong Dam is indicated by the solid line at approximately 100,000 ML.

Moogerah Dam provides an excellent surrogate example of the failure of dams in this highly variable rainfall area to provide any useful water during normal and expected periods of below average rainfall (eg. the prevailing dry since the early 1990s and particularly since 2001). Figure 3 provides the record of storage levels for Moogerah for the past 22 years. This dam has been below one quarter of capacity almost 40% of the time over the past 22 years. Since 1995 Moogerah has never filled and has been below 25% of capacity two thirds of the time (Table 2).

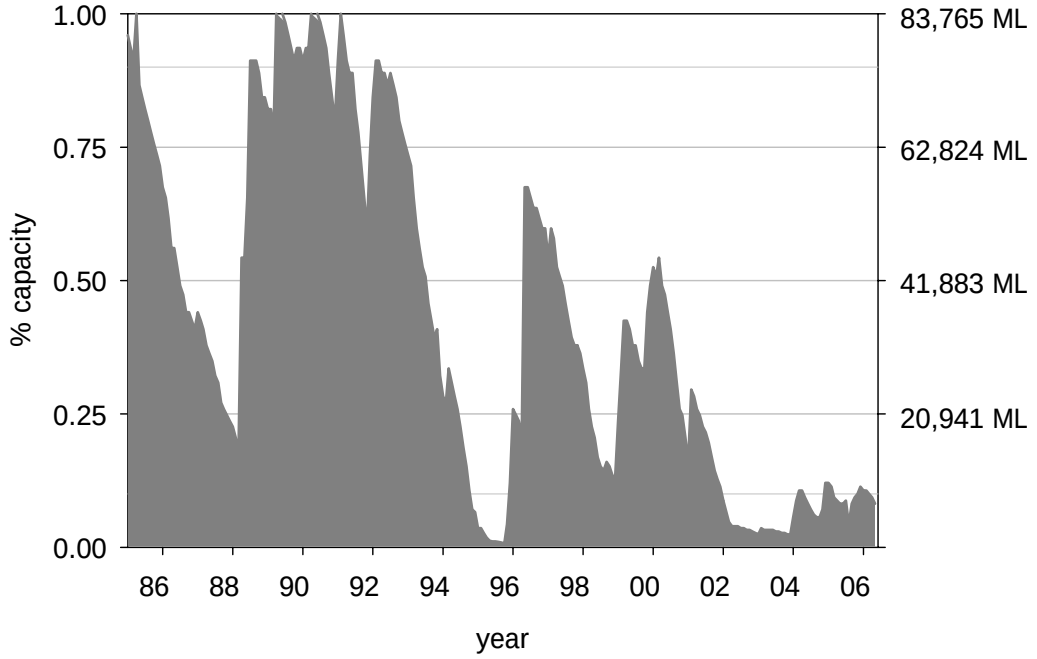



**Figure 3**. Moogerah storage level from 1985 - 2006 (**Note**: These data were supplied by Sunwater, but our interpretation and use of the data do not in any way infer that Sunwater holds a policy position on the issues surrounding the potential Wyaralong Dam)

**Table 2.** Proportion of time (as a percent) that Moogerah has been below different capacities since 1985 and since 1995.

| Dam level | 1985-2006 | 1995-2006 |
|---|---|---|
| less than 90% | 88 | always |
| less than 75% | 77 | always |
| less than 50% | 62 | 88 |
| less than 25% | 39 | 65 |
| less than 10% | 23 | 41 |

Moogerah Dam is located in the adjacent catchment to the north of the Teviot Brook, and although has a smaller catchment, it is a smaller dam with a capacity of 83,700 ML. The observed yield values for the Teviot Brook in Figure 2 correlate well with the dam levels for Moogerah from 1985-2006 (Figure 4). The test for the proposed Wyaralong Dam performance is to model its storage over the past using actual catchment yield data. Figure 5 demonstrates the performance of Wyaralong over the past decade based on a simple year by year model. This model is based on the following equation: conservative fixed extraction rate of 17,000 ML/yr, plus conservative evaporation rates of 12,000 ML/yr (if storage is more than 50,000 ML) and 4,000 ML/yr (when the dam is below 50,000 ML), plus a conservative loss to seepage of 3000 ML/yr (when above 50,000 ML) and 1,200 ML/yr (when below 50,000 ML), subtracted from the annual catchment yield data. Average annual evaporation rates in the Wyaralong area are slightly over 1.6 m per year. This means that at capacity the dam, covering 1280ha would loose over 20,000 ML per year. The dam would loose far more water from evaporation and seepage (no actual data are yet available for seepage) at higher levels than it is intended to provide for use.

