



Irrigation Efficiency Programs



VICTORIA

Victorian
Auditor-General

Irrigation Efficiency Programs

Ordered to be printed

VICTORIAN
GOVERNMENT PRINTER
June 2010



This report has been produced to ISO14001 environmental standards. It is printed on FSC credited Novatech Satin & Media Print Silk paper. The print supplier, Blue Star PRINT has initiated an EMS promoting minimisation of environmental impact through the deployment of efficient technology, rigorous quality management procedures and a philosophy of reduce, re-use and recycle.

ISBN 978 1 921650 38 3



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 Efficiency Programs*.

Yours faithfully

A handwritten signature in black ink, appearing to read "Dr Peter Frost", with a long horizontal flourish extending to the right.

DR PETER FROST
Acting Auditor-General

9 June 2010

Contents

Audit summary.....	vii
Background.....	vii
Audit objective	vii
Conclusions	vii
Main findings.....	viii
Recommendations	x
<i>Audit Act 1994</i> section 16—submissions and comments.....	xi
Introduction	xi
Submissions and comments received	xi
1. Background	1
1.1 Introduction.....	1
1.2 Irrigation efficiency	2
1.3 Irrigation renewal.....	5
1.4 Audit objective and scope	6
2. Planning for irrigation efficiency.....	7
2.1 Introduction.....	8
2.2 Conclusion.....	8
2.3 Considering the need to invest and options	9
2.4 Developing the business cases.....	15
3. Managing irrigation efficiency projects	21
3.1 Introduction.....	22
3.2 Conclusion.....	22
3.3 Project management	22
3.4 Assessing water savings.....	30
Appendix A. <i>Audit Act 1994</i> section 16—submissions and comments.....	33

Audit summary

Background

Irrigators are significant consumers of Victoria's water. They use around 74 per cent of all the harvested water in Victoria—on average around 2 600 gigalitres (GL) each year. In comparison, Melbourne's annual water use is around 460 GL.

Victoria's irrigation delivery system is inefficient—around one third of the water diverted into the irrigation channels and pipes does not reach the end users. Recognising the inefficiency of existing irrigation delivery systems, the 2004 policy *Our Water, Our Future* committed to increase the efficiency of irrigation systems across the state by 25 per cent, by the year 2020. In addition, it committed to develop responsive irrigation systems to better meet the needs of irrigators. A range of remedial and modernisation works on Victoria's irrigation infrastructure have subsequently started.

Audit objective

This report examines how effectively, efficiently and economically irrigation-related programs have been planned and managed to achieve intended outcomes. The audit examined the planning processes for the Foodbowl Modernisation Project and the Sugarloaf Pipeline, but not the achievement of outcomes. This will occur in a subsequent audit, following completion of the projects.

The audit also examined the planning, project management and project outcomes for the Central Goulburn 1234 Channel Automation Project, Shepparton Irrigation Area Modernisation Project and the Macalister Channel Automation Project.

Conclusions

Victorian Government decisions to invest around \$2 billion in irrigation efficiency and related projects between 2004 and 2007 were poorly informed. Whether these projects represent the best solution to achieve the government's policy objectives of saving water and securing Victoria's water, remains unclear.

This was particularly evident for the Foodbowl Modernisation Project, where the decision to commit \$1 billion was based on advice of water savings and cost assumptions that had not been verified, technology that had not yet proven itself and the feasibility of the project, which was unknown. As a consequence, assumed water losses have been significantly revised down, making the achievement of intended water savings less certain.

That all projects went straight to the development of business cases, without adequately demonstrating the need to invest or properly consider the most appropriate solution, represents a significant departure from mandatory requirements. Poor documentation and record keeping has been a consistent concern in this audit and has inhibited The Department of Sustainability and Environment's (DSE) ability to provide the necessary assurance on the status of the irrigation efficiency programs.

From the information provided, while the three irrigation projects have generally progressed as planned against their time frames for completion, in some instances the costs of the projects exceeded the planned costs, expected water savings had not been achieved and the effectiveness of the modernisation was uncertain.

While the Foodbowl Modernisation Project was conceived and developed in what the government considered a 'crisis' situation due to record low inflows, this was not the case for the other irrigation efficiency projects.

Main findings

Planning for irrigation efficiency

Each of the irrigation projects selected asset solutions, primarily involving channel automation, to achieve the government's priorities. There was no evidence that any of the projects had undergone a robust assessment of the need to invest in asset solutions, rather than non-asset solutions, as the main way to increase irrigation efficiency or to secure Victoria's water supplies. This was also the case for the Sugarloaf Pipeline.

For each of the four irrigation projects, the choice of the new channel automation technology was assumed, rather than being considered as one of a number of possible options. As a consequence, the decision-making process from the concept stage to development of a service requirement lacked transparency and rigour.

The consideration of investment options to meet the identified need was limited. There was not evidence to show that the planning for any of the projects considered investment options, including evaluation, ranking and detailing the actions required to progress to the business case. In most cases, the only option considered was the asset solution presented in the final business case.

While business cases were developed for the four irrigation projects and the Sugarloaf Pipeline, in all instances they lacked the evidentiary rigour appropriate to the risk and cost of the proposed projects. Analysis of costs and benefits was superficial and information to support the basis for water savings assumptions was lacking.

None of the business cases set out options other than the proposed solution, or variations of the solution. While it is acceptable in some situations for the business case to focus on the preferred option only, this should only happen where the business case has been preceded by a detailed options analysis. This was not the case for the projects audited.

The timeliness of the development of the business cases was also an issue for most projects, with instances of project works starting before the final business case was actually approved.

Managing irrigation efficiency projects

There was limited management information to enable these projects to be assessed, including how they are progressing and to what extent they have met, or are meeting, their intended outcomes. This was exacerbated by the lack of centralised project status information, which was significant given the large number of stakeholders involved and the high-risk and high-cost nature of the projects. Combined with the repeated revisions to scope, it was difficult to determine the final outcomes for some projects, particularly for water savings.

From the information provided, the projects have generally progressed as planned against their time frames for completion. However, in some instances the costs of the projects exceeded the planned costs, expected water savings had not been achieved and the effectiveness of the modernisation was uncertain. Where costs were less than expected, this was due to reduced project scopes.

A new water savings protocol to guide the assessment of water savings was developed in June 2009. The water savings protocol and accompanying technical manual are comprehensive and reflect better practice.

An independent auditor has been engaged to assess water savings using the new protocol. The auditor focused on savings for the period between 1 March 2009 and 15 May 2009, and shows that around 4.2 GL was saved during this period, generally in accordance with expectations. There was no evidence of audits to verify water savings in the period before 1 March 2009. Southern Rural Water has recently appointed an independent auditor to verify the water savings from the Macalister project.

Recommendations

Number	Recommendation	Page
1.	The Department of Sustainability and Environment should: • develop processes and quality assurance mechanisms for the planning of major investments so that future investment decisions are appropriately informed and considered, consistent with mandatory guidance • develop an approach to cost-benefit analysis that demonstrates consistency and enables comparisons over time.	20
2.	The Department of Sustainability and Environment should: • better document decisions and project information, with particular emphasis on demonstrating outcomes • routinely report publicly on the status of projects, including time, cost, quality and achievement of water savings.	31
3.	The Department of Sustainability and Environment and water authorities should produce more comprehensive project status information to provide greater transparency around the status of projects.	31

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 was provided to the Department of Sustainability and Environment, Goulburn-Murray Water, Southern Rural Water, Melbourne Water and the Northern Victoria Irrigation Renewal Project 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.

The agencies' full submissions are included in Appendix A. Extracts of the submissions have been included below where further comment from the Auditor-General has been provided.

Submissions and comments received

RESPONSE provided by the Secretary, Department of Sustainability and Environment

By way of background DSE and relevant water authorities spent considerable time assessing and exhausting all options for water savings projects. The most promising of these options were developed into business cases. These studies provided the basis for ongoing investigations and refinement of water efficiency programs. The knowledge gained assisted in the timely development of the NVIRP and the Sugarloaf Pipeline projects, in response to unprecedented dry conditions and the resultant stress on both water supplies and the environment.

The report creates a distinction between 'asset' and 'non-asset' solutions and suggests that insufficient consideration was given to the latter.

First, it should be noted that the Government has implemented a range of 'non-asset' reforms that complement the investment program in seeking to meet the objective of a more efficient and sustainable irrigation sector. These include legislated rationalisation processes, unbundling of entitlements to support water trading, sustainable water strategies, independent price regulation and on-farm efficiency programs. Second, the Government's policy position in relation to water for environment is to invest in infrastructure rather than purchase water on the water market, as is reflected in Victoria's Our Water Our Future White Paper and the Central Region Sustainable Water Strategy.

Further comment by the Auditor-General

The audit focused on the requirement to consider, document and assess asset and non-asset options in addition to the preferred option, as part of the investment proposal.

This requirement is designed to demonstrate to project funders that in identifying the preferred option, other options had been considered, and the reasons for their non-preferred status are documented and clear. This did not occur for any of the projects examined in this audit.

RESPONSE provided by the Managing Director, Goulburn Murray Water

Goulburn-Murray Water rejects the suggestion of an unduly narrow approach in selecting asset solutions. The business cases for the Central Goulburn 1234 and Shepparton Modernisation projects were developed following many years of evaluating water loss mechanisms and remediation techniques. Goulburn-Murray Water has evaluated more than 40 technically feasible water savings initiatives and assessed 13 as worthy of consideration. It was this underlying knowledge that allowed Goulburn-Murray Water to streamline the development of business cases, which have been perceived as narrow in this audit.

Further comment by the Auditor-General

With over \$200 million in public funds made available for these projects, demonstrating transparency and rigour in the development of proposals, including demonstrating investment need and robust analysis of options is core to being accountable for the application of very significant public resources.

RESPONSE provided by the Managing Director, Goulburn Murray Water

We do not agree that the decision to revise the projects' scopes detracts from this achievement.

Further comment by the Auditor-General

The audit report makes no such statement about the project revisions detracting from achievements. The revisions, and the reasons for them, are noted on pages 26 and 28 of this report.

RESPONSE provided by the Chief Executive Officer, Northern Victoria Irrigation Renewal Project

The audit report suggests that the singular Government objective for the Food Bowl Modernisation Program (FBMP) was water security. Whilst acknowledging the Government's Our Water Our Future – The Next Stage of the Government's Water Plan (June 2007) has as a key focus water security, the Government clearly intended for the project to deliver on a broader range of objectives in confirming its proposed investment... The singular focus on water savings as a security measure undervalues the wider range of objectives associated with the FBMP.

Further comment by the Auditor-General

The report notes in the Background chapter, that the Foodbowl Modernisation Project aims to provide water security for Victoria by reducing systems losses. This is, as noted above, the key focus of the project.

RESPONSE provided by the Chief Executive Officer, Northern Victoria Irrigation Renewal Project

The report (Audit Summary) also indicates that there has been a lack of robustness in the NVIRP Business Case with regard to the calculation of water savings in particular stating "information to support the basis for water savings assumptions was lacking". The Stage 1 Business Case, which was provided for review at the commencement of the audit process in August 2009, addresses in some detail the water savings assumptions. That Business Case detail incorporating a dedicated chapter on water savings, two detailed expert reports in the form of appendices (200+ pages) and an analysis of water savings to be targeted by the modernisation works (automation, remediation and rationalisation).

Further comment by the Auditor-General

Part 2 of the report discusses the water savings figures that were used to seek funding approval, and that informed the development of the business case. These figures had not been verified before approval was obtained. Nevertheless, the report positively notes that NVIRP undertook progressive testing of its water loss estimates.

RESPONSE provided by the Chief Executive Officer, Northern Victoria Irrigation Renewal Project

Audit's comment that the cost benefit analysis contained in the business case was preliminary is acknowledged, however NVIRP refutes the broad assertion that evidentiary rigour appropriate to the risk and cost of the project was lacking in the NVIRP business case.

Further comment by the Auditor-General

As noted on page 18 of the report, the cost-benefit analysis undertaken for this \$1 billion project was cursory and inadequate. It did not include the assumptions underpinning the analysis, or undergo sensitivity testing. Given the cost and risks associated with a project of this size, these deficiencies in assessing costs and benefits represents a lack of evidentiary rigour. I note that a new cost-benefit analysis for this project was completed for the stage 2 business case, and this has sought to overcome many of these weaknesses.

