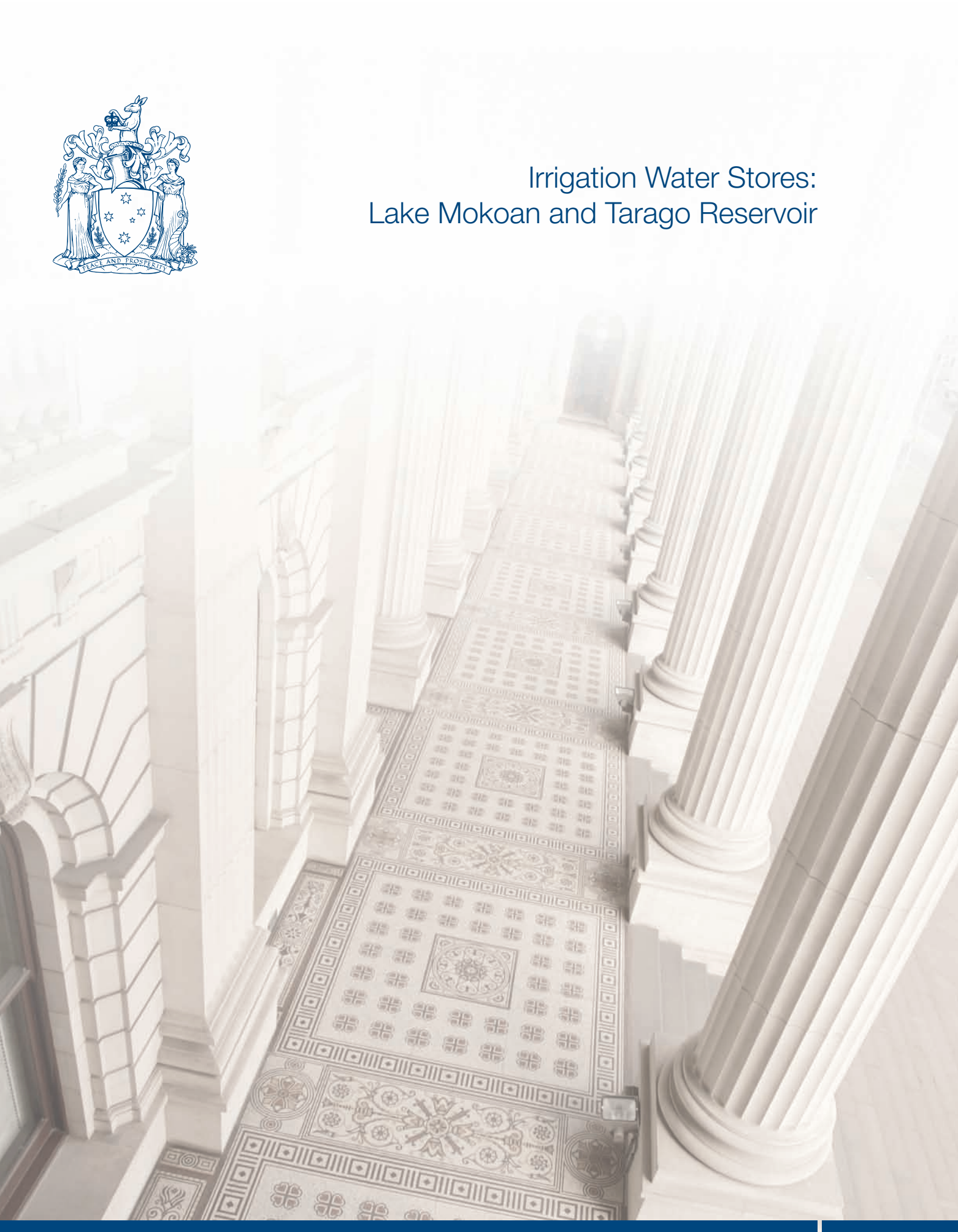
Irrigation Water Stores: Lake Mokoan and Tarago Reservoir



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Irrigation Water Stores: Lake Mokoan and Tarago Reservoir

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Victorian Auditor-General's Office

Auditing in the Public Interest

The Hon. Robert Smith MLC
President
Legislative Council
Parliament House
Melbourne

The Hon. Jenny Lindell MP
Speaker
Legislative Assembly
Parliament House
Melbourne

Dear Presiding Officers

Under the provisions of section 16AB of the *Audit Act 1994*, I transmit my performance report on *Irrigation Water Stores: Lake Mokoan and Tarago Reservoir.*

Yours faithfully

DR PETER FROST
Acting Auditor-General

10 March 2010

Contents

Audit summary

Background

A secure water supply is linked to the health of the environment, businesses, community and farms. Recognising this, the government committed to an action plan in the 2004 white paper *Securing Our Water Future Together.* It re-affirmed this in 2007 in response to an extended drought period and the need to accelerate major water augmentation projects.

Although the white paper's strategies varied in size, complexity and priority, all had the objective of achieving regional and national benefits. They also addressed local issues. Two such projects are the decommissioning of Lake Mokoan and the reconnection of Tarago Reservoir to Melbourne's water supply.

The Broken system, located in north-east Victoria is made up of weirs, channels, creeks, rivers and large water storages. One of its components Lake Mokoan, was considered unsustainable because of its inefficiency as a large water storage and its substantial future costs. Water to be saved by the decommissioning project was committed to the Snowy and Living Murray projects, a collective action between governments to restore the health of these rivers.

The Lake Mokoan project comprised multiple capital works projects and attracted significant local resistance, principally relating to fears over water security and increased flooding risks. These concerns were known at the time of the decision to decommission and persisted through the life of the project.

The reconnection of Tarago Reservoir was an initiative to increase water supply to Melbourne. By comparison with Lake Mokoan this project was less complex, because reconnecting Tarago Reservoir only required the establishment of a water treatment plant. Unlike Lake Mokoan, there were no residual community concerns about the decision.

This audit examined the role of the Department of Sustainability and Environment (the department), Goulburn-Murray Water (G-MW) and the Goulburn Broken Catchment Management Authority (GBCMA) in managing the decommissioning of Lake Mokoan. Similarly, the audit examined the role of the department and Melbourne Water in reconnecting Tarago Reservoir.

In particular the audit examined the extent to which the governance frameworks were sound, whether the advice to government regarding the cases to proceed was well founded, and whether consultation and communication with the communities and stakeholders was effective.

Conclusions

Both the reconnection of Tarago Reservoir and the decommissioning of Lake Mokoan were the most suitable options to pursue on environmental and cost grounds. Advice to government was comprehensive and robust.

The governance structures and approaches to decision-making and project implementation by the governing bodies were appropriate and sound for both projects. However, for Lake Mokoan, after the decision to decommission was made and implementation commenced, it took 20 months before an appropriate project governance framework was fully established.

Melbourne Water delivered the Tarago Reservoir project with no residual community issues identified. Despite the department's and G-MW's comprehensive and continuous engagement, community concerns remained throughout the life of the Lake Mokoan project. Although community engagement was generally well managed, a more targeted approach in addressing known areas of community dissatisfaction would have been beneficial.

Main findings

The Lake Mokoan project

A sound project governance framework with a project specific focus and support by the department was not established until 20 months after the decision to decommission Lake Mokoan had been made and implementation had commenced. While this did not stop the delivery of the project, confused roles and responsibilities during this period contributed to uncertainty about program accountability. Given the project complexities and community sensitivities known at the time, this should have been addressed earlier.

The decision to decommission Lake Mokoan was based on sound technical advice and comprehensive community consultation. The investigation of alternatives to full decommissioning and flooding risks included consultation with stakeholders, consistent methodology, relevant data and appropriate technical advice.

Although *Securing Our Water Our Future Together* did not record an approximate cost for the Lake Mokoan project, it was announced by the Premier in 2004 to be $60 million. However, at the time it was not made clear this cost was a preliminary estimate. The cost of all project components could not be finalised until 2009 when the level of interest by irrigators in selling their water entitlements was determined. As at January 2010 the project expenditure is expected to be $108 million once land rehabilitation, the final project stage, is completed. This cost increase has not invalidated the decision to fully decommission Lake Mokoan. Cost benefit analysis against alternatives still demonstrates that full decommissioning is the preferred option in regard to water savings, cost and the environment.

Communication throughout the project was continuous. Technical reports were accessible through the dedicated project website and a comprehensive program was in place to keep the community up to date in regard to the project implementation and key issues and concerns.

Despite comprehensive community engagement, the communication objectives did not target the community's dissatisfaction with the decision to fully decommission Lake Mokoan, the main project risk. The strategies employed were ineffective in allaying concerns by community groups, resulting in project delay and an atmosphere of mistrust.

In the course of the audit, interest groups raised a number of issues related to the Lake Mokoan project. This included a dispute regarding the government's commitment to maintain water security after the decommissioning of Lake Mokoan. The supply reliability, an estimation of current water security, was reassessed as 91 per cent in the Broken system in 2004, meaning the water users could expect to receive their full licence volume in 91 out of 100 years. This figure was used to guide the infrastructure investment and water entitlement buy back decisions. Some irrigators argued this rate should have been 97 per cent. Audit found the most defensible scenario was that supply reliability was between 91 and 93 per cent in 2004 when the commitment was made. Supply reliability of 92 per cent has been achieved as a result of the 2009 water entitlement buy-back process.

The risk of flooding to Benalla as a result of decommissioning Lake Mokoan was also an area of community concern, based largely on the belief in the community that Lake Mokoan was part of a flood mitigation strategy. Decommissioning Lake Mokoan will not raise the flooding risk for Benalla and its region, as Lake Mokoan was not used for flood mitigation.

The Tarago Reservoir project

Melbourne Water established a sound governance framework from the commencement of the Tarago Reservoir project. The decision to proceed with the option of reconnection was well founded on technical advice and included an assessment of alternatives. The community was engaged by targeting those affected and their concerns were identified and responded to throughout consultation. The project is complete and there are no residual community concerns.

Although *Securing Our Water Our Future Together* recorded the approximate cost as $50 million, it also noted the timing, cost and environmental impacts required further investigation. Once this work was complete, the cost of the project was estimated to be up to $99.3 million ($94.6 million +/- 5 per cent) with completion by the end of 2009. The project was completed within time and budget although the final cost of $96 million, stated as being $3 million under budget, was actually within the estimated cost range.

Recommendations

Number	Recommendation	Page
	The Department of Sustainability and Environment should:	
1.	Establish and promulgate at the commencement of all major projects clear roles and responsibilities and reporting requirements.	30
2.	Make clear when project costs are announced whether they are preliminary estimates or firm commitments.	30

Audit Act 1994 section 16— submissions and comments

Introduction

In accordance with section 16(3) of the *Audit Act 1994* a copy of this report, or relevant extracts from the report, was provided to the Department of Sustainability and Environment, Goulburn-Murray Water, Goulburn Broken Catchment Management Authority and Melbourne Water with a request for comments or submissions.

The comments and submissions provided are not subject to audit nor the evidentiary standards required to reach an audit conclusion. Responsibility for the accuracy, fairness and balance of those comments rests solely with the agency head.

Submissions and comments received

RESPONSE provided by the Secretary, Department of Sustainability and Environment

The following is an extract of the response provided by the Secretary, Department of Sustainability and Environment.

I welcome the conclusions that the reconnection of Tarago Reservoir and the decommissioning of Lake Mokoan were the most suitable options to pursue on environmental and cost grounds and that these decisions were supported by comprehensive and robust advice to the Victorian Government.

The Department of Sustainability and Environment (DSE) is broadly satisfied with the proposed audit report in regard to the Lake Mokoan project. However, DSE believes the comments made in regard to the governance framework, as detailed in my letter of 3 February 2010, are still valid.

> *Note: Extract from letter dated 3 February 2010:*
>
> ***'Project Governance***
>
> *Initially, the decommissioning of Lake Mokoan was overseen by the high-level Joint Department/Goulburn-Murray Water: Water Savings Infrastructure Steering Committee, as well as the Goulburn-Murray Water Operating Area Program Management Group.*

RESPONSE provided by the Secretary, Department of Sustainability and Environment – continued

The respective roles of the Steering Committee and Program Management Group and associated reporting arrangements were defined in a Memorandum of Understanding between DSE and Goulburn-Murray Water, terms of reference and other documentation.

The specific Mokoan Project Control Board was established in April 2006. In retrospect, it would have been ideal to establish the Project Control Board at the start of implementation however the Steering Committee and Program Management Group represented appropriate governance arrangements, given the level of project definition at the time.'

The proposed audit report fairly represents the Tarago Reservoir project.

The department notes and accepts the Proposed Audit Report Lake Mokoan and Tarago Reservoir.

RESPONSE provided by the Managing Director, Goulburn-Murray Water

The following is an extract of the response provided by the Managing Director, Goulburn-Murray Water.

G-MW welcomes the findings of the audit and the positive manner in which the findings have been researched and presented.