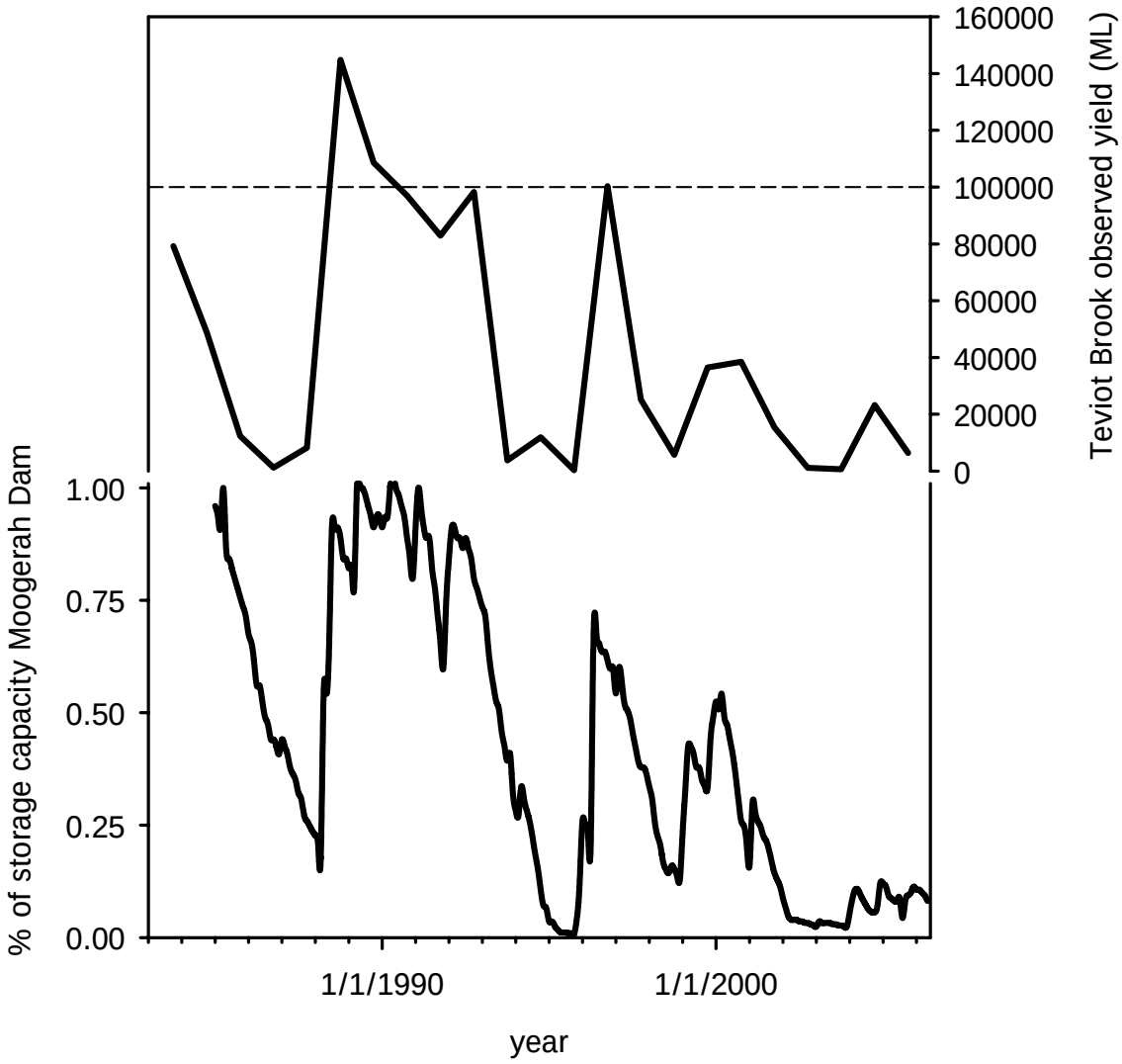



**Figure 4.** The correlation between observed historical yield from the Teviot Brook at "the Overflow" and storage levels in Moogerah Dam from 1985-2006

Wyaralong is only intended to produce 17000 ML, even though GHD (2006) estimated 27,000 ML/yr could be safely extracted from the dam. Wyaralong would have failed to adequately provide a trivial 17000 ML since 2002 and in 1994 and 1995 (see Figure 6). Very importantly there would have been no natural environmental flow beyond the dam wall in the Teviot Brook since 1996. It is not likely that Wyaralong could have supplied any water for the proposed Cedar Grove Weir (on the Logan River down stream from Wyaralong) since 2000 as the Queensland Government has anticipated.

