The Living Murray
Water Recovery Regional Studies

SUMMARY REPORT
- Final
- 10/10/2003
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1. Background

1.1 The Living Murray
The vision for The Living Murray, agreed in April 2002 by the Murray Darling Basin Ministerial Council is “a healthy River Murray System, sustaining communities and preserving unique values”. The Council in May 2003 reiterated its view that the evidence of the declining health of the River Murray is clear and demands action.

Over the following decade, the Council expects to see a healthier river, a more prosperous and sustainable irrigation sector, and more efficient water resource management.

To guide and support The Living Murray, Council has agreed to four high level principles:
- Action will be taken to restore a healthy working river system;
- Action taken will be fair and reasonable;
- A range of measures will be used in an integrated and adaptive manner; and
- There will be both government and community responsibilities for The Living Murray decisions and outcomes.

1.2 Murray-Darling Basin Ministerial Council decisions on water recovery
Council Meeting 32 - 1 November 2002, directed the Commission to undertake the necessary further work to establish cost effective water savings, based on a set of principles for water recovery for the environment.

Council Meeting 33 – 9 May 2003, while noting that the Commission has identified six possible mechanisms for water recovery for environmental flow, also recognised that the choice will depend on the targets agreed, and that the improvement of the health of the River Murray will depend on a range of factors other than flow volumes.

Council also agreed that water recovery mechanisms should be developed further through regional studies. In its consideration of such mechanisms in November 2003, Council agreed it will have regard both to ecological and socio-economic implications and the degree of choice and flexibility available through such measures at the system, reach and irrigation district levels.

1.3 Water recovery mechanisms
The discussion paper provided to Council Meeting 33 on mechanisms to recover water for environmental purposes provided preliminary information and analysis of six possible mechanisms.
Specifically the mechanisms are:

a) **Modifying Reliabilities** – Voluntary conversion of existing low security entitlements to high security entitlements at an exchange rate that would maintain the integrity of all entitlements.

b) **Regional Supply System Redevelopment** – Regional irrigation supply systems would be redeveloped in accordance with the relevant catchment strategies and priorities, reflecting the contribution, risk and opportunity irrigation provides the region.

c) **Market Based Water Recovery** – Entitlements purchased by government or by a designated organisation through current market mechanisms.

d) **On-Farm Redevelopment** – Investment in improved irrigation management and infrastructure on-farm to increase water environment use efficiency. Cost sharing between governments and irrigators would determine the proportion of the on-farm water use savings made available for environmental purposes.

e) **Changing Reliabilities** – Change reservoir operating rules or allocations strategies to increase the amount of environmental water in wetter years while protecting and/or enhancing water availability for consumption in dry years.

f) **Compulsory Acquisition** – Reduce the volume of water entitlements on all water licences and make payments to offset impacts.

In providing this advice to Council, particularly on the issue of cost effectiveness of mechanisms, it was emphasised that the information and analysis was limited to an assessment of individual mechanisms under generalised conditions.

The primary costs and benefits of implementing any one of the above mechanisms will differ in different regions according to its suitability, complexity and affordability in the context of regional and on-farm irrigation priorities. Therefore a regional study approach was recommended to facilitate access to reliable information and structured community input on water recovery, in order to assess the feasibility and acceptability of these proposed mechanisms, and identify alternate recovery mechanisms.

### 1.4 Council of Australian Governments National Water Initiative

On 29 August 2003, the Council of Australian Governments (COAG) agreed to develop a National Water Initiative which will build on the achievements of the 1994 COAG strategic framework for the reform of the Australian water industry, the *Natural Heritage Trust* and the *National Action Plan for Salinity and Water Quality*.

Recognising the declining health of the River Murray System in particular, COAG noted that the member jurisdictions of the Murray-Darling Basin have agreed to provide new funding of $500 million over five years to address water over allocation in the Basin.
2. Introduction

2.1 Regional water recovery studies
The Murray Darling Basin Commission is further developing knowledge about water recovery mechanisms to support The Living Murray objectives through a regional study approach.

The most important feature of the regional studies is that a consistent study methodology has been applied to each of the four study regions. There has been consistency in approach with the information sought from each region, the application of an evaluation framework to review water recovery proposals and the recording of information in the respective regional reports. This consistency of individual reporting has enabled the drawing together of all of the information to a southern Basin scale.

The intent of the four studies across the southern Basin has been primarily to increase Commission’s understanding of a set of proposed water recovery mechanisms (refer Section 1.3) and identify possible activities under these mechanisms and alternate mechanisms that may be proposed by regional stakeholders. An important aspect of this work is to assess the feasibility and implementation issues of proposed water recovery mechanisms (individually or as a package) in the context of existing catchment and sub regional plans. The approach has also provided the opportunity to identify key issues and investment requirements for a more prosperous and sustainable irrigation sector.

The Commission’s work is based on an expectation that government will invest in water recovery actions to obtain water entitlements for the River Murray.

Under The Living Murray, any water recovery decision will involve the Murrumbidgee, Goulburn and Murray River systems. The regional studies therefore involve the:

- Murray-Darling Basin in South Australia;
- Goulburn Broken, North East and North Central catchments in Victoria;
- Murray catchment in New South Wales; and
- Murrumbidgee catchment in New South Wales.

The regional study approach relies on active participation of key organisations in the respective areas, drawing on existing arrangements and processes to facilitate regional participation and information exchange. The studies have an interactive process at a regional level which provides the opportunity to build relationships and the capacity in planners, policy makers, decision-makers and the broader community to progress The Living Murray.
The catchment communities are represented by a Steering Committee established for each of the regional studies. The Steering Committee is comprised of a chairman from the relevant catchment management organisation, nominees from the catchment management organisation and relevant water authorities, representatives from State government agencies, and staff members from the MDBC office. The Steering Committees decide on their Committee membership and the approach to the study within their region.