RESPONSE provided by the Chief Executive Officer, Northern Victoria Irrigation Renewal Project

Figure 2B in section 2.4 of the report also suggests no approvals relating to the project were forthcoming in the period between August 2008 and June 2009. That conclusion suggests that from the August 2008 Business Case decision point until the Business Case in June 2009 no further analysis had been undertaken by NVIRP to support key decisions for which Government approvals were necessary. That is not correct.

Further comment by the Auditor-General

Figure 2B, as its title states, is a timeline for business case approvals. It highlights the key decision dates and period of time it took for the approval of the final business case. The report makes no comment either on the activities occurring between those dates, nor suggests any lack of action.

RESPONSE provided by the Managing Director, Southern Rural Water

On the matter of project management we disagree that there was a lack of detailed reporting. Our view is that reporting has been to a contemporary project management standard for projects of this size. An active Project Board was in place which included appropriate representatives from the funding authority and received regular reports on each project.

Tight project management controls were implemented and the stakeholders were kept up to date with the key project elements of scope, cost, schedule, and risk management.

Further comment by the Auditor-General

As noted on page 30 of this report, the reporting for the Macalister project lacked sufficient detail to provide a clear understanding of its status. Reporting was by exception, which is considered insufficient for a \$27 million project.

1 Background

1.1 Introduction

Irrigation, artificially applying water to soil, is a key practice of Victoria's agricultural industries. Farmers irrigate to grow crops and for pasture to feed livestock. Irrigated agriculture generates around \$9 billion in production and \$1.5 billion in exports for the economy annually.

Irrigators receive water from an extensive system of irrigation channels, pipes and outlets at the farm-gate. In the main irrigation districts there are around 8 000 kilometres of open channels and pipes, the majority in the Goulburn-Murray area. Goulburn-Murray Water (GMW) manages 6 770 kilometres of open channels and 252 kilometres of pipelines, while Southern Rural Water (SRW) manages about 600 kilometres of channels and pipelines. The Macalister irrigation district, managed by SRW, is the largest irrigated area south of the Great Dividing Range. Figure 1A shows the main irrigation districts.

Figure 1A
Victoria's main irrigation districts

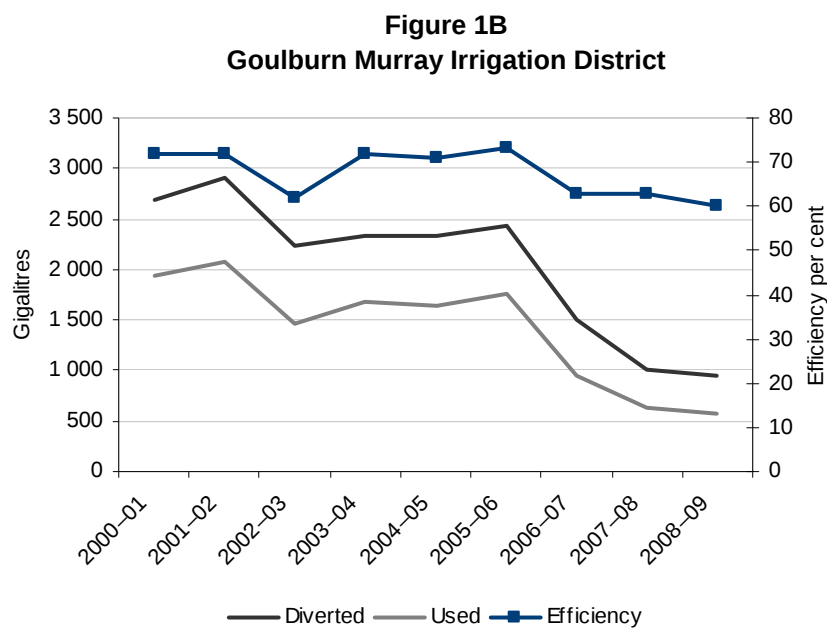


Source: Department of Sustainability and Environment.

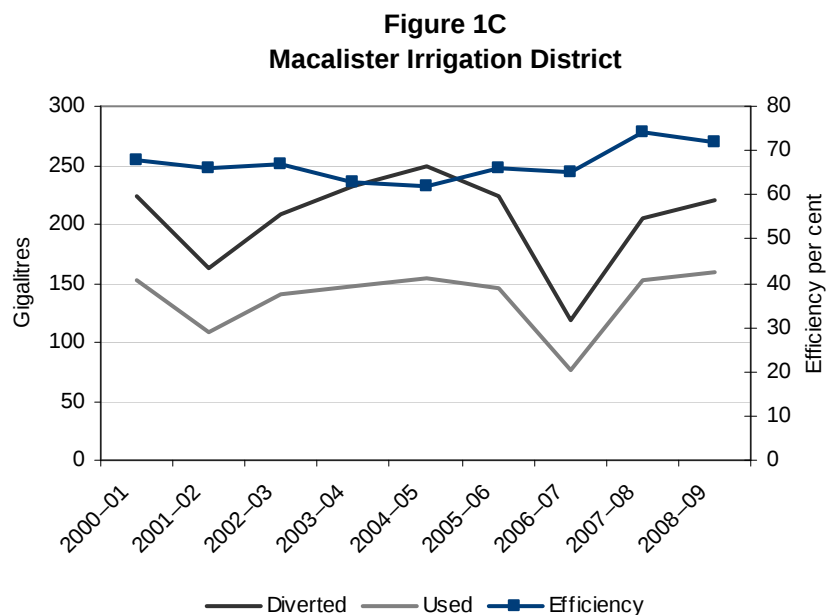
1.2 Irrigation efficiency

Irrigators are significant consumers of water. They use 74 per cent of all the harvested water in the state—about 2 600 gigalitres (GL) each year—on average. In comparison, Melbourne uses about 460 GL annually.

The irrigation delivery system is inefficient. Much of the water diverted into the irrigation channels and pipes does not reach end users. For example, in 2008–09, around 958 GL of water was diverted for irrigation in the Goulburn-Murray Irrigation District. Irrigators used 578 GL, an efficiency rate of 60 per cent. The other 40 per cent was 'lost' to the system. Figures 1B and 1C show the diversions, use and system efficiency for the Goulburn-Murray Irrigation District and the Macalister Irrigation District for the years 2000–01 to 2008–09.



Source: Victorian Auditor-General's Office from data provided by Goulburn-Murray Water.



Source: Victorian Auditor-General's office from data provided by Southern Rural Water.

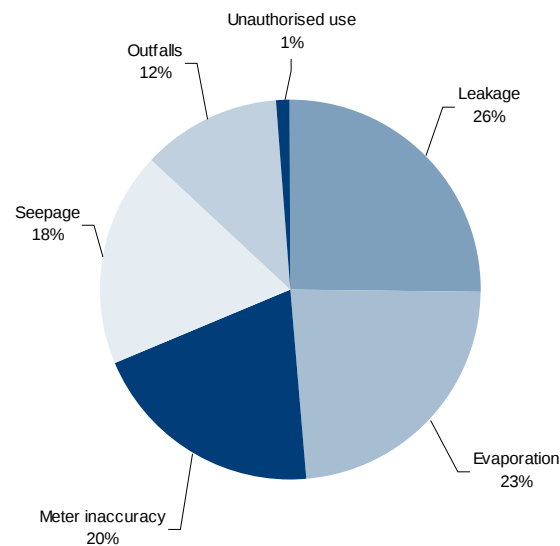
1.2.1 Water losses

Water is lost in many ways. Ranked from the largest to the least losses, they are:

- water leaking through the banks of the irrigation channels
- evaporation
- inaccurate metering—more water flows through the meter than the meter records
- seepage—water seeps into the ground from the bottom of the channel
- outfalls—unused water spills over the end of channels, either into a drain, another channel or a river
- unauthorised use, including theft.

Figure 1D shows factors behind the water loss and the estimated percentage of the total losses from each, for the Goulburn-Murray Irrigation District.

Figure 1D
Factors contributing to water loss: Goulburn-Murray Irrigation District



Note: This data is indicative only. Actual losses can vary across irrigation districts and from year to year.
Source: Victorian Auditor-General's Office from data provided by Northern Victoria Irrigation Renewal Project.

Defining water loss is contentious. Some regard the only true loss to be from evaporation, with all other water returning to the environment via leakage and seepage, being re-used via outfalls, or being productively used but not measured due to inaccurate metering.

Others consider that all losses are the unaccounted for difference between what was in the irrigation system and what arrived at the farm. The Department of Sustainability and Environment (DSE) and water authorities have taken this approach in business cases for the irrigation efficiency projects. It means that as the water losses are higher, so too are the potential savings from mitigating the losses.

This report uses the DSE and water authorities' approach when referring to estimated water losses and potential savings.

1.3 Irrigation renewal

Recognising the inefficiency of irrigation systems, the 2004 policy *Our Water, Our Future* committed to increase their efficiency across the state by 25 per cent by the year 2020. In addition, it committed to develop responsive irrigation systems to better meet the needs of irrigators.

Remedial and modernisation works on the irrigation infrastructure have since started. These works include:

- rationalising, or decommissioning irrigation channels that are unused or underused
- re-lining irrigation channels to reduce seepage and leakage
- constructing pipelines to replace irrigation channels, reduce seepage, leakage and evaporation
- automating irrigation channel gates to better control and measure the flow of water
- replacing manual water meters with automated meters to better measure water flows to the farm.

1.3.1 Irrigation renewal projects

The most significant irrigation renewal project, in investment and scope, is the Northern Victoria Irrigation Renewal Project. Other significant projects are the Central Goulburn 1234 Channel Automation Project and Shepparton Irrigation Area Modernisation Project in northern Victoria, and the Macalister Channel Automation Project in south eastern Victoria.

Northern Victoria Irrigation Renewal Project

This project, also known as the 'Foodbowl Modernisation Project', encompasses the areas of the Goulburn-Murray Irrigation District not covered by the Central Goulburn 1234 Channel Automation Project and Shepparton Irrigation Area Modernisation Project. The area includes around 6 200 kilometres of irrigation channels and pipelines. This is the largest project established under the 2007 policy *Our Water, Our Future: The Next Stage of the Government's Water Plan*. It aims to provide water security for Victoria by reducing system losses.

The State Owned Enterprise for Irrigation Modernisation in Northern Victoria, which trades as the Northern Victoria Irrigation Renewal Project, manages the project. It expects to save a long-term average of 225 GL each year in a system currently operating at about 70 per cent efficiency, with one third of the savings going each to irrigators, the environment and Melbourne water users.

The Sugarloaf Pipeline, originating near Yea on the Goulburn River and ending in the Sugarloaf Reservoir north east of Melbourne, will carry one third water savings from this project to Melbourne.

Central Goulburn 1234 Channel Automation Project

The Central Goulburn 1234 system covers about 20 per cent of the central Goulburn area, and comprises around 265 kilometres of irrigation channels. This project will automate channels one to four and will cut losses estimated in the project's 2004 business case to around 32 GL, meaning the system is 69 per cent efficient. This project continues a pilot project on the Central Goulburn 2 channel, which tested new automation technology.

Shepparton Irrigation Area Modernisation Project

The Shepparton irrigation system has about 750 kilometres of channels and pipes. GMW estimates that the system is about 71 per cent efficient, losing around 84 GL of water a year. This project aims to modernise and rationalise irrigation supply in the Shepparton irrigation system through channel automation, piping, channel remediation and upgraded metering, with expected water savings of 52 GL.

Macalister Channel Automation Project

The Macalister irrigation system has about 600 kilometres of channels and pipes, and in 2004 had an estimated efficiency of 67 per cent. This project aims to automate the irrigation channels and reduce system losses, using the same automation technology as the other projects. Southern Rural Water expects the project to save around 15 GL annually, which will return to the Macalister and Thomson Rivers as environmental flows.

1.4 Audit objective and scope

The audit examined how effectively, efficiently and economically irrigation-related programs had been planned and managed to achieve intended outcomes. Specifically, the audit examined:

- planning, including the development of options and assumptions leading to the case to proceed
- project management practices for selected programs
- effectiveness and achievement of program outcomes.

The audit reviewed planning for the Foodbowl Modernisation Project and the Sugarloaf Pipeline. It also examined the planning, project management and outcomes for the Central Goulburn 1234 Channel Automation Project, Shepparton Irrigation Area Modernisation Project and the Macalister Channel Automation Project.

The audit was performed in accordance with the Australian Auditing Standards applicable to performance audits. The total cost of this report was \$380 000.