RESPONSE provided by the Chief Executive Officer, Goulburn Broken Catchment Management Authority

The following is an extract of the response provided by the Chief Executive Officer, Goulburn Broken Catchment Management Authority.

Reliability

While the GB CMA accepts there is a degree of uncertainty in modelling, it does not believe expressing reliability as a range assists the discussion. Rather a discussion around the impact of changing key assumptions has on reliability would be more useful. For example, reliability would drop if BGA blooms occurred earlier in the season and would improve if they became less frequent.

The report would be enhanced by referring to reliability as a figure and discussing the impact of changing assumptions has on reliability.

As stated above, utilisation of water entitlements in the Broken Basin is low and water trading is inhibited by a ban on trading outside the Broken Basin. This is a substantially different environment to the rest of the GMID.

The report would be enhanced by a discussion on how individual irrigators had access to very high annual allocations in a system with relatively low reliability.

RESPONSE provided by the Chief Executive Officer, Goulburn Broken Catchment Management Authority – continued

Communications and Consultation

It is the view of the GB CMA that effective communications can be put in place and 'concerns within sections of the community over decommissioning' remain. The State Government's responsibility is to act in the best interest of all Victorians. Broken Valley irrigators do not have this responsibility so it is perfectly reasonable for them to come to a different conclusion after considering the same facts. There is no evidence in the report to support the assumption that specific concerns over decommissioning could have been better addressed by targeted communications.

The comments with regard to Volume 5 are not consistent with records provided to your office, but the issue is not of major importance.

Flooding Risk to Benalla

The GB CMA is satisfied that 2.5.3 is an accurate representation on how the flooding issue was addressed.

Recommendations

It is noted that there are no direct recommendations for the GB CMA to address.

The recommendations provided in the Audit Report are supported.

RESPONSE provided by the Managing Director, Melbourne Water

The following is an extract of the response provided by the Managing Director, Melbourne Water.

The Tarago Reservoir reconnection was delivered ahead of time and within budget, which could not have been achieved without a sound governance framework and effective engagement of stakeholders. This VAGO review confirms that both these elements were observed on this project in the context of a challenging timeframe.

We note that there were no specific recommendations for Tarago; however the audit has provided an opportunity to gain an independent perspective of the project and the exchanges during the review were considered valuable as we seek to continually improve our performance.

1 Background

1.1 Introduction

A secure water supply is directly linked to the health of the environment, businesses, farms and community. Recognising this, the government committed to an action plan which was included in the June 2004 white paper *Securing Our Water Future Together.*

Although the white paper's strategies varied in size, complexity and priority all had the objective of achieving regional and national benefits. They also addressed local issues. Two such projects are the decommissioning of Lake Mokoan and the reconnection of Tarago Reservoir to Melbourne's water supply.

1.2 Lake Mokoan

Lake Mokoan was created in 1971 for the Goulburn and Murray irrigation systems and for local water supply. It is part of the Broken system in north-east Victoria that comprises:

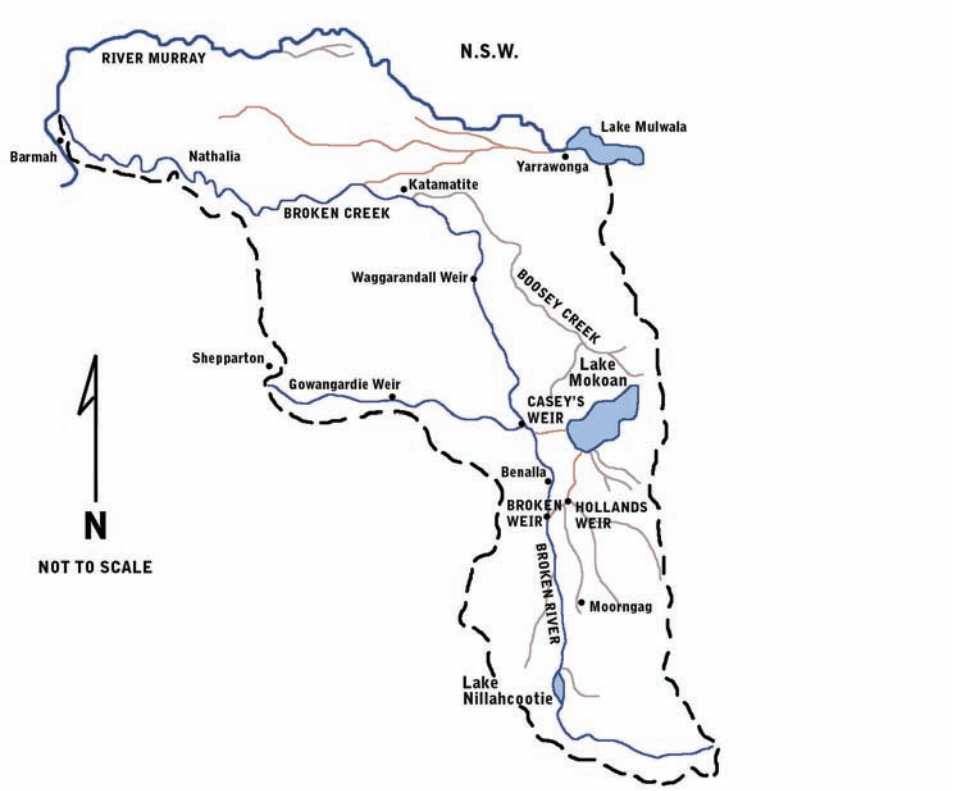
- Broken River, which rises in the Victorian highlands, flows through Benalla and joins the Goulburn River at Shepparton
- Broken Creek, which splits from Broken River at Casey's Weir close to Lake Mokoan and rejoins the Murray River at Barmah
- the Broken water supply system along Broken Creek, which ends at Waggarandal Weir, about 15 km downstream of Casey's Weir
- Lake Nillahcootie, created upstream of Benalla in 1967, filled by local catchment inflow
- Lake Mokoan created downstream of Benalla in 1971, filled by diverting water from Broken River and Hollands Creek, and inflow from a small natural catchment
- weirs and channels to divert water from the river and creek to Lake Mokoan.

The capacity of the lake was 365 gigalitres (GL) and it lost on average 50 GL a year in evaporation. Prior to the 2009 water entitlement buy-back, there were 180 irrigation diverters who together held 26.4 GL in bulk entitlements.

Following many dry years, Lake Mokoan fell from 12 per cent full in August 2007 to dry in February 2009. It stayed dry until September 2009 when increased flows in Hollands Creek allowed small diversions into the lake to resume.

Figure 1A provides an overview of the Broken system.

Figure 1A
The Broken system



Source: Fact sheet no. 1 *Water in the Broken System* published at <www.lakemokoan.com.au>.

1.2.1 Decommissioning Lake Mokoan

The decision to decommission the man-made Lake Mokoan and return it to wetland was announced in 2004 in the *Securing Our Water Future Together* White Paper. This was the first time a major reservoir was to be decommissioned in Victoria.

The primary objective of the decommissioning was to return 44 GL of water savings annually to the Snowy River (20 GL) and Murray River (24 GL) systems.

In addition to the expected environmental benefits from increased water flows and the return to wetlands, other stated benefits, relating specifically to irrigators were:

- removing an inefficient water storage, which would save Goulburn-Murray Water (G-MW) and their customers about $676 000 each year in operating and maintenance costs
- avoiding dam safety costs, which would be imposed on G-MW customers, in the order of $20 million in the following ten years

- improving the efficiency of irrigation and domestic and stock water supply in the Broken system
- provision of a supplementary water supply to Lower Murray irrigators via the Mid-Murray Storage.

In 2004, an undertaking was given by the government to irrigators that the decommissioning would not affect the reliability of their water supply measured in terms of the number of years that water users could expect to receive their full licence volume in every 100 years. The supply reliability committed to in 2004 was 91 per cent, although this rate was not referred to in the white paper.

To give effect to this undertaking, while achieving the water savings target of 44 GL, it was anticipated that it may be necessary both to reduce demand for water, by purchasing water entitlements from some irrigators, and to undertake capital works to cut water losses or to provide alternative sources of supply. There was, however, an interplay between these two approaches – purchasing more water entitlements reduced the need for offset infrastructure projects.

This audit focused on two project components:

- remove, modify and build infrastructure to decommission the lake and establish the offsets to maintain reliability of water supply
- rehabilitate the lake site after decommissioning.

The cost of decommissioning was estimated in 2004 to be approximately $60 million as outlined in Figure 1B below, at a cost of $1 344 per megalitre (ML) of water saved.

Figure 1B
The cost and objectives of project components as at 2004

Components	Initial estimation	Implementation objective
Tungamah domestic and stock pipeline	$15.1 mil	To be completed in late 2005.
Supply to direct diverters	$6.2 mil	Aim to maintain supply to diverters.
Lake Boga mid-Murray storage	$10 mil	Components will depend on other infrastructure decisions outside the Broken system.
Reliability offset measures	$18.6 mil	Offsets and their implementation were yet to be finalised. The aim was to maintain water security at the time of full decommissioning.
Lake Mokoan works decommissioning	$7.8 mil	To be completed by December 2009.
Lake Mokoan rehabilitation	$1 mil	The strategy and implementation timeline were yet to be developed.
Management	$0.5 mil	Project to be completed by December 2009.
Total	**$59.2 mil**	
Water savings (annual)	**44 GL**	

Source: The Department of Sustainability and the Environment and Goulburn-Murray Water.

1.2.2 Roles and responsibilities

Goulburn Broken Catchment Management Authority (GBCMA) was responsible for conducting the 2003 feasibility study examining the future options for Lake Mokoan. It was also represented on the Lake Mokoan Project Control Board, which from 2006 oversaw the project implementation.

As the project owner, the Department of Sustainability and Environment (the department) was accountable for the success of the project. It advised the Minister for Water regarding progress and sought his endorsement for major decisions. It also contributed to some aspects of the project planning and coordinated some technical contributions.

G-MW was responsible for project implementation. The Project Director, a G-MW officer, had responsibility for the day-to-day project activities, the quality of the project's deliverables and its successful completion in regard to time and budget. The Project Director led the project team, which consisted of officers of the department, G-MW and GBCMA who undertook activities within the areas of their responsibilities.

1.3 Tarago Reservoir reconnection

East of Melbourne at Neerim South, Tarago Reservoir stores water from the Tarago River. Built in 1967 to supply the local areas, it is the sixth largest of Melbourne's 10 reservoirs with a 37.5 GL capacity. The catchment compromises state forest, privately owned agricultural land and a small area of Melbourne Water land.

In 1994 Melbourne Water stopped supplying Tarago Reservoir water to Mornington Peninsula and Westernport because of periodic failure to comply with Australian Drinking Water Guidelines for colour, taste and algal content.

Water from the reservoir continued to be supplied to Gippsland Water customers which was locally treated.

1.3.1 Reconnecting the Tarago Reservoir

The *Water Industry Act 1994* requires Melbourne Water to:

- identify the best mix of supply and demand measures for Melbourne
- meet current demand and have contingency water supply equivalent to seven years growth for urban areas
- have a works program consistent with government strategies to secure water supplies beyond seven years.

In June 2005, the government announced it would reconnect Tarago Reservoir by 2011 to supply South East Water customers and help manage the likely fall in water yield from climate change. The reconnection is the first of three major supply projects in the government's $4.9 billion plan to provide an extra 240 GL of water by 2011. The completion date was brought forward to December 2009 in response to continuing dry years.

The government also announced it would build a treatment plant so the water would comply with the *Safe Drinking Water Act 2003*. The plant would average 15 GL of water a year or up to 21 GL if pre-drought conditions returned. Its actual capacity is 25.5 GL (or 70 ML per day).

1.3.2 Roles and responsibilities

Melbourne Water was responsible for all aspects of the Tarago Reservoir reconnection project including the initial justification, community consultation and delivering the project on time and within budget.

The department briefed the Minister for Water on Melbourne Water's delivery of the project including compliance with timelines and budget and management of major or sensitive issues.

1.4 The audit

1.4.1 Audit objectives

The audit objective was to examine the effectiveness of managing the decommissioning of Lake Mokoan and the reconnection of the Tarago Reservoir.

In particular the audit examined whether:

- there were sound governance frameworks
- the advice to government regarding the case to proceed was well founded
- consultation and communication occurred with the community and stakeholders and was effective.

1.4.2 Audit scope and methodology

The audit examined the role of the department, the GBCMA and G-MW in the decommissioning of Lake Mokoan, and department and Melbourne Water in regard to the reconnection of Tarago Reservoir.

We reviewed and analysed both the publicly available information and the department's, GBCMA's, G-MW's and Melbourne Water's records; inspected Tarago Reservoir, the treatment plant, the Broken system including Lake Mokoan and the surrounding areas; interviewed officers from the department and agencies, and consulted with stakeholders.

We examined documents dating back to the capital works projects in the 1960s, the weir keeper's 1970s and 1980s diaries, and the technical documents that informed project decision-making.

