Regional economic effects of irrigation efficiency projects

Report of case studies

Prepared for the Crane Group

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ACIL Tasman

Economics Policy Strategy

ACIL Tasman Pty Ltd

ABN 68 102 652 148
Internet www.aciltasman.com.au

Melbourne (Head Office)

Level 6, 224-236 Queen Street
Melbourne VIC 3000

Telephone (+61 3) 9604 4400
Facsimile (+61 3) 9600 3155
Email melbourne@aciltasman.com.au

Darwin

Suite G1, Paspalis Centrepoint
48-50 Smith Street
Darwin NT 0800
GPO Box 908
Darwin NT 0801

Telephone (+61 8) 8943 0643
Facsimile (+61 8) 8941 0848
Email darwin@aciltasman.com.au

Brisbane

Level 15, 127 Creek Street
Brisbane QLD 4000
GPO Box 32
Brisbane QLD 4001

Telephone (+61 7) 3009 8700
Facsimile (+61 7) 3009 8799
Email brisbane@aciltasman.com.au

Perth

Centa Building C2, 118 Railway Street
West Perth WA 6005

Telephone (+61 8) 9449 9600
Facsimile (+61 8) 9322 3955
Email perth@aciltasman.com.au

Canberra

Level 1, 33 Ainslie Place
Canberra City ACT 2600
GPO Box 1322
Canberra ACT 2601

Telephone (+61 2) 6103 8200
Facsimile (+61 2) 6103 8233
Email canberra@aciltasman.com.au

Sydney

PO Box 1554
Double Bay NSW 1360

Telephone (+61 2) 9389 7842
Facsimile (+61 2) 8080 8142
Email sydney@aciltasman.com.au

For information on this report

Please contact:

Chris Summerfield
Telephone (03) 9604 4430
Mobile (04) 1951 3059
Email c.summerfield@aciltasman.com.au

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Executive summary

ACIL Tasman has been commissioned by the Crane Group, a manufacturer and distributor of non-ferrous metal products and plastic pipeline systems in Australasia, to develop some case studies to illustrate the types of regional and environmental benefits that might be delivered through sound investment in irrigation infrastructure that includes an emphasis on improved water efficiency and reduced losses as a way of supplying better environmental flows and supporting improved supply reliability in the regions.

The case studies show indicative benefits in terms of regional employment resulting from the construction phase of the projects. These have been estimated at an additional 56 full time equivalent employees, from direct and flow-on demands, in the Murrumbidgee area, up to 54 additional employees in Trangie-Nevertire area and an additional 220 jobs created in the Wimmera-Mallee area. Most of these jobs are expected to be direct employment on the project, but the figures also incorporate significant regional flow-on effects back to suppliers of inputs to the project. Further and more sustainable regional employment will be generated by supporting the viability and throughput of agricultural and agribusiness employers in the region through improved access to irrigation water.

With very large sums identified by the Federal Government for investment in priority water projects, the potential for these funds to advance the timing of, expand and/or enable a range of such regional programs to proceed, with correspondingly large suites of regional benefits is substantial. Given that Federal funds have been allocated to projects of this type – with $3.7 billion announced last year – delay in moving to approval and implementation of sound projects involves delay in delivering these regional benefits at a time when general economic and hydrological circumstances suggest the benefits are likely to be particularly high.

The case studies suggest that these funds could have the potential, dependent on cost sharing arrangements, to leverage some billions of dollars of regional benefits through the construction phases while underpinning the longer term benefits across the affected regional economies, not just at the farm level, that form, along with improved environmental flows, the primary rationale for these projects.

While sound planning and assessment, with due diligence, remains essential, the magnitude of the implied benefits is large. Ultimately, in weighing and assessing the best balance between buyback and infrastructure investment, these regional impacts and the quite different patterns of regional impact between infrastructure and buyback investment, are highly relevant. This paper is designed to support balanced consideration of both the value of such infrastructure projects and the best balance between such projects and direct buyback. Recognition of the impacts that are the focus of the paper, alongside environmental water benefits, generally strengthens the competitiveness of infrastructure projects.

A feature of regional irrigation infrastructure projects, relative to investment in buyback of water sourced out of farmer decisions to contract production, is the boost they can afford the regional economies during the construction phases, and the longer term strength they may offer the overall regional economy, including input supply, product processing and transport, associated employment and wider flow-on effects.

From a regional stakeholder perspective, these regional benefits are likely to be viewed as the main drivers for proposing and contributing to the funding of a project of this type – with environmental water provision almost a by-product. This does not of course detract from the potential of such a project to deliver cost effectively on both the aspirations of regional stakeholders and wider government and community commitment to improving environmental water.

The potential scale of the benefits may, in some cases, be sufficient to allow consideration to be given to involvement of the Federal Government not only via sale of the water released to the environment, but with sale linked into an infrastructure project designed to deliver a portfolio of benefits and manage some of the adverse regional consequence of some buyback.

Background

The July 2008 meeting of COAG announced in-principle Commonwealth support for $3.7 billion of funding directed at significant water projects in the states and territory that span the Murray-Darling Basin – with the emphasis being on water savings, water efficiency and the management of environmental stresses, including but not restricted to the return of a proportion of water savings as improved environmental flows. These sums are additional to the allocation of funds to enter water markets and buy back water entitlements.

Earlier in 2008, ACIL Tasman, engaged by the Crane Group, released a report (*Australia's Working Rivers*) that explored the competitiveness, relative to buyback of water rights, of direct investment in irrigation system infrastructure as a contributor to government and community objectives to restore environmental water in a range of stressed systems. The report saw such investment as likely to be a useful element in any cost-effective response to this environmental water agenda, alongside buyback. The emphasis in the report was on the cost of water 'saved', but it was recognised that irrigation infrastructure investment is capable of delivering a range of other regional benefits that should be factored into decisions on overall strategy – and that these would add to the case for some infrastructure projects proceeding.

This report looks more closely at those regional benefits. The work is designed to add a stronger understanding of the regional issues and opportunities involved with such schemes, as a complement to the earlier ACIL Tasman study. Both investments in water efficiency and buyback are complementary in delivering required flows across the system cost effectively. The case studies address in greater detail the wider regional consequences of the infrastructure projects. They should be seen as complementary to the earlier study and should be interpreted alongside that discussion.

Impacts of infrastructure vs. early buyback

Clearly, choices made between buyback and infrastructure investment can have radically different implications for some regional communities for any given level of return of environmental water. They can also entail quite different costs. These differential implications seem logically a part of any sound weighing of alternatives. Relative to *early direct buyback that involves contraction of regional irrigation activity levels*, irrigation infrastructure projects may be able to offer a range of desirable elements, including:

- Substantial employment and output benefits for the region during the construction phase, possibly coupled with delivery of a more sustainable regional economy longer term.
  - With possibly enhanced value in the short term as part of the attention being paid to accelerated investment in infrastructure as part of overall stimulus to the economy in the wake of the global financial crisis.
- Potentially lower cost acquisition of environmental water, by tapping economies associated with sunk investment, size economies and regional capability and by sourcing water from losses;
- Ability to address market failures that may encourage excessive contraction in food and fibre production relative to private investment in reducing losses and shifting to more efficient production systems.
  - Ability to relax the potentially harsh trade-off between levels of production and economic activity and level of contribution to

environmental water in a way that might grow the overall cake – by tapping into water use inefficiences as a 'funding source'.

- Greater flexibility to target 'compensation' for the delivery of environmental water across the range of stakeholders within a region who were reliant on irrigation-based activity – food processors and their workforces, input suppliers and their workforces and wider linkages across the regional economy.
  - Pure buyback delivers compensation to the holder of the water rights but not to others in the value chain, who can be adversely affected.

Specific projects and project proposals

Earlier this year, there was media reporting, based on work commissioned within the region, of the direct economic stimulus created by the construction of Wimmera-Mallee Pipeline Project – with economic modelling suggesting very substantial regional impacts over and above the implications for environmental water. This modelling and discussion was a trigger for the Crane Group commissioning the current work. We include a summary of that experience as an attachment to the present paper.

Two other projects are considered in the present paper – the Lake Wyangan development by Murrumbidgee Irrigation and the upgrade to the Trangie-Nevertire system, both located in New South Wales within the Murray Darling Basin. These two were chosen on the basis of access to data within confidentiality and planning constraints rather than as exemplars of high value projects – they are intended to be illustrative of types of benefits and potential value, rather than being necessarily promoted as the best of their type. The scope of the exercise and the available data did not allow for strong conclusions to be drawn as to overall net value of the projects – nor was this a purpose of the study, which was to yield insights into this class of relevant regional impacts and benefits. These types of benefits can and should be factored into assessments of the merits of the projects and possible cost and risk sharing arrangements – alongside of the value of environmental water and the lasting regional value associated with improvements in water supply reliability and the capacity to retain production and processing that would otherwise be threatened.

These benefits can be large, viewed at the regional level, though their sustainability beyond the construction phase will necessarily require that the new infrastructure be capable of supporting competitive production based on the new water supply characteristics and, where relevant, competitive supply to any urban development. The projects considered in the study are intended to deliver such competitiveness.

Caution is needed in assessing the regional benefits of infrastructure projects, especially where they involve substantial outside funding – which entails lost opportunities elsewhere – or where their impact may be to reduce losses in the form of accessions to groundwater from the local system that might subsequently have delivered value downstream. These arguments are most pertinent if regional benefits are being used to justify government funding being directed to such regional projects – because the funds could have more than competitive value used in quite different ways. This is not the current situation.

In the case of these projects, we are looking at funding coming from a *pre-allocated pool of Federal funds directed at this type of water project*, coupled with regional funding based on expectations of future regional value. In an important sense, the opportunity cost of Federal funding is 'sunk', though the level of benefits it 'purchases' is not, as long as decisions are still being taken as to which projects to fund; the challenge is largely to choose between competing water projects, all of which will offer significant regional benefits. Regional funds will be largely subjected to commercial testing, that will take into account the competitive value of existing regional investment sunk into water infrastructure and facilities, people and skills employed through the value chain. We also provide some insights into the scope for some of these projects (subject to important checks) being more than competitive in contributing some environmental water against some direct water buyback – which can itself have significant, and in many cases detrimental, regional impacts.

The major opportunity cost of relevance is that of how the regional funds being directed into these projects would otherwise be spent and here the particular characteristics of these projects in supporting established economic and social systems appears highly relevant.

We stress that the estimates included here are intended to be illustrative of potential from these types of investments rather than precise estimates in respect of the specific projects.

The main case study is of the Lake Wyangan development by Murrumbidgee Irrigation, which aims to update the irrigation infrastructure leading to:

- reduced water losses
- significant increase in flows to the environment (6+ GL per annum)
- improved flow rates and reliability of supply to consumptive uses
- improved water quality
- retained flexibility in future proofing the area against urban encroachment

- significant savings in operating and maintenance costs.

While the majority of the inputs to the project construction will largely be sourced from outside the region, there will still be substantial demands within the local economy. Indicatively, the construction phase is expected to contribute about $16m to the value of regional output and to support about 56 full time equivalent jobs within the area, over a planned 4-year construction period.

Longer term benefits for the sustainability of the economy are likely to be much greater, as reflected in the proposal for a high proportion of total project coming from within the district, mainly from the water business.

The apparent funding gap (for which Federal f7unds are being sought), of the order of $20m based on the proposed funding arrangements, appears consistent with competitive cost of the proposed additional release of environmental water, provided that some system-wide hydrology concerns can be effectively addressed.

Only very limited information is available on the structure and costs of the Trangie-Nevertire upgrade. However, in addition to modest recoveries of water, it appears likely to offer a broadly analogous range of long term regional benefits, along with substantial impetus during the construction phase. Depending on final project specification, regional impacts and flow-on effects that are broadly comparable to and possibly somewhat higher than those implied by the Lake Wyangan project would seem plausible. This judgment stems from consideration of a possibly higher cost project with a lower share of inputs sourced regionally, but must remain highly speculative.

The Wimmera-Mallee Pipeline Project is of a large scale and well advanced – scheduled for completion early in 2010. In addition to recovery of substantial water from losses, the scheme was designed for a wide range of long-term regional benefits, including a substantially more sustainable economic base. The construction phase of the project has been assessed as bringing into the region 220 direct, and a further 128 indirect jobs and a direct injection of wages of the order of $114m.

Wider implications of funding for water projects

Clearly the proposed scale of Federal funding for priority water projects, if coupled regional and State contributions comparable to those proposes for projects such as Lake Wyangan, has the potential to leverage some very large benefits across a wide range of regions. These investments will, of course, also entail substantial opportunity costs that need to be justified within a sound assessment framework that extends beyond, but includes, these regional effects.