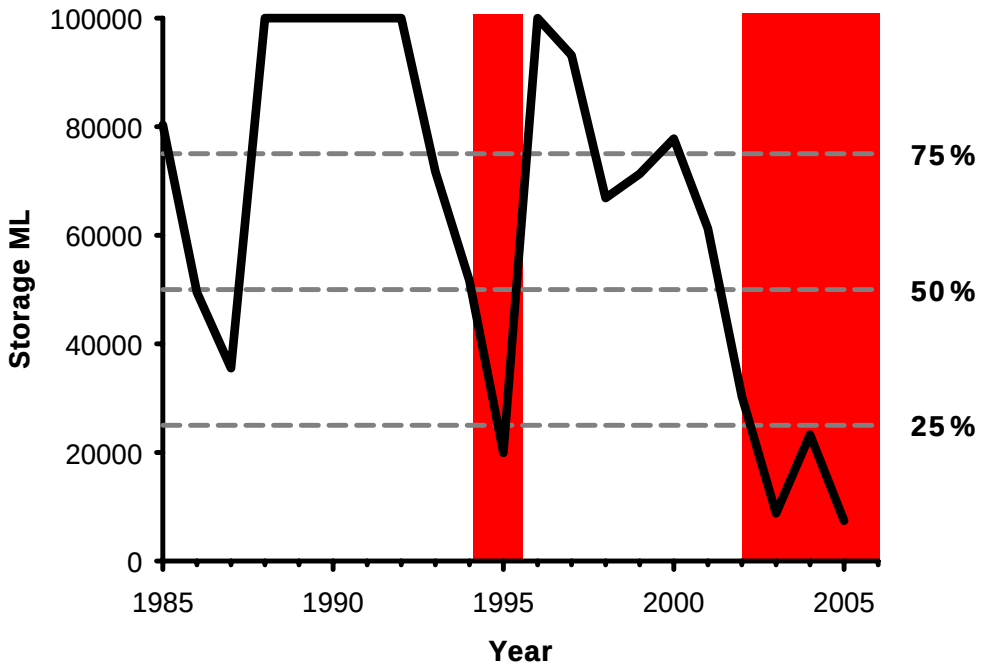



**Figure 5**. Modelled Wyaralong Dam maximum storage levels Oct 1985 - Oct 2005 based on actual historical catchment yield minus anticipated extraction of 17000 ML/year, evaporation of 1.6 m/year and a percolation loss. Red (shaded area) indicates periods when the dam would have been unlikely to supply the expected yield.

It is essential to interpret the model of the Wyaralong Dam (Figure 5) with the caveat that no environmental flow allocation has been allowed. The Queensland Government has not made available the actual data used to model, and therefore support, a decision to dam the Teviot Brook. In the absence of complete data, it is impossible to know what a safe environmental flow allocation would be for the Teviot Brook. Some attempt to deal with this is made in the *Draft Water Resource (Logan Basin) Plan*, (2006). A crude safe estimate would indicate that a minimum of a third of median stream flow would be required to maintain some riparian ecological and environmental processed. Naturally this would vary; however, over the long term at the very least 10,000 ML/yr would have to be released in years that do not receive significant natural flooding. An environmental flow allocation would significantly affect the storage and yield capacity in our conservative model (Figure 5).

Given the example of Moogerah and its relationship to yields from the Teviot Brook, and the model presented in Figure 5, it is clear that a dam on the Teviot Brook is likely to fail to produce adequate supply during dry periods. If the consensus opinion that climate change will result in greater variability in rainfall with longer dry spells, short intense periods of more extreme rainfall events, then it can be expected that the performance of a hypothetical Wyaralong Dam over the past decade is a good indication of potential performance in the decades ahead.

The past 120 years of rainfall are barely adequate to begin to determine if there are any trends in long term average rainfall. However, the interaction between Inter-decadal Pacific Oscillation and El Nino do appear to result in long periods of approximately two or more decades of above and then below average rainfall. Although droughts still occur during these times. Figure 1 demonstrates that

rainfall was very low (particularly in the upper catchment) during much of the first half of the 20th Century. It is important to note that variability and extreme drought affected the upper catchment significantly between the late 1890s and 1930s. The higher rainfall area of the upper Teviot Brook catchment is responsible for much of the catchment's yield and if we experience similar conditions in the coming decades to that of the late 1890s to the 1930s (as appears to be happening now) then a serious failure of the dam can be expected. Disregarding climate change, if the observed long term decadal variation is part of a cycle then it would appear that our recent trend to lower rainfall in much of eastern Australia is likely to continue well into this century. The performance of dams in existence and those proposed, will not provide 'new water' nor drought proof south east Queensland.

**Figure 6.** The Teviot Brook in the area intended for ponding if the proposed Wyaralong Dam proceeds demonstrating clearly the ephemeral nature of the brook. The Teviot Brook has been in this state for most of the time since 2001.