The audit was performed in accordance with the Australian Auditing Standards.

1.4.3 Cost

The total cost of the audit was $310 000 and included staff time, overheads, expert advice and printing.

1.4.4 Structure of this report

This report is structured as follows:

- Part 2 examines the Lake Mokoan decommissioning project.
- Part 3 examines the Tarago Reservoir reconnection project.

A chronology of key events and a glossary are included as appendices.

2 Decommissioning of Lake Mokoan

At a glance

Background

The decision to decommission Lake Mokoan and return it to wetlands, was announced in 2004 as a strategy to return saved water to the Snowy and Murray Rivers. An undertaking was given to irrigators that the decommissioning would not affect the reliability of their water supply. Some community members were dissatisfied with this decision and raised their concerns during the project feasibility and implementation phases.

Findings

- The decision to decommission Lake Mokoan was supported by extensive technical analysis that presented full decommissioning as the most effective option based on cost, water savings and environmental benefits.
- There was a 20 month hiatus before an effective project governance framework was in place following the decision to decommission Lake Mokoan, which allowed individual issues to develop that created difficulties in managing the project.
- There was extensive communication with the community throughout the project. Community members were kept up to date, had opportunities to contribute and participate and had access to government agencies for enquiries and grievances. Communication strategies during project implementation, however, were not tailored to address specific concerns within sections of the community over decommissioning.
- The department's water supply reliability rate of 91 per cent was at the lower end of the defensible range, which extended to 93 per cent.
- The full decommissioning of Lake Mokoan would not add to the risk of Benalla flooding.

Recommendations

The department should:

- establish and promulgate at the commencement of all major projects clear roles and responsibilities and reporting requirements
- make clear when project costs are announced whether they are preliminary estimates or firm commitments.

2.1 Introduction

In 2004 the government released its *Securing Our Water Future Together* white paper, which announced that Lake Mokoan would be decommissioned and the area returned to wetland. The statement said:

- decommissioning would improve environmental flows to the Snowy and Murray rivers by 44 GL annually
- Lake Mokoan's high evaporation rate made it inefficient
- the lake had water quality problems of blue green algae and turbidity
- irrigators outside the region paid most of its operating costs
- the dam would need a safety upgrade at significant cost.

Lake Mokoan, September 2009.

In *Securing Our Water Future Together* the government committed to irrigators that Lake Mokoan's decommissioning would not affect their water security. It proposed 'offsets' to meet this commitment involving increasing the efficiency of water supply or reducing the demand for water from the system.

2.2 Status of the project

The Lake Mokoan project is not yet complete and assessing all of the project outcomes against the expectations in *Securing Our Water Future Together* is therefore premature. The status of the project as at January 2010 is outlined in Figure 2A below.

Figure 2A
Status of project components as at January 2010

Component	2004 estimates	Jan 2010 Actual/ estimated	Comment
Tungamah domestic and stock pipeline	$15.1 mil	$16.8 mil	Completed in early 2006
Supply to direct diverters	$6.2 mil	$13.2 mil	Completed in June 2009
Lake Boga mid-Murray storage	$10.0 mil	$10.6 mil	Stage 1 completed. The requirement for Stage 2 will depend on whether Little Murray Weir is decommissioned. This decision is yet to be made
Reliability offset measures	$18.6 mil	$35.7 mil	Comprises: • $5.2 million infrastructure offset measures • $1.3 million entitlement buy-back in 2004 • $29.2 million entitlement buy-backs in 2009 *(a)*
Lake Mokoan works decommissioning	$7.8 mil	$6.2 mil	To be completed by mid 2010
Lake Mokoan rehabilitation	$1.0 mil	$19.7 mil	Strategy endorsed in 2008 and implementation committee announced in 2009. It will take up to 8 years to implement
Management	$0.5 mil	$1.2 mil	Ongoing to mid 2010 when all decommissioning components are complete
Unplanned work required		$2.1 mil *(b)*	Some relate to water service delivery requirements and others include: additional work required for maintenance and renewal costs for drainage depression; a temporary pump
Global Project Risks (Contingency)		$2.6 mil	Not included in original estimation
Total	**$59.2 mil**	**$108.1 mil**	
Annual water savings	**44 GL**	**50.2 GL**	
Cost per ML of water saved	**$1 344**	**$2 153**	

Note: (a) The cost of water entitlement buy-back includes on costs.
(b) present value and discount rate of 4 per cent applied.

Source: Department of Sustainability and Environment and Goulburn-Murray Water.

The Lake Mokoan project received funding from the Victorian Water Trust, Water for Rivers and the sale of local land. The South Australian and the Commonwealth governments also contributed through the River Murray Environmental Flow Fund and the Living Murray Initiative respectively.

Decommissioning is expected to be completed in mid-2010, six months after the planned completion. Offset measures in place to maintain water security will include new pipes, pumps and rain rejection storage; however the future land use strategy will take eight years to implement.

2.3 The 2004 decision to decommission the lake

2.3.1 Were governance structures appropriate?

Leading up to the 2004 decision to fully decommission Lake Mokoan, the governance structures, including reporting frameworks, were clear and appropriate.

In 2001 G-MW and the former Department of Natural Resources and Environment (the department) engaged a consultant to identify possible water savings in Northern Victoria and the potential impact of such savings on customers, the environment and regional economies (2001 study).

Concluding that the best savings could come from Lake Mokoan, the study gave three options:

- full decommissioning and reversion to wetlands
- partitioning of the lake and no change in the operating rules
- partitioning of the lake for use as an annual storage facility.

Under a Memorandum of Understanding, the department commissioned and funded the Goulburn Broken Catchment Management Authority (GBCMA) to determine the feasibility of the three options. The GBCMA set up steering and reference committees for this.

The steering committee, comprising the department and the stakeholder agencies, was established to give the government sufficient advice to make a decision about the future of Lake Mokoan.

In 2003 the steering committee appointed consultants to engage with the community and conduct the *Lake Mokoan Study* (2003 study). In this feasibility study, five partial decommissioning models were assessed alongside full decommissioning and changes to the lake's operating rules.

The reference committee comprised appointees from a diverse range of interested public, commercial and government organisations. It was responsible for planning and delivering a community consultation program, advising consultants on relevant community matters and receiving progress reports. Community feedback highlighted resistance to full decommissioning and preference for the partial decommissioning options. This resistance was based on concerns including flooding, water security and the loss of recreational and tourist value.

In November 2003 GBCMA reported the study results, referred to as Volumes 1 to 4, to the Minister for Water, together with the community feedback.

Subsequent to the steering committee overseeing the conduct of the 2003 study, the Department of Sustainability and Environment (the department), as successor department to the Department of Natural Resources and Environment, responded to the community concerns about cost and risks, by engaging the same consultants to further analyse in more detail two options from the 2003 study, full decommissioning and a partial decommissioning model called the spit bank option. It did this with the endorsement of the Minister for Water, but without advising the steering and reference committees.

The results of this study, known as Volume 5, were published in March 2004 (the 2004 volume). In the course of the audit, concerns were expressed that neither the reference nor the steering committee was aware of this later volume until the work had been completed. As a result mistrust surfaced when full decommissioning was represented in this volume as the preferred option.

Given the inclusion of full decommissioning as the preferred option, and the known community resistance, it would have been more prudent had the department informed the two committees of the conduct of the 2004 volume, acknowledged their contributions and apprised them of this further analysis.

2.3.2 Was the decision to decommission well founded?

The decision to fully decommission Lake Mokoan was the most effective option based on cost, water savings and environmental benefits given the available data at that time. It aligned with *Growing Victoria Together's* vision for water and the challenges and principles in the white paper *Securing Our Water Future Together*.

The decision was the end point of a process to identify and make water savings from headworks in Northern Victoria. This commenced with a review of Northern Victoria's bulk water storages in 2001, followed by a review of Lake Mokoan's future between 2002 and 2004, and concluding with a feasibility review of the full, partial and no decommissioning options in 2003 and 2004. This feasibility study informed the 2004 white paper *Securing Our Water Future Together* in which the Premier and the Minister for Water announced the full decommissioning of Lake Mokoan.

The decision was supported by hydrological, engineering, economic and other technical analysis and was prepared after consulting with the community and technical experts to identify and investigate issues. Interested parties could raise ideas and concerns through a reference committee, public meetings, letters and telephone. Some parties put forward alternatives to full decommissioning.

Cost-benefit analysis

The 2003 study and the 2004 volume outlined preferred options based on current data, costs and information. Although the 2004 analysis used a slightly different methodology to the earlier volumes, this was to accommodate new data and information to bring the analysis up to date.

Audit found that there was a consistent and sound approach applied to the analysis of the costs and benefits of full decommissioning and the alternatives. The assessment criteria applied to this analysis covered water savings, cost, the environment, heritage and socio-economic criteria.

The analysis confirmed that full decommissioning was the most cost-effective option, as set out in Figure 2B, which presents the two most-preferred options in the 2004 volume.

Figure 2B
Summary of water savings, benefits and costs (2004)

	Option 1 Return to Winton Swamp (includes Tungamah and Broken system offsets)		Option 2B3 Spit bank, permanent storage, shallow	
Water Savings (ML)	44 000		34 000	
Discount rate	**4 per cent**	**8 per cent**	**4 per cent**	**8 per cent**
Present value of benefits ($mil)	87.9	49.1	72.2	41.4
Less: Present value of cost (including lost recreation and dam rehabilitation costs) ($mil)	60.6	52.9	72.4	62.4
Present value of net benefit ($mil)	**27.3**	**–3.8**	**–0.2**	**–21.0**

Source: Adapted from *Lake Mokoan Study Volume 5 – Benefit Cost Analysis: Addendum*.

Full decommissioning was also a lower cost option in terms of the present value of the cost for water saved. In 2004, at a 4 per cent discount rate, this was $1 377 per ML saved, compared to the spit bank option at $2 129 per ML saved.

2.3.3 Was communication and consultation appropriate?

The community engagement strategy up to the 2004 decision was clearly documented in the three phase communication plan as:

- setting up the reference committee
- consulting and delivering community engagement as part of the feasibility
- analysing and summarising the feedback.

The communication was comprehensive and appropriate, using a range of strategies to reach the broad community. Consultation for the 2003 study included an initial phase to further develop the three options listed in the 2001 study, and a later opportunity for the community to comment in regard to the feasibility assessment.

There was no further community consultation undertaken for the 2004 volume, nor was it technically required, as the scoping of options had finished and the further analysis that was required involved technical rather than community input.

However, despite the comprehensive communication and consultation, resistance to full decommissioning remained after the decision to decommission.

2.4 The project implementation phase

2.4.1 Were governance structures appropriate?

Following the 2004 decision to decommission, 20 months elapsed before a Lake Mokoan-specific governance framework was established that enabled the department, as the project owner, to concentrate more closely on overseeing the project and its sensitivities.

Although this hiatus did not stop the project implementation it did provide opportunity for the resistance to full decommissioning to continue without a firm response and for government's water security commitment to be challenged.

A clearly documented and communicated governance framework from the start, with a single project focus would have provided a clearer purpose and a better foundation to respond decisively to concerns within the community.

Project governance

A joint department and G-MW Water Savings Infrastructure Steering Committee was established in 2001 providing senior executive strategic oversight for water saving infrastructure projects. G-MW through the Lake Mokoan project director, provided progress reports to the committee. The committee monitored the implementation of each project at a high level only.

As the project owner, the department was accountable for the success of the project. After G-MW's engagement in October 2004, there was frequent contact between the two organisations on the day-to-day management of the project before the final offsets were approved. There was also a Water Savings Program Management Committee which had a coordinating role within G-MW for all of its water savings projects.

The Water Savings Infrastructure Steering Committee's high level multi-project oversight was replaced in April 2006 by a Lake Mokoan specific Project Control Board. This centralised and aligned more comprehensive reporting and advice to the department, G-MW and GBCMA.

The department had responsibilities as:

- funds provider
- project owner with a strategic oversight
- members of the implementation team reporting to the G-MW project director.

Recognising its multiple responsibilities, the department acknowledged there was some confusion between it and G-MW over roles and accountabilities. In order to remove any uncertainty over program accountability, the department clarified to G-MW and the Project Control Board these relationships. The department presented an implementation plan and a governance structure, with roles and responsibilities, decision-making processes, milestones and applied its 2005 project risk plan.

Consultative committees

At the end of 2004, the Minister for Water announced that the community would be fully involved in planning the decommissioning. This was addressed through substantial communication strategies and formally constituted committees.

The Minister endorsed two committees:

- the Lake Mokoan Future Land Use Steering Committee (the Future Land Use Committee) to develop a strategy to reclaim the site after decommissioning
- the Broken System Reliability Reference Committee (the Reliability Reference Committee) with eight irrigators advising G-MW Board on the development and implementation of the reliability offsets.

The committees' governance frameworks were clear. They were constituted under the *Water Act 1989*, had charters and codes of conduct developed early and the details of each meeting were recorded with endorsed minutes. There was community representation, relevant interest groups and departmental and G-MW members attended as ex-officio officers acting as conduits to their agencies.

