Murray-Darling Basin Commission Response

Productivity Commission study
Rural water use and the environment – the role of market mechanisms

The following information provides an overview of key MDBC programs of relevance to this study, together with further references, and program manager contact details. Relevant MDBC publications have either been referred to (these can be requested by contacting the MDBC Information Officer on 02 6297 0141), or have been provided as attachments. All MDBC publications can either be downloaded or ordered on the MDBC website at http://publications.mdbc.gov.au/.

1. Purpose and functions of the Murray-Darling Basin Commission

The Murray-Darling Basin Commission (MDBC) is the Executive arm of the Murray-Darling Basin Ministerial Council. The Council is the partnership of six governments – New South Wales, Victoria, South Australia, Queensland, the Australian Capital Territory and the Australian Government. The partnership is enabled by the *Murray-Darling Basin Agreement 1992* (the Agreement).

The purpose of the partnership, as stated in the Agreement, is to:

'promote and coordinate effective planning and management for the equitable, efficient and sustainable use of water, land and other environmental resources of the Murray-Darling Basin.'

The Agreement states that the functions of the Commission are to:

- advise the Ministerial Council in relation to the planning, development and management of the water, land and other environmental resources of the Murray-Darling Basin;
- assist the Ministerial Council in developing measures for the equitable, efficient and sustainable use of water, land and other environmental resources of the Murray-Darling Basin;
- coordinate the implementation of or, where the Ministerial Council so requires, to implement any measures authorised by the Ministerial Council;
- give effect to any policy or decision of the Ministerial Council, which the Ministerial Council requires the Commission to implement.

MDBC continues to be a partner in large scale cooperative research programs. Examples of MDBC funded research relevant to this study are provided throughout this document.

The Murray-Darling Basin Commission Annual Report series is a good source of broad information on programs. The 2004-2005 Annual Report is attached (**Attachment 1**), and previous years are available from the Commission Office on request.

2. Water management – the River Murray System

River Murray Water (RMW) is the water service delivery arm of the Murray-Darling Basin Commission. RMW undertakes the tasks of sharing and supplying water through:

- assessing future availability of water
- accounting for actual use of water
- regulating river flows to meet environmental and user needs.

State irrigation diversions from the River Murray and lower Darling River are summarised in Table 1.

Table 1 – Summary of state diversions (GL)

Year	River Murray*				Darling†
	NSW	Vic	SA	Total	NSW
1991-92	2431‡	1827	589	4847	101
1992-93	1633	1147	482	3262	77
1993-94	1902	1407	587	3896	158
1994-95	2254	1970	663	4887	54
1995-96	1935	1740	568	4243	168
1996-97	2231	1745	600	4576	136
1997-98	1886	1696	664	4246	71
1998-99	2000	1766	690	4456	192
1999-00	1234	1522	642	3398	85
2000-01	2070	1682	662	4414	246
2001-02	2113	1884	621	4618	126
2002-03	879	1701	737	3317	107
2003-04	1312	1442	612	3366	23
2004-05§	1258	1418	618	3294	26

* Data based upon the official MDBC record for the reporting requirements of implementation of the 'Cap' on diversions, with the exception of data for 2004-05
† Includes data from Cawndilla Outlet to the Great Darling Anabranch
‡ Record high diversion
§ Data presented for 2004-05 is estimated based on hydrographic and operational data, and advice from the SA Department of Water, Land and Biodiversity Conservation.