2 Planning for irrigation efficiency

At a glance

Background

Since the government commenced its modernisation of irrigation and related infrastructure, it is expected it will invest around \$2 billion. With such significant investment, robust planning is critical to assure there is a sound case to proceed, that the expected benefits are clear and that the investment is likely to achieve the expected results.

Findings

- None of the four irrigation modernisation projects, or the Sugarloaf Pipeline, had undergone a robust assessment of the need to invest in the chosen asset solutions. Non-asset solutions, such as demand management, were not considered.
- There was inadequate consideration of investment options to meet the identified need. In most cases, the preferred option was the only one considered in the business case.
- While the Department of Sustainability and Environment and water authorities developed business cases, they lacked the rigour appropriate to the nature and cost of each project.

Recommendation

The Department of Sustainability and Environment should:

- develop processes and quality assurance mechanisms for the planning of major investments so that future investment decisions are appropriately informed and considered, consistent with mandatory guidance
- develop an approach to cost-benefit analysis that demonstrates consistency and enables comparisons over time.

2.1 Introduction

Since 2004, the government has committed to spend around \$2 billion modernising and building irrigation and related infrastructure. The scale of this investment demands robust planning to provide assurance that there are clear reasons for such significant investment, there is a sound case to proceed, that the expected benefits are clear and that the investment is likely to achieve the expected results.

The Department of Treasury and Finance wrote the *Business Case Development Guidelines*, later revised and retitled *Lifecycle Investment Guidelines*, to set a framework for public sector planning of major asset investments. Specifically, they require that for all investment proposals greater than \$5 million, agencies should:

- assess the business need and likely solutions
- consider options for the best solution
- develop compelling business cases.

Planning for the projects examined in this audit should substantiate the need for each investment and robustly assess potential options. There should also be comprehensive business cases, reflecting the high-risk and high-value nature of these projects, including analysis of the costs and benefits for each option, to inform decision making.

2.2 Conclusion

Planning for irrigation efficiency and related projects, prior to the decision to invest, has been poor and has not met the standards expected of high-risk and high-value projects.

None of the projects followed the *Business Case Development Guidelines*, which require proposals first to demonstrate a need then assess options to meet that need. Instead, all the projects went straight to business case stage, adopting the preferred option. This was particularly so for the Foodbowl Modernisation Project, where the business case was formalised two years after the decision to proceed.

In by-passing the processes set out in the *Business Case Development Guidelines*, these decisions on major investments were not fully informed. As a result, the planning lacked rigour, and because of a lack of documentation, lacked transparency. There is no assurance that these projects were the most cost-effective solutions to the government's policy priorities.

2.3 Considering the need to invest and options

Considering the need to invest, and the potential investment options to meet that need, are the first stages of planning for major asset investments. They provide decision makers with information about the outcome required and the options for delivering that outcome. Without sound consideration of needs and options, there is a risk that planners will develop unnecessary or overly complex solutions, or solutions that do not match the need, leading to poor investment decisions.

In the case of the five projects examined in this audit (four irrigation modernisation projects and one pipeline project), the government's priorities were two-fold: to increase irrigation efficiency by 25 per cent by 2020 for the Central Goulburn 1234, Shepparton and Macalister projects, and to provide water security for Victoria (the Foodbowl Modernisation Project and the Sugarloaf Pipeline).

2.3.1 Establishing the need to invest

For each of the irrigation projects, the business case included a specific asset solution, primarily involving channel automation, to achieve the government's priorities. Not one of the asset solutions chosen for the four irrigation efficiency project proposals was rigorously assessed. Other asset solutions, such as pipelining the open channels, were not considered. There was also no consideration of non-asset solutions, such as purchasing water, as the primary way to increase irrigation efficiency or to secure Victoria's water supplies. Considering non-asset solutions is a key element of establishing the need to invest.

For the four irrigation projects, the choice of the new channel automation technology was assumed, rather than being chosen from among a number of possible options. As a consequence, the decision-making process from the concept stage to development of a service requirement lacked transparency and rigour.

Central Goulburn 1234, Shepparton and Macalister projects

The government's water policy at the time that the Department of Sustainability and Environment (DSE) was planning the Central Goulburn 1234 (CG1234), Shepparton and Macalister projects was to increase irrigation efficiency by 25 per cent, through pipelining open channels and other technological improvements.

The efficiency improvements were required as a way to save water for environmental flows, as part of the government's commitment to the Snowy and Living Murray initiatives. A portion of the water savings from the CG1234 and Shepparton projects was intended to meet this commitment. Saved water from the Macalister project was intended for the Macalister and Thomson Rivers.

DSE advised that the need for modernisation and the use of channel automation was demonstrated through a range of disparate reports, developed for them between 2000 and 2009, and through their commitment to increase environmental flows under the Snowy and Living Murray initiatives. The reports included a 2000 study of water savings in irrigation distribution systems and the pilot study of the CG2 project.

Taken together, neither these reports, nor the environmental flow commitments, demonstrate a clear need for modernisation and channel automation as either the only option or the preferred option.

The government's commitments to the Snowy and Living Murray initiatives were commitments to increase environmental flows through investment in water savings projects. DSE and the water authorities developed the business cases on the presumption that 'water savings projects' entailed modernisation and channel automation. They did not assess the need for these asset solutions. The need was assumed, rather than being considered as one of a number of possible options.

DSE relied upon the *Water Savings in Irrigation Distribution Systems* (2000) report to support the need for modernisation and channel automation. However, this report does not demonstrate the need for modernisation or channel automation. It identifies a range of options to save water and does not consider factors expected of a needs assessment, including:

- describing government service requirements, priorities and outcomes
- outlining and prioritising the objectives of a specific proposal
- describing the extent of alignment with governmental and departmental strategic direction
- describing detailed actions to progress it to the analysis of options.

The 2002 CG2 pilot project was the origin of these irrigation efficiency projects, and designed to test channel automation technology. DSE and Goulburn-Murray Water (GMW) did not develop this project in response to an identified investment need. Rather, a commercial entity wanting to trial proprietary channel automation technology initiated it.

The CG2 pilot also did not demonstrate the need to invest in modernisation or channel automation. Its purpose was to demonstrate the capabilities of the technology to save water in irrigation systems. The pilot study's results did not inform a robust needs assessment. Rather, they became the justification for channel automation as the preferred solution.

Foodbowl Modernisation Project and Sugarloaf Pipeline

DSE, GMW and other government agencies did not identify the investment need for the Foodbowl Modernisation Project (FMP). A group of irrigators from Northern Victoria developed the project proposal and submitted it to the government for consideration around February 2007. The government had not identified the FMP as a way to secure water for Victoria until then.

The absence of adequate supporting documentation means the decision-making for this project cannot be evaluated. DSE could not assure that there was a demonstrated need to invest in this asset solution to secure water supplies. This was contrary to the February 2007 advice to Cabinet, which acknowledged that the Victorian Water Plan would have to be robust so the government did not commit to projects that were not the best solution.

Evidence that the then DSE Secretary gave under oath in July 2009 indicates that the need for the FMP and the Sugarloaf Pipeline was influenced by the desire to invest in water infrastructure. He said that to meet this need to invest in large scale augmentation, DSE 'created' a set of water inflow forecasts in 2007 using the years 2004–2006, rather than the last ten years as had been used in the 2006 *Central Region Sustainable Water Strategy*. He also said that had DSE used the ten-year forecasts, the need to invest in these large projects would not have been established.

Examples of poor practices in the development of the case to proceed with the FMP include:

- The proposal, submitted by irrigators, was not given to DSE, including its Office of Water, to review and assess, despite this agency having both the expertise and responsibility for irrigation projects.
- Repeated advice from Treasury officers between March 2007 and May 2007 to conduct a comprehensive feasibility study into the proposal—because preliminary advice provided to the government during that time was based on 'limited and unverified information from the media'—was not followed.
- A feasibility study was not undertaken before the proposal was submitted to Cabinet and before Cabinet committed, in early and late June 2007, to the FMP.
- A commitment to Cabinet in late June 2007 to immediately undertake a feasibility study into the FMP, which was not met.

In addition, an assessment of the investment need for the Sugarloaf Pipeline did not occur and the project proceeded straight to a business case.

2.3.2 Investment options

Once the need to invest has been determined, the next stage in developing a case to proceed is to assess the options capable of delivering the desired outcome. This entails identifying, short-listing and ranking a range of investment options, both asset and non-asset, for detailed assessment in the business case. Generally, more complex, high-risk and high-value proposals require a more rigorous assessment of the options.

For the projects this audit examined, the consideration of investment options to meet the identified need was limited. In most cases, the only option considered was the asset solution presented in the final business case, or variations of the preferred solution. This primarily involved channel automation. None of the projects considered alternative investment options, including evaluation, ranking and detailing the actions required to progress to the business case.

While it is sometimes acceptable for the business case to focus on the preferred option only, it should happen only where a detailed options analysis precedes the business case. This was not the case for the projects audited.

Channel automation

Channel automation originated with the pilot of CG2, which occurred between 2002 and 2004. While the pilot project was designed to assess the capabilities of channel automation, it became the preferred technology option for all the projects, with limited assessment of other options.

Based on DSE's assumption that channel automation was the solution to address the government's policy and other commitments, they commissioned a competitor analysis to assess other competing channel automation technologies.

The competitor analysis, which identified that there were no other companies able to provide the technology solution, was a limited scope desktop review. It included interviews with DSE, GMW, Southern Rural Water (SRW), the supplier of the channel automation technology for the pilot project and four other agencies with expertise in the water industry. However, the nature of this review meant that it could not provide DSE with adequate information on the nature of other similar technologies—not least because the information provided was not verified.

DSE also commissioned a technical assessment of the channel automation technology to determine whether it was sufficiently robust to proceed with further investment. While the review concluded that the technology provides the appropriate level of functionality, compatibility and robustness for further investment, the review's limitations meant it could not provide the necessary assurance to DSE or other investors.

Specifically, the review noted that it was limited to a high-level review of information that the proprietary company provided the authors. It further noted that the extent and veracity of any conclusions drawn from the review were limited to the extent that the proprietary company provided it with complete and accurate information.

Given the vested interest of the technology provider to enter into contracts with DSE and GMW, and the investment that these two agencies had already made in the technology, DSE's reliance on these reports to justify further investment is a significant concern.

Central Goulburn 1234, Shepparton and Macalister projects

For both the Central Goulburn 1234 and Shepparton projects, DSE and GMW did not consider both asset and non-asset options for these projects, as part of developing the case to proceed.

For the Central Goulburn 1234 project, the only alternative option to channel automation DSE and GMW considered was pipelining. However, this was only noted in the final business case, and there was no substantive analysis of this option. In the business case, consideration of other options was confined to a sentence that noted other options had been considered and that the preferred option was best.

The Shepparton business case considered only variations of the preferred asset solution, in this case modernisation, rather than alternatives to modernisation. These options were the only options analysed in the business case.

GMW commissioned a study in 2000 to review options to save water in its irrigation system. It identified water loss areas and identified a range of options to address these, including automation, pipelines, and domestic and stock metering. However, this study was not undertaken to inform the development of the respective business cases and was not used to do so.

For the Macalister project, a study was undertaken in 2004 to assess possible water savings options for the Macalister and Thomson rivers. The focus of this study was on increasing environmental flows, not increasing irrigation efficiency. The report was not comprehensive and recommended further work to investigate and analyse options. There was no further work before committing to the preferred asset solution of modernisation in the business case.

The business case noted that the preferred option was the most attractive with lowest cost water savings, and that the automation technology had been subject to studies 'that indicated its feasibility'. Business case options are discussed only in terms of:

- existing policy commitments
- lost policy commitment opportunities by doing nothing
- economic and water savings benefits.

Foodbowl Modernisation Project and Sugarloaf Pipeline

The FMP and Sugarloaf Pipeline asset solutions were the only options considered and used in decision making for securing Victoria's water supplies. As a consequence, DSE could not be reasonably assured that these projects represented the best investment to meet priorities, or that they had greater merit than other options.

There were two high-level reviews examining options to secure Victoria's water undertaken in late 2006 and early 2007: the *Central Region Sustainable Water Strategy: Independent Review and Critique of Major Augmentation Options*; and *Review of Victorian Water Supply-Demand Options and Risks*. Both detailed similar options, including:

- desalination
- water recycling from various sources
- use of groundwater
- north-south connection.