The specific cases studies hardly constitute an adequate sample on which to base extrapolation to the regional benefits likely from the full expenditure of the $3.7b of Federal Funds earmarked for this type of water project. Nonetheless, we note that general application of this level of funding, if coupled with regional and other funds in the same proportion (around two thirds) as is proposed for the Lake Wyangan project, is suggestive of potential for leveraging construction phase regional benefits of the order of $2b – followed by the more sustainable benefits to the relevant systems that constitute the primary rationale for the projects. We stress that this is essentially extrapolation and not a formal estimate. It is indicative of a potentially large block of regional benefits that are delayed by avoidable delays in identifying and committing to sound projects.

1 Introduction

ACIL Tasman has been commissioned by the Crane Group, a manufacturer and distributor of non-ferrous metal products and plastic pipeline systems in Australasia, to analyse the benefits to the environment and the regional economy from a proposed irrigation project in the Murrumbidgee Irrigation Area. We also discuss some of the wider national linkages implied by such a project. The discussion is accompanied by some further insights into two other upgrade projects – one already under way (Wimmera-Mallee) and another proposed project (Trangie-Nevertire).

These case studies have been selected on the basis of access to relevant regional data – not on the basis of their likely merits as least cost suppliers of water to the environment. This paper is about illustrating the form of wider benefits needing to be considered – not about trying to justify specific projects.

This work represents an extension of, and complement to, earlier work from the Crane Group as summarised in Section 2 below covering the role of infrastructure projects in supporting government objectives for better environmental water supply. It addresses a group of potential benefits and costs that were not the focus of that earlier work but that are highly relevant in weighing the competitiveness of regional irrigation investment relative to water buy-back as contributors to a cost-effective response to threats to supply reliability and environmental and social values.

This report needs to be considered alongside the earlier work. That work by ACIL Tasman, summarised below, highlighted the potential for soundly-based irrigation projects, attacking system water losses and delivering water use efficiencies, to be *competitive elements* in a national response to concerns over water availability and reliability – and associated pressures on environmental and social values.

The earlier work focused on costs in achieving water savings without probing in any detail other forms of benefits to the regions involved from such projects. The present paper addresses this gap through a specific case study in the Murrumbidgee Irrigation Area. Two attachments provide some insights into the likely implications of projects in two other regions.

2 Background

2.1 Working Rivers Report

In 2008, the Crane Group released the ACIL Tasman report *Australia's Working Rivers: the Role of Infrastructure and Water Buybacks in Recovering Environmental Flows* (ACIL Tasman, 2008). That report drew on publicly available information to explore the potential for infrastructure projects to prove competitive against water buybacks as part of the overall recognised need to secure better environmental flows.

The report did not argue that infrastructure projects were inherently better than buybacks. Instead, it explored arguments involving the following threads:

- One means of sourcing water for environmental flows is through reduction in losses of water that occur within current irrigation systems – through mitigation of evaporation and of some losses to groundwater.
- Not all losses to groundwater are losses from the overall system – groundwater additions can and do emerge downstream to deliver either or both of irrigation water and environmental flows. Care in accounting is needed, within a framework that extends beyond the accounting for water solely within an irrigation project – with the need to recognise any system opportunity costs of reducing 'losses' to groundwater.
- Nonetheless, especially given the level of sunk infrastructure investment in irrigation districts and the opportunities to delivery greater water use efficiencies in a range of ways, it is sensible to explore whether such investment could be cost effective relative to more dramatic reductions in irrigation following sale of rights, as a way of sourcing *some* of the needed environmental flows.
- While a market to sell water rights to environmental uses posts some incentives to explore such options, there are risks of market failure in respect of the types of investments that are broad-based across major irrigation system and where there may be capital and other impediments to early coordinated action.
- Equally, a number of other reasons to anticipate some early failure in the market to sell permanent water rights were recognised, favouring consideration of a wider set of instruments than just buyback.
  - Equally, of course, the analyses could be viewed as pointing to potential value for irrigators in undertaking strategic investment to allow the sale of some or all water recovered as well as delivering benefits through improved reliability.

- Based on a range of projects under public consideration, there was significant *prima facie* evidence that some of these projects could offer significant water to the environment at less than the market price of buybacks, while also supporting a range of regional social values.
- Against this background, it was inferred that moving to build a solid understanding of the opportunities offered by such projects should be a matter of urgency, to limit the risks of excessive costs being incurred in pursuing environmental flows through buyback alone. While considered urgent, it was also important that the assessments be done well enough to make sure risks to whole of system hydrology are handled sensitively.
- While the report recognised the potential value to regional economies of infrastructure investment, it was not developed in any detail in the study – the emphasis was on the costs of recovering flows.

The fact remains that there are serious concerns for the social and regional consequences of a rapid reduction in levels of regional irrigation activity as a result of aggressive buyback schemes – and this has underpinned resistance. Not all those who will suffer as a result of reduced irrigation activity share in the compensation paid for water rights and there are risks that some regions could move to a tipping point, in terms of capacity to sustain operations based on sunk investments in food processing and other elements of the regional economy that link back to irrigation activity levels.

An immediate attraction of infrastructure investments designed to recover flows from water efficiencies and possibly to also add to regional supply reliability, lies in the scope for *limiting these adverse regional consequences* and for *deriving greater value from sunk investment*. In effect it *weakens the trade-off* between level of environmental flow and level of farm production by tapping into water losses. It may also support the *flexibility for a more gradual adjustment* response – including progressive reduction in farm-level water needs and sale of rights, as a result of the accumulation of investment in better technologies, farming systems etc.

Another important feature is that, relative to buyback measures, regional investment in infrastructure tends to *lock into a region* into the longer term, a *higher proportion of funds spent*. Furthermore, it tends to spread the benefits across those in regions traditionally reliant on the irrigation activities – including input suppliers, processors and their workforces. It does so via *established economic systems* and patterns of *regional employment* – helping to maintain throughput of existing harvesting, transport and processing investment, supporting demands from input suppliers etc[1]. These effects are on top of any short term regional impacts during the construction phase.

While there is a 'Magic Pudding' element to an argument to source replacements for shrinking flows out of reduced losses, the facts are that losses are real (if downstream flow effects are properly accounted) and sometimes substantial, and that traditional incentives for infrastructure investment to contain losses were distorted by price signals that now appear seriously deficient and by the lack, in the past, of access to some of the technologies and farm systems now possible or in prospect.

There was also a philosophical problem. Farmers historically have been commonly encouraged to view water 'escaping' from their land as inefficient[2]. Water use efficiency was often interpreted as maximising on-farm use of available water rights – effectively as minimising return flows and accessions to groundwater. Now, recognition of the value of downstream environmental flows and concerns with water interceptions across many patterns of land use post serious challenges for this way of thinking.

Farms and irrigation businesses now operate in a world in which they need to, and face clear incentives to, explore the *non-use of some water* as a valid 'product line' alongside production of meat, cereals, fibre, vegetables etc. Water not used has value, can be traded and may justify capital investment to support its 'production'. In particular, it is appropriate to explore whether the production of surplus water is best achieved through *reduced production of other farm outputs* or through *investment in less water intensive patterns of production* of other farm outputs – or through a *combination*.

Our strong suspicion, based on the work done, is that across the whole system the right answer is a combination. Investments in infrastructure and altered product mix will make sense alongside some contractions in production in areas where the marginal value of water in that production on that land is only modest compared to the alternative use value (including use

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[1] Of course, locking funds into particular use patterns *may* encourage inefficiency, but may also allow for efficiency in utilisation of sunk capital (if there are market failure concerns otherwise) and may be efficient as a means of addressing social and welfare concerns of the community.

[2] In recent work done by ACIL Tasman in respect of water interceptions through land use change, we found ourselves needing to argue that 'water use efficiency does not equal efficient water use', precisely because of the way the term water use efficiency had been linked through to the farm, rather than whole of system, level. The problem with a purely farm, or even irrigation project-level, perspective is that it ignores opportunity costs elsewhere in the system. These opportunity costs have been a key driver, alongside concerns for climate trends, of the current emphasis on protecting flows in systems.

in environmental flows) of the water. Cost-effective infrastructure investment, as part of the overall combination of measures, will almost certainly involve a mix of large-scale irrigation system investment, progressive development of on-farm investment and progressive modification to farm systems to free up the consumptive water uses of least value to the farm.

ACIL Tasman (2008) was prepared and released largely in advance of a full appreciation of the extent of the recent financial meltdown and the strengthened emphasis that emerged on *strategic infrastructure investments as part of a stimulus process for the economy*. Clearly, sound investment in reducing water use inefficiencies and in recovering flows to environmental assets – especially projects likely to make sense in the long run – are sensible candidates for accelerated attention as part of a wider infrastructure program. This does not obviate the need for care – but it can add an additional element of regional and macroeconomic value to be included sensibly in such deliberations and can alter the cost effectiveness of these investments if they are competing against other accelerated infrastructure projects. This argument also strengthens the case for moving as fast as can be done with sufficient care to assemble the case for these projects being funded – because there may be high opportunity cost for the economy as whole in delay if it results in funding being directed at other projects with poorer fundamentals or if it encourages an inefficiently high early reliance on buybacks with substantial, and possibly unnecessarily high, production implications.

2.2 Regional economic impacts

Studies of regional impacts can be valuable in providing a rounded understanding of the competing strengths of different patterns of intervention – in this case between direct buyback and strategic investment in infrastructure, with some basis for sharing the gains through reduced losses. However, such studies are also *prone to serious abuse* and can, viewed in isolation, present a quite *misleading understanding of project benefits and costs*. It is important that these risks be appreciated and managed if the analyses are to be used appropriately.

Spending a lot of money in a single region will almost always boost the regional economy – in much the same way that the recent stimulus spending has supported stronger economic performance as indicated by employment, GDP etc. If some spending is good, then does it follow that more spending is better? As with stimulus spending the answer is ‘not necessarily’.

The problem with infrastructure spending as a device to support a regional economy is that it comes at a real cost – money spent in one region is money not spent in another, or higher taxes or debt across the whole economy. These 'funding sources' all entail an opportunity cost.

Infrastructure spending, even spending on 'bad' infrastructure, can have short-term regional benefits. This would not usually make such spending justified. Where there is a demand for stimulus, and a willingness to add to the budget higher levels of funds for infrastructure, then *earlier and faster investment* in infrastructure that will *in any case make long-term sense* is likely to be most cost effective and should be most competitive for funding. Effectively, the costs of bringing the investment forward are defrayed by the *increased benefits attached to short-term stimulus*. We certainly would not seek to have the regional analyses used to support projects that would not in any case make long-term sense as a way of addressing concerns for waters reliability or as a result of wider, sound economic considerations.

The short-term stimulus effect of a major project in a small region can be huge but must be kept in perspective. The opportunity cost may be spread across a larger economy and extended over many years, but it will not be avoided and it is important that the investment prove sound in the longer term. Soundness of course includes the value of environmental flows delivered, or the lower costs of delivering environmental flows, as well as the value of sustainable production activity in the region and its associated longer term employment etc.

All that said, it is important to recognise that the Federal funds earmarked for priority water projects ($3.7b) are just that – earmarked and essentially sunk into this type of project. The key issues relate to which of the possible projects, in what form, with what level of additional funding from regional and state sources, and with what timing. Some of these decisions have been taken, others are pending. A point made in this report is that, while some delay to ensure the right decisions are taken is important, any additional delay comes at the cost of delay in delivering these regional benefits at a time when these regional benefits are likely to be particularly high. This follows from severe drought, reassessment of long-term water availability and individual and regional strategy and the recent impact of the global financial crisis.

2.3 Flow-on effects and multipliers

The analyses reported here place heavy reliance on a class of analytical tools termed 'input-output' tools. They work with the structure of the regional economy and with empirical relationships defining the input needs for delivering production, and indicators of the share of inputs likely to be sourced within the region relative to from outside the region. The logic of this is fine. It is reasonable to ask how a new construction project will add to input demands from within the region. It is reasonable to probe how a project that will protect farm production levels will translate into protection of employment and value across all input suppliers to the regional production.

In practice, making input-output analysis practical generally involves simplifying assumptions – for example that increased activity levels will imply pro rata levels of input demand. These assumptions can sometimes prove misleading. An obvious example is where the capacity to supply to a new project is limited within the region, so that a higher proportion of inputs for the increased activity needs to be sourced externally – the region is unable to capture all of the suggested benefits.

One of the most common errors in input-output analysis is linked into the treatment of flow-on effects. The direct stimulus created by an investment typically has a multiplying effect – through the circulation of increased income in the region and through flow-on demands for greater inputs to input suppliers etc – indirect effects. These multipliers are real – flow effects can often exceed substantially the direct effects of investment. However, it does not follow that these flow-on effects imply a much greater benefit-cost for the investment than is implied by the direct effects – though this is often claimed.