2.2 A staged approach to the studies

The regional studies have been established on the basis of a two stage approach. Stage 1 provides a ‘proof of concept’ assessment, to verify the feasibility and acceptability of the water recovery mechanisms and the associated costs and benefits drawing on existing information. Stage 2 is proposed to involve further detailed investigations and consultation to develop the water recovery mechanisms to a point that would enable their trial implementation.

The studies are designed to occur over a period of 18 months with the initial focus of Stage 1 on contributing to Council’s first step decision in November 2003. Subject to Council’s decision in November 2003, it is envisaged that a more detailed examination of possible scenarios and options could be investigated through 2004.

Specifically, the objectives that have guided the Stage 1 regional studies are:

- To set the water recovery options in the history and context for irrigation in the region.
- To undertake a preliminary technical audit of the feasibility and credibility of water recovery options in the context of existing plans and investment priorities of catchment management organisations, water authorities or irrigation trusts, particularly as it relates to planned infrastructure solutions.
- To test the in-principle acceptability of the proposed water recovery mechanisms (individually or as a package) within each regional study area.
- To assess alternative recovery mechanisms proposed by a region.
- To determine the direct financial costs and benefits associated with water recovery within and across the target irrigation communities.
- To determine the package of water recovery mechanisms that delivers the greatest regional benefits in the most cost-effective manner.

It is envisaged Stage 2 could be used to undertake a series of integrated activities such as:

- engagement with State agencies to refine opportunities and costs for water recovery through improved river management and supply system redevelopment;
- detailed consideration and analysis of market-based approaches and an evaluation of the mix of interventions;
Further detailed studies to improve the regional and on-farm information and capacity to adopt proposed measures.

2.3 The Summary Report
This report provides a summary at a southern Basin scale of the information and issues documented from Stage 1 of the four regional water recovery studies.

For each of the four study regions, Stage 1 has been completed and individual reports finalised for each of the respective regions.

The Report presents summary information from all four regional reports in relation to:

- significant aspects of water resource management and irrigated agriculture (Section 3);
- overall response to the proposed set of six water recovery mechanisms (Section 4);
- the feasibility and likely uptake of alternate water recovery mechanisms (Section 4);
- possible investment approaches or projects through the proposed mechanisms or alternate mechanisms including potential volumes of recoverable water and the associated costs (Section 5).

The report represents the major findings from the preliminary assessment process of Stage 1 and aggregates the individual report findings against the objectives of the regional studies. It provides the foundation information on which a ‘first step decision’ about how to proceed with water recovery in a way that recognises and supports regional priorities while delivering environmental outcomes.

The individual study reports on which this Summary Report is based are provided in a separate volume as Attachment A.
3. Regional study catchment characteristics

The southern Murray Darling Basin includes the entire Basin area in both Victoria and SA and the NSW Murrumbidgee and Murray river valleys including the Menindee Lakes and Lower Darling River (Figure 1). The southern Basin region accounts for 82% of the total long-term diversion cap (excluding Queensland) including 68% of the diversion Cap in NSW. The region includes the major Rivers, the Murray, Murrumbidgee and Goulburn and the associated tributary streams.

The rivers within the Murray Darling Basin are subject to considerable flow variability both within and between years. With high and relatively reliable precipitation in their source areas the stream flow of the major rivers of the southern Basin is much more predictable than in other parts of the Basin. The construction of large in-river storages and weirs has reduced this variability, enabling the development of a major irrigation industry that now produces over 50% of Australia’s agricultural production from less than 1% of the landscape. The dairy, horticulture and annual cropping industries are the major irrigation industries within the southern Basin.

- Figure 1: The Southern Murray-Darling Basin
The diversion of surface water for irrigation is complemented by groundwater pumping. The Murray Basin is located in the southern Basin, being the major source of groundwater. The best quality groundwater in the region is found around the Murray Basin margins especially in the east and south east of southern NSW and northern Victoria and in south-east SA. The quality of the groundwater adjacent to the Murray River downstream of the confluence with the Murrumbidgee River is highly saline. There is a high level of connectivity between the River system and the groundwater, necessitating the need for conjunctive resource management.

A significant proportion of the key environmental sites within the Basin are located along the Murray River system. Over 7000 wetlands have been identified along the River Murray alone.

Key aspects of each of the four main regions within the southern Basin are summarised below.

### 3.1 Murrumbidgee Catchment
The Murrumbidgee catchment is approximately 84,000 square kilometres in area. It includes the Murrumbidgee and Coleambally irrigation areas and districts which comprised 2800 irrigation farms. The long term diversion Cap for the valley is 2,289 GL and comprises around 15% of all water entitlements in the MDB. Almost 53,000 people live within the region. One third of all employed people work in the people services industry and one quarter work in the primary industry sector.

The Murrumbidgee catchment has two major storage dams, Burrinjuck Dam on the Murrumbidgee River and Blowering Dam on the Tumut River. The Snowy Scheme has a significant influence on flows in the Murrumbidgee River. An average annual total of 550 GL is diverted into the Murrumbidgee catchment via Blowering Dam and the Tumut River, adding to the average annual 640 GL that naturally flows into Blowering Dam. Surface drainage from the southern portion of the catchment flows via the Yanco and Billabong creeks before entering the Murray River.