The high-level nature of the reports, and the compressed time frames in which they were completed, meant that neither met the standards required of an adequate options analysis. Specifically, neither review compared options against established criteria or ranked the preferred options.

The *Review of Victorian Water Supply-Demand Options and Risks*, which based its analysis on the same years as the *Victorian Water Plan*—later retitled *Our Water, Our Future: The Next Stage of the Government's Water Plan*—concluded that the drought had not created a clear need for large and early supply augmentation and that investing in these projects appeared to be very expensive and almost certain to prove unnecessary.

No other assessments of options to secure water for Melbourne, including non-asset solutions such as buying back water entitlements, occurred. The February 2007 Cabinet submission for the *Victorian Water Plan* identified water pricing as the a way to secure the water, and Treasury Briefs between March and May 2007 highlighted that water trading was the cheapest option to secure water. The February 2007 submission also identified a north-south pipeline as a way to transfer this water. The options within the submissions lacked supporting analysis and assessment and there was no additional assessment, other than what was included in the briefs and submission.

The draft *Central Region Sustainable Water Strategy*, which DSE released in April 2006, considered a north-south pipeline option and water trading with Northern Victoria. Both options were explicitly excluded from the final Sustainable Water Strategy, which DSE released in October 2006. However, in February 2007, the Sugarloaf Pipeline project was submitted to Cabinet as an infrastructure investment option for the proposed *Victorian Water Plan*.

There was no evidence to explain the changed position and no evidence that detailed the work underpinning the project's inclusion on the February 2007 submission.

2.4 Developing the business cases

Developing the business case is a critical part of making a decision about whether to proceed with major investments. It provides an opportunity to confirm the business need and to assess in detail the short-listed and preferred options, including comprehensive cost-benefit analyses to inform the decision to invest.

Under the business case development guidelines, a business case should contain the information necessary to make an informed decision. For high-risk and high-expenditure projects, such as those examined in this audit, business cases should contain greater detail and information than low-risk and low-expenditure projects. This detail includes:

- evidence of a significant effort to confirm, quantify and prioritise needs
- assessment of a wider range of options considered and refined for in-depth analysis
- critical assumptions and constraints documented and input to scenario and sensitivity analyses
- fully-detailed risk management issues, with major risks and potential impacts highlighted.

Importantly, the business case should provide the decision-makers with the confidence that the proposed investment is well considered, worthwhile and has more merit than other proposals.

No business case for the four irrigation projects or the Sugarloaf Pipeline was sufficiently rigorous for the risk and cost of the proposed projects. Cost-benefit analyses were superficial and there was no information to support the basis for water savings assumptions. The timeliness of the development of the business cases was also an issue for most projects. In some instances, project works started before the final business case was approved.

Central Goulburn 1234, Shepparton and Macalister projects

The quality of cost-benefit analysis for these three projects varied significantly, with limited analysis only on the preferred option. This was particularly the case for the Central Goulburn 1234 and Macalister projects.

For Central Goulburn 1234, a cost-benefit analysis was undertaken as part of the proposal development. However, an economic assessment was not included in the final business case. The available information indicates that for stages one and two of this project, the benefits outweighed the costs, with a benefit cost ratio (BCR) of 1.2:1. The majority of the benefits were in stage two, with stage one alone deemed uneconomic.

For the Macalister project, a cost-benefit analysis was undertaken for stage one, however, was not completed before the business case was approved. There was no cost-benefit analysis for stage two, and the cost-benefit analysis undertaken for stages three to six was based on the initial analysis completed two years earlier, although using a different discount rate. The analysis for stage one and stages three to six indicates that the benefits outweighed the costs, with BCRs of 2.09:1 and 1.44:1 respectively.

The cost-benefit analysis undertaken for the Shepparton project was more comprehensive, and considered a range of contingency scenarios for the capital cost of five variations of the preferred option. Figure 2A shows the cost-benefit analysis for this project.

Figure 2A
Cost-benefit analysis— Shepparton Irrigation Area Modernisation Project

Variations	Benefit (\$mil)	Cost (\$mil) (15%)	NPV (15%)	BCR (15%)	Cost (\$mil) (40%)	NPV (40%)	BCR (40%)
1	218.4	241.5	-23.1	0.90	254.0	-56.1	0.80
2	200.9	194.8	6.1	1.04	204.6	-24.1	0.90
3	191.8	172.8	19.0	1.11	172.6	-5.2	0.97
4	208.4	208.7	-0.3	1.00	217.3	-29.3	0.88
5	167.7	156.7	11.0	1.07	157.0	-9.7	0.94

Source: Victorian Auditor-General's Office from data provided by Goulburn-Murray Water.

Legend: NPV—Net present value; BCR— Benefit cost ratio

With a BCR of 0.88 with a 40 per cent contingency, and a BCR of 1.0 with a 15 per cent contingency, the preferred option—variation four—ranked fourth of the five variations considered.

Timeliness was a significant issue for both the Central Goulburn 1234 and Macalister business cases. For Central Goulburn 1234, the business case was approved before a feasibility study of the automation technology had been completed. The approval to start early modernisation works was also provided before approval of the final business case. For the Macalister project, the business case was approved before the project's cost-benefit analysis had been completed.

Foodbowl Modernisation Project and Sugarloaf Pipeline

The development of the business cases for the FMP and the Sugarloaf Pipeline commenced only after the government had committed to the projects and approved the funding. This process is contrary to the explicit and mandatory business case guidance for projects such as these.

As a consequence, the business cases could only reflect the preferred option given the funding and water savings constraints that the government had imposed through its earlier commitments—\$1 billion and a long-term annual average of 225 GL in water savings.

For the FMP, two business cases were developed. The first business case, to conduct early works on the FMP before a full business case was finalised, was approved in March 2008. However, in December 2007, the government had approved funding of around \$113 million to conduct the early works—three months before the early works business case was approved.

The second business case, for the remainder of the project, was submitted to government in August 2008. The decision was taken for the second business case to be further developed. A final business case was approved in June 2009—two years after the government committed to the project. However, in August 2008, the government had committed to developing tender documentation and engaging a managing contractor for the project, meaning that the approval for procurement occurred before approval of the final business case. Figure 2B outlines the timing of the decisions for the two business cases.

Figure 2B
Business case approvals timeline

Date	Action
June 2007	Government approves the Foodbowl Modernisation Project.
December 2007	Funding approval for the early works business case.
March 2008	Government approves the early works business case.
August 2008	Second business case submitted for approval. Not approved, with more work required.
	Government approves the procurement process for the second business case.
June 2009	Government approves the second business case.

Source: Victorian Auditor-General's Office.

Water savings assumptions

The government's decision in 2007 to invest \$1 billion was based on Goulburn-Murray Irrigation District's (GMID) estimated annual water losses of about 900 GL. It estimated that wholesale refurbishment and reconfiguration of irrigation systems could save 450 GL each year.

These figures were largely unsubstantiated at the time the project was approved. The submission to Cabinet in June 2007 noted that limited work had been done to confirm the cost estimates or the projected water savings, and also that there was limited data available on the effectiveness of modernisation to achieve the level of water savings.

The original estimated loss of 900 GL reflected the losses for the whole of the GMID. This was potentially misleading, given the Central Goulburn 1234 and Shepparton irrigation districts, which had their own irrigation efficiency projects, were initially included in the FMP proposal, and later excluded. Greater transparency around system losses would have been achieved had the losses for these projects been excluded.

DSE and the Northern Victoria Irrigation Renewal Project (NVIRP)—the state owned enterprise responsible for the project—undertook additional progressive testing of the water loss assumptions as part of the business case development for stage one. This approach recognised the need to apply adaptive processes as better information became available during the implementation stages.

For the area related to the FMP, the best estimate of potential losses is now 632 GL—nearly 270 GL less than the estimates that were used to justify the project. With probable reductions in inflows and allocations due to climate change, which was not considered in the modelling, future losses may be lower still.

The water savings target of 425 GL for stages one to two of the FMP have not been changed to reflect the new loss data. Given there is less water available to make savings from, there is less certainty about whether the savings are achievable. This is particularly so if dry conditions reduce inflows.

Costs and benefits

While the FMP business case considered the costs and benefits for the project, the analysis was cursory and inadequate for a proposal of this size. The business case notes that the analysis is preliminary.

Three benefits were identified in the cost-benefit analysis:

- the value of the water saved
- the broader economic benefit to the irrigators
- the benefits to the Victorian economy and the environment.

The analysis compares the net present value of water savings, estimated at \$1 602 million, with project costs of \$768 million. Figure 2C shows results of the cost-benefit analysis undertaken for the FMP business case.

Figure 2C
Cost-benefit analysis—Foodbowl Modernisation Program

Cost-benefit analysis	(\$mil)
NPV of water saving benefits at 6 per cent	1 602
NPV of project cost at 6 per cent	768
Benefit-cost ratio	2.1

Source: Victorian Auditor-General's Office from data provided by Northern Victoria Irrigation Renewal Project.

A BCR of 2.1:1 suggests the proposal benefits outweigh the costs, although without greater detail the robustness of this assessment cannot be assured. The cost-benefit analysis was not sensitivity tested and does not articulate or reference the assumptions behind the analysis. It cannot be appropriately scrutinised as there is not enough detail and there are no assumptions.

In April 2010, NVIRP provided us with a new cost-benefit analysis for stage one of the FMP. NVIRP undertook the new analysis, titled *Stage 1 Cost-Benefit Analysis: Northern Victoria Irrigation Renewal Project*, as part of its business case development for stage two of the project.

Given the point in time during the conduct of the audit that NVIRP provided us with the new cost-benefit analysis, we have not had the opportunity to assess the analysis. Figure 2D shows that the net present value of the project is \$1.37 billion, with a benefit-cost ratio of 2.65:1. It also compares the costs and benefits with earlier assessments. As with the 2009 cost-benefit analysis, this analysis suggests that the benefits continue to outweigh the costs.

Figure 2D
Revised cost-benefit analysis—Foodbowl Modernisation Program

	August 2008 (\$mil)	June 2009 (\$mil)	April 2010 (\$mil)
Present value benefits	1 602	1 602	2 202
Present value costs	888	768	830
Net present value	714	834	1 372
Benefit-cost ratio	1.8	2.1	2.7

Source: Victorian Auditor-General's Office from data provided by Northern Victoria Irrigation Renewal Project.

The business case for the Sugarloaf Pipeline also included only a preliminary financial analysis, using a 'triple bottom line' framework and multi-criteria analysis to determine the benefits. While this is an acknowledged approach, it also has several limitations that should be highlighted when used. These limitations include the lack of a uniform set of principles and an established theoretical framework. This can lead to the application of different criteria and ranking methods, resulting in subjective judgments.

The financial analysis considered four options. Two options were to do nothing, assuming rainfall will occur in line with the last 10 years (option one, which was the base case) and with the last three years (option two). The other two options considered two routes for the pipeline: the Melba Highway (option three) and the Hume Highway (option four).

Melbourne Water selected a scoring range of -4 to +4, where the option with the highest score indicates the preferred option. The options and their scores are shown in Figure 2E.

Figure 2E
Triple Bottom Line assessment summary—10-year record

Criteria	Sub-weighting	Option 1 Do nothing (10-year record)	Option 2 Do nothing (3-year record)	Option 3 Melba Highway route	Option 4 Hume Highway route
Economic/Financial	40%	0	−0.4	−0.5	−0.8
Environmental	30%	0	−0.36	−0.345	−0.525
Social	30%	0	−0.75	0.375	0.285
Total score	100%	0	−1.51	−0.44	−0.995

Source: Victorian Auditor-General's Office from data provided by Melbourne Water.

Each of the non-base case options—two, three and four—scored less favourably than the 10-year rainfall scenario, indicating the project costs outweighed the benefits. While the business case notes that options three and four scored better compared with the 3-year rainfall scenario, there is no analysis for this scenario.

The proposed project had no sensitivity testing. The business case notes that 'a +/- 25 per cent sensitivity analysis of options three and four would not be expected to alter the ranking due to the clear difference in score between options 3 and 4'.

Recommendation

- 1 The Department of Sustainability and Environment should:
 - develop processes and quality assurance mechanisms for the planning of major investments so that future investment decisions are appropriately informed and considered, consistent with mandatory guidance
 - develop an approach to cost-benefit analysis that demonstrates consistency and enables comparisons over time.

3 Managing irrigation efficiency projects

At a glance

Background

Modernising Victoria's irrigation infrastructure is a complex task. It includes re-lining irrigation channels to reduce leaks, installing automated gates along the channels to better control water flows and replacing a large number of manual water meters with automated ones. This requires competent project management so that intended outcomes are realised in a timely way.