The MDBC have produced a report *Options for water savings from the Lower Lakes for improved flows in the Coorong and through the Lower Lakes* which may be of interest to this study. This report is available for download from the MDBC website at http://publications.mdbc.gov.au/

3. Cap on surface water diversions

In June 1995, in response to an audit of water use in the Murray-Darling Basin, the Murray-Darling Basin Ministerial Council agreed to cap water use within the Basin. In December 1996, the Murray-Darling Basin Ministerial Council agreed that:

- for New South Wales and Victoria, the Cap is the volume of water that would have been diverted under the 1993/94 levels of development, plus allowances in the Border Rivers for Pindari Dam (NSW) and in the Goulburn/Broken/Loddon system for Lake Mokoan (Victoria);
- for South Australia, highland irrigation diversions were capped at 440.6 GL. This represents a small increase in diversions over 1993/94 levels of development; and
- the Cap for Queensland would be determined after the independently audited Water Allocation and Management Planning (WAMP) and Water Management Planning (WMP) processes had been completed.

Through capping diversions at 1993/94 levels of development in the two major water using States, coupled with the diversion measures planning for South Australia, and future caps in Queensland and the ACT, the Ministerial Council has effectively established a new framework for water sharing in the

Basin. Because of the value placed on water rights, it is important that each State is only using water in line with its Cap. For this reason, the implementation of the Cap requires an integrated reporting framework including significant improvements to the way that diversions are monitored and reported. An annual Water Audit Monitoring Report and Independent Audit Report are part of this annual reporting process.

The Water Audit Monitoring Report includes annual information on water use, water trading, water use efficiency measures (in some cases), and water availability, flows and allocations. The Water Audit Monitoring Report for 2003/04 is attached (**Attachment 2**), and previous reports can be downloaded from the MDBC website at www.mdbc.gov.au/nrm/water_management/the_cap/wam_reports.

4. The Living Murray Program

In mid-2002, the Murray-Darling Basin Ministerial Council established the 'Living Murray' initiative in response to substantial evidence that the health of the River Murray system is in decline. The Council's concern was that the decline would threaten the Basin's industries, communities, and natural and cultural values.

In November 2003, the Council decided on a 'First Step' for the Living Murray, with a focus on achieving environmental benefits for six significant ecological assets. These are:

- Barmah-Millewa Forest
- Gunbower and Koondrook-Perricoota Forests
- Hattah Lakes
- Chowilla Floodplain (including Lindsay-Wallpolla)
- Murray Mouth, Coorong and Lower Lakes
- River Murray Channel.

Implementation of this 'First Step' is provided for through an *Intergovernmental Agreement on Addressing Water Overallocation and Achieving Environmental Objectives in the Murray-Darling Basin* signed by the Council of Australian Governments on 25 June 2004. The Intergovernmental Agreement provides the framework under which $500 million will be invested by governments in water recovery over five years, for actions outlined in the *Living Murray Business Plan* (**Attachment 3**), to begin addressing water overallocation in the Murray-Darling Basin and achieve specific environmental outcomes along the River Murray. This investment will combine with:

- $150 million provided by the Murray-Darling Basin Ministerial Council for the Environmental works and Measures Program, and;
- $75 million committed to recovering water for the River Murray through the *Snowy Water Inquiry Outcomes Implementation Deed*.

The *Living Murray Foundation Report on the significant ecological assets targeted in the First Step Decision* (**Attachment 4**) is a compendium of scientific information on each of the six significant ecological assets that was available prior to the development of the Intergovernmental Agreement.

Actions being undertaken as part the Living Murray first step include:

- Water recovery: including through infrastructure improvements and rationalisation, on-farm initiatives, efficiency gains, and market based approaches and purchase of water from willing sellers (see section 4.1 for further information).
- Environmental delivery: this program is responsible for managing the delivery of recovered water in a way that maximises ecological outcomes across the six ecological assets and achieves environmental objectives as agreed by all parties to the Intergovernmental Agreement.

The *Living Murray Environmental Watering Plan 2005-06* (**Attachment 5**) provides an operational framework for the application of environmental water. This water plan aims to manage competing

environmental objectives between sites, and includes a set of criteria to help make 'trade-off' decisions. For example, different sites have different requirements for water, and delivery of water at one site governs the amount available for delivery of water at another site. This criteria will continue to be developed over time.