## 3.2 Water quality

### *3.2.1 Pollution, nutrients and effluent*

The catchment area of the proposed Wyaralong Dam includes significant areas of intensively used irrigated and non-irrigated agricultural land, including chemical - dependant cropping and large dairies extending right into the riparian zone. In the heart of the catchment, and less than 10 km from the proposed dam lies the township of Boonah which discharges its treated effluent directly into the Teviot Brook. Unusually high Copper levels have been recorded for the Teviot Brook in the area under consideration for the Wyaralong Dam (Logan Basin Technical Advisory Panel, 2006). It has been warned that the environmental and human health consequences these high levels require detailed investigation.

No consideration has been given to the impact of the factors above on water quality in the ponded area. Indeed, concerned upstream farmers have been consoled that their current management practices will not be affected in any way by the construction of the Wyaralong Dam. This is despite several reports indicating that water quality in the Teviot Brook has been an issue of concern for many years (GHD 1993, DNR 1998, Logan Basin Technical Advisory Panel, 2006).

The Water Resources Commission (1989) *Guidelines for planning and design of urban water supply systems* states that "The physical features of a storage and its catchment and the physical, chemical and biological process which occur in the storage can have a considerable effect on the water quality. Consideration of water quality management should begin at the planning stage". For these reasons, other existing dams designed for urban potable drinking water have been constructed on the upper reaches of catchments where there is usually higher rainfall (and therefore runoff) and better quality water.

### *3.2.2 Salinity*

The Wyaralong Dam site is situated at the lower end of the Teviot Brook catchment. As highlighted above, the Teviot Brook alternates between very low flow rates and volumes, in a high proportion of years, and flood periods. During the frequent low flow periods water quality is severely affected by salinity and nutrients. Additionally, during high flow periods the sediment loading is extremely high (GHD, 1993). Stream water quality data for the Teviot Brook is recorded at "The Overflow" (within the proposed Wyaralong Dam site) and is available from 1966. A Department of Natural Resources report on *Water Quality of the Logan/Albert Basin* found extreme levels of salinity (3,270 µs/cm EC) in surface water samples from the Teviot Brook at the Wyaralong dam site (DNR 1998). In this document "The Overflow" monitoring site is marked in red as unsuitable for domestic use, unsuitable for irrigation of crops and suitable for tolerant stock only. Turbidity levels also exceed domestic use guidelines at 5NTU. The Teviot Brook at "The Overflow" had the highest salinity rating in the whole Logan Basin catchment. All other tributaries have an average salinity count of less than a sixth of this (480µs/cm). Below are a list of water categories and their salinity levels for comparison (Table 3). The water at the Wyaralong Dam site is well into the 'brackish' range.

Engineering consultants (GHD 1993) reported that salinity levels in the Teviot Brook do not fall below 1,000µs/cm until flows exceed 50ML/day and flows exceeding this value occur less than 30% of the time. More recent data show that for 43% of days the flow is less than 1ML/day (Logan Basin Technical Advisory Panel, 2006). Therefore, the water stored in the Wyaralong dam will be saline. When the water is ponded in a shallow dam salinity levels will increase due to high rates of evaporation (approximately 1.6m/yr).

Poor water quality would add significantly to the cost required for treatment to make the water from the proposed Wyaralong Dam suitable for urban use. The additional costs of water treatment to provide an acceptable standard for urban use have not been included in cost calculations. The environmental impacts of releasing saline water into downstream ecosystems must also be considered.

**Table 3.** Categories of water from pure through to sea water and their relative salinity level indicated by electrical conductivity (µS/cm) the range relevant to the lower Teviot Brook at Wyaralong is in bold

| Water type | Electrical conductivity (µS/cm) |
|---|---|
| Deionised water | 0.5-3 |
| Pure rainwater | <15 |
| Freshwater rivers | 0-800 |
| Marginal river water | 800-1,600 |
| **Brackish water** | **1,600-4,800 (3,270 Wyaralong)** |
| Saline water | >4,800 |
| Seawater | 51,500 |

Source: Waterwatch Australia (2002)
(http://www.waterwatch.org.au/publications/module4/electrical.html)

## 3.3 Environmental impacts

Construction of the Wyaralong dam will inundate and destroy at least 32kms[1] of stream, riparian and dependent terrestrial ecosystems along the Teviot Brook. The associated Cedar Grove weir at the confluence of the Teviot Brook and Logan River will cause the destruction of a further 3.5kms of the Teviot Brook and 10kms of the Logan River riparian ecosystems. Recent environmental investigations of the section of Teviot Brook from Wyaralong dam site to the Logan River recorded only minor change from a reference 'natural' state (Logan Basin Technical Advisory Panel, 2006). There are very few waterways in south east Queensland that remain close to a natural state. These are precious and deserve protecting. In recognition of the ecological significance of these waterways, the Council of Australian Governments (COAG) in their National Water Initiative generally discourages the construction of large new water storages (COAG, 2004). The environmental impacts of big dams are well documented (see International Commission on Large Dams, 2000; WWF, 2005). Where alternatives do exist, as they do in south east Queensland, these alternatives should be given priority consideration in preference to the large dam options. In contrast to the COAG position, dams are being proposed as the first response to water supply deficits.