The Future Land Use Committee was a conduit for information from the community to government agencies and met its chartered responsibilities. It proposed the *Lake Mokoan Future Land Use Strategy* which the Minister endorsed in 2008 and funded with $20 million.

Reliability Reference Committee

The G-MW Board dissolved the Reliability Reference Committee before it completed its work, because of an unresolved dispute. The committee had exceeded its charter by investigating and disputing the supply reliability with the department and G-MW.

Despite the charter, the committee members believed the review of supply reliability, as a measure of water supply security, was part of their task. Project publications increased the confusion as they incorrectly described the committee's role to include a focus on supply reliability. There is also no evidence in the meetings' minutes that the committee members or the G-MW and department ex-officios, recognised that the focus on supply reliability conflicted with the charter and the committee's purpose.

From its first meeting in February 2005 the Reliability Reference Committee reviewed and studied the supply reliability rate. Members were committed to 97 per cent and wrote to water users and the Minister for Water seeking support. The committee voted to reject 91 per cent and to seek agreement to 97 per cent.

The Minister for Water advised the committee he did not support 97 per cent and asked members to consider the offsets and supply measures that would achieve 91 per cent supply reliability.

Even though the removal of the members was consistent with the committee's code of conduct and within the G-MW Board's authority, the committee was working in an atmosphere of mistrust. An earlier warning regarding the implications of exceeding its charter is the only notable avenue that was not used. The absence of a project-specific oversight body at the time also did not assist in managing this dispute.

2.4.2 Was the basis to proceed with full decommissioning well founded?

The decision to fully decommission Lake Mokoan was confirmed by the Minister for Water in December 2007, following analysis to assess the alternatives to full decommissioning subsequently proposed by community groups.

However, the full cost of the decommissioning could not be determined until after the package of reliability offset measures, including the buy-back of water entitlements, was finalised in 2009. Only then could the actual cost-benefit of the project be determined.

2007 analysis of alternatives to full decommissioning

Community groups concerned about water security and flood risks in the Benalla region maintained an interest in alternatives to full decommissioning. In the course of the audit, concerns were expressed by some community members that these alternatives were not being properly assessed.

The department and G-MW did not specifically rule out alternative options to full decommissioning after the government's decision in 2004. On the contrary, they were open to considering the alternatives to full decommissioning and applied a consistent approach to their assessment seeking quality technical advice.

Smaller storage facility proposals continued to be presented as alternatives to full decommissioning. For example, an irrigators' group proposed a 'modified Lake Mokoan' in late 2006. They claimed it saved enough water for the government not to buy water entitlements. In March 2007 the department engaged consultants to investigate its merits. G-MW investigated an additional option of a 'mini-Lake Mokoan' model and contracted consultants to study both the 'modified' and 'mini' alternatives.

The studies assessed the technical merits and cost-benefit aspects of the alternatives, consistently and robustly. They were well referenced, used accepted professional practice, the most recent available data and engaged interest groups and experts where appropriate.

Each review met its terms of reference and new information was appropriately considered. The findings in each study were soundly based and represented when included in advice to the government.

The hydro-geological modelling was consistently applied in reports and with other modelling. Earlier estimates were refined over time as new data became available. Up-to-date data such as construction costs were used and options refined so that the analysis was more accurate and soundly based.

The studies concluded that neither alternative offered better value for money compared to full decommissioning, particularly in water loss, construction and operating costs, system reliability and overall water savings.

Three years after the decision to decommission had been announced, the department advised the Minister for Water in 2007 to reject the alternatives and confirm full decommissioning. Following a meeting with the irrigators' group in December 2007, the Minister announced that full decommissioning was to proceed.

Full cost of decommissioning

The 2004 cost-benefit analysis, which was the basis for the original decision, estimated that decommissioning would cost $60 million in 2004 dollars. The department did not clarify at the time of the announcement that the project cost was an initial estimate and further work was needed to finalise the cost. *Securing Our Water Future Together* did not include a project budget but it did present possible, but not final offset measures.

There are two substantial differences between the original cost estimate and the current cost estimate (Figure 2A)—the cost of the reliability offset measures, and the cost of rehabilitation.

Cost of reliability offset measures

A number of infrastructure projects were planned in conjunction with the buy-back of water entitlements, to offset the decommissioning of Lake Mokoan and achieve the supply reliability commitment of 91 per cent.

The initial cost estimate for these projects, excluding Tungamah Pipeline, was $18.6 million in 2004, but after further investigation and stakeholder consultation, a set of measures were proposed and costed. These measures were subject to a review following the 2009 water entitlement buy-back process, as the location and volume of the remaining entitlements changed demand and service delivery requirements across the Broken system. The measures set out in Figure 2C are those which were identified as no longer required.

Figure 2C
The planned offset measures assessed as no longer required in 2009

Reliability offset measure	2008 estimation ($mil)
Piping of supply to Major Creek area	6.9
Pump station and pipeline to supply irrigation diversions 2 km upstream of EGM to Violet Town Boundary Road from EGM	2.0
Supply infrastructure into Broken River downstream of EGM	0.1
Costs saved	**9.0**

Source: Goulburn-Murray Water.

The cost of offset measures is presently estimated to be $35.7 million, $17.1 million more than the original estimate. It includes costs of $29.05 million for the buy-back of 8 300 ML of water entitlements in 2009 at a cost of $3 500 per ML.

The buy-back of 8 300 ML of water entitlements exceeded the volume needed to:

- avoid the need for planned infrastructure offset projects that had yet to commence—only 6 139 ML was required for this
- achieve supply reliability of 91 per cent—92 per cent has been achieved
- achieve 44 GL of water savings—50.2 GL has been achieved.

At $3 500 per ML, the price paid to irrigators is also significantly above the fair value of water entitlements of $2 000 per ML, as determined by the Valuer-General in 2008, and remains above current market prices in Victoria.

G-MW first asked Broken system water users in 2007 for expressions of interest in the sale of their water entitlements. The buy-back process was then suspended due to the ongoing assessment of the alternatives to full decommissioning. It was further delayed as the Victorian Farmers Federation (VFF) negotiated with the department and G-MW over the buy-back as part of the final offset measures.

The VFF made an offer to sell 10 GL through a targeted water entitlement purchase at $5 000 per ML, with other conditions. It also suggested this offer would improve reliability in the Broken system above the 91 per cent supply reliability commitment. The department presented offset packages to VFF applying the Valuer-General's value of $2 000 per ML.

The parties could not agree and as negotiations had failed, the department engaged Water for Rivers in 2009 to buy the required water entitlements from the irrigators directly. Owned by the Victorian, Australian and New South Wales governments, Water for Rivers is set up to recover water for the Snowy and Murray River systems by investing in water efficiency projects and buying water entitlements.

Water for Rivers also rejected the VFF offer of 10 GL at $5 000 per ML as it was above the 91 per cent supply reliability commitment, and was more expensive than the project could afford and what the government considered reasonable.

A fixed price of $3 500 per ML was offered to targeted areas by Water for Rivers. The price was set considering the better than expected savings from the Tungamah project, the Valuer-General's report and the 'price premium' required to secure more than 6 139 ML, so as to avoid the remaining infrastructure offsets.

In response to the offer price, the targeted irrigators offered to sell 12 000 ML of their entitlements. As this response was greater than expected, or needed, the Project Control Board and the Minister were able to consider the benefits of an entitlement purchase greater than the 6 139 ML needed.

The Minister endorsed the buy-back of 8 300 ML on the basis that:

- the remaining offset infrastructure projects would not be required—providing savings of $9 million (Figure 2C)
- supply reliability of 92 per cent would be achieved—1 per cent above the 2004 commitment
- the Broken system demand reduced by about 30 per cent
- the additional 2 161 ML of water savings were directed to the Broken, Goulburn, Snowy and Murray rivers for environmental health.

The VFF and some irrigators expressed support for this offer and the entitlement buy-back process is now complete. 8 300 ML of water entitlements was purchased.

Rehabilitation costs

In 2008 the Minister for Water announced a commitment up to $20 million to restore the former Winton Wetlands after Lake Mokoan is decommissioned, which was significantly more than the $1 million estimated in 2004.

There was no restoration strategy in 2004 resulting in the original estimate failing to identify the extent of work required to rehabilitate the land and to recreate the infrastructure. The detail required for an accurate cost determination was provided only after the *Future Land Use Strategy* was developed by a community representative committee in 2008. The department conducted a cost-benefit analysis of this strategy as a separate project.

Impact of additional costs on cost-benefit of the project

The 'premium' of up to $1 500 per ML paid to irrigators to purchase the 6 139 ML needed to avoid infrastructure offsets represents an additional cost of $9.2 million, but 'saved' $9 million in planned expenditure; and so is cost neutral.

The additional 2 161 ML purchased above need at $3 500 per ML represents an additional cost of $7.6 million, but contributed to additional water savings of 6.2 GL each year above plan.

The additional $19.7 million for rehabilitation is less than the difference between the 2004 present values of the net benefits of the two most-preferred options, noting also that the partial closure of the lake would still require some rehabilitation, and so does not alter the original cost-benefit conclusion.

2.4.3 Was communication and consultation appropriate?

Although some of the public were concerned that the department as project owner and G-MW as project director were ignoring their concerns, audit found no evidence to support this position. To the contrary, the department devoted considerable time and resources listening, investigating and responding to public concerns.

The comprehensive and appropriate communication and consultation during the feasibility phase continued after government announced its decision in 2004 to decommission Lake Mokoan. Despite this, some community groups strongly objected and resisted full decommissioning, leading to an atmosphere of dissatisfaction and mistrust. This atmosphere persisted during the project despite the constant engagement using a variety of strategies.

The communication strategy

The department developed the communication strategy when it clarified the governance framework in April 2006, 20 months after the decision to decommission. Audit found the strategy was appropriate as it had action plans for each project component or event that describe target audiences, communication tools, timelines and expected results.

The strategy also documented objectives, key messages and the responsible agencies for a range of issues. These issues were consistent with most of the issues in the project risk plan, however the communication objectives and G-MW's project brief did not include the need to mitigate and manage stakeholders' opposition to the full decommissioning of Lake Mokoan.

Even though the department's communication strategy was delivered late, G-MW had earlier prepared a *Communication And Participation Strategy* specifically for the water supply maintenance and reliability offset measures. This provided clear objectives, describes the context and the roles of the project team and the committee and the position of interest groups and stakeholders. It also presented an overview of communication events, responsibilities, timelines and methods.

As is appropriate for a long term project, the communication strategy was reviewed twice, most recently in April 2009. That review recognised the volume of communication but advised on more effective media engagement. Audit concurs with this assessment.

There were events before 2006 that would have been managed more effectively had the department taken more care in planning targeted communications. These events include advising the committees about the conduct of the 2004 volume and dissolving the Reliability Reference Committee.

Access to information

Overall, the public's access to information was very good as the technical reports and articles about the project stages and the concerns raised were on the dedicated project website.

There has been a stream of information to target groups and the public, via the website, regular bulletins, newsletters, fact sheets, media releases, face to face meetings and public forums. The community has been kept up to date regarding key events and issues such as assessing the alternatives to full decommissioning and the development of the offset measures.

Access to grievances

There was a transparent process to consider and respond to grievances. Concerns or feedback were raised directly with the project team. The project team incorporated the concerns and the responses into fact sheets, bulletins and decision-making.

Community engagement

Although it was not in the department's communication strategy, community engagement elicited feedback and advice which informed decisions, such as the alternatives to full decommissioning, the finalising of offset packages and negotiations on the water entitlement buy-back.

The Reliability Reference Committee included representatives of those directly affected by supply reliability. The department also sought a large cross-section of the community for the Future Land Use Committee. All the consultative committees channelled information from the community to the consultants or government agencies advising on pertinent community issues.

Despite concerns expressed regarding stakeholder engagement and the water entitlement buy-back, process, the irrigators were consulted thoroughly. Represented by a group of irrigators and a VFF subcommittee, they entered into extensive negotiations with the department. The irrigators presented an offer to the department that the broker Water for Rivers later considered then rejected because it exceeded the buy-back budget.

The irrigators were consulted, had access to relevant and current information, contributed to the Valuer-General's review and had their offer considered and responded to. They could contact the department, G-MW and Water For Rivers as individuals and through representative groups and consulted with senior officers.

Information was provided to entitlement holders in letters and fact sheets and to the broader community through the local media, bulletins and the dedicated website.

2.5 Analysis of other community concerns

Three other significant community concerns were raised during the course of the project:

- the accuracy of the estimation of water supply reliability at the time of the decision to decommission Lake Mokoan in 2004
- the price of water following decommissioning
- the risks of increased flooding of Benalla following decommissioning.

2.5.1 Supply reliability

Supply reliability is an estimation of water security applying long term historical data. The model used to determine supply reliability is the Resource Allocation Model (REALM) which when applied to the Broken system is the Goulburn Simulation Model (GSM).