- It is crucial to recognise that opportunity costs also entail flow-on costs, in the form of lost opportunities for input suppliers, and their suppliers, to the alternative projects not funded because a specific project has been funded. This includes any redirection of regional resources from other activities into the project as part of cost sharing arrangements.
  - In general, if you want to count the indirect benefits of a project as part of its benefits, you need also to count the indirect opportunity costs as part of its costs.
  - Often, this is not done.
  - However, guidelines for cost-benefit analysis used by jurisdictions across Australia and internationally typically indicate that these flow-on effects should be ignored for purpose of weighing costs against benefits – or that the complete set of flow-on effects should be addressed through more broadly-based whole-of-economy modelling.

In what follows, we have emphasised direct effects, during construction and operation, and have discussed the nature and likely magnitude of flow-on effects. But the above considerations are critical to ensuring that the analyses are not misused.

2.4 And, more positively...

The above comments are intended to stress the need for care in the use of regional analyses if they are to be used to add balance to an assessment of competing approaches to delivering environmental water. They certainly do not mean that the regional perspectives are not important. The potential for investment in water efficiencies to relax the trade-off between environmental water and irrigated production; to support the whole of the regional economy and its existing assets, not just the farm and water owners; the scope for retaining significant profitable food production alongside the return of water the environment; and the potential macroeconomic stimulus effects of this form of strategic regional investment; are all relevant considerations in composing a 'portfolio' of measures to address environmental water needs.

Recognition of all these dimensions of value is likely to favour greater use of infrastructure investment, with water sharing, relative to early buy-back than might otherwise be expected. A lot of this early investment is likely to make commercial sense even without direct government support. Farmers can look to more water efficient technologies and farm systems as a way of freeing water for sale; irrigation businesses can expect to gain greater support for investments that reduce losses and create opportunities for regional as well as environmental benefits. In effect, such investments are likely in a number of cases to allow regions to 'have their cake and eat it too' which is not something offered by early sale of rights without complementary measures to compensate for reduced effective access to water.

Of course any such investment that proceeds autonomously and that delivers scope for returning significant water to the environment should prove relatively uncontroversial. The harder area is where there is an argument for government contribution to infrastructure funding. However, what is envisaged here is projects where any government contribution is largely as an alternative to some or all of the money that would otherwise be directed at buyback and where funds have already been earmarked following cross-jurisdictional consideration of the challenge and opportunities.

In particular, there are valid reasons for being concerned about potential market failures. A farmer holding water rights and under financial pressure may well see scaling back and selling rights as attractive – because he or she would gain the benefits of the sale of rights without necessarily being held to account for the costs of reduced regional activity levels that might, if factored into planning, suggest a different approach. This form of externality is a concern. The scale of infrastructure investment needed might be beyond the immediate resources of a water business. The levels of uncertainty remaining in relation to climate trends, climate policy and water resource management are all reasons that might encourage earlier sale relative to this form of strategic investment – in some cases this may be sensible but in all cases the alternatives appear to warrant careful consideration.

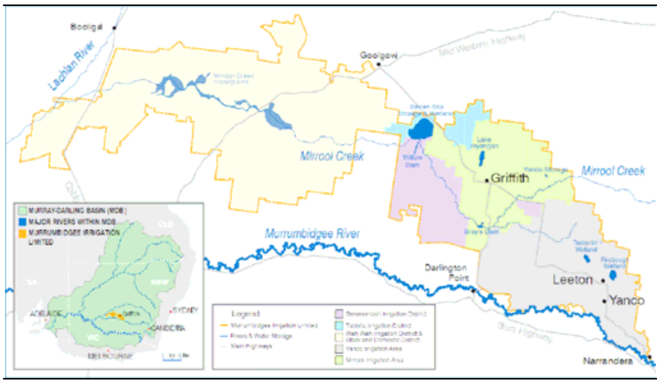
3 Background to the Lake Wyangan project proposal

3.1 Murrumbidgee Irrigation Area

Murrumbidgee Irrigation Limited is a customer-owned irrigation company located in the Murrumbidgee Irrigation Area (MIA) in southern central NSW. It provides irrigation and drainage services to some 3,200 customers over an area of 660,000 hectares, and manages some $500 million of infrastructure assets that service over 1,400 GL in water licences.

Established in 1912, the MIA is one of the original irrigation areas in Australia that falls within the Murrumbidgee and Lachlan catchments. The MIA forms part of the Murray-Darling Basin and includes the city of Griffith, the town of Leeton and many smaller regional centres. Water for the MIA is sourced from the Murrumbidgee River through the main canal east of Narrandera and the Sturt Canal at Gogeldrie near Leeton. Water is delivered to customers via an integrated supply and drainage network, predominantly through open channels but, more recently, using pipe solutions in low volume supply districts. The system supports five local government regions and significant numbers of stock and domestic supplies. A map of the MIA is shown in Figure 1:

Figure 1 **Map of the Murrumbidgee Irrigation Area**



Source: Murrumbidgee Irrigation

Lake Wyangan is located in the northern section of the Murrumbidgee Irrigation Area and is immediately north of the City of Griffith. Community consultation in the 1990s identified a need to upgrade the infrastructure to improve the operation of the system and overall environmental management within the catchment.

3.2 Key issues

3.2.1 Environmental issues

All runoff and excess irrigation water drains to Lake Wyangan or to one of the other wetland areas within the catchment. There are no natural discharge points from the catchment and as a result water has to be pumped from the lake during high rainfall periods to avoid flooding.

As is discussed below, seepage from the system appears to be contributing to some local problems of salinity and associated damage to production and infrastructure. Some of these seepage losses (that in total account for about a third of measured losses and half of real losses from the local system) may, however, be contributing to water availability elsewhere in the system.

The relatively more contained character of the present system reduces the significance of these concerns – especially in respect of reduced downstream availability of irrigation supply in this case. By and large, water that leaves the irrigation system as downstream flow is delivered to the environment, though some of the current losses are likely already to be passing through to the downstream environment.

The relatively contained character of the surface water system, and the probability that at least some groundwater accessions resurface within this contained system, suggests that concerns about downstream opportunity costs of limiting seepage are likely to be less than for some other irrigation districts.

3.2.2 Operating inefficiencies

The current system layout and operating regime does not have the ability or capacity to meet the base level of service in terms of flow rate to customers; this has caused difficulties in operating the system to meet customer demand. Additionally, the current system is ageing and has for an extended period lost a significant amount of water to seepage. This has in turn created environmental problems such as salinity and water logging, which have affected not only crop production but also infrastructure such as roads and electricity poles.

Total loss rates in all channels are estimated to be 21%, with equal amounts represented by seepage and evaporation (7%), operational mismatch (7%) and farm measurement losses (7%).

3.2.3 Urban encroachment

Substantial tracts of the southern part of the catchment that have traditionally been irrigated land have been identified as future urban release areas by Griffith City Council. Refurbishment of many kilometres of Lakeview Branch Canal through an area which will transit to residential land is not economically feasible and presents additional land use conflict, maintenance and operational issues. The future urban development also creates problems in terms of the provision of stormwater drainage and water quality control within a network of existing irrigation water supply, return channels and tile drains. This urban encroachment creates additional difficulties in managing the LVBC and creates additional uncertainties about how best to optimise the system for future operation.

4 Proposed Lake Wyangan project

4.1 Project overview

To address the issues identified previously, it is proposed to replace the existing 73 kilometre gravity fed open channel system with a modern and efficient irrigation water system that augments the existing Lake Wyangan storage and utilises a combination of gravity, low pressure and high pressure delivery systems to provide reliable irrigation water to approximately 22,000 hectares of irrigable land area. The proposed system also includes an extension of the main canal feed and newly constructed water storage. The water storage will provide greater flexibility to manage water within the system as well as provide a more efficient supply to the western and northern end of the development area.

In addition to the proposed augmentation to the irrigation system, Griffith City Council proposes to undertake a series of water quality improvement works that will assist in maintaining project viability in the long term. These include sewer upgrades for Lake Wyangan and Nericon villages and extension of the sewer to Lake Wyangan foreshore, development of a stormwater management system for Lake Wyangan Village, and development and implementation of a Master Plan for Lake Wyangan and its foreshore. These works are estimated to cost approximately $4.5 million.

4.2 Project benefits

The project will produce a number of benefits that will accrue in terms of water savings, operational efficiency and environmental improvement (summarised in Table 1).

4.2.1 Water Savings

It is estimated that the project will realise annual average water savings of 6,000 ML. This is brought about by the provision of selected pressurised pipe systems and the removal of the requirement to allow associated losses in existing open gravitational channel systems – recovering water from both evaporation and seepage losses.

Losses in the open channel system can be attributed to channel evaporation and seepage/leakage, escape flows to maintain the correct operating level, rainfall rejection, filling and emptying, and metering losses. In simple terms the water saving volume is determined by estimating the losses on the Lake View system assuming that there is 60–70 percent annual usage for general security allocations and 80-90 percent annual usage for high security allocations. The calculation assumes the system losses on the Lake View system to be 15 percent – a conservative estimate given the evidence of 21% losses previously stated. (With an estimate of current losses (21%) the savings could be closer to 9,000 ML per annum).

4.2.2 Operational Efficiency

The proposed project will replace the existing inefficient gravity fed open channel system with a modern and innovative irrigation system comprising of gravity, low and high pressure pipelines and efficiently designed and constructed open channels. This will provide a more responsive and flexible system better suited to meeting customer requirements. The proposed system will increase operational flexibility for both current and future requirements as the southern portion of the catchment transitions from irrigated agriculture to urban use.

Specifically, the proposed system will provide for the transition of the southern section of Lake Wyangan catchment from predominantly horticulture to residential and rural residential, and will ensure that an efficient water delivery system is available to enhance production from irrigated agriculture. The project has been designed to enable the irrigation infrastructure that is proposed for the future residential areas to be utilised as part of the future residential water reticulation system, therefore reducing redundancy in the system. The project will also provide the opportunity to transfer approximately 10,000 ML of high security water allocations from areas that are to be urbanised to new areas of high agronomic potential that currently can’t be serviced by a gravity supply system.

There will also be significant savings in operations and maintenance expenditure compared to the existing open channel system due to the maintenance issues such as desilting, weed control, and on-going repairs to the lining of channels that will be no longer required.

4.2.3 Environmental Improvement

The proposed project will have the potential to improve the quality of water in Lake Wyangan through augmenting the volume by an additional 5,000 ML for irrigation supply. The constant filling and emptying will turn over a greater volume of water, and is expected to result in an improvement in water quality parameters such as salinity and nutrients.

Both Nericon and Campbell's Swamps are recognised as important wetlands in the Murrumbidgee catchment. They have been granted an environmental water allocation from the Murrumbidgee Catchment Management Authority due to their significance. Currently the environmental water is delivered through irrigation supply channels, but with only limited success due to supply constraints. However, the proposed system would be integrated to include provision for supply of the environmental water allocation.

The current system has, for an extended period, lost significant amounts of water to seepage, which in turn has caused environmental problems such as salinity and water logging that affect not only crop production but infrastructure such as roads and electricity poles. The proposed piped system will eliminate groundwater accessions, hence lowering the water table and reducing the potential for land salinisation. This will not only improve soil health but will also reduce salinity impacts to infrastructure.

Augmentation of North Lake Wyangan as proposed will ensure that it continues to provide an important recreational amenity that is utilised by people from the local area and the broader region.

Table 1 **Summary of Lake Wyangan project benefits**

Description of Benefit	Benefits of the Project	Timeframe until Benefits Achieved	Beneficiary
Economic	Increased productivity through: • reduced water losses from system meaning greater return from available water • increased reliability of water supply and efficiency of delivery resulting in greater consumer confidence to invest in high return products • long term savings through dual use of irrigation infrastructure in future urban areas – reducing land use conflicts • reduced ongoing maintenance costs • continued irrigation based agriculture in catchment providing ongoing revenue source for landholders and local community pricing of water reflecting state of infrastructure and level of service	Approximately 4 years continuing for life of infrastructure	Local water users, local, regional, state and national businesses, irrigation industry Australia wide; Murrumbidgee Irrigation, Griffith City Council, current and future residents of Lake Wyangan catchment
Environmental	• Saving an average of 6,000 ML of water that can be used for environmental purposes • Continued recycling of return flows to sustain environmentally significant areas such as Nericon and Campbell's Swamps and Lake Wyangan • More efficient water supply system resulting in reduced energy usage per $ return Improved water quality in Lake Wyangan and surrounding wetlands	Approximately 4 years for full benefit	General environment, Nericon and Campbell's Swamps and Lake Wyangan; areas; Areas benefiting from River Reach program

Data source: Murrumbidgee Irrigation

It is clear that these benefits, and the motivation for the project, extend well beyond recovery of water for the environment. The proposed project involves diverse benefits across multiple stakeholders as a result of a major restructuring of the infrastructure to restore lost function and to much better align it with expected future patterns of demand. Of course, one of the demand patterns is the now established demand for environmental water.