Findings

- There was limited management information to provide the requisite assurance about how these projects are progressing and to what extent they have met or are meeting their intended outcomes. This was exacerbated by the lack of centralised project status information.
- Poor documentation, particularly within the Department of Sustainability and Environment, limited their ability to assess the achievement of intended outcomes.
- While the projects have generally progressed as planned against their time frames for completion, in some instances the costs of the projects exceeded the planned costs, expected water savings had not been achieved and the effectiveness of the modernisation was uncertain.
- A new water savings protocol was developed in June 2009 to assess savings from the irrigation modernisation projects. The protocol and its technical manual are comprehensive and reflect better practice.

Recommendations

The Department of Sustainability and Environment should:

- better document decisions and project information, with particular emphasis on demonstrating outcomes
- routinely report publicly on the status of projects, including time, cost, quality and achievement of water savings.

The Department of Sustainability and Environment and water authorities should produce more comprehensive project status information to provide greater transparency around the status of projects.

3.1 Introduction

Modernising Victoria's irrigation infrastructure is a complex task. It involves a range of works, including re-lining irrigation channels to reduce leaks, installing automated gates along the channels to better control water flows and replacing a large number of manual water meters with automated ones.

Much of the modernisation work occurs over a short period and generally during a few winter months when the irrigation system is shut down. This not only extends the duration of projects, but also requires effective project management so that intended outcomes are realised in a timely way. This requires robust planning—not just in project management but also at project conception—to maximise the chances that expectations will be met.

The audit examined how well water authorities had managed irrigation modernisation, and whether the projects had achieved their intended outcomes. The audit also examined whether water authorities had robust methods in place to determine whether the primary outcome, water savings, could be reliably assessed.

3.2 Conclusion

Most projects have progressed well against their planned time frames. However, costs and water savings have often not been met or are uncertain, and project scopes have been repeatedly revised. Some elements of the projects have also experienced issues with the automation technology, highlighting one of the consequences that can arise from a lack of rigour in planning these projects, and failing to address unresolved issues from the pilot project.

A comprehensive water savings protocol has recently been developed to assess water savings from the modernisation projects. Independent audits should help the Department of Sustainability and Environment (DSE) and the water authorities to accurately assess the amount of saved water.

Poor documentation, particularly within DSE, is ongoing and needs to be resolved quickly, because it limits DSE's ability to assess what results it has achieved.

3.3 Project management

This section examines the management of the Central Goulburn 1234 (CG1234), Shepparton and Macalister irrigation modernisation projects. They were expected to be either finished or nearly finished at the time of this audit. This section also comments on the pilot project in the Central Goulburn number two channel (CG2); the genesis of the other three projects. This review focused on time, cost and quality, and whether the projects had achieved or were achieving their intended outcomes.

There was limited detailed information to enable the management of these projects to be assessed, including how the projects are progressing and to what extent they have met, or are meeting, their intended outcomes. This was exacerbated by the lack of centralised project status information; a significant deficiency given the large number of stakeholders involved, and the high-risk and high-value nature of the projects. Combined with the repeated revisions to scope, and a lack of detailed information in business cases and funding deeds, it was difficult to determine the intended and final outcomes, particularly for water savings.

A monthly reporting template is designed to provide DSE with details including:

- project funding and expenditure
- status of works completed, against the milestone
- approved, revised and actual completion dates
- variations and notes on progress.

However, there are no status reports and no completed reports.

From the information provided, the three projects have generally progressed as planned against their time frames for completion. The CG1234 and Shepparton projects have been completed, while the Macalister's final stage is due for completion in late 2010. In some instances the costs of the projects exceeded the planned costs, expected water savings had not been achieved and the effectiveness of the modernisation was uncertain.

Figure 3A summarises the cost and water savings outcomes from the business cases and funding deeds for the three main projects. The lack of clarity around some of these figures highlights the difficulties presented by the lack of centralised reporting. CG2 has been excluded from the summary as it did not have water savings as a primary aim.

Figure 3A
Summary of intended and estimated project outcomes

Project	Intended cost (\$mil)	Estimated cost (\$mil)	Variance (%)	Intended savings (GL)	Estimated savings (GL)	Variance (%)	Intended cost/ML (\$)	Estimated cost /ML (\$)
CG1–4 stage 1	17.9	17.3	–3.4	^(f) 4.8	5.7	16.0	3 729	3 035
CG1–4 stages 2–3	^(e) 25.5	32.5	27.5	13.2	10.7	–19.0	1 931	3 037
Shepparton stages 1–2	148.0	140.7	–4.9	^(a) 52.3	52.1	–0.3	2 830	2 700
Macalister stages 1–2	^(b) 7.5	^(c) 7.9	5.0	5.0	^(c) 5.0	0.0	1 500	^(c) 1 580
Macalister stages 3–6	20.0	^(d) Unknown	n.a.	10.0	^(c) 10.0	0.0	2 000	^(c) 2 000

(a) These figures are based on the business cases and have not been adjusted to reflect the water savings guidelines.

(b) Stage 1 had an actual cost of \$1.1 million, while the stage 2 intended cost was up to \$6.4 million.

(c) Based on information that DSE provided.

(d) These stages of the project are not complete and the actual cost/water savings are not yet known.

(e) Based on revised costs for stages two and three.

(f) Based on information that GMW provided. The business case did not identify the amount of water to save for this stage of the project.

Note: n.a.—not applicable.

Source: Victorian Auditor-General's Office.

3.3.1 Central Goulburn 2 project

The CG2 project was a pilot study of proprietary channel automation technology. Initiated by a commercial entity in 2002, it later included Goulburn-Murray Water (GMW) and DSE. The pilot project was expected to show benefits like:

- improved customer service
- water savings
- productivity savings
- improved occupational health and safety.

The Pilot Management Board evaluated the pilot. The board comprised the three parties involved in the project. The absence of an independent evaluation is a deficiency in the project governance.

The Pilot Management Board's *Report of Findings* noted that it failed to fully meet several of the 16 project objectives, although the report does not verify the claims against any of the objectives. Objectives not fully achieved include:

- gathering enough information to plan for possibly acquiring and installing channel automation later in other channel systems within GMW
- gathering enough information from the pilot to plan how possible water savings from such later work could add to environmental flows

- estimating the volume of water savings from such later work that could add to environmental flows
- providing information and reporting on the benefits of the channel automation technology, including the economic value to affected water users and/or GMW.

One objective was not achieved. This was to fully test the differences in operating range for channels under different downstream controls.

Despite several issues being identified, many had not been resolved four years after the pilot. These issues, identified in GMW's *CG2 Resolution of Outstanding Issues Final Report*, included:

- channel operating height
- accuracy of measurement
- consultation expectations not met
- integration of new assets into old channels, resulting in leaks
- inflexibility of the system, with a lack of control, scheduling issues, and a non-user friendly system
- no choice in outlet type, with expensive outlets installed for customers with small entitlements.

No evidence was provided to show that these issues have since been resolved. Despite this, the government approved three projects using the same technology between 2004 and 2008.

3.3.2 Central Goulburn 1234 project

The Central Goulburn 1234 project involved modernisation of channels one to four of the Central Goulburn irrigation area. Conducted over three stages and with intended costs of \$45.6 million, the project was expected to achieve water savings of around 31.5 GL through channel automation (stage one); channel remediation (stage two); and meter replacement (stage three). This represented a cost per megalitre saved of \$2 821 for all three stages.

Limited information was available on the intended outcomes for this project and how GMW was going to achieve those outcomes. The business case provided only high-level information on what works were to be undertaken and when they were to be completed. For example, there was no detailed timeline included, and for stages one and two, the intended works needed to be deduced from information about capital costs. No timing was provided for stage three and water savings were not detailed for each stage when the project was approved in 2004.

Following the completion of stage one, GMW transferred responsibility for stages two and three to FutureFlow, the alliance partner engaged to modernise the Shepparton irrigation area. At the time of the transfer, the funding arrangements and expected outcomes were revised following the availability of more accurate data and correcting flawed assumptions within the original business case. The revisions reduced the costs for these stages from \$27.6 million to \$25.5 million, with a reduction in the expected water savings. The revised stages show that:

- stage two was expected to generate around 2.8 GL, for \$11.3 million
- stage three was expected to generate around 10.4 GL of water savings, for \$14.2 million
- all water from these stages was to be used for the short-term augmentation of Melbourne's water supplies for the 2010–11 year.

Achieving project outcomes

Whether actual outcomes for stage one of the Central Goulburn 1234 project, in terms of cost and water savings, have been achieved is unclear. Information about the project status, progress or completion is contained in disparate documents. There were no documents that clearly documented and detailed this information.

Audit analysis is that stage one of the Central Goulburn 1234 project was completed in 2006 at a cost of \$17.3 million, which was \$600 000 less than the project budget. The stage also generated savings of around 5.7 GL. This represents a cost per megalitre saved of \$3 035. However, there is no evidence that shows the amount of water this stage was intended to save. In addition, there is no independent verification of the accuracy of the water savings.

In relation to stages two to three of the Central Goulburn 1234 project, the project under-delivered on the original scope in terms of works undertaken, and exceeded project costs by around \$7 million. Specifically, 9.2 kilometres less channel rehabilitation was undertaken—22 per cent less than expected, with an under-spend for this component of \$600 000. While all the 885 water meters were installed as planned, costs for this component increased by around \$12 million to \$26 million, or 84 per cent. The reasons for the increase are cited in the findings regarding the Shepparton project, which were also applicable for stages two and three of the Central Goulburn project.

DSE estimates that for stages two to three, around 10.7 GL of water has been saved, at a cost of \$32.5 million. The cost per megalitre for this stage was around \$3 037. When combined with the outcomes from stage one, the whole of the Central Goulburn 1234 project is estimated to have saved around 16.4 GL of water at a cost of \$49.8 million—\$4.3 million more than the original estimate, albeit with a reduced scope. This represents a cost per megalitre of \$3 037.

Effectiveness of the asset solution

Apart from assessing water savings, limited other work had been undertaken to determine the effectiveness of the modernisation works, in terms of improved irrigation efficiency and service needs. The draft July 2009 value-for-money report indicated that irrigators were surveyed to determine whether the modernisation has improved service levels, including obtaining their views on whether:

- new meters have made irrigating more efficient
- flow rates have improved
- less water is used to irrigate
- meters open and close at the requested times
- automation has impacted adversely on irrigation requirements.

No survey responses were in the report, but were to be included in later reports. The surveys of user experiences were not undertaken as FutureFlow considered the results would be subjective and difficult to draw conclusions from. Instead, they are using system data to determine effectiveness.

We also found that a key element of modernisation—reducing water ordering times for irrigators—had not yet been achieved. The value-for-money report notes that this was due to complications associated with operating the irrigation system with low water allocations. Reduced ordering times will not be implemented until allocations improve.

3.3.3 Shepparton project

The Shepparton project involves modernising the Shepparton irrigation area through a combination of channel automation; reconfiguration and rationalisation; gravity and pressurised pipes; and meter replacement.

The project consists of two stages: stage one, conducted between December 2007 and December 2008, involved automating the major channels, replacing meters and reconfiguring. Stage two, conducted between January and December 2009, involves the completion of the remaining stage one project elements, reflecting the staged approach undertaken.

The total project cost, identified in the funding deed, was \$188.2 million. This included \$34.6 million of avoided costs and service costs—costs incurred by customers for improved service. The actual external project funding was \$153.6 million. However, the final funding provided for the Shepparton project was \$148 million, reflecting an increase in the avoided and service costs after the funding deed was signed.

With expected water savings for the Shepparton project of 52.3 GL, the project cost represented a cost per megalitre saved of \$2 830. Around 12 GL of this savings was to be allocated to augment Melbourne's water supplies until 2011–12.

Project scoping

At the request of the GMW board and the project review group, FutureFlow revised the Shepparton project's scope in June 2009. The revision removed the pressurised pipeline from the project, with a view to including it in the stage two business case for the Foodbowl Modernisation Project, which is being developed. Upon commencement of the project alliance in 2008, FutureFlow reviewed the original scope and they found that to implement the intended scope would cost \$61 million more than originally planned.