The Murrumbidgee Catchment Management Board has responsibility for the Murrumbidgee region and has oversighted the preparation of a Catchment Blueprint, a Water Management Plan, a Water Sharing Plan and a Regional Vegetation Management Plan. The Water Sharing Plan details that the Access licences for irrigation total 2531 GL, including 200GL of supplementary water and a further 373 GL is licensed for conveyance. Annual allocations and usage is subject to climatic variability.

Annual agricultural production in the Murrumbidgee catchment exceeds $1.9 billion, and accounts for over 16% of total agricultural production in Australia. The farm gate value of irrigated production in the catchment is in the order of $308 million with horticulture and rice being the major industries.
The major natural resource management issues identified by the Murrumbidgee community include declining surface water quality and flow, irrigation and dryland salinity and waterlogging, soil erosion and acidification, stream bank erosion, riparian zone degradation and wetland health, native vegetation decline, weeds and pest and feral animals.

The regional committee identified the following opportunities for the region:

- strengthening of export and domestic markets – horticulture, viticulture, rice, cereals, corn, meat and wool production;
- value adding and diversification opportunities – food processing, stockfeed, ethanol production and prune factory;
- tourism and recreational opportunities;
- improved irrigation efficiency technology and infrastructure;
- key local agricultural industries and employers;
- key manufacturing industries and employers; and
- key service industries and employers.

3.2 NSW Murray Catchment
The NSW Murray region includes the NSW Murray and the Lower Darling catchments, including and downstream of the Menindee lakes. This region contributes around 6% of the mean annual runoff of the MDB. The Snowy Mountains Scheme contributes an annual average 570 GL to Murray River resources, or around 5% of inflows into Hume Dam. The long term diversion Cap for the catchment is 1,877 GL.

Annual diversions within the region account for 2,060 GL or 17% of total diversions within the MDB. Of this volume, 1,966 GL is used for irrigation. Groundwater allocations total 256 GL. The total value of on-farm agricultural output from this region in 1996 was estimated at $953 million, with irrigation estimated to generate between 43% and 83% of household income. Rice, dairy and winter cropping are the major irrigation industries in the central Murray and horticulture is the predominant irrigated industry within the Lower Murray Darling area. The Lower Murray Darling region has a population of 131,300 people.

River health and salinity were identified as the two major natural resource issues. Changes to flow regimes have been made to both the Murray and Lower Darling rivers in past years to reduce the impact of irrigation water requirements. The irrigation system in the Murray Irrigation area has been used in most years to convey water around the Barmah Millewa forest and upper section of the Edward river to minimise unseasonal flooding. Land and Water Management Plans have been put in place for both the Murray Irrigation and Western Murray Irrigation areas to reduce the threat of rising groundwater levels and the discharge of poor quality runoff entering the River Murray.
The regional committee identified the following opportunities and strengths for the region:

- horticultural development;
- stabilisation of the annual rice crop;
- more efficient production with less personnel;
- location of irrigation close to major storage dams, providing good quality water;
- growth of irrigated cereals in dry years;
- potential for annual water trade to maximise return on investment;
- strength of export and domestic markets; and
- strength of environmental management and BMP adoption via LWMPs.

3.3 Northern Victoria

The Victorian component of the southern MDB includes the five catchments managed by the Goulburn Broken, North East, North Central, Wimmera and Mallee Catchment Management Authorities. The regional study focussed on the Goulburn Broken, North East and North Central catchments. The Goulburn Broken catchment occupies less than 2% of the MDB area and contributes 11% of the Basins stream flow and includes 280,000 ha of irrigation. The North Central catchment comprises four major river catchments (Campaspe, Loddon, Avon Richardson and Avoca) and includes the irrigation areas of Rochester-Campaspe, Pyramid Boort, and Torrumberry. The North East catchment provides 38% of the total runoff from the MDB and includes the major water storages of Hume Dam, Lake Buffalo, Dartmouth Dam and Lake William Hovell. The Wimmera and Mallee catchments include the irrigated horticultural developments along the Murray River near Swan Hill and the Sunraysia region near Mildura as well as extensive stock and domestic water systems.

The major natural resource related management issues for the region include dryland and irrigation salinity, water quality decline and flooding, soil degradation and degradation of biodiversity and ecosystem processes. The Goulburn Broken, North East and North Central catchments have a population of 564,100 and generates agricultural output estimated to be worth $2.38 billion.

The two main river systems providing irrigation water for the region are the Goulburn (including the Broken and Goulburn Rivers with input from the Campaspe and Loddon Rivers) and the Murray. The Murray system includes the River Murray and the tributary catchments of the Mitta, King and Ovens Rivers. Total annual average streamflow is around 9,435 GL and annual average diversions are in the order of 6,676 GL. The region also includes two major groundwater basins – the Murray Basin and the Highlands Basin. In the Shepparton Irrigation area alone over 1100 bores are licensed to pump over 45GL annually.
The regional committee identified the following opportunities for the region:

- Improved irrigation efficiency based on technology and infrastructure upgrades;
- Highly efficient irrigation supply systems in the horticultural zones and continued increase in on-farm efficiency;
- Improved river and stream health with the continued implementation on integrated plans;
- Value adding and diversification associated with irrigation industries, including high value horticulture;
- Future growth within local industries as a result of increased export market opportunities;
- Further development of tourism based on the aesthetic and recreational values of the catchments.

3.4 South Australian Murray-Darling Basin

The SA MDB catchment covers the 640 km length of the River Murray downstream from the NSW and Victorian borders to the sea. Although the catchment area covers the drainage flow paths toward the River, there are no reliable tributaries and all flow is effectively derived from the upstream states.