The structure of benefits clearly raises important questions about cost sharing.

4.3 Project Cost

ACIL Tasman has been advised that indicative expenditure over the four year project schedule is $56 million, with a net present value of $47.3 million. The costs are stated in June 2009 prices.

Murrumbidgee Irrigation is expecting to commit approximately $30 million towards the project, $11 million of which is to be sourced from the NSW State Government Asset Refurbishment Fund[3]. The balance of some $26 million would be sought from the Commonwealth Government.

The operations and maintenance cost of the project over its life is estimated at 1.5 per cent of the capital costs with a ten year maintenance free period once the project is commissioned. This would be an annual cost of $14,187 with a present value in 2009/10 of $99,533. This is a significant reduction in O&M costs compared to the existing open channel system which currently has operations and maintenance costs of $60,000 per annum with a present value of $842,350.

Exact estimates for construction costs are not yet available because the construction would be put out to tender and, as such, the estimates are guidelines based on the 2004 Pratt Water study into feasible investments in improving MIA's infrastructure. It is expected that the likely component of locally sourced inputs would be 20-30% of the total cost, and if the local area were to cover approximately 300 kilometres, then with Albury, Wagga Wagga and Shepparton within that catchment, the "locally" sourced inputs could be a much higher proportion. MIA would require local content to be a minimum of 10-15% of the total project cost to ensure that a proportion of the project benefits would flow to the local community.

An additional $4.5 million of capital works would be undertaken by Griffith City Council at the same time as this development. These council works are necessary for the development of the residential area and to improve the

[3] The Asset Refurbishment Fund is a long-standang legacy of the privatisation of NSW irrigation assets, established at the time in recognistion of the factor that many of the assets would need significant refurnbishment. We assume here, as is proposed by MIA, that access to Federal funding will allow leveraging of these funds by building the economic case for refurbishment. These funds are not part of the $3.7 billion allocated in 2008 for major water projects, and discussed in Section 8.

public amenity. The costs (and $4.5 million “in-kind” contribution towards them by Griffith City Council) have not been included above because they would be undertaken in some form regardless of the Lake Wyangan development. However, these expenditures by the City Council are complementary with the Lake Wyangan development and should enhance the benefits stated in this report.

We have not assessed the proposal for the appropriateness of its implied cost sharing. However, we do note that the suggested funding gap of $20m might be filled via formal infrastructure funding or via a contract to sell the additional environmental water as part of the project’s development.

Selling in this way, linked into the project rollout and with anticipated offsets from reduced losses, is quite different from pre-emptive sale of water rights to be supported via contraction in levels of irrigation activity alone – with very different regional consequences.

5 Socio-economic background to Griffith and the MIA

5.1 Overview

The MIA includes parts of the Statistical Local Areas of Carathool (10%), Griffith (91%), Hay (8%), Leeton (81%) and Narrandera (1%).

Griffith is a regional centre which has developed off the back of the agricultural growth of the region, which is a major exporter of processed foods, wine and agricultural products.

According to the NSW Department of Planning, in 2005 the population in the MIA was 33,600 and according to the 2006 Census the Griffith local government area (LGA) housed a population of 24,867 people – this is basically unchanged since the previous Census.

Apart from retail and healthcare, the largest employers in the MIA are related to agriculture. 13.5% of employees were directly employed in the agriculture, forestry and fisheries sector while 18.8% were employed in manufacturing, which is heavily related to the food processing and farm-equipment/food processing equipment related industries. Other industries such as construction, transport, storage and wholesale trade were also heavily reliant on the agricultural sector and its processed outputs.

5.2 Horticulture

Irrigated agriculture in the Murrumbidgee Valley covers 4% of the land area but accounts for 41% of its agricultural output. The "farm-gate" value of irrigated production in the Catchment is in the order of[4]:

- $98 million for rice
- $190 million for horticultural and other crops
- $20 million for livestock products

5.3 Other industries

The level of employment related to agriculture, fisheries and forestry sector in the Murrumbidgee Valley is double that for non-metropolitan New South Wales. Griffith contains a number of industries which add value to the

[4] Murrumbidgee Regulated River Draft Water Sharing Plan, 2002

agricultural output of the region. These include food processing, wine production and agriculture.

Food processing

There are a number of food processing industries which export food and vegetable products worldwide. Nugan Foods, which exports fruit and vegetables worldwide, is an example of such an enterprise. Another significant employer is the processing facilities owned by Baiada Poultry, the largest producer of chicken meat in Australia. The company is vertically integrated from grain-growing for feed to processing and distributing chicken products. Although recently rationalising its production staff after taking over the Bartter/Steggles business in Griffith, the company has stated a commitment to further expansion in the area over the next 10 years.

In addition to food processing there are a number of local firms which manufacture agricultural and food processing equipment. A&G industries has become a leading developer and manufacturer of stainless steel wine and food processing equipment.

Wine production

Griffith is a large producer of wine, producing 20% of Australia's yield and 70% of NSW's production. De Bortoli, Casella and McWilliam's wineries are in the top ten largest Australian wineries by tonnage produced.

Farm output

The area produces around 15% of Australia's citrus fruits, with much of this juiced locally or sold as fresh fruit in the Australian and export markets. A large output of other fruits and vegetables including wine grapes are also produced in the region. The region produces the majority of the Australian rice harvest, although this industry has been in drought-induced decline for a number of years.

6 Water availability

The amount of water available for Murrumbidgee water access licences is determined by the NSW Government over the irrigation season, derived from the amount of storage in the two main reservoirs, Burrinjuck and Blowering Dams, minimum expected inflows and releases from the Snowy mountains Hydro-electric scheme. Recent CSIRO modelling (CSIRO, 2008) has determined the future long-term average water availability for the Murrumbidgee as 88% for high security and 60% for general security access licences under the report's "Scenario A: Historical climate and current development", other scenarios generated both higher and lower expectations for water availability.

The long term cap equivalent (LTCE) factors in the Murrumbidgee Valley are 0.95 for high security water and 0.6369 for general security water.

6.1 Water entitlements

A snapshot of water entitlement held within the MIA is shown in Table 2 below. Water entitlement held in the MIA represents almost 50% of the water access entitlement in the Murrumbidgee Valley. There are a large number of small customers (around 82% of total) holding less than 1,000 ML of available water entitlements. The largest 10% of customers hold 58% of available water entitlements.

Table 2 **Water entitlement held within the MIA**

Water entitlement category	MIA licences	Murrumbidgee Valley licences
	GL	GL
General security	775	1,888
High security	314	356
Stock/domestic/towns	27	56
Conveyance (Max)	223	373
Supplementary	37	198
Total	1,376	2,871

Data source: Murrumbidgee Irrigation

In 2008-9 there were some 27,500 ML of high security and 11,800 ML of general security entitlements held in the Lake Wyangan catchment. In addition, some 1,500 ML of general security water entitlements were permanently sold out of the Lake Wyangan catchment in 2008-9. On 16 September 2009 water availability in the catchment was 60% for high security entitlements and 0% for general security entitlements, this availability is updated monthly.

6.2 Permanent trade in water entitlements

The National Water Initiative established an interim threshold limit of 4% on the level of permanent trade out of all water irrigation areas of the southern interconnected Murray-Darling Basin. In 2008-09 this limit was reached for the first time in the MIA and equated to 42,831 ML for the MIA.

Table 3 highlights the scale of government buyback programs in the MIA.

Table 3 **Water trades out of the MIA in 2008-9**

External permanent water trade purchaser	2008-9	
	ML	%
Private water users	60	0.1%
MDBC (Water efficiency programs)	240	0.6%
ACTEW (ACT government-owned utility)	4,231	9.9%
NSW Government (Snowy River/Living Murray programs)	38,300	89.4%
Total	42,831	100.0%

Data source: Murrumbidgee Irrigation

The government activity in the market is obviously significant, and is having a significant impact on the price for water entitlements.

6.3 The effect of water leaving the region

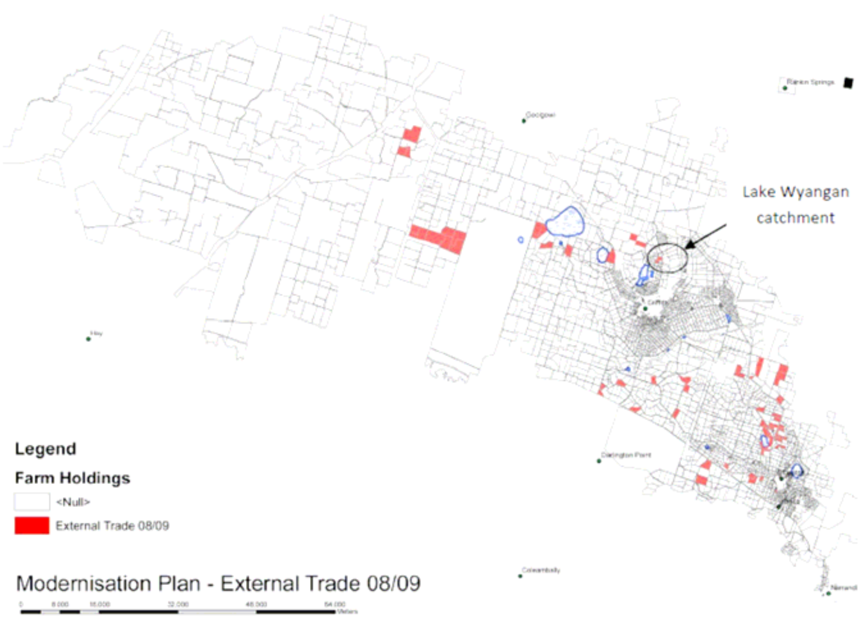
When irrigators trade their water entitlements outside of the area, they bear only the private costs of doing so and receive the private gain from the sale proceeds. These costs include exit fees from Murrumbidgee Irrigation, but in order to facilitate government buybacks of small licence holders the Government offered up to $150,000 as a special exit payment, along with other transitional assistance, to eligible irrigators on 40 hectares or less who agree to sell all their water entitlements to the Commonwealth; applications for this package closed on 30 June 2009.

As a result of sales to the Commonwealth, the MIA system is losing technical efficiency. Because MI cannot know in advance who will choose to sell their entitlement and leave the system, they suffer additional inefficiencies and costs maintaining assets which are now only relevant as a conduit to other properties. Continued permanent sale of water entitlement out of the MIA over an extended period would be expected to reduce further the technical efficiency of the irrigation delivery system.

It does not follow that the buybacks were themselves inefficient. In any economic system, demand patterns change over time and immobile and lumpy capital assets often end up becoming stranded or finding service demands now mean that the asset is not well suited to need. It may still be more efficient than replacement – because of the sunk costs involved. The key efficiency question arises if these costs could have been lowered through a different approach to addressing the changing demand (and in this case supply) patterns.

Figure 2 shows the locations of sales out of the MIA catchment. Obviously this patchwork of sales and the expectation of similar dispersed entitlement sales in the future make it very difficult for Murrumbidgee Irrigation to plan an efficient irrigation system. Certainly the existing infrastructure is inadequate to the task.

Figure 2 **External permanent trade in water entitlement out of the MIA in 2008-9**



Data source: Murrumbidgee Irrigation

A study of the impact of the closure of the Wakool Irrigation area (or parts thereof) stated that "The level of impact is linked to the volume of water that may be removed from the region. Farm businesses that sell the water receive an injection of funds to help adjust to the changed circumstances. However, the flow-on impacts of a significant drop in the rural economy due to the loss of water will be pronounced, but there is no adjustment support for those remaining in the region." (RMCG, 2009).

Those remaining include irrigation farmers who must deal with a water delivery system with declining technical efficiency and with the need to spread maintenance costs over a shrinking pool, plus transport, processing and input supply activities and their direct employment, where lower throughput involves lower size economies, especially where based around sunk investment in equipment now larger than is needed.

This study also estimated that every 1,000 ML of water that is lost from the region resulted in:

- $300,000 loss of agricultural production within the shire
- up to $900,000 loss from the regional economy
- $3,500 in direct rate revenue loss
- loss of one agricultural job
- loss of one regional job.

ACIL Tasman (2008) identified the implicit value of water savings through irrigation infrastructure rather than water buybacks (ACIL Tasman, 2008). The June 2009 Market Price report issued by GHD Hassall, 2009 stated a price of $3,100 for a Murrumbidgee high security entitlement and $1,250-$1,300 for a general security entitlement (note: this price does not include other inducements to sell offered by the government). The associated prices per LTCE ML were $3,263 and $1,546 respectively.