Figure 2D
Resource Allocation Model (REALM)

The Resource Allocation Model (REALM) estimates water reliability using more than 112 years of data. By simulating a water supply system it studies different scenarios by changing the operating rules, system configuration and by changing input data.

REALM has been applied to the Goulburn water supply system to form the **Goulburn Simulation Model (GSM).** The Broken basin is part of the Goulburn system and so GSM has been used to model the Broken system.

Source: Department of Sustainability and Environment and Goulburn-Murray Water.

The 2004 commitment

Investigations finalising bulk water entitlements in June 2004, set the Broken supply reliability rate at 80 per cent, meaning that Broken system water users could expect to receive their full licence volume in 80 out of 100 years.

In June 2004 government committed to maintain water security after the decommissioning of Lake Mokoan. The department and G-MW consulted with irrigators and VFF representatives in August 2004. After this consultation it applied data about the improved operating efficiency of G-MW achieved during the 2002–03 drought and the following dry years to the GSM REALM model. As a result, the reliability rate was raised from 80 to 91 per cent. The department committed to 91 per cent, which the Minister for Water also supported.

Based on the data available at the time, 91 per cent was at the lower end of the defensible range, which extended to 93 per cent. On this basis, the commitment to 91 per cent reliability was reasonable.

Figure 2E below presents comment against the respective reliability rates proposed. The range of lake closure data, the impact on the supply reliability rate and audit's findings in regard to the data set applications are presented. While there are other components of REALM, the audit concentrated on the lake closure rule as this has been disputed by irrigators and the results from the modelling are sensitive to any rule change.

Figure 2E
Supply reliability rates audit findings

Supply reliability rate	Findings on supply reliability rate
80 per cent	This is the reliability rate finalised following the bulk water entitlements consultation process leading up to its announcement in June 2004,
91 per cent	G-MW's and the department's reliability rate of 91 per cent is a defensible lower bound, based on sound argument and information available at the time. The rate was low as it reflected significant blue-green algae problems which may not have been representative of the lake's history. The department was seeking an observable change and three additional years of operation between 2001 and 2004 was not sufficient to introduce a rule change in 2004.
93 per cent	93 per cent is a defensible upper bound as it applies all the lake closure data immediately preceding the review, 1991–2004.
97 per cent	97 percent was proposed by the irrigators and uses the 1996–2005 decade of lake closure data. This is however a difficult position to defend given the government's commitment was made in 2004 and as for any short period this decade may not be representative of lake history.
100 per cent	Supply reliability of 100 per cent was proposed because some entitlement holders reported that they always received their full entitlements. This is not a defensible position as it ignores the history of the Broken system prior to Lakes Mokoan and Nillahcootie and the incidence of blue-green algae.

Source: Victorian Auditor-General's Office.

Changing the supply reliability rate has a number of implications. These include project costs, water users outside the Broken system, the rights and responsibilities under bulk entitlements for all water users, including the environment, and the commitment to Victoria's river restoration programs. In the case of the decommissioning of Lake Mokoan, these wider implications were considered as part of the decision-making process.

Supply reliability in dispute after the 2004 decision

Despite the supply reliability rate review in 2004, some irrigators believed 91 per cent to be incorrect, given their experience with supply and their observations of Lake Mokoan. The figure the irrigators presented most frequently was 97 per cent supply reliability.

The irrigators presented their view through the Reliability Reference Committee and communicated with government agencies, an independent consultant, the Victorian Minister for Water, the Federal Minister for Climate Change and Water, and voiced their concerns publicly through forums and local media.

In 2005, 91 per cent was confirmed by the Minister for Water in a meeting with the Reliability Reference Committee, by G-MW in a project bulletin and in a departmental report to the Reliability Reference Committee. The Minister also confirmed it in a letter to the Chair of the Reliability Reference Committee.

As a powerful cost driver, supply reliability has been an important focus for the government. In June 2005 the department advised the Minister for Water that moving the rate from 91 to 93 per cent could cost $10 million.

The irrigators also focussed on supply reliability as the higher the figure, the more offset measures are needed to maintain water supply security. Higher supply reliability rates may also lead to a higher market value for water.

It was therefore not surprising that supply reliability was contentious and parties disputed it.

Predicting blue-green algae events

The irrigators challenged the assumption made in the GSM REALM about the incidence of blue-green algae and periods of lake closure.

Blue-green algae events are part of Lake Mokoan's history. They affect supply reliability in the Broken system and, along with dry seasons, are the major reason for lake closure, hence their inclusion in the GSM REALM. What remains in dispute is their occurrence in the future. It is generally accepted by all parties that predicting algae incidence is difficult. The department applied a simple model of using annual inflow to Lake Nillahcootie as an indicator, which some irrigators say does not reflect that the risk of events has reduced in recent years because of operating efficiency changes, shore line restoration and upper catchment improvements.

Neither the irrigator's nor the department's view about the likelihood of future events could be reliably verified at the time. There was not sufficient data to determine if the years following 2004 were normal variations, as contended by the department, or a trend change, which required adjustments to the model, as argued by the irrigators.

The lake closure rule

REALM is a model with 'rules' which are held constant, and 'variables' to which new data is applied each time it is run. The Lake Mokoan closure rule in GSM REALM has drawn criticism by irrigators as they believe it is inaccurate and should be changed.

It is reasonable to review rules when the model is challenged. Community dissatisfaction with the results of modelling is not a good reason to review a rule but evidence of factors that weaken a model's validity is a good reason.

The GSM REALM was redesigned in 2001 for the bulk entitlement conversion, to include the lake closure rule. The algae data available at the time was applied, being 1992 to 2001. Algae recording only started in 1992.

In retrospect, the period from 1992 to 2001 had significant algae problems and may not have been representative of the lake's history. However, it was a reasonable rule to adopt in 2001, as it applied all the data available at the time.

Analysis of GSM REALM in 2004 showed the model predicted accurately to 1997, then new variables such as changes in operations, affected the trend significantly. It was reasonable to recalibrate the model and adjust for these drivers. The department reported that the additional years to 2004, of which two out of the three Lake Mokoan was open, did not present a trend change.

Audit found following independent technical advice that the department's position in 2004 not to change the lake closure rule was defensible because the three years of additional data was not enough observable change to confirm a trend as distinct from a temporary change. Modelling rules should only be amended if it can be established a permanent change has occurred. It would have been beneficial if the irrigators had been formally advised of this.

Since 2004 the irrigators refer to improvement in the lake's health in response to the restoration strategies such as operating efficiencies, shore line restoration and upper catchment improvements. However, this information was not available in 2004 when the government committed to maintain supply reliability. When the irrigators presented data from subsequent years, the department did not reinforce that this data was irrelevant to the 2004 commitment.

Although technical advice has recommended the department investigate blue-green algae further, this is no longer relevant to GSM REALM as Lake Mokoan is being decommissioned and removed from the simulation model.

Independent review of REALM

There has been no independent review of the GSM REALM rules for assumptions about lake closure and blue-green algae.

The 2004 review of supply reliability did not resolve the supply reliability dispute and an irrigators' group called for an independent review. The group did not challenge the model's validity but disagreed with the department about Lake Mokoan's closure, the frequency of blue-green algae and how these were applied to REALM.

A consultant was engaged by the department and published a report in 2007 called *Independent Review of Reliability of Supply from the Broken System*. The report met its terms of reference and verified the use of REALM and the communication of its results. However the report's terms of reference excluded reviewing the assumed frequency of Lake Mokoan's closure, as the department has confirmed the consultant was not engaged to do so.

The consultant was engaged to conduct an independent review at the time the irrigators expressed their concern and challenged the rule assumption. Given this, it would have been prudent to include in the terms of reference a review of the rule assumptions. With a negligible impact on time and cost, this would have provided a clear and direct response to the irrigators' concerns.

2.5.2 The future price of water supply

Irrigators were concerned about poor access to information regarding the prices that would be charged for supplying water after decommissioning Lake Mokoan. This information would assist them to decide whether to sell their water entitlements.

Information regarding the future price of water was provided in a timely manner to assist those making decisions about the sale of their water entitlements. The price was reviewed each time new information became available and the outcomes were communicated clearly.

In 2004 the price of water supply was $9 to $10 per ML. After the decommissioning of Lake Mokoan, the price of water will increase for the remaining entitlement holders. This is currently estimated to be $48 to $58 per ML.

However, the most significant potential driver of price in recent years has been the pending introduction of 'basin pricing', which is an initiative independent of this project. This pricing method will shift the sharing of water supply costs within a river system to within a river basin. A river system is a number of river basins. Until basin pricing is introduced into the Broken system, operating costs are largely paid by irrigators outside the region who derive little benefit from it.

From 2007, when the department first invited expressions of interest to the October 2009 purchase of water entitlements, there was reasonable access to price information when it became available.

The first letters in 2007 from the department, G-MW and GBCMA inviting expressions of interest in the sale of water entitlements covered the background, the context and the process of the buy-back. They also explained why the agencies could not gauge the impact on future water prices. They did, however, state that water was likely to be more expensive in the future and in a fact sheet estimated $40 to $50 per ML as a guide.

The department, G-MW and GBCMA put a range of information products on the Lake Mokoan website, provided access to enquiries, and for those wanting advice on how to farm with less water, they could contact the Department of Primary Industry.

In 2009, analysis of the future price of water was conducted, which was when the appropriate information was available. Prior to that, the cost-benefit studies covered the total costs of each alternative, but not the impact the offset and other project components would have on the future price of water. Information to allow such analysis was not available at the time.

The new basin pricing system is independent of the Lake Mokoan project. However, as its introduction was being considered at the same time, its estimated impact was included in the later analysis and communications.

Once the introduction of basin pricing was planned and the Lake Mokoan offset package was finalised, including the buy-back of water entitlements, G-MW analysed the effects of these on the future price of water. *Fact sheet 20A* (Figure 2F) provided this information. Prior to this, the community had expected some rise in water prices consistent with the policy in *Our Water Our Future* that 'prices cover the full cost of sustainably managing water resources'.

Figure 2F
Future price of water

Given that buying water shares reduces the irrigators in the area, will there be an associated cost of water to the remaining users?

The cost of operating and maintaining new infrastructure being added to the Broken system combined with levels of entitlement purchase up to approximately 5,000 ML will result in similar water charges to those associated with operating and maintaining the current Lake Mokoan infrastructure.

Effectively, after the introduction of Basin Pricing, the water charges for the with-decommissioning case and the without-decommissioning case will be similar. The level of impact will depend on the level of uptake in the entitlement purchase offer.

Indicatively, the possible pricing outcome for the combination of infrastructure and entitlement purchase or entitlement purchase only, up to approximately 5 000 ML, with basin pricing in place, would see a price range of the order of $45 to $55 per ML.

Any purchase of entitlement in excess of 5 000 ML would see a gradual increase in the price range as the size of the remaining entitlement pool decreases.

Source: An excerpt from *Fact sheet 20A* issued in June 2009 <www.lakemokoan.com.au>.

Fact Sheet 21, issued in August 2009, when the entitlement buy-back was being finalised, stated 'The net result of an 8 307 ML purchase combined with a reduced scope of Rain Rejection Storage Works is that prices, under basin pricing, would likely be in the range of $48 to $58 per ML compared with purchase of 5 200 ML being in the range $45 to $55 per ML'.

2.5.3 Flooding risk to Benalla

In the course of the audit, community concerns were expressed regarding an increased risk of flooding Benalla as a result of decommissioning Lake Mokoan. Benalla is on a flood plain downstream from the Broken River and Hollands Creek catchments. There were major floods in the 1970s and 1980s with the most significant in 1993.

Both Lakes Mokoan and Nillahcootie were commissioned for water storage and not built to mitigate floods.

Before 1992 Lake Nillahcootie was kept low, as water was released and diverted to Lake Mokoan to supply water users. This was not a flood mitigation strategy. In 1992 the lake operating rules changed due to excessive blue-green algae in Lake Mokoan, and Lake Nillahcootie was filled as quickly as possible to maximise its water storage function.

Lake Nillahcootie, September 2009.

Responding to community concerns

Some of the public perceived they were not being appropriately engaged and their concerns regarding flooding had been dismissed. Audit found there had been appropriate engagement. Community concerns had been investigated yet dissatisfaction with the report findings remained.

Some community members have pursued retaining Lake Mokoan, or partially decommissioning it and building a smaller water storage facility within the lake to allow a return to the pre-1992 operating rules of keeping Lake Nillahcootie low. Some understood this to be a flood mitigation strategy. The full decommissioning of Lake Mokoan removes any potential for reinstating the pre-1992 rules of diverting water from Lake Nillahcootie to a large water storage.

A flood awareness group had approached the department and agencies including the local council. *Lake Nillahcootie Flood Study* RM2179 (2008 study) was eventually conducted to review the previous flood advice and to respond specifically to the community's concerns.