### *3.3.1 Terrestrial environment*

The Wyaralong Dam will inundate an area of 1,280ha. Most of this is comprised of the Endangered Regional Ecosystem 12.3.3 (*Eucalyptus tereticornis* woodland to open forest on alluvial plains) (see Figure 7). This ecosystem has less than 10% of its pre-European extent remaining today, with recent mapping indicating a remaining extent of only 3% (Sattler & Williams 1999). Large remnants of this Endangered Regional Ecosystem are particularly rare as it occurs on the more fertile creek flats and alluvial soils which have mostly been developed for agriculture. Although the Queensland Government Herbarium mapping only identifies isolated pockets of this ecosystem as being affected by the proposed dam, significantly more of this ecosystem will be lost, than that identified on

[1] Depending on the final full supply water level, this figure could be significantly higher

mapping simply because the mapping technique based on satellite imagery fails to identify narrow areas in riparian environments due to scale issues.

The area is some of the least modified in south east Queensland due to the prudent management of the same families for over 100 years. Much of the Wyaralong area has been left in tact and is presently mapped as remnant vegetation. Notable in this broader regional context, the Wyaralong area was identified in the *Draft South East Queensland Regional Plan* (Office of Urban Mangement, 2004) as part of a bioregional wildlife corridor, linking areas of State and regional environmental significance. The vital role of this bioregional corridor was strangely disragarded in the amended draft plan with no explanantion (Office of Urban Management, 2006).

No assesment of the environmental impacts of the proposed Wyaralong Dam has been completed.

**Figure 7.** Endangered Regional Ecosystem 12.3.3 (*Eucalyptus tereticornis* woodland to open forest on alluvial plains). The large old trees form hollows and provide critical habitat for koalas, possums and gliders as well as birds and reptiles.
Photo by A. Grodecki 2006

### *3.3.2 Stream environment*

Figure 5 (page 12) indicates how rarely natural catchment flow would exceed the proposed dam. The model demonstrates that natural dam overflow will not be sufficient for environmental flows and that extraction for that particular purpose will be required frequently. If our model was revised to include extraction for environmental flows, then the estimated yield would be significantly reduced and in dry times, the dam would essentially be ineffective.

Environmental flow releases are particularly import for the Teviot Brook system because of the naturally high variability in the flow regime and the sandy nature of its streambed. Reductions in high flows may lead to loss of deeper pool habitats downstream which are habitat and feeding areas for many aquatic species including fish and platypus (Logan Basin Technical Advisory Panel, 2006).

"Storages drastically and permanently change the water quality downstream, including loss of seasonal variation, even if multi-level offtakes are used" (Logan Basin Technical Advisory Panel, 2006). The quality of water released from the proposed Wyaralong Dam has been already identified as an issue of concern. Nutrient build-up from upstream agriculture and sewerage works increases the risks of algae breakouts and the presence of harmful bacteria and microbes. Most of the storage of the proposed dam would be very shallow which would lead to high water temperature and exacerbated water quality issues.

Further effects of the dam on the Moreton Bay Marine Park and the estuarine wetlands of the Logan River are little known and have not been investigated.

## 3.4 Social and cultural impacts

### *3.4.1 European Australian cultural heritage*

The Wyaralong district in the Teviot Brook valley is one of considerable heritage significance, as the valley was settled in the earliest period in which was land was opened up for free settlement. There are several historic homes and buildings that fall within the area to be affected by the dam. These properties have remained in the same families for generations providing a continuous historical record and an invaluable source of local knowledge which is rare in the rapidly changing landscapes of south east Queensland.

'Wyaralong' the property, played a significant role in World War 2 as a training ground for RAAF and army. The RAAF set up a practice bombing range there and mowed the outline of a ship into one of the paddocks. In 1995 the renowned 23 Squadron of the RAAF held their 50 year reunion at Wyaralong. For more information see http://home.st.net.au/~dunn/raaf/wyaralong.htm

The historical and architectural significance of both Wyaralong and The Overflow homesteads have been described by conservation architect Clive Lucas, which records "a number of buildings whose preservation is a matter of national importance" (Lucas and Joyce 1987). The history and heritage of 'Wyaralong' has also appeared in several books including *Historical Homes of Queensland*, *The History of Queensland: its people and industries*, (Fox 1919) *Australian Style* (Walter and Wright 1991) and *Vogue* Magazine. The Philp, Collins and Joyce families who have continuously owned these properties have played a considerable role in the history and development of the State of Queensland.