6.4 The value of water

This paper is primarily about the benefits beyond environmental flows – those were the focus of ACIL Tasman (2008). However, the project is intended to deliver a range of 'joint products', including the regional benefits and significant restored flows. It is appropriate that these joint products be considered in a framework that recognises the major interactions.

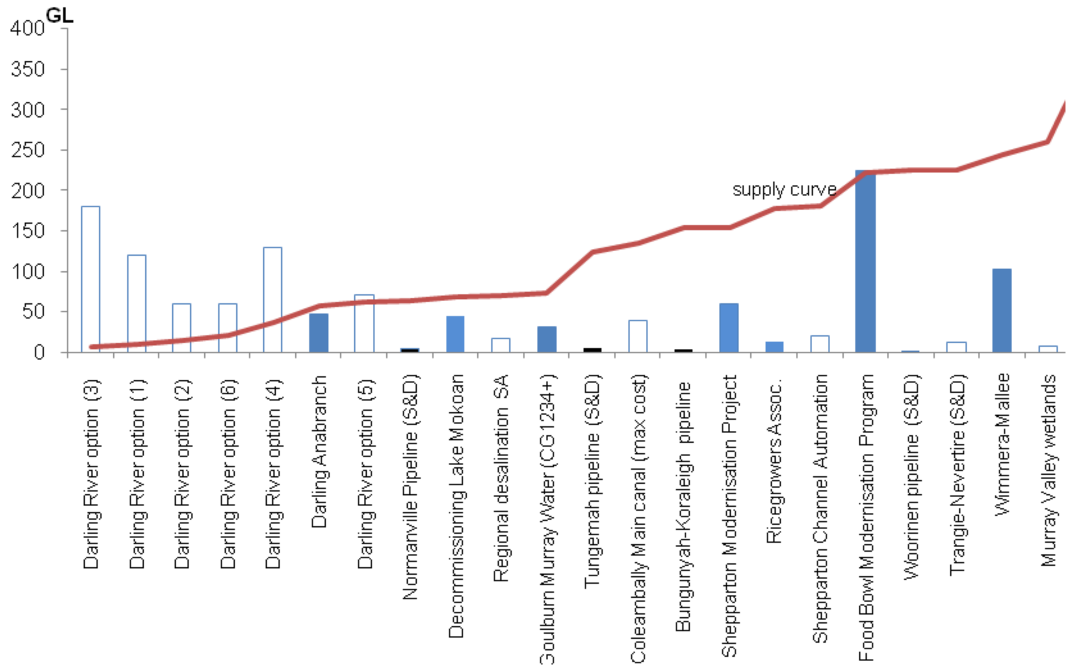
On average, the Lake Wyangan development is expected to return 6,000ML of water to the environment each year at a whole of project capital cost of $43 million in net present value. However, these figures fail to capture the range of regional benefits indicated above. Section 4.3 indicated that almost two thirds of the projects funds are to be sourced via the irrigation business and the NSW Government – presumably justified in terms of the benefits expected to follow. Indeed, this willingness to contribute to costs probably underestimates expected value as a natural part of the planning process.

The proposal is that *an additional $26m* is needed to *deliver the set of benefits,* including the additional average flows of about 6,000 ML to the environment. We have not audited the value of the wider benefits, simply noting that the indicated willingness to commit funds of $30m presumably places a lower bound on their assessed value across the regional and State interests. The pertinent proposition in the current context is whether the additional $26 million could be justified in terms of:

- The additional environmental flow being offered on a permanent basis;
- Any additional value the Federal Government might attach to the perceived better equity of this approach in compensating stakeholders, relative to early buyback;
- Any value attached to the stimulus value of an infrastructure of this form, with its multiple dimensions of long-term value.

Looking only at the first of these elements suggests a cost for the flows that is at least comparable with payments being made for buyback. The other two elements – and the possibility that the wider benefits to the region and to NSW could exceed the required contributions, all suggest that the scheme could warrant closer consideration. This consideration would need to include evaluation of any opportunity costs associated with reduced groundwater accessions, as was flagged earlier. However, we note that the scheme will be recovering significantly from sources other than seepage to groundwater.

Figure 3 **Supply cost and benefit (GL per annum for the environment) of ranked infrastructure projects**



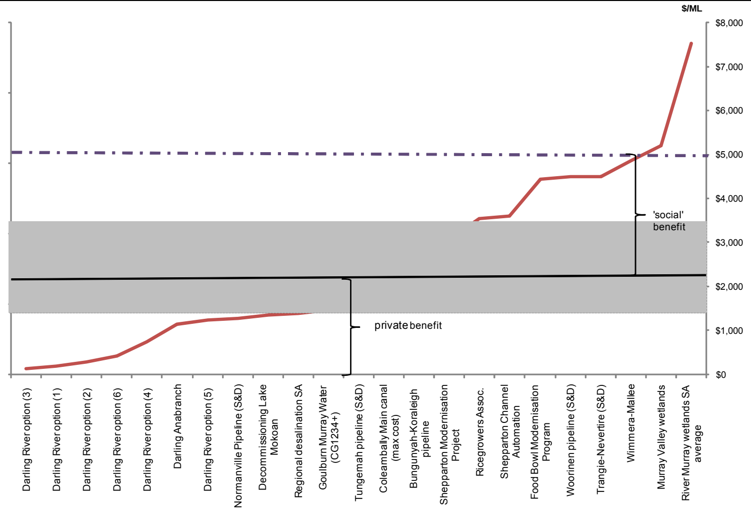
Note: The upward sloping line traces marginal cost of each infrastructure project. The methodology adopted in this report follows that set out in an earlier work (ACIL Tasman, 2003)

Data source: *(MDBC 2008d)(Maunsell Australia, 2007) (Victorian Government, 2004)*and ACIL Tasman estimates

Where a project has a cost per megalitre below the market price of water, then the project would be financially viable and would have a positive net present value (NPV) if assessed by a private firm. Only in the case of market failure would this project not be undertaken by private enterprises.

Government could consider funding projects whose cost exceeds the market price of water entitlements where there are additional social and environmental benefits, or in economic terms, where there are "positive externalities" – and as one possible approach to addressing perceived market failure.

Figure 4 **Supply cost and benefit (GL per annum for the environment) of ranked infrastructure projects**



Note: The upward sloping line traces marginal cost of each infrastructure project. The methodology adopted in this report follows that set out in an earlier work (ACIL Tasman, 2003)

Data source: *(MDBC 2008d)(Maunsell Australia, 2007) (Victorian Government, 2004)* and ACIL Tasman estimates

By social benefits we mean that there are social, environmental or economic benefits that may not be easily quantified, but that nevertheless would contribute to national welfare. Economists refer to these social benefits as positive externalities and social costs as negative externalities. Governments incorporate externalities into their investment decisions with the aim of increasing national welfare.

7 Aggregate picture

7.1 Project cost

The direct expenditure on the project has capital costs with a present value of $55.9 million and future maintenance costs with a present value of $99,534 when a 7% discount rate is applied.

7.2 Economic Benefits

7.2.1 Water savings for environment

The economic benefits can be measured in a number of ways. Firstly, there is the market value of water saved – estimated at $3,263/ML cap equivalent for a high security entitlement. On this basis, the water savings of between 6,000 and 9,000ML of water (out of conveyance water with 100% entitlement) might be considered to have a net present value of the order of $15-$22.5 million, on a present value basis if timed to coincide with project completion.

7.2.2 Flow-on benefits

Spillover benefits arising from construction expenditures also have a positive impact on a local area. As was flagged in Section 2.3, these effects are real but need to be treated carefully in weighing if an investment is justified. The opportunity cost of what might otherwise be done with the resources needs to be factored in, and that includes recognises that alternative projects would probably also have flow-on benefits. Section 7.3 below provides further insights into these important regional effects.

7.2.3 Efficiency benefits

The improved system will be better able to supply customers with predictable amounts of water, and to better maintain pressure in the system – better service standards in ways that could be expected to have commercial and social value.

Other benefits include reduced ongoing maintenance costs – the annual cost after 10 years are expected to be $14,187 per annum which is much lower than the current maintenance costs of $60,000 per annum for the area. This is a saving in net present value terms of $742,818.

7.2.4 Improved supply flexibility

The ability to have piped reticulation through areas marked for residential development provides organisational flexibility to manage the system in an uncertain environment, to sell third-pipe water at higher prices to residential customers, and to avoid stranded assets whose value and maintenance costs would have to be recovered from existing customers (or written off by Murrumbidgee Irrigation – with negative financial outcomes).

Such flexibility is hard to measure, but a rough estimate is that 1/3 of the company's system through Lake View Canal is no longer at risk of being stranded, and as such replacement or abandonment of an area has been avoided. This saved 1/3 of the lake view capital costs multiplied by the expected value of the discount rate (the weighted average cost of capital). The estimated present value of this is currently unknown, but is likely to be significant.

Environmental benefits

The infrastructure will also provide environmental benefits which are hard to quantify: improved water quality in Lake Wyangan, the preservation of wetland environments in Nericon and Campbell's swamps, improving groundwater and soil salinity problems. While the value of environmental savings is difficult to quantify, we know that it may be significant – after all, the entire water buybacks program is predicated on the assumption that the environment values additional water as high as, or higher, than the current market price of water. Of course, care is needed in weighing these effects not to double count – the discussion of the value of the water returned to environment, set out in Section 7.2.1, is another way of looking at these same benefits and should not be counted twice.

7.3 Multipliers for regional and national impacts

In evaluating the regional impact and national impact of a proposed construction project, it is typical to measure the flow on benefits from construction. These flow on effects include the stimulus to local (or national) businesses from manufacturing inputs into the project, the additional local (or national) spending from labourers involved in the project, and greater efficiencies from businesses using the improved infrastructure.

Typically, these flow-on benefits are estimated using a "multiplier" – a factor reflecting the extent to which impacts are scaled up after taking into account the various indirect flow-on effects, as well as the direct effects. Multipliers can attach to output, employment, income etc. Again, multipliers relate to real effects that are especially important at the regional level – but they are also often misused to present a project as more competitive than it really is because of the way they can distort consideration of opportunity costs.

If the alternative to this scheme proceeding were to be a project funded in a very different region, then the MIA would lose the regional indirect as well as direct benefits. These indirect effects are quite important to the regional assessment of the project – but are usually obtained at the expense of analogous benefits elsewhere.

ACIL Tasman has used as a starting point output and employment multipliers derived for a similar analysis of the Wimmera-Mallee Pipeline Project which were derived using REMPlan, an off-the-shelf regional planning tool. The Wimmera-Mallee Pipeline Project is outlined in more detail in Attachment C.

The Wimmera-Mallee and Murrumbidgee regions were compared to determine any differences which would impact the multiplier values and adjustments were made to the multipliers. Relevant differences between the two regions are:

Table 4 **Comparison of Wimmera-Mallee to Murrumbidgee**

Difference	Impact on multiplier for Murrumbidgee project
Murrumbidgee has a larger population	Higher. A greater proportion of the project could be sourced locally
The two regions have a similar mix of industries	Modest
Higher unemployment in Wimmera-Mallee in the 2006 Census (6.8% in Horsham compared to 5.5% in Griffith)	Modest, with educed regional multiplier, unchanged national multiplier – higher unemployment may mean that there is increased chance that local labour could be sourced
Higher proportion of labourers to total employment compared to in Murrumbidgee area	Higher. More workers with relevant skills in the region
Murrumbidgee is closer to significant manufacturers of inputs (<300 km)	Regional multiplier is increased, national is unchanged

Data source: 2006 Census, Australian Bureau of Statistics, ACIL Tasman analysis

The above analysis suggests that the local impact of investment is at least as high as, and most likely higher than, the multipliers estimated for the recent Wimmera-Mallee project. Consequently the same regional multiplier (1.43) has been used with a sensitivity of +10% also used in the estimates. The national multiplier of 2.58 has also been retained, although this national multiplier would be very similar for alternative project s undertaken in different regions – meaning the net national effect of undertaking the project in the MI rather than another region would be very low.

One issue which is relevant to multiplier analysis is constraints to capital and labour. This is incorporated in our analysis of regional multipliers when we make adjustments for local unemployment and skills in the above table. However, when there is a finite amount of funding available for infrastructure projects, then it is appropriate to consider the extent to which investing in one project "crowds out" investment in another project at a different location. The appropriate national multiplier should therefore only report on the net benefit of this project compared to the best investment which was crowded out by investment in this project.

In accordance with the requirements of the Guidelines for the Private Irrigation Infrastructure Operators Program in New South Wales (Australian Government, 2009) we have briefly considered impacts compared to a "no change" scenario.