Each significant ecological asset also has an *Asset Management Plan.* Summaries for each of the plans are attached, along with an overview of the *Living Murray Environmental Watering Plan* (**Attachments 6, 7, 8, 9, 10, 11 & 12).** Full copies of the *Asset Management Plans* for the Barmah-Millewa, the River Murray Channel, the Hattah Lakes, and the Lower Lakes, Coorong and Murray Mouth are available for download from the MDBC Living Murray website at http://thelivingmurray.mdbc.gov.au/implementing/six_significant_ecological_assets. The individual management plans for each of the assets reflects the need to tailor management responses, including flow regimes and for specific market mechanisms.

Environmental works and measures

This program aims to deliver works and measures to improve the health of the River Murray by:
- making the best use of water currently available
- optimising the benefits of any water recovered
- adopting a principled approach to ensure investment is targeted towards the best environmental outcomes.

The publication *The Living Murray Environmental Works and Measures Program: a $150 million program to complement the delivery of environmental flows and improve the health of the River Murray* is attached (**Attachment 13)**.

4.1 Water recovery

Currently, there are three main streams of activity under the Living Murray Water Recovery Program. These are:
- developing consistent technical procedures for assessing and reviewing water recovery measures
- supporting the development of potential new water recovery packages within irrigation districts (the Infrastructure Improvements Projects Program)
- investigating the potential for water recovery by reducing river and storage losses along the River Murray, Edward River and lower Darling River systems.

The Ministerial Council agreed in November 2003 that: *the water for [the] First Step will come from a matrix of options with a priority for on-farm initiatives, efficiency gains, infrastructure improvements and rationalisation, and market based approaches, and purchase of water from willing sellers, rather that by way of compulsory acquisition.*

To date, the use of market based mechanisms to acquire water for the environment has not occurred. However, the *Intergovernmental Agreement on Addressing Water Over-allocation and achieving environmental objectives in the Murray-Darling Basin* (the Intergovernmental Agreement) provides for water recovery through a range of measures, including via market based mechanisms (Clause 23):

> *Water recovery proposals which may be considered eligible for accreditation against funding commitments under this agreement include:*
> *(i) investment in water infrastructure, whether on- or off-farm;*
> *(ii) purchase of water on the market, by tender or by other market-based mechanisms;*
> *(iii) investment in infrastructure and behavioural changes to increase efficiency and reduce consumption in urban areas;*
> *(iv) regulatory measures as part of a broader package of proposals; and*
> *(v) any other such measures as may be agreed by all Parties to this Agreement.*

So far, the focus on recovery of water for the Living Murray by the jurisdictions has been from infrastructure based projects, however, the MDB Ministerial Council agreed in September 2005 to investigate water recovery through market based mechanisms. The Communiqué from the meeting on 30 September 2005 states:

> *Recognising the challenges facing Council in recovering water, they have agreed to explore the use of market instruments to complement existing infrastructure projects. The Council directed the Commission to develop options for the Council to consider at its April 2006 meeting. This should also include consideration for options for water purchasing.*

Options which are likely to be explored in relation to acquisition of water via market based mechanisms include:

- purchase of water from willing sellers, including targeted purchase;
- lease in-perpetuity or purchase of part of an entitlement (to be explored in NSW Water Recovery Package A – Acquisition of innovative water products).

Market based mechanisms for water recovery may be considered (consistent with the primary criteria of the Intergovernmental Agreement) because of:

- cost effectiveness (infrastructure projects are often more expensive than the market price of water);
- the demands of water by the environment and irrigators are often counter-cyclical (i.e. often the greatest environmental benefits can be achieved in wetter years, when the irrigators are likely to require less water. Similarly, in drier years, the irrigators will require more water and the environmental opportunities are likely to decline);
- market based mechanisms provide flexibility to both the environment and irrigators (see the ABARE publication *Water options for the environment*); and
- Water savings from on-farm initiatives may provide a win-win for both the irrigator and the environment (irrigators gain more efficient technology and the environment gains water).