The major natural resource management issues include salinity, turbidity and nutrient water quality, threats to public health from poor water quality, general environmental decline particularly in the floodplain and wetland environments and loss of biodiversity, loss of aesthetic and recreational values and reduced land productivity. Key irrigation related natural resource management issues include irrigation induced salt accessions to the River and floodplain and water logging due to excessive irrigation drainage and water quality of surface drainage flows to the River.

The population of the catchment is estimated to be 67,159 people representing 5% of the South Australian population. Total economic output associated with production using water from the River Murray for the 2001/02 season was $663 million with post farm gate processing increasing the value of the commodities and processed product up to $1.80 billion.

The River Murray Water Allocation Plan limits irrigation water use to 699GL with an additional 22 GL allocated to provide environmental water to minimise the effects of rising saline groundwater on irrigated pasture or land retired from irrigation and 200GL allocated for wetland environmental flow. Irrigators within the river Murray Irrigation Management Zone are required to achieve water use efficiency of 85% by June 2005.

The Water Allocation Plan forecasts that future irrigation along the River Murray will continue to move towards higher value horticultural crops and that the land will be efficiently irrigated. Future water demands of an additional 60GL are expected to be met by efficiency savings and water trade.
The regional committee identified the following opportunities for the region:

- future growth in viticulture and other horticultural industries as a result of export market opportunities;
- highly efficient irrigation supply systems in the horticultural zones and further increases in on-farm efficiency expected with efficiency requirements of the Water Allocation Plan;
- value adding associated with irrigation industries; and
- development of tourism based on aesthetic and recreational values of the River Murray.
4. Preliminary assessment of water recovery mechanisms

The MDBC has identified six water recovery mechanisms that may contribute (individually or collectively) to water recovery for the River Murray (refer Section 1.3). It is likely that different implementation arrangements would apply to each of the mechanisms. The nature of the mechanism and the institutional, market and physical environment into which they could be introduced would result in an array of differing costs and benefits to stakeholders. Clearly, the issues of implementation and distributional equity of likely costs and benefits affects the attractiveness and feasibility of the mechanisms in different regions.

4.1 Regional views on proposed water recovery mechanisms

Through the regional study process and stakeholder consultation, the relative merit of each of the proposed water recovery mechanisms was assessed. Each of the proposed mechanisms was discussed in detail, leading to documentation of the strengths, weaknesses, issues and opportunities from the perspective of the Steering Committee for each regional study. Table 4.1 provides a summary of the key points, conclusions and estimated volume of water recovery for each mechanism arising from the regional studies. An assessment of the confidence level of the information provided by the regions is based on the definitions below:

a) **Low confidence** – analysis can not be demonstrated or is based on poor quality data or analysis methods.

b) **Medium confidence** – analysis is demonstrated and is based on acceptable data and analysis methods.

c) **High confidence** – analysis is demonstrated and is based on high quality data and analysis methods.
1. Exchange of low security entitlements to high security

Uptake is likely to be strongly influenced by the current security of supply within the existing systems and the nature of the irrigation enterprises. Any conversion would need to be on a voluntary basis, potentially underpinned by incentives. Further studies are necessary to ascertain the third party impacts.

**Volume of water recovery identified:** 0GL at less than $1200/ML, 150GL at more than $1200/ML

**Confidence level of information:** Low for 11GL, medium for 100GL

**Comments:**
- The exchange rates for conversion have not been quantified
- Third party impacts are unknown
- Estimated volumes are based on opinion, rather than known irrigator behaviour

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<th>Strengths</th>
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<td>Already being applied in some regions, creating more certainty in relation to water availability, particularly for those without high security entitlements. Should enable water recovery at lower cost than other mechanisms, and provide environmental benefits through water recovery and more frequent spills from storages.</td>
<td>No attraction for regions with current high security entitlements, or the capacity to achieve high security by using carryover. Furthermore, some irrigators are prepared to accept lower levels of security for higher but more variable annual allocations. Large conversions could also undermine the security of other water users, particularly during dry years. Complicates the management of water storages, while questions remain over capacity to establish fair exchange rates and achieve real water recovery.</td>
<td>Could be applied as a compulsory or voluntary mechanism with incentives to accelerate adoption. This could involve the creation of other water products with differing reliabilities.</td>
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2. Regional water supply system redevelopment

This mechanism is generally favoured but low cost options have already been implemented in many irrigation areas. Regions expressed a preference to pursue low cost options for their own benefit, keeping resultant savings to underpin new development. There is a need to ensure that any investment is made in sustainable irrigation areas. Furthermore, it is evident that it is becoming increasingly important to meter all water use to distinguish between river losses and un-metered river diversions.

**Volume of water recovery identified:** 84.6GL at less than $1200/ML, 199GL at more than $1200/ML

**Confidence level of information:** Low for 134GL, medium for 70.4GL, and high for 22.2GL

**Comments:**
- the costs quoted by the regions have a variable basis, some include only capital, others include O&M
- the costs do not include any cost shares, except for where agreements have been reached
- the underlying assumptions for the costs vary, some include environmental benefits, others don’t
- the volumes do not account for exchange rates for transmission losses between regions
- the volumes in some cases are gross figures, others are net savings
- some projects have been investigated on the basis of providing environmental flows to the Snowy River