The cultural heritage significance of the Wyaralong district has not been considered because none of the properties are listed as 'heritage properties' on State or National Registers. This is more a reflection of the inadequacies of the legislation than a lack of historical significance.

Direct impacts of the proposed dam, and the appalling decision making process followed in 2005 and 2006 by Government has had a catastrophic affect on the Wyaralong community and extended families. Details of these impacts will not be discussed in this report but will be dealt with in other forums.

### *3.4.2 Indigenous Australian cultural heritage*

Detailed archaeological knowledge of indigenous cultural heritage at the Wyaralong dam site is largely unknown. The Logan Basin water resource planning process included a report on Indigenous Cultural Heritage in the area. Local elders identified the Teviot Valley as an important travelling route, linking inland and coastal peoples (NRM&W, 2006a). The line of permanent and semi-permanent waterholes (the Teviot Brook) and surrounding floodplain was also important for food and hunting. The area also has several caves which provided shelter.

Although there have been no formal surveys done, present landowners have noticed a variety of artefacts. Aboriginal families have lived and worked on the properties until as recently as the 1950's. They told the legend of a Bunyip residing in one of the waterholes. The NRM&W (2006a) report considered the site to have high potential for archaeological sites.

## 3.5 Cost efficiency and distributional equity

The proposed Wyaralong Dam is currently estimated to cost $500 million dollars including construction, land acquisition and road reconstruction. Half a billion dollars is a very large investment for a risky dam that is only intended to produce 17,000 ML/yr. The Australian Water Association was cited in The Courier Mail (August 3, 2006) as estimating the Wyaralong Dam as the second most expensive option at $1.73 per kilolitre, second only to the proposed scheme to take water from the Burdekin Dam 1,200km north and pipe it to south east Queensland (see Table 4). The GHD (2006) report which reviewed all bulk water storage options for south east Queensland as a guide for decision making by government created the impression that Wyaralong was one of the more economically viable alternatives available. Their cost data are extremely inaccurate, as were their catchment yield and rainfall calculations (see Section 3.1). Table 5 provides both the data used by GHD (2006) and the current more realistic prudent yield and cost estimates given by the government. When the real cost of the Wyaralong Dam are considered it becomes the worst performing bulk storage option for south east Queensland.

**Table 4.** Cost comparisons of some options for water provision in south east Queensland

| Water option | Cost per 1000 litres |
|---|---|
| Existing local surface water (rivers and dams). | $0.30 |
| Seawater desalination. | $1, plus distribution |
| Recycling wastewater into high-grade industrial or drinking water. | $1 to $1.50, plus distribution |
| New dams. | Mary River dam: $1.10, plus distribution; **Wyaralong dam: $1.73, plus distribution** |
| Long-distance water pipelines. | A 1,200km pipeline from the Burdekin Dam: $4.80 |

(Source: Australian Water Association, cited in The Courier Mail August 3, 2006)

**Table 5.** Comparison of actual costs of the Wyaralong Dam and Cedar Grove Weir vs. the serious underestimate of costs provided to government by GHD (2006)

| | **Potential Yield (ML/yr)** | **Storage required (ML)** | **Full supply level (m ASL)** | **Cost ($Million)** | **Unit cost ($/ML/yr)** |
|---|---|---|---|---|---|
| GHD (2006) | 26,674 | 97,025 | 63 | 128 | 4,791 |
| Latest estimates | **21,000** | 104,000 | 63.6 | 500 | **23,810** |

The actual cost of building a dam at Wyaralong over the next 5 years is likely to increase above $500 million. The World Commission on Dams (2000) has identified that the costs of large dams run over estimates on average by 56%. It is not unlikely then that the proposed Wyaralong Dam could finish costing over $700 million. Full cost recovery and a shift towards user-pays principles in pricing of water have been recognised as essential in contributing to new and more efficient uses of water in Australia. The Council of Australian Governments has recognised this need and stated in regards to water storage and pricing policy that it should:

> give effect to the principles of user-pays and achieve pricing transparency in respect of water storage and delivery in irrigation systems and cost recovery for water planning and management;
>
> COAG (2004 p 13)

At a total cost of half a billion dollars the Wyaralong Dam is expected to supply 17,000 ML/yr (except in drought as shown in section 3.1). Ignoring all agricultural and industrial use and assuming that the water is only used for domestic consumption this mean that just over 100 000 households could be provided with water. The State, and indeed the Nation (through GST revenue) would be subsidising these people between $3500 and $4000 per household. This figure does not include distribution, treatment and ongoing maintenance. It seems highly unlikely that the beneficiaries of future regional development south of Brisbane would be willing to pay for the full cost of supply through their water charges. Quite simply development in rural and regional areas in future can no longer assume the Nation or State to massively subsidise water infrastructure. Technologies, some as simple as rainwater tanks, exist to ensure that future development does not require new large dams.