7.4 Regional impact

On the assumption that 20% of inputs to the project are locally sourced, this would translate to an output increase in the local economy with a present value of $11.2 million. The output multiplier looks at the effect of stimulating regional businesses and how their purchases further stimulate the local economy. Using a regional output multiplier of 1.43 we would expect the total impact on the MIA economy to be of the order of $16 million, which includes flow-on benefits to the MIA economy of $4.8 million. We would expect that this would be associated with to an additional 56 full time equivalent jobs in the MIA area as a result of this project – including direct employment on the project and flow on employment as a result of demands for regional inputs and activity. Most of the jobs during construction within the region are likely to be direct employment.

With a multiplier that is 10% higher there would be an additional $1.5 million of follow-on benefits and another 5 full time employees in the MIA.

The Lake Wyangan development would help to generate employment and compensate for a recent downturn in the MIA economy, including the recent redundancies at the former Steggles chicken meat processing plant.

7.5 National impact

The national impact is larger than the regional impact because there are relatively few leakages of expenditure from the Australian economy – most inputs are expected to be purchased from Australian manufacturers. However, national impacts also need to be treated with much more caution than do the specific regional benefits for reasons flagged earlier. At the national level, the benefits of this type of investment will accrue irrespective of which regions the investment occurs in – clearly with greater benefits the stronger the fundamentals of each project. Sensible consideration of national benefits *must* be done alongside consideration of the national opportunity cost of directing resources at these projects – something that need not be so true of regional benefits from a specific project, where the local region benefits from the specific project proceeding to a much greater extent than it would if a different project were funded instead.

A range of projects of this type, as is envisaged through the proposed funding arrangements for priority projects (as discussed in Section 8) will have large nominal implications for national output and employment, but these impacts are likely to be substantially offset by reduced activity elsewhere in the economy as a result of this direction of resources. A lot of projects of this type can deliver a lot of benefit to the regions 'hosting' the projects, because of money spent in these regions that would otherwise be largely spent elsewhere, but can suggest an overly optimistic view of the overall national impact.

The output multiplier is estimated to be 2.58. We would expect the total economic benefit of undertaking the Lake Wyangan development to be $144 million, with $88.3 million of flow-on benefits being enjoyed by the nation.

As an indicator only, these figures suggest that this expenditure would lead to an additional 768 full time equivalent employees around Australia, though again extrapolation to national impacts from regional assessments of this type is highly imprecise and tends to be seriously biased upwards – especially where a large number of such projects would result in significant competition for key resources needed for the projects. The analyses are best interpreted in their regional settings. This figure flows from the assumption that 80 per cent of inputs are sourced from outside the region and from the larger national vs regional multipliers.

Again, we stress this assessment is relative to a 'do nothing' scenario when in fact the funding would almost certainly be redirected to the national economy – as alternative projects, lower taxes or faster repayment of debt. In this context, actual net national employment implications are likely to be much more modest. Of course, if the investment is highly cost effective, and delivers environmental water more cheaply than would other be possible, then it may offer substantial national benefits.

For the reasons outlined earlier, the regional impacts would appear far more significant than the national impacts in relation to this type of project. However, systematic consideration of opportunities for accessing environmental water more cost effectively, in conjunction with the socio-economic and stimulus impacts of such projects, could aggregate to a significant national benefit.

7.6 Summary of costs and benefits

The capital cost of the Lake Wyangan development is estimated to be $55.9 million. Against this is the expected benefit of 6,000ML of environmental water released ($19.5 million), and the estimated benefits to Australia which the expenditure would generate ($144 million, of which $16 million is in the region). In addition, there is close to $1 million in system maintenance savings. There are also significant benefits flowing from the sustainment of ongoing agricultural industry activities, which have not been quantified in this report.

At an indicative water value of $3,263/cap equivalent ML, the present value of the water savings is $14.9 million and the direct and flow on benefits from construction have a present value of $16 million to the MIA region.

Value of improved water services within the scheme, and the value of the region from improved environmental flows and associated management, would be additional to this. More generally, the indications of willingness by Murrumbidgee Irrigation and the NSW Government to invest substantially ($19m and $11m respectively) in the project points to a high value attributed to the benefits to be retained within the scheme and capable of commercial recovery. Flow on benefits to the region in terms of retained activity, employment and asset values looks likely also to be substantial.

The water savings are from conveyance losses, which have higher value than high security entitlements, however prices for conveyance entitlements could not be obtained. Valuing the benefits of the water savings returned to the environment at the current price for high security entitlements in the Murrumbidgee catchment at $3,263/ cap equivalent ML, there are between $19.5 million and $29.4 million of water benefits (before discounting back to present value) from undertaking this development, the present value of these savings is between $14.9 million and $22.4 million. This is without valuing the environmental and recreational benefits of better water quality in the region.

Indicatively, we estimate that the project would create 56 additional jobs within the MIA and 768 additional jobs nationally in pipeline manufacture, transport, and machinery and equipment industries.

8 Concluding comments

Considering this assessment of the regional impacts of the Lake Wyangan project, along with the discussion in Attachments B and C of the Trangie-Nevertire and the Wimmera-Mallee projects, certainly highlights the scope for large benefits to accrue locally from these projects. As was noted earlier, the benefits from the construction phase of the project accrue almost automatically from the large capital expenditures implied. These benefits will not usually be justified, even by the large early regional benefits, unless they deliver a competitive combination of improved environmental flows and restructured regional economic capability sufficient to deliver to the community a sustained stream of value into the future. For a project involving a large contribution from within the local community this is reason for caution even within the regions.

That said, a range of factors suggests that some projects of this type could be highly cost effective:

- the potential for accessing substantial volumes of water from historical losses – after taking due account of any downstream flows fed by seepage;
  - with the possibility of greatly relaxing the trade-off between economic activity and environmental flows;
- scope for tapping into sunk costs of existing regional infrastructure – irrigation and other water supply; input supply systems and product processing and transport systems; skilled and available labour etc;
- the fact that there have been very significant advances in water efficient technologies in respect of both main irrigation/supply systems and on-farm systems for managing water applications efficiently and directing them to the product mixes that are efficient given the access to these technologies;
- limitation of the potential for a combination of market and regulatory failure, combined with the incidence of incentives implied by the buyback arrangements, to encourage combinations of water sales and contraction in farm systems that prove later to have been unnecessarily costly and inefficient from a whole of region or whole of system perspective;
- Scope for directly addressing the social costs of regional dislocation that might accompany rapid sale and scaling back of production, through a transition strategy that offers greater smoothing and limitation of the risks of excessive contraction.

The July 2008 meeting of COAG announced in-principle (subject to due diligence etc) Commonwealth support for $3.7 billion of funding directed at significant water projects in the states and territory that span the Murray-Darling Basin – with the emphasis being on water savings, water efficiency and the management of environmental stresses, including but not restricted to the return of a proportion of water savings as improved environmental flows. The total was composed indicatively of $1.3 billion in NSW, $1.1 billion in Victoria, $650 million in South Australia and $510 million in Queensland. This includes the Stage II Food Bowl and the Sunraysia Modernisation Projects in Victoria, and a range of, generally individually smaller, projects in other jurisdictions.

Allocation of these funds must address three criteria, requiring demonstration that:

1. deliver substantial and lasting returns of water for the environment
2. secure a long-term future for irrigation communities, and
3. deliver value for money in the context of the first two tests.

These criteria are entirely consistent with the justification needs set out earlier.

Additional funding would be directed at farm level water efficiency improvements – that could complement, support the value of and add to the justification for some major irrigation upgrade projects and for the release of environmental water. In other cases, they may allow farms to restructure production systems in ways that both support sale of water to the environment and a more reliable continuing contribution to the regional and Australian economies.

Were these expenditures to be accompanied by regional impacts of a form broadly analogous to that expected in relation to Wimmera-Mallee and Wyangan Dam, and inferred for Trangie-Nevertire, then the aggregate impact across a wide range of regional economies would be very large.

The specific cases studies hardly constitute an adequate sample on which to base extrapolation to the regional benefits likely from the full expenditure of the $3.7b of Federal Funds earmarked for this type of water project. Nonetheless, we note that general application of this level of funding, if coupled with regional and other funds in the same proportion (around half) as is proposed for the Lake Wyangan project, is suggestive of potential for leveraging construction phase regional benefits of the order of $2b – followed by the more sustainable benefits to the relevant systems that constitute the primary rationale for the projects. We stress that this is essentially extrapolation and not a formal estimate. It is indicative of a potentially large block of regional benefits that are delayed by avoidable delays in identifying and committing to sound projects.

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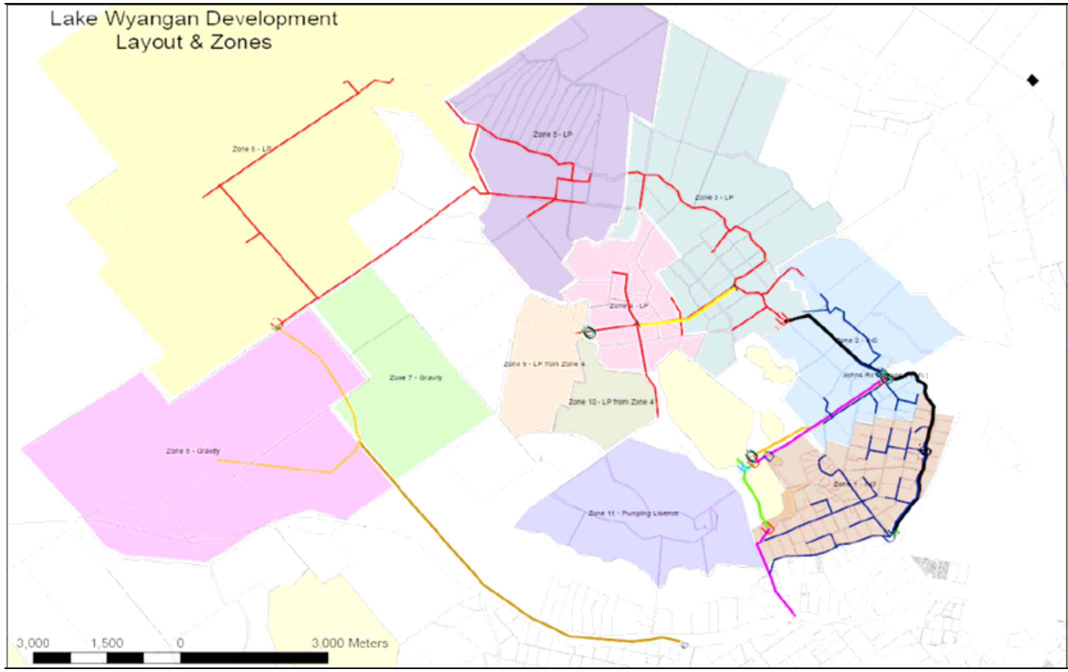
A Lake Wyangan development layout and zones

Figure 5 **Lake Wyangan development layout and zones**



Data source: Murrumbidgee Irrigation

B Trangie-Nevertire irrigation scheme

Much more limited information is available on the Trangie-Nevertire upgrade proposal, but it still offers valuable insights into the types of regional benefits that might combine with impacts on environmental water to build a more balanced case for considering this type of irrigation infrastructure project. This attachment provides an overview of these potential benefits and linkages.

Irrigation within the Macquarie River Regulated WMA includes private irrigation as well as several irrigation schemes (Narromine-Trangie, Buddah Lakes, Tenandra, Trangie-Nevertire, Nevertire and Marthaguy). There are two primary water storages within the area, Burrendong and Windamere Dams. Major towns in the area include Dubbo, Wellington and Mudgee.

Construction of the Trangie-Nevertire irrigation scheme (TNIS) commenced in March 1970 and was completed in 1973. The system operates by pumping water from the Macquarie River 7-8 metres above its level, with the entire system being gravity fed from this point onwards. The main channel is 209 kilometres long, with a further 35.5 kilometres of subsidiary channels also being operated – these are earth lined. Sixty six farms are served by TNIS, covering an area of 101,984 hectares, although there are only 44 irrigation scheme members, with an irrigable area of 21,450 hectares. The TNIS is currently in the process of rationalising the system to improve efficiency, and is undertaking modernisation planning under a government-funded program.

Crops grown under the TNIS include coarse grains, cotton, oil seeds, wheat, pasture, lucerne and vegetables. The annual additional production attributable to irrigation on this scheme is estimated by the TNIS to be $35 million. Cost of construction of the scheme in 1971 was $1.1 million ($9.8 million in 2009 prices); significant investments have been made by irrigators and TNIS since construction.

B.1 Key issues

The system is outdated and inefficient, with significant water losses in the TNIS. Delivery losses account for some 25-30% of water allocations and almost 50% of water extracted from the Macquarie River.

The scheme requires at least minimum parcels of water to be delivered to avoid otherwise unacceptably high losses relative to water delivered. The minimum parcel is judged by TNIS to be 1,500ML per delivery. This water is then used in flood irrigation and delivered to on-farm storages – that can entail additional losses in storage.