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<td>Addresses transmission losses with the potential for real water savings and reduction in environmental impacts from irrigation drainage (which has been demonstrated). Does not target individual irrigators, and without loss of water from productive use, there is no negative impact on regional economy.</td>
<td>Generally represents a relatively high cost ($/ML) water recovery approach in comparison to other mechanisms, particularly because many of the easier and more attractive projects have already been implemented. Also potential loss of current return flows to the river, undermine water recovery and affecting water quality. Furthermore, irrigation districts generally want to retain the savings.</td>
<td>Can be delivered as a package with other mechanisms. Some opportunities for major infrastructure upgrades that can return substantive volumes of water (e.g. rehabilitation of the Lower Murray Reclaimed Irrigation Areas). Alternative water storage methods may need to be adopted (e.g. aquifer storage and recovery)</td>
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3. Market based water recovery

A favoured mechanism on the basis that participation is voluntary. Need to adjust a range of rules affecting permanent trade of water from irrigation areas. An ‘environmental water trust’ could be established and temporarily trade water to irrigators in dry years. The issues of stranded regional assets (water supply, power, roads and other utilities) and socio-economic consequences need to be addressed, while there is also a need to monitor future trade to prevent water being reintroduced to areas that are unsustainable. A range of methods could be used to secure and administer the water required for environmental purposes.

Volume of water recovery identified: 0GL at less than $1200/ML, 158GL at more than $1200/ML.

Confidence level of information: medium

Comments:
- the cost figures were based on current market price and no adjustment was made for any market distortion that may occur from the participation by Government
- the nominated water price has been influenced/underpinned by Government adjustment/support program
- estimated volumes are based on opinion rather than known irrigator behaviour

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<td>Mechanism is likely to be cost effective, quick to implement, capable of being applied in regulated and unregulated systems, and result in the immediate recovery of water without the need to prove savings. Process must be voluntary and transparent, involving only those who want to sell their entitlements.</td>
<td>Must involve the purchase of ‘used’ water, not sleeper licences, to achieve real water recovery. Potential for inequitable spread of consequences and distortion of the water market across the basin. Current restrictions on water trading may present a limitation; existing access to some markets in some regions may mean they are more heavily impacted. May present a localised threat if water is traded out of areas and undermine the cost effectiveness of operating the infrastructure with fewer remaining irrigators (i.e. stranded assets issue). It may also change the nature of irrigation businesses.</td>
<td>Could achieve targeted water recovery, potentially over an extended period of time to allow individuals to adjust. Also provides an opportunity to use a tender system, although legislation also permits compulsory participation in water auctions in some regions. Presents an option for government to purchase a proportion of every permanent trade (say 20%). Could involve establishment of a Water Trust for temporary trading of recovered water to maximise the financial return and environmental benefits, particularly during dry years.</td>
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4. On-farm redevelopment

Regional stakeholders have varying views on the potential of this option for water recovery, although net water recovery is not expected to be large. Differing levels of participation and water recovery are expected across the regions, affected by the nature of irrigation enterprises, current level of allocation, perceived scope for improvement from capital injections, and prevailing regulatory arrangements. High allocations can be traded back to government for capital injection. Government investment is required to trigger the redirection of on-farm water savings back to the river.

**Volume of water recovery identified:** 0GL at less than $1200/ML, 130GL at more than $1200/ML

**Confidence level of information:** Low

**Comments:**
- the nominated volumes strongly influenced by the level of strategic vision of the regions
- the regional assessment did not include any consideration of reduction in externalities from implementation of redevelopment initiatives e.g. groundwater accessions
- nominated projects limited to horticulture irrigation system upgrade and management and rehabilitation of the Lower Murray Swamps in SA. No estimates of water recovery were made from the northern Victorian irrigation area or irrigated cropping regions of southern NSW

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<td>On-farm financial drivers help to facilitate change. Enables improved use of irrigation water and the introduction of improved technology providing known production and environmental benefits. Also beneficial for the region because no loss of production and contributes to a ‘clean and green’ image.</td>
<td>Tax incentives already in place to drive this change. Water savings currently used for new development, and irrigators will want to retain savings on-farm. Crop leaching requirements also present limitations to efficiency gains. The loss of recovered water from a property reduces the private incentive. Also, difficult to accurately quantify and harness water savings for the environment. Likely to be an expensive option for water recovery.</td>
<td>Region can capture government funds to help restructuring. Potential for intermittent leasing of water savings for environmental benefit. Ultimate outcome is consistent with market expectations of the irrigation industry.</td>
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5. Change reliability based on environmental requirements

This mechanism was not well regarded because it was a regulated change based on environmental requirements, although some regions were interested to explore the details of its application. There are expected to be few benefits to irrigators, particularly those who have fully developed their entitlement with major investments.

**Volume of water recovery identified:** 0GL at less than $1200/ML, 0GL at more than $1200/ML

**Confidence level of information:** Not assessed

**Comments:**
- option only seen to be applicable to northern Victoria
- estimated water recovery volumes based on opinion not a quantification based on modelled conversion rates

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<td>No benefits identified by regional stakeholders.</td>
<td>An imposed rather than voluntary approach that reduces the capacity of landholders to effectively manage water for production purposes. In some regions, sleeper water may be activated with negative river impacts.</td>
<td>Would need to focus on unused sleeper water when implementing this mechanism.</td>
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6. Compulsory acquisition

This mechanism was not favoured by any region due to its compulsory nature. The mechanism does not differentiate between efficient and inefficient irrigators or between water licences that are fully or partially developed, and it is difficult to establish a level of compensation that recognises impacts on irrigators and the region.

Volume of water recovery identified: see comments below

Confidence level of information: see comments below

Comments:
- volumes and costs have not been detailed as it is assumed that the application of the mechanism is at the prerogative of Government to determine the required volume, timing of implementation and the water purchase price.