The flood awareness group was consulted in preparation for the 2008 study's terms of reference, it provided a list of questions to be addressed, contributed its own rainfall data and attended the steering committee meetings. The group received the study results in December 2008 at a meeting with the consultants but remained dissatisfied and members wrote to the council with more questions.

Following the consultation and the technical assessments responding to specific issues, concerns still remain for some of these issues. The Minister for Water told the local council in May 2009 that he supported the study conclusions which recognised that Lake Nillahcootie could not be run as an effective irrigation storage and flood mitigation facility. The Minister also decided against further flood studies.

Technical advice

Previous reports addressed flood risks and the 2008 study responded to residual community concerns.

The technical reports were competently prepared using recognised methods and practices in line with the nationally accepted technical standard *Australian Rainfall and Runoff*, where applicable. The reports also used the best data available. The researchers reviewed rainfall data provided by community members but appropriately dismissed it as not consistent with the technical standards. This data measured daily totals rather than rainfall intensity.

Assessment of flooding risk is technical because of the many interrelated components such as seasonal changes, operating rules, infrastructure and land management. Amongst other findings, the 2008 study concluded that:

- Lake Nillahcootie reduces the impact of floods at Benalla. Even if it is full before the flood event, it reduces the peak flow in a one in a hundred year flood by some 153 cubic metres per second. If it was 75 per cent full before the flood, the peak would be reduced by a further 131 cubic metres per second.
- Even if the pre-1992 operating rules applied to Lake Nillahcootie at the time of the four major floods of 1974, 1975, 1981 and 1993, the effect would have been the same. There were significant wet periods before the flood and Lake Nillahcootie may have filled and overflowed rapidly, and significant water flow might not have been caught by the Nillahcootie dam wall.

It still remains that the pre-1992 operating rules of Lake Nillahcootie will not be reinstated at the time of decommissioning Lake Mokoan. Water will not be released from Lake Nillahcootie rather it will continue to be filled as soon as possible to maximise its water storage function during the irrigation season. For these reasons the flood risk to Benalla and its region has remained unchanged since 1992, and decommissioning Lake Mokoan will not change this risk.

2.6 Overall conclusions

There was a 20 month hiatus before an effective project governance framework was in place following the decision to decommission Lake Mokoan in 2004. While this did not stop the delivery of the project, it contributed to uncertainty about program accountability. An effective governance framework from the start, with a single project focus oversight would have provided a clearer purpose and a better foundation to respond decisively to community concerns.

The decision to disband the Reliability Reference Committee was within the powers of G-MW Board. However, advance advice should have been provided to the committee on exceeding its charter before a final decision to disband the committee was made. This would have served both to put the issue beyond dispute, and demonstrate due process.

The decision to decommission Lake Mokoan was supported by extensive hydrological, engineering and economic analysis that presented full decommissioning as the most effective option based on cost, water savings and environmental benefits compared to other alternatives. Our further analysis of the project benefits supports this conclusion in the light of large increases to the original cost estimations for the future land use and rehabilitation strategy and water entitlement buy-back. The full extent of these costs was not known in the period leading up to the decision to decommission and was only known in 2008 and 2009 respectively.

There was extensive community consultation and engagement throughout the project. Community representatives were involved through their representation on various committees to consider issues such as land use and offsets. G-MW maintained a comprehensive website that contained a large range of information from technical reports, bulletins and fact sheets and there were extensive face to face meetings with the community.

Although the Lake Mokoan project was technically well founded and there was comprehensive community engagement, the communication strategies were not tailored to address specific community concerns and these concerns persisted throughout the project.

Community interest groups raised specific issues with aspects of the decommissioning of Lake Mokoan namely the commitment to water security and the supply reliability rate and concerns that decommissioning Lake Mokoan would increase flooding risks to Benalla and its region.

Based on the best available data as at 2004, the date from which the government commitment to maintain water security applied, the department's supply reliability rate of 91 per cent was at the lower end of the defensible range which extended to 93 per cent. There are, however, inherent difficulties with establishing a definitive rate due to the difficulty of forecasting the presence of blue green algae and the frequency of lake closure.

In terms of the increased risk of flooding, the full decommissioning of Lake Mokoan would not add to that risk. Lake Nillahcootie will continue to operate under the same operating rules after decommissioning of Lake Mokoan as before.

Recommendations

The Department of Sustainability and Environment should:

1. Establish and promulgate at the commencement of all major projects clear roles and responsibilities and reporting requirements.
2. Make clear when project costs are announced whether they are preliminary estimates or firm commitments.

3 Reconnection of Tarago Reservoir

At a glance

Background

The government water policy *Securing Our Water Future Together* first proposed reconnection of Tarago Reservoir in 2004. Reconnection of Tarago Reservoir required the building of a treatment plant to maintain water quality. The project was approved in 2007 with a budgeted cost of up to $99.3 million and brought forward for completion in 2009 as a result of below average rainfall.

Findings

- The decision to reconnect the Tarago Reservoir was clearly the preferred option in terms of cost and water savings.
- Sound governance arrangements were established to effectively oversee the project's implementation.
- Community engagement and consultation was generally well managed with no residual community concerns following project completion.

3.1 Introduction

In 2002 Melbourne Water developed the *Melbourne Water Resources Strategy to 2050*. This predicted that Tarago Reservoir would not need to be reconnected until 2023 based on demand management strategies and population projections.

In 2004 the *Securing Our Water Future Together* policy document included the reconnection of Tarago Reservoir as a possible water augmentation project for Melbourne but noted 'through water conservation measures, Victoria can defer or avoid the need for such augmentation works'.

As a result of ongoing below average rainfall, Melbourne Water engaged a consultant to evaluate the effect of climate change on Melbourne's water systems. The *Melbourne Water Climate Change Study* was published in 2005. It predicted climate change, as a mid-range scenario, could contract Melbourne's water supplies by 8 per cent by 2020 and 20 per cent by 2050. The report also noted the water supply strategies which Melbourne Water should investigate further, including the Tarago Reservoir reconnection.

Following this study, in 2005 the Minister for Water announced that the reservoir would be reconnected by 2011. Announced in 2007 in *Our Water Our Future – The Next Stage of the Government's Water Plan,* the completion date was brought forward a second time, to the end of 2009, because of a further fall in average inflows into Melbourne's water systems.

Tarago Reservoir, September 2009.

Reconnecting Tarago Reservoir required the building of a treatment plant. Bought in 2007, the plant site is close to the previously used pipeline and is below the reservoir to take advantage of gravity in order to eliminate the need for pumping and to reduce energy costs.

3.2 Status of the project

The primary objectives for reconnection of the Tarago Reservoir to Melbourne relate to water quantity, water quality and the timing of service delivery. Their achievement is presented in Figure 3A.

Figure 3A
The objectives and cost of reconnecting Tarago Reservoir

Project objectives	Achievement
Reconnection of Tarago Reservoir with the water treatment plant by December 2009	Completed: June 2009
Estimated cost of $99.6 million ($94.6 million +/- 5 per cent)	Within budget: $96 million
To exceed an average of 15 GL per year	A full year has not passed but the plant is meeting its volume targets.
Water quality specification to meet the *Safe Drinking Water Act 2003*, Australian Drinking Water Guidelines and water retailer water quality and pressure requirements	No adverse water quality events reported.

Source: Melbourne Water.

The project was completed in June 2009. Tarago Reservoir is now reconnected to the Melbourne water system and treated water is being supplied to South East water customers.

3.3 The decision-making and planning phase

In 2007 Melbourne Water approved the design and construction of the water treatment plant and presented a business case to the Department of Treasury and Finance. The business case stated the benefits as:

- a 4 per cent increase in Melbourne Water's system yield
- drought recovery benefits, including earlier relief from water restrictions for Melbourne
- being more cost effective and environmentally sustainable than alternatives given the use of existing pipeline and reservoir infrastructure
- more expedient than other options resulting in increasing yields while larger augmentation projects were being completed.

The business case

Melbourne Water's business case for the reconnection was robust, thorough and based on a triple bottom line assessment. The business case compared Tarago Reservoir reconnection with other options to supplement Melbourne's water supply; considered the requirements for a suitable location; procurement options and critical success factors. A comprehensive risk register with controls was included as well as a clear project program with costs and milestones.

The business case sets out timelines and described in detail the proposed contractor arrangements, risk management and stakeholder consultation.

The business case established that reconnection was the least expensive of many options to augment Melbourne's Water supply. It assessed several treatment technologies, recommended one as the most suitable and identified the most likely project cost.

Melbourne Water developed the case using the skills and experience of its own staff and had independent technical experts conduct further analysis. The business case took the preferred treatment options through a first screening process applying water quality and timing criteria. A shortlist was subject to capital cost, operating cost and net present cost assessments. These were further compared in regard to greenhouse, health risk, cultural heritage and aesthetic risk criteria.

Water treatment technology

A thorough comparative assessment of the water treatment options was conducted applying a 'triple bottom line' analysis of the financial, social and environmental impacts of the project. Two treatment solutions were identified as meeting the minimum specified standards and were further evaluated. Dissolved air flotation filtration with ultraviolet radiation was the preferred solution. The details of this approach are outlined in the glossary.

This was a reasonable option for Melbourne Water to adopt as it was assessed to better manage risks in the appearance, taste and odour of the water, and had lower greenhouse emissions than the alternatives. Its capital and operating costs were rated best out of a shortlist of options which met the water quality and timing criteria. It also had the best net present cost.

Total project costs

Although in 2004 *Securing Our Water Future Together* reported that $50 million was the approximate project cost, it also noted that the timing, cost and environmental impacts required further investigations. The 2007 business case included this analysis and the Minister for Water endorsed the project at a cost of up to $99.3 million ($94.6 million +/- 5 per cent).

The Tarago project was completed six months early and was within budget. However, at $96 million this project has been promoted as $3 million under budget. Audit found that the project cost was within the estimated cost range $94.6 million +/- 5 per cent.

3.4 The project implementation phase

3.4.1 Were there appropriate governance structures for this phase?

Audit found the implementation plan, risk plan, roles and responsibilities were all clearly defined early. Melbourne Water established accountabilities for building the plant on time and within budget. There was no confusion or duplication in governance arrangements during the project in terms of roles, accountabilities and responsibilities.

The Department of Sustainability and Environment (the department) was not active in the project planning and implementation. Its role was to advise the Minister regarding progress. Government agencies and the community had representatives on the Agency Reference Group (ARG).

A clear governance framework supporting sound project implementation resulted in Tarago Reservoir being connected early, within budget and with water treated to the appropriate standard. There are no residual stakeholder issues as all issues raised during the project implementation were dealt with.

Implementation and reporting

Melbourne Water had a robust implementation plan, and regularly reported progress internally and to the government through the department.

Once the decision was made to reconnect Tarago Reservoir, Melbourne Water set up a project management team reporting to a project leadership team. It immediately prepared a project management plan that included:

- risk management plans
- stakeholder engagement and communication plans
- the sequence and timing of construction
- cost control.

The management team reported to Melbourne Water's Board the appropriate information to enable effective project oversight. It regularly kept agencies informed and involved through the ARG, and immediate neighbours and the community through various communication activities.

It reported stakeholder activities, achievements and outcomes in the monthly progress reports to the leadership team and to the Board.

3.4.2 Was the basis to proceed well founded?

Reconnecting Tarago Reservoir required the building of a new water treatment plant. Audit found the decision to reconnect was sound, well developed and well communicated despite the completion target progressively being brought forward.

The earlier reconnection

In 2004 the reconnection was mentioned in *Securing Our Water Future Together.* In 2005 the Minister for Water announced the reservoir would be reconnected in 2011. In 2007 it was brought forward to the end of 2009 in response to the impact of climate change on Melbourne's water supplies.

Melbourne Water had to fast-track the reservoir reconnection to meet the government's 2009 timeline. Fast-tracking can increase project risks but Melbourne Water's business case for the reconnection was well informed. Melbourne Water planned and managed the project to mitigate any 'fast-track' risks.

Site selection and planning approval

Melbourne Water preferred the treatment plant to be sited on flat land close to the Tarago-Westernport transfer infrastructure and at the best possible elevation to reduce pumping costs.

To enable construction of the treatment plant, the site needed to be rezoned. Melbourne Water preferred to do this through ministerial approval. It set up an Agency Reference Group (ARG) in 2007 to streamline the approval. The ARG met to consider project updates, rezoning and community relations and was joined in its later stages by community members.

Baw Baw Shire Council supported the application for rezoning and the Minister for Planning approved it in October 2007 with a condition that there was formal stakeholder consultation. Melbourne Water had already written a Cultural Heritage Management Plan after consulting the local indigenous community.

Tarago treatment plant.

3.4.3 Was consultation well managed?

The community engagement plan

Melbourne Water prepared a communications and consultation plan for the treatment plant design and construction similar to the plan it had used for the siting of the plant. It specified how to handle complaints which had to be recorded in a stakeholders' issues database.