The Intergovernmental Agreement (Clause 33) includes the consideration of externalities when jurisdictions decide whether or not to invest in any type of water recovery measure:

> *Other matters which may be taken into account in assessing proposals for further development or accreditation for funding include social and economic impacts, salinity and water quality outcomes, additional environmental benefits and third party impacts.*

The *Living Murray Business Plan* takes this further and indicates in Clause 58 that:

> *The Other Matters may assist with deciding cost-sharing arrangements but will only be a barrier to listing a measure on the Eligible Measurers Register if there are substantial negative impacts or outcomes as assessed by the MDB Ministerial Council based on advice from the MDB Commission.*

4.2 Living Murray research

The following MDBC Living Murray research reports are related to the environmental impacts of flow regulation and other water resource developments and investigate the potential for markets for the environment. These reports are attached, and are also available for download from the MDBC Living Murray website http://thelivingmurray.mdbc.gov.au/reports.

BDA Group (2003) *A market approach to the Living Murray initiative: a discussion paper* (**Attachment 14**).

Vic DPI & University of Melbourne (2003) *The Living Murray: creating markets for the environment* (**Attachment 15**).

Murray-Darling Basin Commission (2004) *The Living Murray: scoping of economic issues in the Living Murray, with an emphasis on the irrigation sector* (**Attachment 16**).

Fluvial Systems (2002) *Review of environmental impacts of flow regulation and other water resource developments in the River Murray and Lower Darling System* (**Attachment 17**).

The report *Development of a framework for social impact assessment in the Living Murray: Water recovery in the Murray Irrigation Area of NSW* is potentially of interest and is available from the MDBC Living Murray website www.thelivingmurray.mdbc.gov.au/reports.

5. Water trade

The MDBC jurisdictions have a 'Cap and trade' model for water re-allocation. Each year, reports are prepared on the Murray-Darling Basin Cap on Diversions and Review of Cap implementation (MDBC 2005a, MDBC 2005b) see also the *Water Audit Monitoring Report 2003/04* at **Attachment 2.**

Since the inception of the pilot interstate water trade project in November 1997 (between Nyah in Victoria and the Barrages in South Australia), reviews have been completed every two years detailing the economic and environmental effects of an interstate water trade market (Tim Cummins & Associates 2005; Mike Young et al 2000).

Through the Murray-Darling Basin Commission, various reports on barriers to trade (Hassall & Associates 2002), environmental impacts of water trade in the Murray-Darling Basin (SKM 2002), *Review of Environmental Clearances for Permanent Interstate Water Trade* (O'Neill, Danny 2004), and modelling of third-party impacts as a result of exchange rate trade, have been completed.

Environmental impacts can create barrier to water trade. For example, intra- and interstate trades within the Victorian Mallee district of Sunraysia currently do not allow water trade into a High Impact Zone (HIZ). Trade is generally allowed as within a HIZ or out into a Low Impact Zone (LIZ). This is outlined in the *Nyah to South Australian Border Salinity Management Plan* (Mallee CMA, Victoria document) (Tim Cummins & Associates 2000). Additionally, South Australia has also developed a HIZ/LIZ system and identifies that trade should be out of a HIZ into a LIZ. However, water can only into a HIZ as 'new water' if there is an existing prior commitment (before 30 June 2003). The Department of Water, Land and Biodiversity Conservation in SA website has information on their zoning system (http://www.dwlbc.sa.gov.au/murray/salinity/index.html#Would_increased_flows_to_SA_make_a_difference_).

See also **Section 6** below for further information on Interstate Water Trade and Irrigation developments in the Mallee Region of the Southern Murray-Darling Basin.