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<tr>
<td>Presents the opportunity for immediate water recovery that is legally feasible and can be targeted with guaranteed results. Will contribute to developing a more robust water market, and is likely to increase the market value of water and shift production to high value commodities.</td>
<td>An imposed rather than voluntary approach that does not account for the impacts on an individual, with potential to penalise efficient irrigators. May make many businesses non-viable. Likely to be very unpopular and is therefore politically hard to implement. May need new or amended legislation to enable acquisition.</td>
<td>Potential for targeted acquisition, dealing with issues of land suitability, stranded assets and environmental outcomes. Could start with a compulsory tender or introduce incrementally to allow irrigators time to adjust through water trading or efficiency improvements.</td>
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4.2 Other water recovery approaches

Regional stakeholders identified a number of alternative water recovery mechanisms that could be applied within their region or across the southern Murray-Darling Basin. Some of these mechanisms were effectively subsets of, or adjustments to, the mechanisms proposed by the MDBC, while others are distinctly different. Table 4.2 provides an overview of the alternative mechanisms proposed by the regions with an assessment of their relative merits.

It is important to note that the regional studies for water recovery have effectively triggered new thinking on approaches to water recovery (as distinct from achieving water savings). In this context, however, the majority of alternative mechanisms identified below are conceptual in nature and have been subject to little or no work to confirm their feasibility or attractiveness.
### Table 4-2: Alternative water recovery mechanisms suggested by regional stakeholders

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Water Supply Management</td>
<td>A mechanism to continue to improve the overall bulk water supply management infrastructure and river system operations to reduce transmission losses and enhance the effectiveness of water management so that the remaining water can be used to maximise environmental benefits. This includes the need to meter all diversions using the most appropriate technology to better distinguish between measurement errors and river losses. Relatively low cost, likely to generate water savings in wet years that can be used strategically.</td>
<td>Perception of excessive river losses occurring from unmetered diversions, high transmission losses from use of natural water bodies to supply irrigation water to some areas and unnecessary rain rejection flows resulting from water orders not used. Potential to have adverse impacts on farm if ordered water is required to be used on farm following rainfall.</td>
<td>Improved water diversion metering Improved river management to reduce transmission losses by reducing rain rejection flows, including water ordering debiting Construction of infrastructure to supply water to landholdings in place of minor tributaries.</td>
</tr>
<tr>
<td>Allowing environmental water donations by water licence holders</td>
<td>This is a voluntary option, enabling water licence holders to donate water for environmental purposes on either a temporary or permanent basis. The environmental water could be traded temporarily for productive use in dry years and maintained in the river during wet years. This mechanism could smooth water availability and prices in the temporary water market, while funding the purchase of additional permanent entitlements.</td>
<td>Perception of the environment profiting at the expense of irrigators. Also lowers the amount of water available for productive use, with social and economic impacts within the region.</td>
<td>Potential for irrigators and the environment to establish long-term option contracts that could be triggered by seasonal allocations. Potential to provide tax benefits to landholders who donate water.</td>
</tr>
<tr>
<td>Leased environmental water in wetter years</td>
<td>Irrigators retain ownership of water entitlements, avoiding tax implications of water sales, transfer and water management issues. Water to be leased by Government (Environmental Manager) when required for environmental purposes. Low capital investment required by Government. Lower implementation costs as water would be purchased in wetter years when water trading prices are lower.</td>
<td>Annual costs of water recovery unknown and subject to climatic conditions. Increased uncertainty of security of irrigation water</td>
<td>Avoidance of water ownership transfer costs and reduced capital and implementation costs</td>
</tr>
<tr>
<td>Industry self regulation for environmental flows</td>
<td>A voluntary mechanism implemented by industry involving capping of production (e.g. rice) in wet years to keep water in the river when incremental returns on produce are low. Expected to be relatively cheap to implement while contributing to improved profitability for the industry ($/t).</td>
<td>Greatest water recovery would be in wetter than average years. Need to ensure the price is attractive to both growers and the industry. Comparable to a quote system but some questions over the legality of this approach.</td>
<td>Encourages more efficient uses of water and industry participation in environmental management. Linked to environmental stewardship credentials of particular commodity groups</td>
</tr>
</tbody>
</table>
4.3 Issues raised by the regions

In addition to gaining an appreciation of the feasibility and attractiveness of the various water recovery mechanisms, the regional study process identified a number of issues that need to be considered and addressed across all regions in pursuing water recovery:

- Regional stakeholders have strongly emphasised the distinction between options for water recovery and water savings. Water savings options are aimed solely at reducing losses (evaporation, seepage, leakage, outfalls) whereas water recovery options include the transfer of water from productive use to the environment with consequential impacts on the regional economy and community.

- Regional stakeholders consider that the burden of water recovery is being placed solely upon irrigation communities. However, there is a need to improve the overall management of bulk water supply infrastructure and the river system to reduce transmission losses and enhance the effectiveness of water use so that the remaining water can also be used to maximum effect for environmental benefit. This may involve altering the way in which the shares of water in the Murray storages are managed between the states and river environment.

- There is a high level of concern that other river Murray system water users (e.g. recreation/tourist industries) are not being brought to the same level of accountability for the river health issues and trade offs.

- In many cases the infrastructure and institutions may not exist to acquire and manage the recovered water in the most effective way for environmental benefit. These issues need to be addressed before regional stakeholders can be confident that water recovery will warrant the public and private investment and associated socio-economic trade-offs. Having said this, a number of the suggested mechanisms are already being applied in some regions, or work is being undertaken (e.g. legislative reform) that would facilitate their application.