The draft value-for-money report that the project alliance completed in July 2009 noted the following reasons for the project cost increase, which also applied to stages two to three of the Central Goulburn project:

- a requirement to adopt Northern Victoria Irrigation Renewal Project's metering principles in relation to meter selection and enhancement lead to a 60 percent cost increase in comparison to the business case assumptions
- there were omissions and wrong assumptions in the original business cases including:
 - no allowance for customer consultation, farm irrigation assessments and decommissioning of meters
 - insufficient allowance for additional meter costs
 - under-costing of meters
 - failure to recognise the step change required to manage the logistics of the program
 - non-specific factors, such as CPI increases and contingencies.

Consequently, FutureFlow reduced the scope of the project to meet the pre-existing budget, rather than seek additional funding. One of the more significant scope changes was the removal of the pressurised pipeline in the Shepparton East area. DSE's advice to the Minister for Water was that there was no guarantee that the pipeline cost could be contained, and that the project had the potential to significantly exceed its budget if all the planned works were undertaken. The removal of the pressurised pipeline reduced the project cost by \$39.1 million, with a reduction in water savings of around 4 GL.

Achieving project outcomes

The status reports for the Shepparton project were detailed and provided adequate information to assess the status of the project. In addition, draft value-for-money reports were developed by FutureFlow in July 2009 and March 2010. These reports, while not designed to keep investors informed of the project's status on an ongoing basis, provide detailed evidence of project outcomes.

The Shepparton project has been completed. The project achieved its intended water savings and was under budget, although this was largely due to reductions in scope. We were unable to assess the timeliness of this project, as the business case did not establish a time frame for completion.

The project alliance's draft 2010 value-for-money report notes, at a high-level, that the project's cost for the works completed to date was \$140.7 million, with actual water savings of 52.1 GL. This represents a cost per megalitre of around \$2 700 and is consistent with the expected cost per megalitre.

3.3.4 Macalister project

The Macalister project involves targeted modernisation of irrigation systems within the Macalister Irrigation District. It aims to achieve water savings, primarily through the use of channel automation, to improve environmental flows to both the Macalister and Thomson Rivers. In addition, the project aims to:

- reduce outfalls from the irrigation drains, thereby reducing by three tonnes the annual nutrient exports to the Gippsland Lakes
- provide improved supply service to the irrigation customers.

While the original business case proposed undertaking the project in two stages, this was ultimately revised and the project was divided into six stages. Figure 3B shows the proposed scope, cost and estimated water savings for each of the stages.

Figure 3B
Proposed scope, costs and water savings, stages 1–6

Stage	Scope	Cost (\$mil)	Water savings (GL)
1	Measurement and pilot on Valencia Ck	^(a) 1.1	1.8
2	Targeted automation	6.4	3.2
3	Outfall measurement	1.4	0.0
4	Off-take and system measurement	3.2	2.0
5	Targeted automation	7.9	0.0
6	Targeted automation	7.5	^(b) 8.0
Total		27.5	15.0

Notes: (a) This is the actual cost for this stage.

(b) This includes water savings for stage 4.

Source: Victorian Auditor-General's Office.

The total funding for the project is \$27.5 million, of which \$20 million—funded by the Commonwealth Government—is for stages three to six. With expected savings of around 15 GL, this represents an expected cost of around \$1 833 per megalitre.

Achieving project outcomes

While reporting against outcomes occurred for this project, it lacked sufficient detail to obtain a clear assessment of progress and obtain adequate assurance. In particular, there is no detailed analysis of performance against scope, time and water savings.

For example, when reporting against scope, budget, construction program and quality, technology implementation and the implementation schedule, it reports only that there was 'no deviation'. Reporting on a 'by exception' basis, such as this, limits both transparency and accountability.

Project costs were revised on several occasions, although it is not clear from the documentation the reasons for the revisions or whether the project scope had also changed. The revised cost of \$25.3 million, down from \$27.5 million, is likely to be met, based on analysis of the cost information that Southern Rural Water (SRW) provided. DSE advised that 5 GL of water from stages one and two was released as environmental flows in autumn/winter 2009, with a further 5 GL expected to be released in April/June 2010. There was no evidence that the environmental release was achieved through water savings. In addition to water balance assessments undertaken during the project for irrigation outfalls, SRW has recently appointed an independent auditor to verify the water savings from this project.

3.4 Assessing water savings

Given the high-level of investment in saving water in irrigation systems, it is important that the outcomes, in the form of water savings, are assessed accurately and promptly. Equally important is that the method of assessment is robust and the outcomes are independently verified. This will help not only to inform whether the investment represents value-for-money by achieving the expected savings, but can also help to inform the assumptions used in the planning of future projects. In addition, it can help to develop community confidence in these projects.

The three irrigation projects—Central Goulburn 1234, Shepparton and Macalister—did not have methods established for assessing project water savings when they were approved. It was unclear how water savings for these projects were to be consistently measured.

In June 2009, DSE published a protocol to guide the assessment of water savings. The protocol has been applied retroactively to the earlier projects and will be applied prospectively to these and other irrigation modernisation projects.

The water savings protocol and accompanying technical manual are comprehensive and reflect better practice. The protocol:

- specifies a reliable and repeatable process and methods to estimate water savings from irrigation modernisation projects
- provides the best estimate of water savings for inclusion in economic assessments of investments in irrigation modernisation projects
- establishes a transparent process, which can be readily audited and reported on to enable actual water savings to be converted to entitlements at an appropriate time.

An independent auditor is assessing water savings using the new protocol. In November 2009, the auditor published the results of the first audit of the Central Goulburn 1234 and Shepparton projects. The audit, which focused on savings for the period between 1 March 2009 and 15 May 2009, shows that around 4.2 GL was saved during this period, generally in accordance with expectations. There was no evidence of audits to verify water savings before 1 March 2009.

Recommendations

- 2 The Department of Sustainability should:
 - better document decisions and project information, with particular emphasis on demonstrating outcomes.
 - routinely report publicly on the status of projects, including time, cost, quality and achievement of water savings.
 - 3 The Department of Sustainability and Environment and water authorities should produce more comprehensive project status information to provide greater transparency around the status of projects.
-

Appendix A.

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 was provided to the Department of Sustainability and Environment, Goulburn-Murray Water, Southern Rural Water, Melbourne Water and the Northern Victoria Irrigation Renewal Project 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 Department of Sustainability and Environment



Department of Sustainability and Environment

Ref: SEC006732
File: CS/36/3067

PO Box 500
East Melbourne Victoria 8002
Telephone: (03) 9637 8000
Facsimile: (03) 9637 8100
www.dse.vic.gov.au
DX 210098

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

Dear Mr Pearson

PROPOSED AUDIT REPORT - IRRIGATION EFFICIENCY PROGRAMS

Thank you for your report "Irrigation Efficiency Programs", which examined the planning, project management and outcomes for the Central Goulburn 1234 Channel Automation Project, Shepparton Irrigation Area Modernisation Project and the Macalister Channel Automation Project, as well as the planning for the Northern Victorian Irrigation Renewal Project (NVIRP) and the Sugarloaf Pipeline.

I note your finding that the projects examined have generally progressed as planned.

The Department of Sustainability and Environment (DSE) accepts the audit recommendations and has already implemented a number of changes, including public reporting on the achievement of water savings.

The report acknowledges the commitment by the Victorian Government to increase the efficiency of irrigation systems to better meet the needs of irrigators. It is important to note that the objective of improving irrigation efficiency is part of a broader commitment by the Government to not only create a high-value sustainable irrigation industry, but to secure more water for the environment, irrigators and the broader community.

By way of background DSE and relevant water authorities spent considerable time assessing and exhausting all options for water savings projects. The most promising of these options were developed into business cases. These studies provided the basis for ongoing investigations and refinement of water efficiency programs.

The knowledge gained assisted in the timely development of the NVIRP and the Sugarloaf Pipeline projects, in response to unprecedented dry conditions and the resultant stress on both water supplies and the environment.

The report creates a distinction between 'asset' and 'non-asset' solutions and suggests that insufficient consideration was given to the latter.

Privacy Statement

Any personal information about you or a third party in your correspondence will be protected under the provisions of the **Information Privacy Act 2000**. It will only be used or disclosed to appropriate Ministerial, Statutory Authority, or departmental staff in regard to the purpose for which it was provided, unless required or authorised by law. Enquiries about access to information about you held by the Department should be directed to the Manager Privacy, Department of Sustainability & Environment, PO Box 500, East Melbourne, 3002.



**RESPONSE provided by Department of Sustainability and Environment –
continued**

First, it should be noted that the Government has implemented a range of ‘non-asset’ reforms that complement the investment program in seeking to meet the objective of a more efficient and sustainable irrigation sector. These include legislated rationalisation processes, unbundling of entitlements to support water trading, sustainable water strategies, independent price regulation and on-farm efficiency programs. Second, the Government’s policy position in relation to water for environment is to invest in infrastructure rather than purchase water on the water market, as is reflected in Victoria’s *Our Water Our Future* White Paper and the *Central Region Sustainable Water Strategy*.

The report makes a number of references to new channel automation technology and the process by which it was selected as the preferred option. It should be noted that Goulburn-Murray Water and DSE trialled innovative technology, developed in Victoria, for automating the operation of irrigation channels and that strategies were put in place to manage the risk of relying on an emerging technology from a single, small supplier.

This included staging the development of projects, initially investing in small-value, stand-alone early works; engaging a probity advisor to provide independent, expert advice on the purchase; commissioning a competitor analysis to identify any viable alternative suppliers which included interviews with water industry experts and representatives of potential alternate suppliers; and using a team of independent experts to examine technology robustness, including field and factory inspections.

The report refers to the measurement of water savings and the likely impacts of climate change on the certainty with which savings will be achieved in the future.

More specifically, the report finds that DSE’s water savings audit and protocol are the best methods to measure savings and that the results to date confirm that the targeted savings are being achieved. The first independent audit of water savings in northern Victoria confirmed that the actual savings for 2008/09 were within one per cent of the estimates. The audit report is publicly available at www.ourwater.vic.gov.au.

In terms of future savings, it should be noted that the impacts of climate change on actual savings is less than proportionate and that the latest approach to measuring actual savings from works undertaken provides more confidence about the savings to be made in the future.

While climate change would reduce water inflows and annual allocations, a significant proportion of losses will continue to occur during dryer periods because even with low allocations the channel network is filled and operated to deliver what little water is available. Consequently, water savings derived from interventions in the channel network, such as lining leaky channels, are somewhat independent of climate change.

The initial estimate of water savings was based on a “top down” assessment, using long-term flow and climatic records. Extensive investigations have since lead to the development of the Water Savings Protocol — a comprehensive “bottom up” methodology

**RESPONSE provided by Department of Sustainability and Environment –
continued**

that estimates cumulative water savings from specific works, such as channel removal, channel automation and meter replacement. The NVIRP Business Case applied this “bottom-up” Protocol and verified that the total forecast water savings are readily achievable.

Yours sincerely

A handwritten signature in black ink, appearing to read 'G. Wilson', with a stylized flourish at the end.

**Greg Wilson
Secretary**

RESPONSE provided by Goulburn-Murray Water



Mr D D R Pearson
Auditor-General
Victorian Auditor Generals Office
Level 24
35 Collins Street
MELBOURNE VICTORIA 3000

27 May 2010

Dear Mr Pearson

Proposed Audit Report – Irrigation Efficiency Programs

Thank you for your letter dated 12 May 2010 regarding your Audit report "Irrigation Efficiency Programs", and the opportunity to provide further comments for inclusion in the report.

The Audit report identifies a range of process improvements that Goulburn-Murray Water will incorporate into existing systems, along with the planning, delivery and reporting improvements that our Alliance partners, contractors and staff continue to identify and deliver. We are pleased that your Audit report acknowledges these continuous improvements, and in particular FutureFlow's status reporting and value-for-money reports. These reporting and tracking processes exceed industry best practice and Goulburn-Murray Water intends to extend this standard to future large scale Goulburn-Murray Water projects.

Goulburn-Murray Water rejects the suggestion of an unduly narrow approach to selecting asset solutions. The Business Cases for the Central Goulburn 1234 and Shepparton Modernisation projects were developed following many years of evaluating water loss mechanisms and remediation techniques. Goulburn-Murray Water had evaluated more than 40 technically feasible water savings initiatives, and assessed 13 as worthy of consideration. It was this underlying knowledge that allowed Goulburn-Murray Water to streamline the development of Business Cases, which have been perceived as narrow in this audit.