# 4.0 Alternative proposal for investigation

## 4.1 Alternatives to bulk water storages generally.

About half of the possible dam sites in South East Queensland have already been developed. The remaining sites are more remote, less productive, more costly, and have greater impacts on existing land use and the environment. More importantly, the amount of water available is small in comparison to existing dams.

In response to growing opposition to dams, the World Bank and IUCN (International Union for the Conservation of Nature) established the World Commission on Dams (WCD) in 1998. The WCD's mandate was to review the effectiveness of large dams worldwide (including Australia) and assess alternatives for water resource development. The final report released in 2000, found that the actual benefits provided by new dams are often (70% of cases) far less than the projected benefits. It also reports that most large dams are only marginally economically viable, with the average cost over-run of dams at 56%. That means if a dam is predicted to cost $ 1 billion, it is likely to end up costing $1.56 billion. By highlighting the inadequacies and inequities arising from previously built dams, the WCD recommends that future decisions about water supply take full consideration of all other available alternatives before the decision to build a dam is made.

**In the case of Wyaralong Dam, few alternatives have been considered.**

Several criteria need to be satisfied before a bulk water allocation or reserve associated with prospective future dams is incorporated into a water resource plan. These criteria include a high likelihood that:

a. it will be technically feasible to develop a dam at or near the proposed location,
b. the economics will be justifiable in the context of available yields, environmental flow requirements, water demands and product affordability
c. there will be no obvious project 'fatal flaws' from an environmental, social and cultural perspective, and
d. the dam will represent the best solution for meeting future water needs based on the three-pronged assessment hierarchy.

(Queensland Government, 2006 p 17)

**The proposed Wyaralong Dam does not to meet any of these criteria satisfactorily with the exception of possibly the first.**

### *4.1.1 Recycled Water*

The amount of water available for recycling is considerable, with the advantage being that there is a guaranteed supply which is not dependant on the weather. Assuming 50% of the existing consumption of about 480 000ML goes to sewer and is recyclable, 240,000 ML of water should be available now for recycling. The amount available will increase to nearly 315,000 ML in 2026 and it is a secure

supply that is largely independent of variable rainfall (Australian Water Association, 2005).

### *4.1.2 Water loss*

It is estimated that 'unaccounted-for' water represents an average of 11% of the total water consumption in south east Queensland (Australian Water Association, 2005). This equals approximately 52,800ML/yr most of which is lost through leaking pipes, burst pipelines and aging infrastructure. Reducing this amount by half would still provide more than the expected yield of the proposed Wyaralong Dam.

## 4.2 A proposed alternative to a Wyaralong dam

If it is considered absolutely essential that 'new water' must be extracted for future growth in south east Queensland, then we suggest that an attractive alternative exists to the construction of a new risky dam on the Teviot Brook. In Section 3 considerable attention was drawn to Moogerah Dam and its consistently low storage levels over the past twenty years. In essence, our proposition of an alternative worth serious investigation is that Moogerah Dam which is already constructed (and in an adjacent catchment running close to areas of the Teviot Brook) could serve as the water storage facility for safe levels of water harvesting from the Teviot Brook.

The Teviot Brook, above Boonah, where most of the catchment's rainfall comes from is very close to the catchment boundary with Moogerah Dam on Reynolds Creek. The majority of the Teviot Brook catchment yield is generated above Boonah and the lower catchment contributes relatively little due to the low rainfall and narrow nature of the catchment. Catchment yield at Croftby some distance up stream from Boonah is approximately 43,000 ML/yr (Logan Basin Technical Advisory Panel, 2006) which is more than 80% of the Teviot Brook's total average annual yield. Closer to Boonah the relative yield would be considerably higher meaning that the catchment in the area where the Wyaralong Dam would be located contributes only about 10% to runoff. A weir, or number of weirs on the Teviot Brook above Boonah could potentially provide a point to pump water a short distance into Moogerah Dam. Clearly, any infrastructure would impact to some extent on landholders in this area so it is imperative that any weir is located to be efficient in terms of pumping distance but also creates minimal impact on any current land use. Given the significant cost savings of this alternative option it may be that some landholders would be willing to forego some land if guaranteed a fair compensation for land and water allocation to ensure viable livelihoods can be maintained. The altitude difference and distance from the Teviot Brook in this area is minimal and Moogerah Dam is already piped to Boonah. Thus, pumping costs to Moogerah and distribution costs to Boonah (which was intended to have an allocation from Moogerah Dam) will be minimal.