While water savings options were preferred over those contributing directly to water recovery, it was recognised that a package of measures including both water savings and water recovery options is required to achieve the desired environmental outcome in a cost-effective way.
5. Approaches to investment

5.1 Applying an Evaluation Framework
A primary objective of the regional studies was to achieve a preliminary technical audit of the feasibility and likely uptake of water recovery mechanisms in the context of existing regional plans and investment priorities, particularly as it relates to planned infrastructure solutions. To achieve this objective within the timeframe of the regional studies an Evaluation Framework was developed. The Evaluation Framework provided the basis for a consistent rapid appraisal of options against:

- the objectives of The Living Murray, and
- best-practice in relation to the scoping and design of infrastructure options for water recovery.

The Evaluation Framework comprised four core questions relating to the process used to design the infrastructure option, and the expected environmental, social and economic outcomes of implementing each of the proposals:

1) Has the proposal been well-developed and tested?
2) Does it provide environmental benefits to the River Murray?
3) What is the cost of implementing the proposal?
4) Is there demonstrated support for the proposal?

Where questions within the Evaluation Framework related to issues of the proposal development process, responses were of the following form:

- g) Has the process (indicated by the question) been used? (Yes / No)
- h) Was the proposal development process well designed and implemented?

Where questions within the Evaluation Framework related to likely outcomes of implementing the proposed proposal(s), responses were of the following form:

- a) Has the range of environmental, social and economic outcomes been identified and considered?
- b) What is the beneficial value of the outcomes?
- c) What is the level of confidence that the benefits will be realised?

The level of confidence associated with a particular proposal was related to the extent to which the available documentation demonstrated that options were considered in designing the infrastructure solution, and the extent to which that analysis was based on acceptable data and analysis methods. Refer to Attachment A and the regional study reports for the detail of the Evaluation Framework.
The assessment of proposals against the Evaluation Framework was conducted by the project team as a desktop evaluation exercise in consultation with key regional stakeholders and proposal proponents. The assessment drew on existing documentation so that the evaluation was based on known or accepted evidence.

5.2 Characteristics of relevant projects and proposals

Proposals for water savings and recovery across the study regions have largely focussed on improving regional supply system infrastructure and management, together with on-farm redevelopment and water use efficiency measures.

Proposals seeking to improve system efficiency and water delivery to production purposes incorporate a variety of measures including reduction of transmission losses through refurbishment of infrastructure, changing the operating rules governing management of water supply system (including improved management of wetlands), and improving metering and monitoring. On-farm redevelopment proposals detail measures to encourage more efficient on-farm water use through the provision of incentives for conversion of flood or furrow irrigation to irrigation by sprinklers, drip or micro-spray, and encouraging greater on-farm storage to enable a reduction in system conveyance losses.

The confidence in the identified water recovery proposals varies substantially but is generally dependent on the proposal’s stage of development. The estimated cost and volume of potential water recovery were classified in the low to medium confidence levels, as most were only at concept or pre-feasibility stage in their development. Generally those proposals that have high confidence in the water recovery estimates also have a relatively high confidence in the cost estimates, and have progressed beyond the concept phase.

Cost estimates were generally based on estimates of capital expenditure, with few proposals incorporating operation and maintenance costs. Most proposals do not yet appear to have adequately addressed the environmental issues or potential social impacts. Only a small number of proposals have been tested through consultation processes.

Based on the low level of confidence in the data available it is not possible to present aggregated information on the volumes of water that could be recovered, nor the cost per megalitre of that recovery. Furthermore, in practical terms, it is not credible to sum the volumes of water that could be recovered through all of the identified proposals. The implementation on one mechanism (e.g. market based water recovery) could influence the volumes of water available through other mechanisms (e.g. on-farm redevelopment).
In general, the cost ($/ML) for water recovery through regional water supply and on-farm redevelopment exceeds the prevailing market price for water. Only a small proportion (~20%) of the proposals documented represent water recovery options at a cost < $2000/ML. Proposals to improve wetland management factor in those proposals offering water recovery at costs competitive with market prices.

5.3 **Factors influencing the development of water recovery proposals**

As indicated above, many of the proposals documented through the regional study process related to water savings initiatives as distinct from water recovery. This reflects a combination of climatic and market conditions, and evolving institutional arrangements in the respective states. Landholders and water authorities are working to save water through improvements in the efficiency of crop water use and water supply so that those savings can be redirected to new development and increasing the security of supply while reducing the impact of irrigation drainage on the river and its floodplain and wetlands.

Few of the well developed proposals are examining methods of water recovery for the river environment. Notable exceptions involving proposals for major water recovery for environmental benefit include modifying the operation of Lake Mokoan in Victoria, and the Darling Anabranch and Barrenbox Swamp in New South Wales. It is important to note that some of the documented work occurring within New South Wales and Victoria is aimed at recovering water to meet environmental flow obligations for the Snowy River.
6. Conclusions

The primary objective of the Stage 1 regional study process was to assess the feasibility and likely uptake of proposed water recovery mechanisms (individually or as a package) in order to achieve water for the environment as well as other catchment benefits in the key regions of the southern Basin. Four regional studies were completed, each overseen by a catchment-based group involving a range of key stakeholders.

The level of involvement within the regional study process by the four catchment communities demonstrated their preparedness to approach water recovery in a constructive manner. The process accessed a high level of regional knowledge regarding industry issues, irrigation infrastructure and what water recovery could be achieved at both a farm and regional level, and the implications of changing policy related to future water availability for irrigation.