We are pleased that your report generally acknowledges that Goulburn-Murray Water modernisation projects have been delivered on time, on budget and in line with their water savings targets. However we do not agree that the decision to revise the projects' scopes detracts from this achievement. We openly acknowledge that the scopes for these projects were adjusted. Both the Shepparton and CG1-4 business cases were conceived well before the Foodbowl Modernisation Project was announced. It was both prudent and sensible for Goulburn-Murray Water to adjust the scope of these projects to appropriately integrate these projects with the much larger FoodBowl Project's principles and service outcomes and to maximise the future operational performance of the entire irrigation system.



ABN: 46 761 336 846
40 Casey Street, PO Box 165, DX 32951, Tatura Victoria 3616 Australia
Telephone (03) 5833 5500 - Facsimile (03) 5833 5501 - reception@g-mwater.com.au - www.g-mwater.com.au

RESPONSE provided by Goulburn-Murray Water – continued

Goulburn-Murray Water established the FutureFlow Alliance to deliver the Central Goulburn 1234 and Shepparton Modernisation projects, and expanded the brief to undertake the Foodbowl Early Works. Under the direction of the Project Review Group, the scopes were adjusted during implementation. For example options to pipeline 20 ML/day channels in the Shepparton Area were removed from the project scope in recognition that the Foodbowl Project's principles proposed significantly different solutions for customers serviced by channels below 50ML/day. The impact of these adjustments on project budgets and savings targets is recognised in your Audit report.

Goulburn-Murray Water's FutureFlow Alliance has delivered its projects ahead of schedule with Practical Completion achieved in February 2010. The Defects Liability Period is currently being served, and all projections show that the projects will be delivered below budget. The ongoing audit processes under the Water Savings Protocol and accompanying Technical Manual which your Audit report recognises as 'comprehensive' will further validate the successful delivery of the water savings targets.

Throughout the audit process, Goulburn-Murray Water provided significant volumes of documentation, however we believe the audit would have benefited from increased communication with the Corporation and the other stakeholders.

There is no doubt that our region's future water security depends on a more efficient water delivery network. As we respond to the challenges of climate change; farmers, communities, water corporations and Governments will continue to make decisions based on the best available information. Audits take place with the benefit of hindsight and inevitably identify opportunities for improvement. The challenge is to make sure we make meaningful improvements that support innovation and successful delivery within this rapidly evolving environment.

I look forward to a closer working relationship with your office on future audits.

Yours sincerely



David Stewart
MANAGING DIRECTOR

RESPONSE provided by Southern Rural Water



24th May 2010

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

**Re: AUDIT ACT 1994, s16(3) - PROPOSED AUDIT REPORT
IRRIGATION EFFICIENCY PROGRAMS**

Dear Mr Pearson

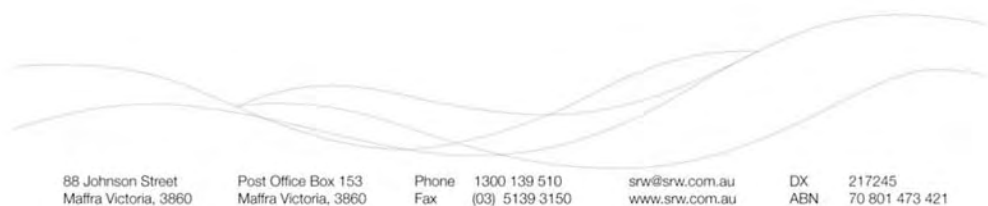
In accordance with Section 16(3) of the Audit Act 1994 please find attached our formal comment on the proposed audit report. The report has focussed on the planning and management of irrigation modernisation programs to achieve intended outcomes.

In reviewing and commenting on the proposed audit report SRW has targeted its comments on areas where we had direct control. That is, the management of the MID Channel Automation Project and specifically project management and the achievement of water savings.

On the matter of project management we disagree that there was a lack of detailed reporting. Our view is that reporting has been to a contemporary project management standard for projects of this size. An active Project Board was in place which included appropriate representatives from the funding authority and received regular reports on each project. Tight project management controls were implemented and the stakeholders were kept up to date with the key project elements of scope, cost, schedule, and risk management.

The governance group also had a strong focus on progress towards meeting the key project objectives of:

- Permanently save water by improving delivery efficiency of the SRW supply system at a reasonable cost
- Improve customer service to support good irrigation practice
- Improved understanding of the system and accountability for irrigation water supply and deliveries
- Ensuring that objectives described above are sustainable.



88 Johnson Street
Maffra Victoria, 3860

Post Office Box 153
Maffra Victoria, 3860

Phone 1300 139 510
Fax (03) 5139 3150

srw@srw.com.au
www.srw.com.au

DX 217245
ABN 70 801 473 421

RESPONSE provided by Southern Rural Water – continued

Water Savings

An independent consultant was engaged to produce an annual water balance report since 2006 to ensure that SRW was tracking on target to achieve the required savings. These reports were provided to the auditors.

SRW has made approximately 6 GL of goodwill environmental releases over the 2008 to 2009 period in association with the local catchment management authority as a result of the annual water balance analysis. In doing this we have based these releases on the estimated water savings and provided real environmental benefits to the Macalister River

Evidence of water savings made has been borne out by a further independent audit by Cardno during 2010 which confirms that the projects have delivered real water savings.

SRW is now planning an additional 5 GL release in 2010 as a result of the Cardno study. These releases are fully supported by our Macalister Customer Consultative Committee demonstrating the confidence SRW and its stakeholders has in the veracity of water savings analysis to date.

In conclusion, SRW believes it has been fully compliant with the requests of the auditor's providing relevant information in a timely manner. Whilst we had anticipated this information would have addressed the concerns raised in preliminary draft report, we still believe that the project control and reporting have been appropriate and that water savings have been suitably assessed and validated. We are unclear what further reporting or water savings analysis could have been undertaken on this project. Our detailed response follows.

We remain open to further discussions and the provision of further information as required.

Yours sincerely



CLINTON RODDA
Managing Director

RESPONSE provided by Southern Rural Water – continued

SRW Response to Performance Audit Irrigation Efficiency Programs
Proposed Audit Report

Achieving Project Outcomes, Page 29

Like the other projects, a lack of detailed reporting meant that we were only able to assess the achievements of outcomes at a high level. In particular we were unable to undertake detailed analysis of performance against scope, time and water savings. This has limited the assurance that we can provide about the project status.

Southern Rural Water is delivering the project through the coordination of internal resources, external design consultants, civil contractors, technology providers, telecommunication, and SCADA specialists. The project is being managed by a dedicated project manager using standard practices for large multi-million dollar projects under a Project Management Plan. These tools enable SRW to manage time, cost, quality, and risk in accordance with the Project Management Body of Knowledge (PMBOK®).

Detailed Project Plans (provided to VAGO) are prepared for each stage of the project and discusses the project governance arrangements. The key to these arrangements is the Project Management Board which comprises representatives from SRW, DSE, DEWHA and the MCCC (the customer representative committee for the Macalister Irrigation District).

The Board meets generally bi-monthly. The SRW Channel Automation Project Manager distributes a detailed project status report for each stage of the project and DSE prepared minutes from the meeting. The reporting is "by exception" and highlights deviations from the Project Plan and upcoming implementation and risk issues if they occur.

The status report is tabled, discussed and are part of the minutes of the meeting - sample status reports were provided with the initial VAGO request and Attachment 1 provides a sample report.

The reports provide the following information:

- Overall project snapshot on status and any deviation from the submitted project plan
- Progress of works for the previous reporting period
- Summary budget report
- Summary of customer service issues
- Detailed project status on:
 - Project construction
 - Project implementation
 - Change or scope status
 - Risk status
- Scheduled milestones and deliverables with a forecast for completion
- Financial statement showing:
 - Detailed period by period expenditure for general account types (SRW and support services, water balance study, channel automation technology, civil contraction contracts, precast contracts) which shows tracking against budget allowance
 - Status of project funding and milestone payment
 - Status of any variations

RESPONSE provided by Southern Rural Water – continued

When read in conjunction with the Project Board minutes these documents provide a clear and accurate picture of project status. To date the various stakeholders in the project have expressed that they are adequately informed on project status and have requested no change to existing project control and reporting documentation.

In addition to the above an annual report is produced (copies were provided to VAGO as part of the original data request) which summarises the project progress in accordance with the Project Delivery Agreement.

The Project Manager also provides regular project updates to the SRW Technical and Environment Committee, and the local consultative committee. During the project implementation period weekly Project Team meetings are conducted between SRW and the technology supplier to monitor progress, customer and staff issues, and to provide a forum to discuss various aspects of the project.

Assessing Water Savings, Page 30

The early irrigation projects – Central Goulburn 1234, Shepparton and Macalister – did not have methods established for assessing project water savings. It was unclear how water savings for these projects were to be consistently measured.

Response for Macalister Project

The Macalister Project was proposed and approved in two stages. The first stage involved establishing a measurement network including all outfalls plus a pilot of the channel automation technology. Following is an extract from the (Memorandum of Understanding) MoU for Stage 1 that demonstrates that the works and the purpose of the works to determine losses before and after the project.

Stage 1

Stage 1 comprises:

- (a) *subject to sub-clause 4.2, installing:*
 - (i) *17 automatic regulators and 11 automatic outfalls at such locations on the Main Northern Channel System as the Project Management Board determines; and*
 - (ii) *6 automatic regulators, 2 automatic outfalls and 12 automatic outlets on the Valencia Creek sub-system, at such locations as the Project Management Board determines; and collecting appropriate data to determine the water used and losses occurring before and after Stage 1 Works are complete;*

Using data from the outfalls collecting after Stage 1 – SRW scoped Stage 2 with the aim of delivering total savings of 5,000 ML to match the agreement intent. The bulk (~90%) of these savings related to reduced channel outfalls using FlumeGates regulators installed in Stage 1 to measure the pre and post project performance. The remainder of the savings related to deemed savings from installing accurate customer service delivery points.

The project funded annual water balance reports conducted by consultant SKM. The purpose of these reports was to provide an independent check on individual outfall volumes and to provide a check at a system scale water balance. The reports

RESPONSE provided by Southern Rural Water – continued

assisted in verifying interim savings to support good-will releases of environmental flows in 2008 (3,000 ML), 2009 (3,000 ML) and 2010 (5,000).

An auditor (Cardno) is in the final stages of verifying the water savings using the Victorian Water saving Protocol. The use of the Protocol has resulted in only very minor changes to the approach. Following are comments on particular aspects:

- No change to project outfall losses (post project value less pre-project value)
- Minor reduction to allow for long-term reduction in performance (durability factor reduces project outfall losses by 5%)
- Minor increase in deeming rate for service point under-recording (8.6% v 5%) based on detailed studies taking after the commencement of the Main Northern project
- Minor increase to allow for deeming leakage rates around service point outlets upgraded
- Minor increase due to deemed reduction in variable channel seepage rates due to channel automation

The adoption of the Protocol overall increased the savings estimate by about 4%.

SRW agrees that the detail of the methodology was omitted in the MoU. However, the methodology of the water savings approach was clear to those involved on the Project Board.

The subsequent agreement (Project Delivery Agreement) for the DEWHA funded project made the methodology more explicit in Schedule 4 as shown in the following extract from the agreement.

Schedule 4 – Water savings calculation principles

The principles for calculating water savings is based on analysis at the System scale. The water balance reports will provide additional detail at sub-system scales within each system. Water savings are based on:

- *Reduced outfall volumes, that is, established outfall volume pre-project less outfall volume post project - both measured by FlumeGate™'s wherever available, accurate measurement or best approximation at the outlets noting this is a deemed saving.*

Verification of the water savings will be achieved by comparing the accumulated direct savings with the overall savings achieved across the target systems. The overall savings for each system are measured by comparing pre-project efficiency with post project efficiency being a measure of delivered volume divided by total inflow into the channel at its offtake.

RESPONSE provided by the Northern Victoria Irrigation Renewal Project



**RESPONSE provided by the Northern Victoria Irrigation Renewal Project –
continued**

NVIRP FORMAL RESPONSE

RESPONSE provided by Chief Executive Officer, NVIRP

It is appreciated that the audit outcomes with respect to the Northern Victoria Irrigation Renewal Project (NVIRP) are substantially focussed on the planning aspects of the project which had its origins in 2007 and not the achievement of outcomes to date or management of the project at the NVIRP entity level. Accordingly a response on the conclusions and commentary associated with the planning aspects is best addressed by the Department of Sustainability and Environment which had carriage for establishing the Food Bowl Modernisation Project as it was then termed.