5.1 Water trade references

MDBC, (2005a) 'Water Audit Monitoring Report 2003/2004 – Report of the Murray-Darling Basin Commission on the Cap on Diversions'

MDBC, (2005b) 'Review of Cap Implementation 2003/04 – report of the Independent Audit Group'

O'Neill, Danny, (2004) 'Review of Environmental Clearances for Permanent Interstate Water Trade' (In Press)

Tim Cummins & Associates, (2000) 'A Review of Salinity Impact Zoning in the Victorian Mallee'

Victorian Government (2004), 'White Paper: Securing Our Water Future Together.'

Tim Cummins & Associates, (2005) 'An evaluation of the interstate water trade pilot program'

Mike Young etal, (2000) 'Interstate water trading: A two year review'

Sinclair Knight Merz, (2002) 'Assessment of the ecological impacts of water trade in Murray-Darling Basin'

Hassall & Associates, (2002) 'Barriers to Trade of Irrigation Entitlements in Irrigation Areas and Districts in the Murray- Darling Basin - Analysis and Development of Solutions'

RM Consulting Group, (2005) 'The Role of Policy in Reducing the Impact of Irrigation on River Salinity within the Victorian Mallee'

PSI Delta, (2005) 'Evaluation of water use efficiency programs'

Sinclair Knight Merz, (2005) 'Oxidised Nitrogen accessions from the Nangiloc-Colignan irrigation area to the Murray River'

6. Basin Salinity Management Strategy 2001-2015

The Basin Salinity Management Strategy (BSMS) 2001-2015 (**Attachment 18**) provides a comprehensive and strategic approach to addressing a challenging environmental issue facing the Basin, consistent with the Integrated Catchment Management Policy (ICM Policy). Targets established for river salinity in each tributary valley and the Murray-Darling system as a whole reflect shared responsibility for action between valley communities and between States. It provides a stable and accountable framework that, over time, will generate confidence in progress of joint efforts to manage salinity. See **Attachment 19** and **20** for the 2003-2004 Annual Implementation and Independent Audit Group Reports.

6.1 Salinity Targets, Credits and Debits

A key component of the BSMS is the Ministerial Council's adoption of end-of-valley salinity targets for each tributary valley and a Basin salinity target at Morgan in South Australia. The target at Morgan is to maintain river salinity at less than 800 EC (the Australian Drinking Water guideline limit) for 95% of the time, and this target is supported by a system of salinity credits and debits.

The salinity credit and debit system provides a consistent currency (EC at Morgan) through which investments can be assessed, trade-offs made and Basin-wide accountability achieved.

The system of credits and debits is tracked via MDBC Salinity Registers, which account for all significant actions undertaken within the Basin after agreed baseline dates. This approach acknowledges that salinity offsets can often be achieved at lower cost at other locations than where the salinity impact occurs.

Under the BSMS, various salinity credit reports have been submitted under the B-register of Schedule C by the States in relation to reducing salinity impacts on the Murray River through land management changes and water use efficiency. These include the 'Drying up the drains' report submitted by Victoria for changes in irrigation and drainage management in the Victorian Mallee Sunraysia region.

6.2 Costs of urban and dryland salinity across the Murray-Darling Basin

Investigations in the 1990s indicated that off-farm costs of dryland salinity were more significant than had been previously estimated. In response, the MDBC commissioned a study to assess the dryland salinity impact cost on dryland agriculture and off-farm costs on rural and regional infrastructure and urban infrastructure. The study (Wilson & Ivey ATP 2004) was designed to provide a benchmark of the current costs of dryland salinity across the Basin and to provide a consistent method to assess and

compare dryland salinity impacts across the Basin in the future (see **Attachment 21** *Dryland and urban salinity costs across the Murray-Darling Basin*).

Wilson & Ivey ATP (2004) estimated that dryland salinity impact cost across the Murray-Darling Basin is approximately $305 million per annum. The total cost of salinity across the Basin is likely to be considerably higher as the study did not consider the impacts on irrigated agriculture, cultural heritage, the environment and the city of Adelaide in South Australia. Within the Basin it was estimated that at least 220 towns and rural centres are affected by dryland salinity.