TNIS only draws water from the river four times per year, and this creates organisational difficulties, because irrigators need to agree in advance what crops they will plant, and when and how much water is demanded. This effectively means that the irrigators need to agree on a single crop to plant to coordinate the water requirement.

The system uses flood irrigation, which means that certain crops are over watered for a time, and then receive insufficient water at a later date. On farm storages are a relatively inefficient means of countering this timing problem. An estimate of the water balance in the TNIS is shown in the table below:

Table 5 **Water balance in the TNIS**

Losses in the river	40-45%
Loss in delivery	25-30%
Delivered water	15-27%
Losses on farm	8-10%

Data source: Estimated from a chart produced by Trangie-Nevertire irrigation Scheme – for the Modernising Irrigation Forum, Presentations, March 2009, located at http://vimeo.com/5104614

It should be noted that the water losses in the river, and seepage from delivery and on-farm are lost to the TNIS, but may ultimately be recovered downstream. This means that the private benefits of reducing losses may be high to the TNIS members, but much lower to the water system as a whole. These matters were flagged by ACIL Tasman (2008) and in Section 2.1 above.

Water losses exacerbate the impact of drought and lead to both operational inefficiencies and reduced security of supply within the TNIS. The current water requirement per hectare is high, meaning that the output per megalitre (ML) delivered is quite low – this is currently being addressed by on-farm efficiency investments.

B.1.1 Environmental issues

The TNIS is located close to the Macquarie Marshes, an area of substantial environmental value, and also the Macquarie River has an MDBC Sustainable Rivers Audit Health Rating of Very Poor, suggesting that there should be high value to additional environmental flows.

B.1.2 Operating inefficiencies

As was flagged earlier, the minimum parcel of water which is run through channels is 1,500 ML, to limit relative losses. The outdated irrigation system creates a number of operating inefficiencies including restrictive needs to coordinate what crops are planted and when, so that the irrigation water can be delivered to all properties at the same time. This greatly reduces the flexibility of the system.

Twenty five to thirty percent of all water is lost in delivery, and this represents almost half of all losses once the water is diverted. More water is being extracted from the Macquarie River than would be necessary to irrigate the same area under an efficient system.

The current system runs only four times a year on average. This means that the pumps need to be operated intensively, missing the opportunity to coordinate with low power prices. There is effectively no storage in the system, so there are additional planning constraints to meet lead times.

The current system relies on flood irrigation, and this is an inefficient method of delivering water for irrigation – increasingly inefficient with a rising scarcity value of water and rising demands for environmental water. Improving the delivery system could create additional certainty of supply, shorten delivery lead times and probably deliver higher value water. Greater availability and improved delivery of irrigation water would increase the incentive to invest in further on-farm efficiencies, such as lateral move or standard pivot technologies.

As with the Lake Wyangan development, this raises the potential gains from coordinating the project and the development of on-farm efficiencies with the return of water to the environment – to limit both adverse regional impacts and possible inefficient early responses.

B.2 Proposed project

B.2.1 Project overview

The TNIS is currently in receipt of government funding to develop an irrigation infrastructure modernisation plan. Details of what the plan would entail are not yet public and could not be obtained by ACIL Tasman due to confidentiality issues. From personal communication with the Chairman of TNIS, it is understood that the whole 240 kilometres of the system is being considered for upgrade – implying a potentially large investment – although some branches of the system may be rationalised to improve the efficiency of the system.

A decision has not been announced as to the proposed upgrade, but it is expected that, at a minimum, channels will be lined, and in some cases pipelines may be laid, along the whole 240 kilometre system. This should attack losses through both evaporation and seepage – more so the latter if the emphasis is in lining.

TNIS expect that of the 25-35% of the total water losses that they experience, about two thirds are controllable, and the remainder relate to river losses, unavoidable evaporation and other losses.

The proposed project has a number of purposes:

- Water for the environment
- Security for essential services
- Security for communities
- Efficient irrigation/ additional production

B.2.2 Supply system

The TNIS region is quite flat, and pressurised flow would be required for any upgrade which involved piping. Whilst this option is being considered it would entail additional cost, including energy use from pumping.

A likely scenario is that the channels will be lined, which would limit seepage, but not evaporation. As mentioned earlier in this report, seepage may well flow downstream, and preventing seepage could have a negative impact on the flows downstream, and in the future. Therefore the benefits of channel lining need to be carefully considered.

Additionally, government money for modernisation is available for funding upfront capital costs only, not any ongoing costs. This means scheme members will need to find a way to fund the ongoing replacement cost of liner, which generally lasts between about 8 to 16 years and which cost could run into the tens of millions per replacement.

Using pipeline for all or part of the upgrade would lead to avoided evaporation, seepage and leakage losses and also avoid large capital injections every 8 to 16 years. This would lead to genuine savings of water for the system.

B.2.3 Supply water source

This would remain unchanged – the Macquarie River.

B.2.4 Storages

With channel lining, or even piping, and reduced delivery losses TNIS expects to be able to store water in the channels, which would allow much shorter lead times for delivery (a matter of hours) than the current system.

Increased efficiency in deliver may reduce the need for on-farm storage of water, although the final impact of this effect has not yet been estimated.

B.2.5 Structures

It is not known what additional structures would be required for the upgrade project.

B.3 Project benefits

At this stage the amount of water which could be recovered from the system is not known. TNIS estimate that of the total water losses (including water lost in the river) some 20% are controllable by TNIS. They have the aim of reducing these losses to single digit amounts – that is, to halve the current amount of water lost by the irrigation scheme.

It should be noted that of these losses, some will be caused by poor metering – which means that the water is in productive use, but is not being charged. Better metering would assist in delivering the desired amount of water, but would not add to the farm output per megalitre.

Another component of water losses is seepage and leakage. One is unable to say whether such losses are true losses to the river system without understanding the hydrology of the system. Earlier work (ACIL Tasman, 2008) stressed the need for sound consideration of these impacts in weighing the value of recovered losses. This does not necessarily require definitive assessment of the ‘fate’ of seepage losses, but it does require sensible management of the risks associated with any uncertainty.

Where the channels are piped there will be savings from avoided evaporation, as well as avoided seepage and leakage. Evaporation losses recovered are more clear cut – but of course need to justify their costs.

B.3.1 Water Savings

The general security allocation announced on 1 July 2009 was 0% on the Macquarie River, although a review of previous allocations indicates that the July allocation is always the lowest allocation of the year, with subsequent increases commonplace (NSW Government, 2009). There is therefore little possibility to deliver water, let alone make efficiencies in the delivery of that water, on the basis of the July 2009 allocation. The total entitlement held by the TNIS is 68,000 ML. If total avoidable losses are 20% of this total, then there are potentially 13,600 ML of water losses in the TNIS. On the assumption that the upgrades can halve the amount of delivery losses, then the potential annual water savings are 6,800 ML per annum. The water capacity factor for general security entitlements in the Macquarie is 0.8084 which means the long term cap equivalent water savings could be of the order of 5,500 ML per annum.

B.3.2 Operational Efficiency

There are certainly expected to be large gains in operational efficiency and operational flexibility from the modernisation.

The TNIS customers would be able to plant a more diverse range of crops and such diversification may lead to smoother employment and profit outcomes for the businesses in the region. Relaxation of technical constraints would certainly encourage exploration of more profitable farm systems.

Modernising the pumping of water into the delivery channel would allow reduced pumping costs by allowing the pump to utilise off-peak power, and to store water in the channels, although piping would imply some offsetting energy costs.

B.3.3 Environmental Improvement

Without knowing more about the ultimate impact of the upgrade, it would be difficult to say what the environmental benefits might be. If the project were funded under current government policies then at least 50% of the water saved must be returned to the environment with LTCE) of at least 2,750 ML being returned to the environment (i.e.: 50% of 5,500 ML calculated under B.3.1 above). Against this environmental gain we should also consider possibly offsetting impacts from reduced seepage in the TNIS.

B.4 Project Cost

ACIL Tasman was unable to obtain project costs from TNIS – both project specification and cost estimates are still being developed and remain confidential.

Crane Group estimate the capital cost of a fully rationalised and upgraded TNIS to be $130 million. This is likely to be an upper estimate for the capital cost of the works that would be undertaken – for most projects there can be rapidly diminishing returns from pushing out towards the limit.

Nonetheless it does point to be potential for this to be a large regional project.

If such an extensive upgrade were to proceed, the whole system would be rationalised and piped within that indicative cost of $130 million If the works were spread over four years, at a discount rate of 7% real, the NPV of the cost is expected to be $110 million – or a bit over twice the proposed cost of the Lake Wyangan project.

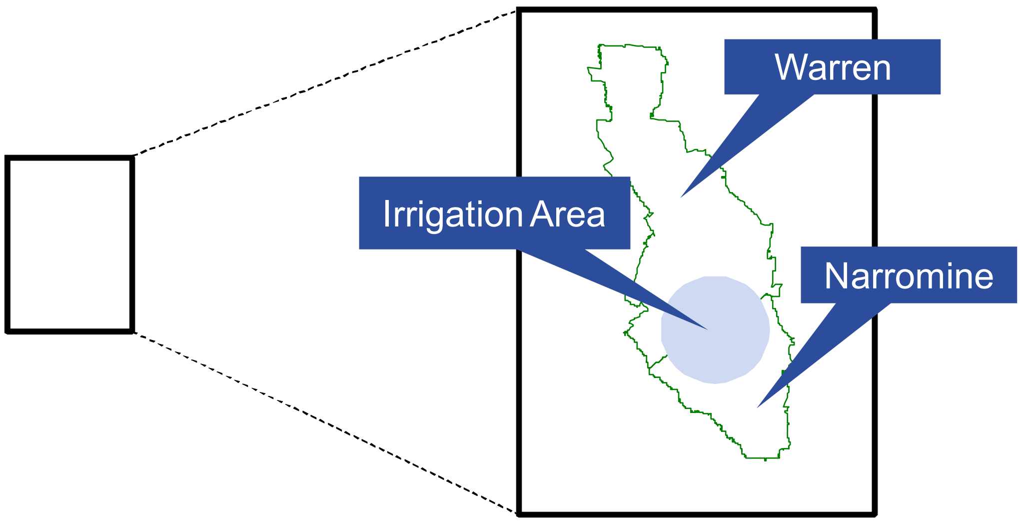
It should be emphasised that these costs are indicative and sourced from estimates by the Crane Group in relation to a theoretical high end upgrade rather than the specific project proposal – it is possible, and even likely, that the eventual capital cost would be much lower than this figure.

B.5 Socio-economic background to the Trangie-Nevertire Irrigation Scheme

B.5.1 Overview

The TNIS straddles the two Local Government Areas of Narromine and Warren. Combined, the population of these two Local Government Areas accounted for just over 9,000 people on the 2006 Census night.

Figure 6 **Trangie-Nevertire Irrigation Region**



Data source: ACIL Tasman analysis, ABS 2006 Census data

The area surrounding the TNIS is heavily dependent on agriculture, with almost all the region's exports coming from the 'agriculture, forestry and fishing industry'. The region has a strong focus on broadacre cropping and grazing as well as the production of cotton. The economy is quite dependent on sheep and cotton, with cotton responsible for an estimated $32 million in 2005-06.[5] Other local produce includes wheat, oats, sorghum and maize.

In 2005-06 in the Narromine community alone, the agriculture, forestry and fishing industry accounted for 36 per cent of the Gross Regional Product of Narromine, which was an estimated $205 million.[6] Its demands would have underpinned a significant proportion of activity in other industries, including input suppliers.

Access to irrigation water from the Macquarie River has been extremely important for the area. The introduction of irrigation water has allowed for the growing of cotton as well as specialised intensive production (e.g. a rose

[5] Cotton Catchment Communities CRC, www.cottoncrc.org.au/files/a631f08c-8b90.../Narromine_study.pdf

[6] Cotton Catchment Communities CRC, www.cottoncrc.org.au/files/a631f08c-8b90.../Narromine_study.pdf

propagation nursery in Narromine). This has helped diversify the economy's agricultural base away from grazing and cropping.

Given the industry make-up of the area surrounding the Trangie-Nevertire system, it is not surprising that the largest employers in the combined local areas of Warren and Narromine are related to the agriculture, forestry and fishing industry. Data from the 2006 Census show that this industry accounted for 34 per cent of employment for the combined local areas. Other important industries were health care and social assistance (10 per cent) and retail trade (8 per cent).

In terms of occupations, almost 30 per cent of employed persons were in managerial roles while 63 per cent of those in the agriculture, forestry and fishing industry were employed in managerial roles.

Although there is a strong dependence on the agriculture industry for those around Trangie and Nevertire, there is also a high level of commuting. In 2006, 24 per cent of employed Narromine residents commuted outside of the shire, and predominantly to the larger centre of Dubbo for work.