There are however a number of assertions and conclusions contained in the report outside of the planning aspects which warrant an NVIRP response.

Broader Objectives of the NVIRP Project

The audit report suggests that the singular Government objective for the Food Bowl Modernisation Program (FBMP) was water security. Whilst acknowledging the Government's *Our Water Our Future – The Next Stage of the Government's Water Plan (June 2007)* has as a key focus water security, the Government clearly intended for the project to deliver on a broader range of objectives in confirming its proposed investment. That broader range of objectives were enunciated in the Water Plan:

"This project (FBMP) presents a once-off historic opportunity to ensure the future prosperity of the region through significant new investment in modernising ageing infrastructure to create a genuinely world class irrigation system – a once-in-a-hundred years reform" (page 4).

Irrigation modernisation *"provides an opportunity to improve the level of service to irrigators"* (page 8).

The goals for irrigation reform are an increasingly productive irrigation sector and lower environmental impact. Modernisation of the irrigation sector – to reduce water lost through inefficiency and to improve services to irrigators helps to achieve the goals of increasing productivity and improving results for the environment" (page 26).

It is clear that those broader objectives contained in the *Water Plan* had their genesis in the Government's earlier 2004 White Paper - *Securing Our Water, Our Future Together*. This major water policy statement outlined a clear commitment to increasing irrigation efficiency across the state by 25% and to developing a financially viable and sustainable irrigation system which included upgrading and rationalising irrigation distribution systems, both key features of the NVIRP project.

As suggested in section 1.3 of the audit report, modernisation projects have been initiated which include works designed to deliver on the broader objectives.

The singular focus on water savings as a security measure undervalues the wider range of objectives associated with the FBMP.

It is also worth observing that the Commonwealth in promoting its \$12.9 billion *Water for the Future* plan has contended that the investment in irrigation infrastructure sets a framework to help farmers, strengthen regional communities and protect food security.

**RESPONSE provided by the Northern Victoria Irrigation Renewal Project –
continued**

Water savings

The audit report offers the view that the achievement of the Government's water savings target of 425 GL in Long Term Cap Equivalent (LTCE) terms is less certain than at the time the decision was made to commit to the project. The report also notes that the Government has not changed its water savings target of 425 GL for Stages 1 and 2 of the project.

Audit's views are premised on the losses applicable to the NVIRP project area, rather than the Goulburn Murray Irrigation District (GMID) as a whole and the potential impacts of climate change.

On the point concerning the coverage of the NVIRP project the audit report indicates that *"For the area related to the FMP, the best estimate of potential losses is now 632 GL..."* This could lead the reader to assume that NVIRP will be restricted to achieving 425 GL in water savings from its existing footprint (632 GL in total losses), that is it excludes the Shepparton and Central Goulburn 1 to 4 areas. This is not the position as NVIRP is proposing through targeted works and rationalisation to capture losses in Stage 2 across the GMID in total.

Notwithstanding a potential reduction in total losses as a result of climate change, fixed losses such as seepage and leakage around meters and channels remain constant while channels are charged with water. Losses such as outfalls and meter error are variable and dependant on the volume of water delivered to customers. The volume of fixed losses will remain the same regardless of the impacts of climate change unless NVIRP intervenes to reduce these losses. If the volume of irrigation deliveries decreases as a result of climate change, the proportion of fixed losses relative to the proportion of variable losses will increase.

On the question of reducing losses, audit's attention has been drawn to the presentation made on 21 August 2009 to the Legislative Council Standing Committee on Finance and Public Administration by Goulburn- Murray Water, operator of the GMID. The transcript of those proceedings provides an important fact on the losses experienced within the GMID over the past 16 years:

"Over the past 16 years which has included 6 years of extreme drought the channel distribution losses have averaged 721,000 megalitres" (page 21).

"The key point is that across this period (16 years) the losses have dropped below 500,000 ML twice but the deliveries have been more variable than the losses." (page 21).

NVIRP remains confident that the 425 GL in average annual water savings for Stages 1 and 2 remains achievable and is committed to that outcome. It is of note that the independent water savings auditor confirmed in the first of such reports that will be delivered on the project that NVIRP had achieved in respect to the 2008/09 works a water savings outcome of 28.2 GL (LTCE) which puts NVIRP on track to achieve the 225 GL (LTCE) target for Stage 1.

The report (Audit Summary) also indicates that there has been a lack of robustness in the NVIRP Business Case with regard to the calculation of water savings in particular stating *".. information to support the basis for water savings assumptions was lacking"*.

The Stage 1 Business Case which was provided for review at the commencement of the audit process in August 2009 addresses in considerable detail the water savings assumptions. That detail incorporated a dedicated chapter on water savings, two detailed expert reports (200+ pages) and an analysis of water savings to be targeted by the modernisation works (automation, remediation and rationalisation).

RESPONSE provided by the Northern Victoria Irrigation Renewal Project – continued

Business Case – lack of rigour

Audits comment that the cost benefit analysis contained in the business case was preliminary is acknowledged, however, NVIRP refutes the broad assertion that evidentiary rigour appropriate to the risk and cost of the project was lacking in the NVIRP business case.

It is accepted that channel automation technology was adopted as the proposed solution for automation aspects of the project, however this needs to be considered alongside the context that a very significant aspect of the project relates to the connections program which is concerned with rationalisation of the irrigation infrastructure and decommissioning of redundant assets and remediation works not involving channel automation technology.

The business case, which was prepared in close consultation with and to the requirements of the Departments of Sustainability and Environment and Treasury and Finance, contained substantial analysis, policy discussion and expert analysis to support the proposition of achieving up to 225 GL in water savings for the \$1 billion Stage 1 budget. This was in addition to a number of value engineering exercises which were undertaken and benchmarking to the Early Works and FutureFlow costs. Considerable analysis was also given to the oncosts/overheads and risk factors including assessment of inherent risk and contingent risk. The business case was also informed by the Whole of Life analysis undertaken by G-MW.

Works approvals

The Audit Summary of the report states:

“The timeliness of the development of the business cases was also an issue for most projects, with instances of project works starting before the final business case was actually approved”

The report at section 2.4 also states:

“However, in August 2008, the government had committed to developing tender documentation and engaging a managing contractor for the project, meaning that the approval for procurement occurred before approval of the final business case”

Figure 2B in section 2.4 of the report also suggests no approvals relating to the project were forthcoming in the period between August 2008 and June 2009.

That conclusion suggests that from the August 2008 Business Case decision point until the Business Case in June 2009 no further analysis had been undertaken by NVIRP to support key decisions for which Government approvals were necessary. That is not correct.

As advised to audit, at the decision point in August 2008 Government sought from NVIRP further immediate development of the principal elements of the NVIRP project. NVIRP subsequently developed in consultation with the key central agencies two significant work packages, those being Backbone Automation and Metering and Connections. These work packages were approved by Government in October 2008 and December 2008 respectively. Whilst it is acknowledged that preparatory work had commenced on a procurement structure in the form of a Managing Contractor this was of a necessity so as to ensure a 2009 winter works program was achievable. It was only after the Automation and Metering package had been considered and agreed to by Government in October 2008 that NVIRP was given approval to finalise tendering arrangements for a Managing Contractor.

**RESPONSE provided by the Northern Victoria Irrigation Renewal Project –
continued**

Channel automation technology

The report with respect to channel automation technology conveys the impression that no precedent was available on which to draw in respect to introducing channel automation technology as a means of achieving, water savings, operator efficiencies and improved levels of service to irrigators.

Coleambally Irrigation Co-operative Limited (CICL) in central western NSW was the first water corporation within Australia to extensively introduce channel automation technology as an integral part of its irrigation water delivery function. The competitor analysis commissioned by DSE in November 2004 to assess competing channel automation technologies, and which is referenced in the audit report, identified CICL as the biggest customer for the relevant technology then under consideration by Victoria.

Whilst the Coleambally water supply district area is not of the scale of the Goulburn Murray Irrigation District its water delivery services (water entitlement of approximately 620 GL and average metered usage of around 350 GL) provided a very relevant benchmark to understanding the impact of water savings technologies introduced into the Coleambally district and resulting efficiencies.

The achievement of 90% distribution efficiency was largely as a result of the investment and implementation of channel automation technology across the entire channel network and avoiding unplanned outfalls. Water savings in the order of 80 GL per annum have been realised.

During my term as Chief Executive Officer of CICL a number of delegations were received from Victoria principally water agencies and GMID customer groups with follow ups in relation to the operation and performance of the technology.

General

Final points of clarification are also required as to broader conclusions identified in the audit and level of consultation that has occurred with NVIRP.

It is acknowledged that a statement is made in the Audit Summary that the audit did not encompass outcomes for the Food Bowl Modernisation Project. However, the report in other parts is less than clear on this point where assertions are made about issues such as project management and assessing outcomes.

NVIRP at the request of VAGO met in August 2009 with VAGO's appointed consultants assisting with the audit. That meeting which was of some two hours duration was followed up by NVIRP providing all of the documentation requested by the consultants at the meeting including the NVIRP Stage 1 Business Case. Since that meeting in August 2009 there had been no subsequent meetings, requests for clarification or attempts to gain a better understanding of the business case elements or of the project itself. NVIRP believes audit may have been assisted in gaining a more thorough understanding of the project by further engagement. NVIRP looks forward to an increased level of engagement on future audits.

Auditor-General's reports

Reports tabled during 2009–10

Report title	Date tabled
Local Government: Results of the 2008–09 Audits (2009–10:1)	November 2009
Public Hospitals: Results of the 2008–09 Audits (2009–10:2)	November 2009
Towards a 'smart grid'— <i>the roll-out of Advanced Metering Infrastructure</i> (2009–10:3)	November 2009
Responding to Mental Health Crises in the Community (2009–10:4)	November 2009
Management of the Community Support Fund (2009–10:5)	November 2009
Auditor-General's Report on the Annual Financial Report of the State of Victoria, 2008–2009 (2009–10:6)	November 2009
Water Entities: Results of the 2008–09 Audits (2009–10:7)	November 2009
Maintaining the Integrity and Confidentiality of Personal Information (2009–10:8)	November 2009
Vehicle Fleet Management (2009–10:9)	November 2009
Managing Offenders on Community Corrections Orders (2009–10:10)	November 2009
Portfolio Departments and Associated Entities: Results of the 2008–09 Audits (2009–10:11)	December 2009
Making Public Transport More Accessible for People Who Face Mobility Challenges (2009–10:12)	December 2009
Use of Development Contributions by Local Government (2009–10:13)	December 2009
The Effectiveness of Student Wellbeing Programs and Services (2009–10:14)	February 2010
Tendering and Contracting in Local Government (2009–10:15)	February 2010
Management of Concessions by the Department of Human Services (2009–10:16)	February 2010
Irrigation Water Stores: Lake Mokoan and Tarago Reservoir (2009–10:17)	March 2010
Management of Safety Risks at Level Crossings (2009–10:18)	March 2010
Fees and Charges—cost recovery by local government (2009–10:19)	April 2010
Performance Reporting by Departments (2009–10:20)	May 2010
Tertiary Education and Other Entities: Results of the 2009 Audits (2009–10:21)	May 2010

Auditor-General's reports

Reports tabled during 2009–10

Report title	Date tabled
Managing Teacher Performance in Government Schools (2009–10:22)	May 2010
Control of Invasive Plants and Animals in Victoria's Parks (2009–10:23)	May 2010
Partnering with the Community Sector in Human Services and Health (2009–10:24)	May 2010
The Community Building Initiative (2009–10:25)	May 2010
Administration of the Victorian Certificate of Education (2009–10:26)	June 2010
Hazardous Waste Management (2009–10:27)	June 2010
Personal Safety and Security on the Metropolitan Train System (2009–10:28)	June 2010

VAGO's website at <www.audit.vic.gov.au> contains a comprehensive list of all reports issued by the Office. The full text of the reports issued is available at the website.

VAGO

Victorian Auditor-General's Office
Auditing in the Public Interest

Availability of reports

Copies of all reports issued by the Victorian Auditor-General's Office are available from:

- Information Victoria Bookshop
505 Little Collins Street
Melbourne Vic. 3000
AUSTRALIA

Phone: 1300 366 356 (local call cost)
Fax: +61 3 9603 9920
Email: <bookshop@diird.vic.gov.au>
- Victorian Auditor-General's website: <www.audit.vic.gov.au>