Prior to the study, dryland salinity was generally considered to be a farm-level problem. However, of the estimated salinity impact costs of $305 million per annum, 33% is borne by dryland agricultural producers, while 46% is borne by domestic, commerce and industry. Local and State Government agencies and utilities account for the remaining 21% of impact costs (Wilson & Ivey ATP 2004).

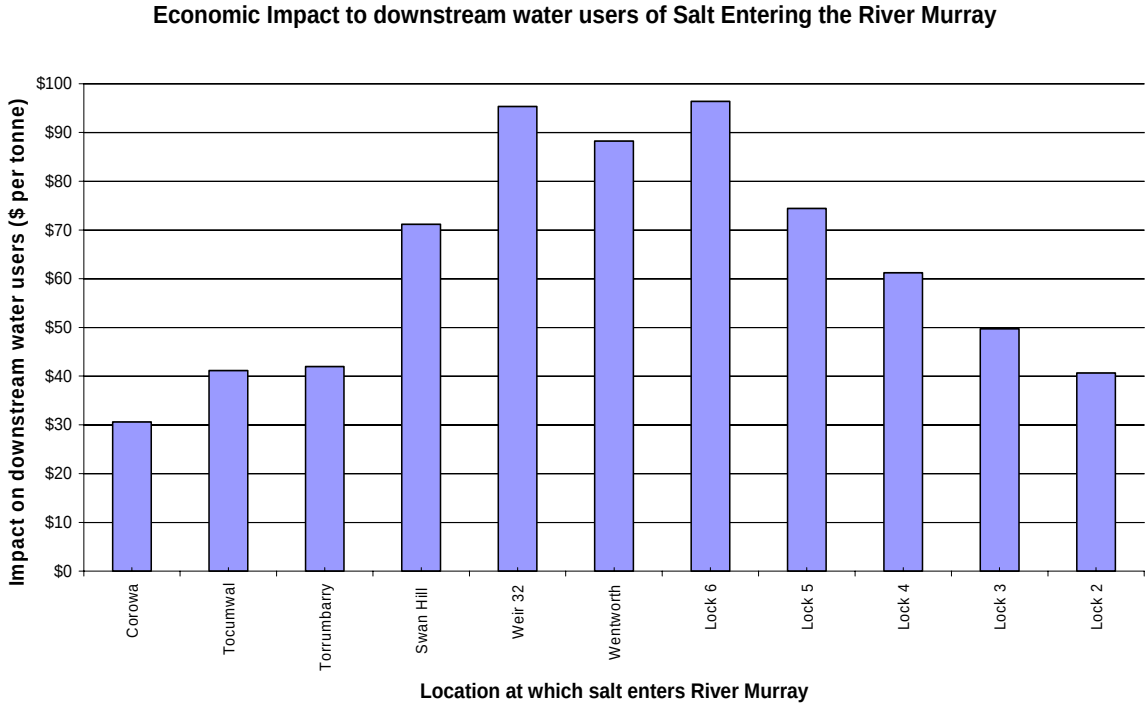
6.3 River Murray Salinity Costs

The assessment of the economic impacts of changes in river salinity has been based on cost functions developed in a series of studies dating back more than two decades. These cost functions seek to quantify the impacts on water users of changes in the salinity of their water supply. More recently, further studies have been undertaken over the period 1999 to 2002, seeking to update and improve these cost estimates (GHD 1999; CSIRO 2002; Wilson & Ivey ATP 2004; ArupWater 2004).

The different reports provide very different estimates of the costs incurred by household, industrial and commercial water users. To establish an agreed estimate of salinity impact costs to inform government decisions to invest in mitigating measures, the MDBC commissioned the Allen Consulting Group to undertake an independent review of previous work.