Aggregated unemployment across Narromine and Warren was 3.4 per cent at the 2006 Census. There is some evidence that employment in agriculture has been declining throughout the drought, but that the mining sector was soaking up young unemployed agricultural workers. The Census unemployment statistics are dated to 2006 and do not include the recent downturn in the mining sector which is likely to have an impact on employment in the region.

B.6 Water availability

The amount of water available for TNIS water access licences is determined by the NSW Government over the irrigation season, derived from the amount of storage in the two main reservoirs, Burrendong and Windamere Dams. Recent CSIRO modelling (CSIRO, 2008) has determined the future long-term average water availability for the Macquarie system as 51% for general security access licences under the report's "Scenario A: Historical climate and current development"; other scenarios generated both higher and lower expectations for water availability.

B.6.1 Water entitlements

The TNIS is a cooperative scheme, with the individual irrigators holding the water entitlements.

Table 6 **Water entitlement held within the TNIS**

Water entitlement category	TNIS licences
	ML
General security	63,408
High security (research)	4
Stock/domestic/towns	562
Supplementary	4,838
Total	68,812

Data source: Murrumbidgee Irrigation

In 2008-9 no water entitlements were sold out of the region because the trading rules had not been finalised. News reports in on the subject showed that $4.5 million of government buybacks are currently held up due to the legal status of the trades. On 1 July 2009 water availability in the catchment was 100% for high security entitlements and 0% for general security entitlements - this availability is updated regularly.

B.6.2 The effect of water leaving the region

As with the MIA project, there can be distortions in the incentives individual holders of water rights face to sell their rights. These can stem from Commonwealth incentives to encourage sales to the buyback scheme and the scope for individuals effectively transferring responsibility for some TNIS costs to remaining irrigators – a form of externality.

Uncertainty regarding future levels of sales limits the ability to plan for and run the system efficiently – though clearly some uncertainty is inevitable and systems must be in place to cope with it. Because TNIS cannot know in advance who will choose to sell their entitlement and leave the system, it will suffer additional inefficiencies and costs maintaining assets which are now only relevant as a conduit to other properties. Progressive changes can strand assets. This need not necessarily be inefficient; assets are stranded routinely in dynamic economies. However, it is appropriate to ensure that the assets are not in fact competitive, taking into account the sunk costs involved, and that the stranding is not a consequence of market or intervention failure.

A study of the impact of the closure of the Wakool Irrigation area (or parts thereof) stated that "The level of impact is linked to the volume of water that may be removed from the region. Farm businesses that sell the water receive an injection of funds to help adjust to the changed circumstances. However, the flow-on impacts of a significant drop in the rural economy due to the loss of water will be pronounced, but there is no adjustment support for those remaining in the region." (RMCG, 2009).

Those remaining include irrigation farmers who must deal with a water delivery system with declining technical efficiency and with the need to spread maintenance costs over a shrinking pool, plus transport, processing and input supply activities and their direct employment, where lower throughput involves lower size economies, especially where based around sunk investment in equipment now larger than is needed.

This study also estimated that every 1000 ML of water that is lost from the region resulted in:

- $300,000 loss of agricultural production within the shire
- up to $900,000 loss from the regional economy
- $3,500 in direct rate revenue loss
- loss of one agricultural job
- loss of one regional job.

ACIL Tasman (2008) identified the implicit value of water savings through irrigation infrastructure rather than water buybacks (ACIL Tasman, 2008). The June 2009 Market Price report (issued by GHD Hassall, 2009) stated a price of $1,250 for a general security entitlement (note: this price does not include other inducements to sell offered by the government). The associated prices per LTCE ML were $1,546.

B.6.3 The value of water

This paper is primarily about the benefits beyond environmental flows – those were the focus of ACIL Tasman (2008). However, the project is intended to deliver a range of ‘joint products’, including the regional benefits and significant restored flows. It is appropriate that these joint products be considered in a framework that recognises the major interactions.

On average, the modernisation is expected to return 2,750 ML cap equivalent of water to the environment each year. We do not at present have enough information on projects costs or funding gap to make an assessment of whether this could be delivered at a competitive incremental cost.

B.6.4 Water savings

The economic benefits can be measured in a number of ways. Firstly, there is the market value of water saved – estimated at $1,250/ML for a high security entitlement or about $1,563 on a cap equivalent basis. On this basis, the water savings of 5,500 equivalent megalitres per annum (shared between the scheme and environmental flows) might be considered to have a net present value of the order of $5.25 million. The assessment would need to consider any implications of current seepage losses that re-enter the system downstream, and this could reduce somewhat the effective level of recovery and associated system value of recoveries.

B.6.5 Direct and indirect benefits from construction

Spillover benefits arising from construction expenditures also have a positive impact on a local area. As was flagged in Section 2.3, these effects are real but need to be treated carefully in weighing if an investment is justified. The opportunity cost of what might otherwise be done with the resources needs to be factored in, and that includes recognising that alternative projects would probably also have flow-on benefits.

The relatively low unemployment levels in the region, combined with a relatively small number of suppliers of the necessary infrastructure in the region suggests that the regional multiplier effects for TNIS might be lower than those seen in the Wimmera-Mallee and Murrumbidgee Irrigation schemes.

The earlier discussion suggested a (highly speculative) upper bound figure for project cost of around twice the cost proposed for the Lake Wyangan project. If realised and combined with a lower regional multiplier, this could suggest overall benefits from construction, including flow-on effects, of the same order of magnitude, or perhaps a bit larger than, as the Lake Wyangan project. Final project specification may well involve a lower cost and consequently lower regional impacts – though very possibly a more cost justifiable project overall if this outcome flows from sound project optimisation.

If the project were scoped at $130 million for piping some 162 kilometres of the scheme, and if we assume that the water savings are 20% of water diverted (higher than the estimate made above which is predicated on only lining the channels), then there could be 11,000 ML cap equivalent of water saved by the scheme. If we then assume that the water is shared equally between the environment and productive use then there is 5,500 ML available for each use. This water is valued indicatively at $1,250 per ML or $1,546 per cap equivalent ML.

Indicatively also we assume a lower regional multiplier of 1.2 for this scheme reflecting the lower proportion of inputs which could be manufactured within the region, although without knowing the exact requirements of the scheme such an estimate can only be indicative. Finally, we assume that 10% of expenditure is locally sourced. Of course, in a smaller regional economy, even a smaller dollar value level of demand can have greater relative importance.

Again working with this high end specification, this reasoning suggests the potential for construction phase regional stimulus including:

- Direct and flow-on regional output benefits from the construction phase of the order of $16 million;
- Associated direct and indirect employment effects during construction of the order of 54 full time equivalent jobs.

Reconfiguration of the scheme to involve less piping and more lining of channels would reduce the overall spend, but could have the effect of increasing the proportion of expenditure sourced locally – implying a less that proportionate reduction in these impacts. However, these estimates must be viewed purely as indicators, probably upper bound indicators, of potential regional impacts, pending firming up of project specifications – and the purpose of the project specification phase is certainly not to maximise the value of the regional benefits but to determine the most cost effective project.

Against these regional benefits must be assessed the contribution to the scheme which would be made by TNIS, presumably reflecting expectations of longer term benefits to the regional economy, and the opportunity cost of government funding, if allocated to the project.

B.6.6 Efficiency benefits

The improved system should be better able to supply customers with more predictable water supply, and better service standards in ways that could be expected to have commercial and social value.

B.6.7 Improved supply flexibility

The ability to take delivery of irrigation water as needed gives irrigators added flexibility to optimise their farm systems for higher profitability and greater robustness.

The infrastructure will also provide environmental benefits which are hard to quantify: improved water quality and volume in the Macquarie Marshes and in the Macquarie River. Of course, care is needed in weighing these effects not to double count – the discussion of the value of the water returned to environment, set out in Section 7.2.1, is another way of looking at these same benefits and should not be counted twice.

C The Wimmera-Mallee Pipeline Project

Earlier this year, there was some media reporting (Herald-Sun Newspaper, 2009) of the regional benefits – from the construction phase – of the Wimmera-Mallee Pipeline Project (WMPP), based around Horsham in Victoria.

The business case for the WMPP contained a number of interesting potential benefits and is worthy of a write up as a separate case study. Further anecdotal evidence and economic estimates supplied by the Wimmera Development Association and included in the Herald Sun article demonstrated the non-water benefits of infrastructure upgrades.

The Wimmera-Mallee Pipeline Project is one of Australia's largest water saving projects and is being funded by the Commonwealth Government, the Victorian State Government and the Grampians Wimmera-Mallee Authority (the Authority). On completion of the project, the Authority's 17,500 km of open earthen channels will be replaced with an 8,800 km piped water distribution system. The new system of seven discrete supply systems will cover 2.3 million hectares and provide water to about 2,500 rural customers, 35,000 urban customers and 36 towns in the region.

Water savings of 103,000 ML per annum are expected to be realised through the piping of the existing open channels. These savings were to be directed to restoration of the important ecosystems of the Wimmera and Glenelg Rivers and to promote regional development. Earlier comments regarding the need for adequate accounting for the downstream consequences of seepage are again relevant here, but overall recoveries appear likely to be substantial.

The aims of the project (Grampians Wimmera-Mallee Water, 2007) and as reported at http://www.pipingit.com.au are to provide:

- secure, reliable and better quality water supplies for the farms, towns and businesses of the region. The new system hopes to substantially improve the security of supply to 96 per cent for rural and urban customers. Currently, the security of supply is 78 per cent for rural customers and 88 per cent for urban customers
- up to 83,000 ML of water to the State Government, which may be used to supplement the region's river systems and the Murray River system as environmental flows. This would help to restore these degraded waterways, and provide increased frequency of flows to the region's nationally significant terminal lake system, including Lake Hindmarsh and Lake Albacutya

- 20,000 ML per annum of additional water for regional economic development
- water for 11 recreational lakes in the region, with flow-on benefits for tourism, and water for environmentally significant water bodies located within the area serviced by the new system
- increased environmental flows for the Wimmera and Glenelg rivers and water for existing wetlands.

C.1 The Wimmera-Mallee region

The Wimmera-Mallee has been under considerable stress and declared for Exceptional Circumstances since 2006, recently extended to March 2010 (Department of Agriculture, 2009). The social indicators of this region in the 2006 Census indicate a relatively good socio-economic profile, based on education, employment and socio-economic status compared to Victorian and Australian averages.

It should also be noted however that Grampians Wimmera-Mallee Water has announced that it is developing a business case to facilitate the permanent closure of the Wimmera irrigation system. This may create a downturn in the region leading to additional unemployment in the region".

C.2 Project cost

The interim business case that was prepared in 2003 estimated the cost of constructing the pipeline at $501 million, including $82 million for on-farm works. The Authority subsequently identified an additional cost of $21 million to meet project management and governance costs not included in the 2003 business case estimate, bringing the total estimated project cost to $522 million.

The estimate of the overall project cost has been revised upward and the 2008 Auditor General's report on the project estimates that the completion cost would be $688 million (excluding private landholder works). This estimate included a $26 million provision for unplanned risk.

The interim business case set a ten-year timeframe for completion of the project. Due to the availability of government funding and the drought, the timeframe was later reduced to five years (project completion date 2011). The current estimate for project completion is the first quarter of 2010.

C.3 Project benefits

The 2003 Interim Business Case, which assessed the full range of the benefits and costs of the proposed project, using multiplier analysis, claimed a positive benefit-cost ratio of 1.19 (Beauchamp, 2009)[7], with benefits of $637 million outweighing costs of $536 million – we have not been able to determine the extent to which the true opportunity cost of this project was included in the project evaluation. The other benefits assessed included:

- increased environmental water for rivers, wetlands and floodplains, both within the region and more widely through additional flows to the River Murray;
- avoided costs currently involved in running the channel supply system;
- on-farm benefits from increased productivity and reduced costs;
- major economic development benefits from the increased opportunities over the next twenty years to grow major business sectors such as intensive livestock, mineral sands and viticulture;
- enhanced recreational values from the provision of more reliable, and larger flows to recreational lakes; and
- water quality benefits, from the extended life-span of hot water systems and other appliances currently corroded by the high salinity levels in the water supply.

In addition to these benefits, the Wimmera Development Association determined that an additional 220 jobs and additional wages of $114 million had been created within the region (Beauchamp, 2009). Mitchell Water Australia, the company engaged to design and build the pipeline has engaged some 500 companies to supply products and services to the pipeline. Such services range from providing earthmovers to childcare, with many of the companies being locally located in Horsham (Beauchamp, 2009). Throughout the build phase, the Development Association has been actively engaged in training local businesses to be successful tenderers for this work.

[7] Noted in a number of internet references, but the Business Case and Interim Business Case are no longer available online.