Audit found the stakeholder engagement plan was comprehensive and included objectives, target audiences, key messages and actions. The plan was actioned and an independent contractor engaged by Melbourne Water assessed the community consultation for each project phase as 'quite outstanding'. Audit generally agreed with this assessment although some lack of engagement was noted prior to site selection. This however, was not detrimental to the management of the project.

Community engagement

Melbourne Water's business case for the reconnection was based on sound decision-making, including consultation with the community where appropriate.

Melbourne Water consulted minimally with the community before it bought the treatment plant site however audit found no residual community concerns. It broadly communicated the project commencement to the community but comprehensively engaged the landowners in the immediate proximity. It undertook extensive communication and consultation for the plant design and construction including local information sessions, face to face communication with neighbours and establishing a website.

Neighbours proposed alternative landscaping and design features of the plant, which Melbourne Water tried to accommodate. Activities and outcomes were reported in newsletters and bulletins and to the ARG.

Melbourne Water also had a Community Benefits Program whereby it financially contributed to a number of community initiatives such as environmental projects.

Melbourne Water and/or contractor representatives participated in a number of community engagement activities such as community information sessions. It also kept targeted sections of the community up to date when they were immediately affected. In 2009 for example, South East Water and Melbourne Water produced a plan to tell South East Water customers that the reconnection was completed and they would be receiving Tarago Reservoir water.

The assessment of stakeholder satisfaction

Melbourne Water's contractors had six key result areas in their contract. These covered indicators for stakeholder engagement and a program of activities to measure performance. There was a baseline survey of internal Melbourne Water staff, agencies and neighbours, a second follow-up survey, quarterly evaluations of the plan and a final evaluation report. The surveys provided data to partly assess contract performance as well as provide Melbourne Water with opportunities to improve communications and resolve issues.

The external consultants engaged to manage the plan did the baseline survey in June 2008 and a follow up survey in April 2009.

The responses to the satisfaction surveys varied. Although agency stakeholder responses were positive in the first survey of June 2008, the treatment plant neighbours identified some dissatisfaction. Of 14 neighbours surveyed, 4 felt that communication about the project, particularly its scope, had not been adequate.

Fifty per cent of the neighbours did not take part in the April 2009 follow-up survey. Of those who did respond, one expressed concern about the behaviour of subcontractors and one about the location of the plant. The remaining five respondents were positive in terms of Melbourne Water's consultation.

3.5 Conclusion

The reconnection of Tarago Reservoir was effectively managed by Melbourne Water. The decision to proceed with this option was based on a thorough assessment of both reconnection and other options using a triple bottom line approach. Technical advice was appropriately sought to provide further analysis of the options. The reconnection option was clearly the preferred approach as it was the least expensive and had greatest environmental benefits such as lower greenhouse gas emissions.

Clear governance structures were introduced to support implementation. Project responsibilities were clearly set and appropriate reporting arrangements were put in place to manage time, cost and quality of water considerations. The project was delivered within the budget range and before the scheduled completion date.

Audit found that there was no community resistance when the reconnection of Tarago Reservoir was announced. While there was some lack of engagement on site selection, community engagement and consultation was generally well handled by Melbourne Water although not withstanding two survey respondents expressing concern. Melbourne Water responded promptly to issues raised and there were no residual community concerns identified after project completion.

Appendix A.
Glossary

Glossary

Basin pricing

Basin pricing is method of pricing that ensures the actual costs of harvesting and storing water in a river basin are shared among the water users within that same basin. Previously, costs were shared within a system. A river system is a number of river basins.

Source: http://www.lakemokoan.com/CMOCMS/Newsletters/Docs/Factsheet 20.

Bulk entitlement

A bulk entitlement is the legal instrument that gives a Victorian water corporation the formal right to take and use water from a waterway. The Minister for Water grants bulk entitlements to water corporations under the *Water Act 1989*.

A bulk entitlement defines the amount of water a water corporation can take and the conditions under which it can take it. For example, the bulk entitlement may include rules for sharing the available water between different entitlement holders and the environment during water shortages.

Source: FAQ at www.ourwater.vic.gov.au/allocation/bulk-entitlement-applications/approved-applications/mokoan.

Dissolved Air Flotation and Filtration with Ultra-Violet radiation (DAFF+UV)

This was the water treatment technology identified as most appropriate for the Tarago Reservoir treatment plant. It is reported as being well suited to water susceptible to algal activity, high colour and moderate turbidity.

The DAFF +UV process removes particles by floating fine bubbles of air up through the water column, thereby transporting the solids to the surface. The water then passes through multimedia filters located in the same tank and the UV offers protection against chlorine-resistant pathogens that may pass the DAFF.

Source: Business Case Tarago Treatment Plant March 2007, Melbourne Water.

Goulburn Simulation Model (GSM)

The Goulburn Simulation Model (GSM) is the Resource Allocation Model (REALM) (defined in this glossary) applied to the Goulburn water supply system. The Broken basin is part of the Goulburn system and so GSM is used to model the Broken system.

Gigalitre (GL)

One thousand megalitres is one gigalitre.

Megalitre (ML)

One million litres is one megalitre.

Lake Mokoan Project

The decision to decommission Lake Mokoan was announced in 2004 as a strategy to return saved water to the Snowy and Murray Rivers.

The decommissioning of Lake Mokoan combined with the creation of the Mid-Murray Storages are a package of works (the Mokoan Project) that will allow an unregulated entitlement for the Murray River (34.3 billion litres) and a high reliability water entitlement for the Snowy River (22.1 billion litres) to be created.

The Mokoan Project package of works includes:

- the decommissioning works of the Lake (which are about to commence)
- the offset package to maintain the existing reliability of supply for Broken irrigators (which has been agreed)
- an alternative pumping system to supply irrigators who have rights to take water directly from Lake Mokoan
- the Mid-Murray Storage works to allow harvesting of Murray surplus water into Lakes Charm, Kangaroo and Boga
- the development of the Winton Wetland rehabilitation plan (which is being finalised).

Source: FAQ at www.ourwater.vic.gov.au/allocation/bulk-entitlement-applications/approved-applications/mokoan.

Lake Mokoan Project Control Board

The Project Control Board (PCB) which consists of representatives from the Department of Sustainability and the Environment, Goulburn Murray Water and Goulburn Broken Catchment Management Authority.

It is responsible for providing approvals and making decisions regarding project progress and delivery throughout the project. PCB members assist in decision-making and overseeing on-going progress of the project.

The PCB provides the project owner with partner/stakeholder/technical input to decisions affecting the project. Ultimate authority and accountability resides with the project owner (the department).

Source: Project Management Roles & Responsibilities: Mokoan – Return to Wetland, Department of Sustainability and the Environment.

Net present cost (NPC)

The net present cost (NPC) is the cost of delivering a project adjusted to present day dollars. The NPC of an investment is calculated by adding the present value of expected future expenditure to the initial cost of the investment. The discount rate is used to convert future expected expenditure to present values.

Reliability offsets

Reliability offsets are measures to meet the government's commitment to irrigators that Lake Mokoan's decommissioning would not affect the reliability of their water supply in *Securing Our Water Future Together* the government committed. Offsets may increase the water supply or reduce the demand for water from a system. They may take the form of infrastructure that cuts water losses or boosts supply, or could reduce demand on the system by the government buying up water entitlements.

Resource Allocation Model (REALM)

The Resource Allocation Model (REALM) estimates water supply reliability using more than 112 years of data. By simulating a water supply system it studies different scenarios by changing the operating rules, system configuration and changing input data.

Supply reliability

Supply reliability is an estimate of water security applying long term historical data. A supply reliability rate of 80 per cent means that Broken system water users can expect to receive their full licence volume in 80 out of 100 years.

Victorian Valuer-General

The Valuer-General is the government's authority on statutory valuations. He has roles and responsibilities under various Acts of Parliament including the Valuation of Land Act 1960 and the Local Government Act 1989. The Valuer-General and his staff at Valuer-General Victoria, oversee valuations for State Government property transactions and the making and return of council rating valuations. They also value government assets so departments and agencies can complete their financial reporting requirements.

The 2007 entitlement buy back negotiation led to the department engaging the Valuer-General to ascertain the value of water in the Broken system. Following thorough consultation with the irrigators regarding methodology, his report offered two values:

- the difference between the market value of a property less the market value of dry land plus remedial costs
- the tradeable value of water at $2 000 per ML for high reliability water share and $100 per ML for low reliability water share.

The department adopted the second option, which was generally more valuable to the landowners.

Source: http://www.dse.vic.gov.au.

Water entitlement

Water entitlements, also known as water shares, are legally recognised secure share of the water available to be taken from a defined water system. A water share is specified as a maximum volume of seasonal allocation that may be made against that share. Water shares are classed by their reliability which is defined by the frequency with which full seasonal allocations are expected to be available.

Source: http://www.ourwater.vic.gov.au/allocation/water_allocation_framework/water_shares.

Water entitlement buy-back

A government buy-back of water entitlements designed to reduce demand on a water system and to help either maintain or reduce supply reliability depending on associate activities. In the case of Lake Mokoan, the volumes and locations of possible entitlement purchase assist in determining the offset package required such as pipelines and re-regulating storages.

Water for Rivers

Owned by the Victorian, Australian and New South Wales governments, Water for Rivers is a company set up to recover water for the Snowy and Murray River systems by investing in water efficiency projects and buying water entitlements. It is an investor in the Lake Mokoan decommissioning project.

Appendix B.

Lake Mokoan: chronology of key events and facts

Figure B1
Lake Mokoan: Chronology of events and key facts

Date	Event
1971	Lake Mokoan created with the storage becoming operational in 1972. Lake Mokoan was originally designed to serve the Murray and Goulburn irrigation areas, however, the infrastructure needed to serve the Goulburn irrigation area was never built due to concerns about water quality. The prime function was to regulate the flow of Broken River to meet stock, domestic and town requirements throughout the Broken Valley. Capacity 365 GL. Evaporation averages 13.9 per cent (50GL) per year.
1970s, 1980s and 1993	Major floods in Benalla and its region.
Pre-1992	Lake Nillahcootie operating rules sought to keep it 30 per cent full in June and 75 per cent full by November, and release water and divert it to Lake Mokoan to maximise the water stored by the end of November each year. This was primarily to meet the supply demand but also mitigated the risk of incidental flooding of the rural land downstream of Lake Nillahcootie.
1992	Lake Nillahcootie operating rules changed because of the risk of diverting water into Lake Mokoan with its history of excessive blue green algae. The new rules meant Lake Nillahcootie was filled as full as possible, as soon as possible to maximise its storage function.
Since 1992	Lake Nillahcootie continued to be filled quickly as full as possible for the start of each irrigation season. Water was released and diverted to Lake Mokoan only when Lake Nillahcootie was full. The decision to decommission Lake Mokoan does not change the Lake Nillahcootie operating rules.
2001	Consultant engaged by the Department of Natural Resources and Environment to identify: • possible water savings in Northern Victoria • the potential impact of savings on customers, the environment and regional economies (2002 water savings study).
2002	Consultant reported giving three options including full decommissioning of Lake Mokoan and reverting to wetlands.

Date	Event
2002	Goulburn Broken Catchment Management Authority (GBCMA) commissioned to consider the options. It set up: • Steering Committee comprising GBCMA. DNRE, G-MW, Delatite Shire Council and later Benalla Rural City Council to provide sufficient advice about Lake Mokoan to government to enable decision to be made. • Reference Committee comprising ministerial appointees from interested public, commercial and government organisations, to provide a focus for consultation, receiving progress reports, advising consultants on relevant community matters, and planning and delivering a community consultation program.
2003	Steering Committee engaged consultants to conduct Lake Mokoan study to determine the feasibility of the three options.
August 2003	Consultant reported to Steering Committee including community feedback and seven options, including full decommissioning and reversion to wetlands. Consultants report released for further public comment. Report did not present a preferred option.
November 2003	Steering Committee endorsed the 2003 report (Volume 1 to 4) and presented it to Minister for Water.
2004	Consultants re-engaged by (now) Department of Sustainability and Environment (the department) to further analyse two preferred options: full decommissioning and the spit bank.
March 2004	Consultants report published, (Volume 5 of the 2003 report). Full decommissioning assessed as the most effective option based on cost, water savings and environmental benefits.
2004	Bulk entitlement of Broken system finalised. Reliability rate 80 per cent.
June 2004	*Securing Our Water Future Together* policy released. Policy indicated Lake Mokoan would be decommissioned and the area returned to wetland. Policy document said: • Decommissioning would improve environmental flows to the Snowy and Murray Rivers by 44GL annually. • Lake Mokoan's high evaporation rate had made it inefficient • The lake had water quality and blue green algae problems and turbidity. • Irrigators outside the area paid most of its operating costs. • The Lake Mokoan dam would need a safety upgrade at significant cost. Decommissioning project to have two parts: • removing, modifying and building an infrastructure to decommission the lake and establishing the offsets to maintain reliable water supply • rehabilitating the lake site after decommissioning. The department accountable for success of the project with G-MW as project manager. Government committed to irrigators that Lake Mokoan's decommissioning would not affect the reliability of their water supply. Proposed 'offsets' to meet commitment.