Their work focussed on reviewing the estimated salinity impact cost functions from water use by households, industrial and commercial water users. No further study of salinity impact cost functions for irrigated agriculture was undertaken as the cost estimates derived by GHD (1999) had been accepted by subsequent studies as the best available. The outcome sought by the MDBC from the independent review was an assessment of the various existing approaches to deriving salinity cost functions for the River Murray, including consideration of the different economic principles adopted; and the provision of a high level opinion on the most appropriate salinity impact cost functions to be adopted by MDBC.

The outcome of the review by the Allen Consulting Group was the adoption of a set of recommended cost functions by the MDBC in September 2004. These salinity cost functions have been applied to the River Murray salinity model (MSM-BIGMOD) to determine the economic impact to downstream water users of salt entering the River Murray at various locations along the River. This economic salinity impact 'ready reckoner' is shown below:



Note: Modelled results from River Murray model (MSM-Bigmod) assuming 100 tonnes/day of constant salt inflow over benchmark climate period

6.4 Irrigation development in the Mallee

Since European settlement, hundreds of dams and weirs have been constructed across the Basin resulting in a heavily regulated river. The extreme low flows encountered prior to river regulation are now mostly avoided (along with the corresponding extremes in salinity). However, at the same time, dryland clearing and irrigation development has mobilised the vast natural stores of salt. The river now transports much more salt in far less flow. Engineering interventions involving groundwater pumping schemes alongside of the Murray are providing very significant relief. A dozen salt interception schemes are collectively pumping around 500,000 tonnes of salt per year away to disposal basins capable of storing the salt in the landscape safely for at least one hundred years or more (MDBC 1999).

Using the popular Groundwater Flow Systems (Walker *et. al*. 2003) terminology, the Murray Groundwater Basin can be regarded as a regional system which implies that the groundwater will respond relatively slowly, often taking centuries to equilibrate to changed hydrologic situations. However, when the hydrologic stress is as aggressive as ribbon development irrigation in close proximity to the river, the stress is severe and the effects can be felt within a few years or several decades. In the Lower Murray below Mildura, the natural salt load accessions have already been doubled due to past irrigation developments and will double again within fifty years if no further action is taken.

6.5 Interstate Water Trade and Irrigation developments in the Mallee Region of the Southern Murray Darling Basin

In November 1997, the MDB Ministerial Council approved the Pilot Interstate Water Trade Project in the Mallee Region of the southern Murray-Darling Basin. It incorporates areas of New South Wales, Victoria and South Australia, from Nyah in Victoria to the Barrages at the mouth of the Murray in South Australia and has resulted in significant trading of water within this region. Over 17,000 ML of water was traded (gross volume) between NSW, Victoria and SA during the period between 1997 and

2003. Most of the traded water in the region has been used for irrigation. In the Sunraysia region of the NSW and Victoria alone around 14,000 hectares of new irrigation development occurred during this period.

See **Section 5** for further information on the MDBC Interstate Water Trade Project.

6.6 Assessing the salinity impacts of irrigation development

Traditional groundwater modelling techniques such as MODFLOW have been used to assess impacts of groundwater movement in numerous areas of the Lower Murray. These models do not however cover the entire area where water trade occurs. In an attempt to create a combined regional perspective on salinity impacts of irrigation and 'fill the gaps' between MODFLOW models, a GIS application known as SIMPACT was developed in South Australia (Miles, *et al* 2001). This had progressive development phases from a pilot study in 1999 through to its second version SIMPACT II which improved on both spatial data and hydrogeological algorithms.