All regions were confident in the opportunities for irrigation in the future for their catchment, in particular opportunities arising from strengthening export markets, crop diversification, value adding strategies, implementation of improved irrigation technology and adoption of environmental stewardship programs.

The regions considered there is scope for continuing to improve the overall management of bulk water supply infrastructure and the river system operations in the Southern Basin to reduce transmission losses and enhance the effectiveness of water delivery so that the remaining water can be used to maximise environmental benefit. This includes the need to improve the metering of diversions to distinguish between river losses and un-metered diversions, and to investigate substitution of natural water carriers for infrastructure options to supply water to some localities, particularly to achieve wetland protection and rehabilitation.

In terms of the proposed water recovery mechanisms, it was found that:

(a) **Modifying reliabilities**: The potential for water savings resulting from the exchange of low security entitlements to high security entitlements was strongly influenced by the current security of supply within the existing systems and the nature of the irrigation enterprises. The mechanism was considered to be not relevant in those regions that had high security entitlements, high levels of entitlement relative to existing use, or where individuals with low security entitlements had the ability to modify their water supply reliability using carryover.

   - The potential volume identified was up to 150 GL, all at costs of more than $1200/ML with low to medium confidence in the level of information provided.

(b) **Regional water supply system redevelopment**: This mechanism is generally favoured. A range of infrastructure projects were identified, however many, if not all of the low cost
projects have been undertaken, or districts prefer to undertake these projects themselves. In general, the volumes of water likely to be recovered are small and the total cost of the projects generally exceeded the current market value for water. There is a need to ensure that any future investment is made in sustainable irrigation areas. In most cases, the proposed projects were in the concept phase and would require further investigations to clarify the level of water recovery possible and appropriate cost share arrangements.

- The potential volume identified was up to 300 GL with only one third less than $1200/ML. While there are some well developed projects, the confidence level was low in the information provided for proposals that accounted for 50% of the 300GL.

(c) **Market based water recovery:** Market based approaches, using both the water market and other investment approaches, were supported by all regions, on the basis that participation was voluntary. The ability for the environment to trade water to irrigation in dry years was an important consideration. Trade barriers currently in place in many localities in the Basin are likely to restrict market participation in the short term. A common concern is the issue of stranded regional assets (including utilities beyond irrigation supply infrastructure) and socio-economic consequences of incremental water sales by marginal farms.

- Only one region estimated a possible volume that may be available, which was based on current market price. It was a general view that it was too difficult to judge the likely costs and volumes in context of the government directly entering the market to purchase water.

(d) **On-farm redevelopment:** The potential for water recovery from farm level redevelopment varied across the regions. The nature of the irrigation enterprises, current level of allocation, the perceived scope for farm productivity improvement from an injection of capital and the prevailing regulatory arrangements would influence the level of water recovery. In the short term, potential recovery was considered to be greatest from the upgrade of water supply systems in horticultural areas and adoption of pressurised irrigation systems in areas involved with annual cropping. The overall level of water recovery is considered to be small.

- The potential volume identified was up to 130 GL, all at costs of more than $1200/ML with low confidence in the information provided.

(e) **Changing reliabilities:** This mechanism was not favoured by any region as it would be a regulated change based on environmental requirements. It is regarded as an approach mainly applicable to northern Victoria due to the security of entitlements in South Australia and the ability for NSW allocations to be carried over from one year to the next.

- No potential volume was identified.
Compulsory acquisition: This mechanism was not favoured by any region as it would be a regulated change. The mechanism does not differentiate between efficient and inefficient irrigators or between water licences that are fully or partially developed. Further, communities considered that it would be difficult to establish a level of ‘just terms’ compensation that recognises impacts both on irrigators and the region.

- Volumes and costs have not been detailed at it is assumed they would be at the prerogative of Government.

The regional reporting process confirmed that there is significant existing knowledge of potential options for water recovery, however this is not at a level to provide a basis for selecting specific options or making investment decisions.

Based on the low level of confidence in the data available, it is not possible to present aggregated information on the volumes of water that could be recovered, nor the cost per megalitre of that recovery. Furthermore, in practical terms, it is not credible to sum the volumes of water that could be recovered through all of the identified proposals. The implementation on one mechanism (e.g. market based water recovery) could influence the volumes of water available through other mechanisms (e.g. on-farm redevelopment).

The regional catchment groups consistently supported voluntary water recovery mechanisms that allow choice and flexibility rather than mechanisms involving regulatory or compulsory elements. It was noted that in the event the voluntary approach did not achieve the required volume of water recovery, a targeted compulsory acquisition approach involving just terms compensation would need to be considered. Removal of water without compensation was considered inappropriate.

It is important to note that the regional studies process has triggered new thinking on approaches to water recovery. This has been due to the positive attitude of the regional committees to achieving environmental outcomes for their region which are also consistent with The Living Murray objectives. Examples include industry trusts to be established to limit water use in years of high water availability to achieve both water recovery at a low cost and to restrict production that would lead to price reductions, and a range of ownership models and variations to the way in which Government could be involved in the water market.

The regional studies confirm that each community would embrace a different ‘package’ of water recovery mechanisms. The applicability of the individual water recovery mechanisms was influenced by a range of factors including current levels of water entitlement and reliability, current farming systems and level of adoption of technology influencing water use efficiency, nature/condition of district level irrigation supply infrastructure and perceptions of water markets.
7. **Attachments**

Attachment A to this report is a separately bound document titled *The Living Murray, Water Recovery Regional Studies*. It contains the four individual regional study reports for:

- Murrumbidgee NSW
- Murray NSW
- Goulburn – Broken, North Central and North East
- Murray – Darling Basin, South Australia