Date	Event
August 2004	In order to meet the water security commitment, following consultation with the irrigators and Victorian Farmers Federation the reliability rate was re-assessed as 91 per cent by the department. Government commits to this reliability rate.
June 23 2004	The Minister for Water and the Premier announced the decommissioning of Lake Mokoan.
October 2004	G-MW engaged by the department to manage the water supply and asset decommissioning elements of the Lake Mokoan project. The department commenced management of the future land use strategy as a separate component.
November 2004	Minister for Water announced that the community was to be involved in forward planning for the decommissioning process and endorsed two committees: • The Lake Mokoan Future Land Use Steering Committee (the Land Use Committee) to help develop a strategy to reclaim the site after decommissioning. • Broken System Reliability Reference Committee (the Reliability Reference Committee)—comprising water users and a VFF representative—to advise G-MW on the development and implementation of the reliability offsets with the aim of maintaining 91 per cent supply. To advise G-MW Board by June 2006. G-MW would then make a recommendation to Minister for Water.
February to December 2005	The Reliability Reference Committee commenced in February and proceeded to debate the risk of blue-green algae and impact of system operating rules on supply reliability. It disagreed with 91 per cent reliability rate, committed to 97 per cent, and sought support from water users and the Minister for Water.
November 2005	The department and G-MW signed a Memorandum of Understanding about the Water Saving Projects, setting out G-MW's responsibility to investigate and consult before the final package of offsets approved.
January 2006	The Reliability Reference Committee disbanded by G-MW Board as it exceeded its charter and the dispute regarding the reliability rate could not be resolved.
March 2006	Project Control Board established to provide sole focus on management of the Lake Mokoan project.
April 2006	First meeting of Project Control Board.
October 2006	Lake Mokoan Project Control Board decided to consult the irrigators on four offset packages. Preferred option needed the least new infrastructure and the greatest water entitlement package.
Late 2006	Irrigators' group proposed a modified Lake Mokoan, claiming it saved enough water for the Government not to buy water entitlements.
March 2007	The department engaged consultants to investigate merits of a modified Lake Mokoan.
May-November 2007	G-MW investigated a mini Lake Mokoan model and engaged consultants to study both (water storage) alternatives.

Date	Event
March 2007	G-MW invited the Broken system water users to express interest in selling their water entitlements. Expected volume 1 150 to 4 640 ML. The process was suspended due to ongoing assessment of alternative options. There was a delay due to VFF negotiation with the department over the price and volume package for a water entitlement buy-back.
November 2007	The department advised the Minister to reject the alternatives to full decommissioning and affirm full decommissioning. (Three years after decision had been announced.)
December 2007	After consultation with irrigators' group, Minister for Water announced that full decommissioning was to progress. The department had commissioned an independent consultant to review the Modified Lake Mokoan proposal and G-MW had commissioned a review of the Mini Lake Mokoan proposal with the department's endorsement. These reviews found the alternative proposals were not sustainable, particularly in construction and operating costs, water loss, system reliability and overall water savings.
May 2008	Valuer-General engaged to ascertain value of water in the Broken system. Consultation with irrigators regarding methodology. Report offered two values.
1 September 2008	The Valuer-General presented report.
June 2008	Minister endorsed the Lake Mokoan Future Land Use Strategy proposed by the Land Use Committee, and provided funding of $20 million.
December 2008	Consultant engaged by Benalla Rural City Council and the department to conduct a flood study addressing the community concerns. The flood awareness group was consulted in preparation of the study's terms of reference, it provided a list of questions, its own data and attended the Steering Committee meetings. Results received in December 2008. Flood awareness group remained dissatisfied and members wrote to council with more questions.
Ongoing throughout 2008	VFF offered to sell 10 GL at $5 000 per ML through targeted water entitlement purchase. Suggested this would improve reliability in the Broken system above 91 per cent.
January 2009	The department presented four offset packages to VFF detailing water entitlement buy back packages. The department did not apply the $5 000 offered by the irrigators, rather it used Valuer-General's value of $2 000 per ML. The parties could not agree.
9 April 2009	Both parties' positions were put in advice from the department to the Minister for Water regarding the appointment of Water for Rivers to undertake the procurement of water entitlements. In this brief, the department adopted the Valuer-General's second option when briefing the Minister on 9 April 2009. The second option was: the tradeable value of water at $2 000 per ML for high reliability water share and $100 per ML for low reliability water share. The second option was generally more valuable to the

Date	Event
	landowners.
May 2009	Following the Minister's endorsement, the department engaged Water for Rivers as a broker to undertake the water entitlement purchase component of the Lake Mokoan Decommissioning Project.
May 2009	Minister advised the Benalla Rural City Council that he supported the December 2008 flood study conclusions, recognising that Lake Nillahcootie could not be run as an effective irrigation storage and flood mitigation facility. Lake Nillahcootie's operating rules to stay the same and there were to be no further studies.
June 2009	VFF met Water for Rivers to discuss its previous offer, but Water for Rivers rejected it. G-MW's Fact sheet 20A explains the reason VFF's offer was rejected.
June 2009	Water for Rivers invited irrigators from Broken Creek and Broken River downstream from Casey's Weir to express interest in selling their water entitlements. Offer was to buy all or part of an irrigator's entitlement for $3 500 per ML.
June 2009	The irrigators offered to sell 12 000 ML, surpassing the water entitlement buy-back target. Water for Rivers sought Project Control Board's approval to buy 8 300 ML in targeted areas to meet 91 per cent reliability commitment.
July 2009	Project Control Board supported purchase of 6 139 ML. The department sought and obtained Ministerial endorsement for 8 300 ML.
July 2009	Media reports VFF and some irrigators supported this offer.
July 2009	Water for Rivers made the offer to 54 Broken System entitlement holders. Those outside the targeted areas missed out.
November 2009	Water entitlement buy-back completed.
November 2009	Response to sell water entitlements was greater than expected and the additional volume allowed G-MW to revisit the need for offset components. Decision made not to proceed with some components as no longer required or their extent and location needed to be reviewed.

Appendix C.

Audit Act 1994 section 16—submissions and comments

Introduction

In accordance with section 16(3) of the *Audit Act 1994* a copy of this report, or relevant extracts from the report, was provided to the Department of Sustainability and Environment, Goulburn-Murray Water, Goulburn Broken Catchment Management Authority and Melbourne Water with a request for comments or submissions.

The comments and submissions provided are not subject to audit nor the evidentiary standards required to reach an audit conclusion. Responsibility for the accuracy, fairness and balance of those comments rests solely with the agency head.

Submissions and comments received

RESPONSE provided by the Secretary, Department of Sustainability and Environment

Department of Sustainability and Environment

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File: CS/21/3021

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DX 210098

Mr D D R Pearson
Auditor-General
Victorian Auditor-General's Office
Level 24, 35 Collins Street
MELBOURNE VIC 3000

25 FEB 2010

Dear Mr Pearson

AUDIT ACT 1994, S16(3) - PROPOSED AUDIT REPORT LAKE MOKOAN AND TARAGO RESERVOIR

Thank you for your letter dated 12 February 2010 giving me the opportunity to comment on the Proposed Audit Report Lake Mokoan and Tarago Reservoir.

I welcome the conclusions that the reconnection of Tarago Reservoir and the decommissioning of Lake Mokoan were the most suitable options to pursue on environmental and cost grounds and that these decisions were supported by comprehensive and robust advice to the Victorian Government.

The Department of Sustainability and Environment (DSE) is broadly satisfied with the proposed audit report in regard to the Lake Mokoan project. However, DSE believes the comments made in regard to the governance framework, as detailed in my letter of 3 February 2010, are still valid.

The proposed audit report fairly represents the Tarago Reservoir project.

The department notes and accepts the Proposed Audit Report Lake Mokoan and Tarago Reservoir.

Thank you once again for the opportunity to comment.

Yours sincerely

Greg Wilson
Secretary

RESPONSE provided by the Managing Director, Goulburn-Murray Water

GOULBURN-MURRAY WATER

Our Ref: #2808956,2010/243/1
Your Ref: 25935/01

DDR Pearson
Victorian Auditor-General's Office
Level 24, 35 Collins Street
MELBOURNE Vic 3000

23 February 2010

Dear Mr Pearson

Audit Act 1994, s16(3) – Proposed Audit Report Lake Mokoan and Tarago Reservoir

Thank you for providing Goulburn-Murray Water (G-MW) with the above report.

G-MW welcomes the findings of the audit and the positive manner in which the findings have been researched and presented.

Yours sincerely

David Stewart
MANAGING DIRECTOR

Award of Excellence
Victorian ENGINEERING EXCELLENCE Awards 2009

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RESPONSE provided by the Chief Executive Officer, Goulburn Broken Catchment Management Authority

26th February, 2010

GOULBURN BROKEN
CATCHMENT MANAGEMENT AUTHORITY

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D D R Pearson
Auditor-General
Victorian Auditor-General's Office
Level 24
35 Collins Street
MELBOURNE VIC 3000

Dear Mr Pearson

Re: Proposed Performance Audit: Lake Mokoan and Tarango Reservoir.

Thank you for the opportunity to comment on the proposed Audit Report. Management of the Goulburn Broken Catchment Management Authority (GB CMA) has reviewed the document and make the following comments.

1.0 Lake Mokoan as it relates to the Broken Basin and the Goulburn Murray Irrigation District (GMID)

While the report description of Lake Mokoan (section 1.2) is accurate, the comments subsequent are largely about irrigation issues in the Broken Basin. Issues associated with different trading rules in the Broken Basin compared to other irrigators in Northern Victoria and the fact that one of their two key storages was frequently rendered unusable because of Blue Green Algae (BGA) blooms helps to explain some of the difficulties encountered in decommissioning Lake Mokoan.

The report would be enhanced by a discussion on the Broken Basin and the above anomalies.

2.0 Reliability

While the GB CMA accepts there is a degree of uncertainty in modelling, it does not believe expressing reliability as a range assists the discussion. Rather a discussion around the impact of changing key assumptions has on reliability would be more useful. For example, reliability would drop if BGA blooms occurred earlier in the season and would improve if they became less frequent.

The report would be enhanced by referring to reliability as a figure and discussing the impact of changing assumptions has on reliability.

As stated above, utilisation of water entitlements in the Broken Basin is low and water trading is inhibited by a ban on trading outside the Broken Basin. This is a substantially different environment to the rest of the GMID.

The report would be enhanced by a discussion on how individual irrigators had access to very high annual allocations in a system with relatively low reliability.

3.0 Communications and Consultation

It is the view of the GB CMA that effective communications can be put in place and "concerns within sections of the community over decommissioning" remain. The State Government's responsibility is to act in the best interest of all Victorians. Broken Valley irrigators do not have this responsibility so it is perfectly reasonable for them to come to a different conclusion after considering the same facts. There is no

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RESPONSE provided by the Chief Executive Officer, Goulburn Broken Catchment Management Authority – continued

GOULBURN BROKEN
CATCHMENT MANAGEMENT AUTHORITY

www.gbcma.vic.gov.au

evidence in the report to support the assumption that specific concerns over decommissioning could have been better addressed by targeted communications.

The comments with regard to Volume 5 are not consistent with records provided to your office, but the issue is not of major importance.

4.0 Flooding Risk to Benalla

The GB CMA is satisfied that 2.5.3 is an accurate representation on how the flooding issue was addressed.

5.0 Recommendations

It is noted that there are no direct recommendations for the GB CMA to address.

The recommendations provided in the Audit Report are supported.

Once again, thank you for the opportunity to comment on the proposed Audit Report.

Yours sincerely

Chris Norman
CEO
Goulburn Broken Catchment Management Authority

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RESPONSE provided by the Managing Director, Melbourne Water

Melbourne Water

26 February 2010

Mr D D R Pearson
Auditor-General
Victorian Auditor-General's Office
Level 24, 35 Collins Street
MELBOURNE VIC 3000

ATT: PETER STOPPA

Dear Sir

***Audit Act 1994* (Vic) s16(3) – Proposed Audit Report Lake Mokoan and Tarago Reservoir**

I refer to your letter dated 12 February 2010 which enclosed a copy of the proposed report on the Performance Audit - Lake Mokoan and Tarago Reservoir. Thank you for the opportunity to provide formal comments for inclusion into the report.

The Tarago Reservoir reconnection was delivered ahead of time and within budget, which could not have been achieved without a sound governance framework and effective engagement of stakeholders. This VAGO review confirms that both these elements were observed on this project in the context of a challenging timeframe.

We note that there were no specific recommendations for Tarago; however the audit has provided an opportunity to gain an independent perspective of the project and the exchanges during the review were considered valuable as we seek to continually improve our performance.

Yours sincerely

ROB SKINNER
MANAGING DIRECTOR

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