A key feature of this proposed alternative is that is has the potential to significantly increase the storage of Moogerah Dam which is far deeper than a dam at Wyaralong would be. Moogerah Dam is a scenic location, and was intended to provide a diverse range of recreational opportunities for south east Queenslanders as well as water provision. Unfortunately, the dam has not been able to provide these recreational and tourism opportunities for well over a

decade due to very low storage levels. By harvesting safe levels of water from the adjacent Teviot Brook and storing it in Moogerah Dam several objectives could potentially be met simultaneously. The dam would store more water for consumptive use, provide recreational opportunities, and save potentially hundreds of millions of dollars by avoiding the construction of a new dam in a region that already has two dams that have performed poorly in the past decade. A water harvesting alternative from the Teviot Brook may or may not provide the 17,000 ML which is anticipated to be provided by the Wyaralong Dam proposal. However, a safe extraction from the Teviot Brook needs to be determined and assessed according to detailed environmental, economic and social criteria.

Boonah Shire already has two dams that have not performed well in periods of less than average rainfall (or even average rainfall in the case of Moogerah). These two water storages (Moogerah and Maroon Dams) could be better utilised by simple and safe water harvesting technologies, or even water recycling technologies if appropriate and viable.

**To construct a third dam costing half a billion dollars in the same area where two already existing and poorly performing dams exist, defies logic. Alternatives such as water harvesting, off stream storage, and recycling, utilising already existing storages must be fully investigated**.

# 5.0 References

Australian Water Association (2005) *Status of water in south east Queensland*. Report for The Courier Mail. Available online at: www.awa.asn.au

COAG (2004) *Intergovernmental Agreement on a National Water Initiative.* Available online at: http://www.nwc.gov.au/NWI/docs/iga_national_water_initiative.pdf

DNR (1998) *Water quality of the Logan/Albert River basin and proposed monitoring network.* Volume 1. Summary report. Queensland Government, Department of Natural Resources, Brisbane

Fox, M. J. (ed) (1919) *The History of Queensland: its people and industries* (illustrated) in three volumes: an historical and commercial review, States Publishing Co., Brisbane, Vol.1, pp.314-319.

GHD (1993) *Proposed Wyaralong Dam: Effects on the future development of Boonah township.* A report prepared for Boonah Shire Council and South East Queensland Water Board. Gutteridge, Haskins and Davey Pty Ltd, Brisbane.

GHD (2006) *South east Queensland regional water supply strategy: Desk top review of identifies dam and weir sites*. Report to the Bulk Supply Infrastructure Task Group. June 2006. GHD, Brisbane.

Logan Basin Technical Advisory Panel (2006) *Logan Basin draft water resource plan: environmental investigations report.* Volume 1. Summary Report. Queensland Government, Natural Resources, Mines and Water, Brisbane.

Lucas, C. and Joyce, R. (1987) *Australian country houses: homesteads, farmsteads and rural retreats*, Lansdowne Press, Sydney.

NRM&W (2006) *Logan Basin draft water resource plan: Overview report and draft plan*. Queensland Government, Natural Resources, Mines and Water, Brisbane.

NRM&W (2006a) *Logan Basin draft water resource plan: Indigenous cultural values report*. Queensland Government, Natural Resources, Mines and Water, Brisbane.

Office of Urban Management (2004) *Draft South East Queensland Regional Plan*. Queensland Government, Office of Urban Management, Brisbane.

Office of Urban Management (2006) *South East Queensland Regional Plan 2005-2026: Draft Amendment 1*. Queensland Government, Office of Urban Management, Brisbane.

Queensland Government (2006) Water for south east Queensland: A long term solution. Queensland Governemnt, Brisbane. Available online at: http://www.nrm.qld.gov.au/water/water_infrastructure/pdf/long_term_solution.pdf

The Courier Mail (2006) *Costs for all options are similar*, The Courier Mail, Brisbane, AUG 03, 2006.

Walter, B. and Wright, J. (1991) *Australian Style*, Weldon Publishing, Sydney.

Water Resources Commission (1989) *Guidelines for planning and design of urban water supply systems*. Queensland Government, Water Resources Commission, Brisbane.

Waterwatch Australia (2002) *National technical manual*. Module 4. Environment Australia Waterwatch Australia Steering Committee, Canberra. Available online at: http://www.waterwatch.org.au/publications/module4/electrical.html

World Commission on Dams (2000) *Dams and development: a new framework for decision making*. Earthscan Publications. Available online at: www.dams.org.