In 2003, the MDBC in collaboration with state agencies, CSIRO and private industry adopted this spatial model as the platform for assessing the salinity impacts of Interstate Water Trade and associated irrigation development and called the tool Salinity Impact Rapid Assessment Tool (SIMRAT, URS 2004). Like any computer model, SIMRAT has a set of assumptions underlying its ability to produce predictions of salinity impact on the river valley. The SIMRAT model enables the rapid assessment of groundwater discharge and associated salt load and salinity impact (EC at Morgan and economic cost) based on aquifer recharge and subsequent discharge to the River Murray within an area of 15 km either side of the river from Nyah (Victoria) to Goolwa (South Australia). The model can assess new irrigation development that occurs as a result of water trading and simulates the impact of both new irrigation and the retirement of existing irrigation. When the salinity impact is assessed for a new irrigation development (water arrival site) the trade type is called an 'arrival type' and the impact is generally a salinity debit. Conversely, if the salinity impact is assessed for a site from which water is sold (retired site) then the trade type is called a 'departure type' and the impact is generally a salinity credit. Both single and batch processing of salinity impacts can be carried out with the model. SIMRAT is not a replacement for MODFLOW. It models a single layer system describing the dynamics of unconfined aquifers, so that the impacts of a change in recharge rates (e.g. from irrigation development) can be assessed. The model's initial input is a rate of drainage below the root zone (RZD). Three stages of calculations then follow:

- Stage 1 RZD rate to aquifer recharge rate
- Stage 2 Recharge rate to aquifer/salt discharge rate
- Stage 3 discharge rate to in-river EC impacts and other indicators.

6.7 Policy approaches to account for irrigation salinity impacts

In the Nyah to Border Salinity Management Plan area of Victoria, the government policy is that an irrigation developer is accountable for their salinity impact. This is achieved via two mechanisms. In the first, The developer is required to pay a levy equivalent to the cost of the impact and the levy funds are then used to undertake works to reduce salinity impacts. The second mechanism is based on a system of high and low impact zoning and associated development rules, originally established in 1993 and adjusted in 2002 (The Irrigator 2002).

In South Australia, an interim zoning policy has been introduced as of 1 July 2003 for water trade approvals, which restricts or prevents new water trades into high salinity impact locations. The interim policy reduces the risk that irrigation development in high impact locations will increase the requirement for salinity credits at an unsustainable rate, and a long term policy is currently undergoing community consultation (DWLBC 2004).

As has been outlined above, water trade can occur on a permanent or temporary (annual) basis. The salinity impacts associated with the permanent or temporary trade can be considered under the following categories, each of which may or may not be significant depending on site specifics:

- changes to salt accessions (surface drainage & groundwater inflows) at departure point;
- changes to river salinity due to the transit of water (i.e. dilution flow);
- changes to salt accessions (surface drainage & groundwater inflows) at arrival point.

Table 2 below illustrates the current level of technical and policy development to account for temporary and permanent trade.

Table 2: Current Status – Consideration of Salinity Impacts due to Water Trade

	Permanent Trade			Temporary Trade		
State	**Departure**	**Transit**	**Arrival**	**Departure**	**Transit**	**Arrival**
NSW	**T**	**×**	**T??**	**×**	**×**	**T**
Vic	**T**	**×**	**T, P**	**×**	**×**	**T,P**
SA	**T**	**×**	**T, P**	**×**	**×**	**T**
Interstate	**T**	**T, P**	**T, P**	**×**	**T, P**	**T**

Notes:
× - salinity impacts not yet considered
T – technical assessment process available
P – policy mechanism in place

It can been seen that while the arrival impacts of permanent trade have been largely considered by the States, there are still significant gaps in terms of the arrival impacts of temporary trade and also the departure and transit impacts of both temporary and permanent trade.

6.8 Salinity conclusions and recommendations

- Water trade is a potential salinity driver if it creates new irrigation developments, land is retired from irrigation, or it changes landscape salt loading in areas where salt mobilisation risk is high.
- Salinity impacts due to changing irrigation development can arise as a result of:
    - changes to salt accessions (surface drainage and groundwater inflows) at departure point;
    - changes to river salinity due to the transit of water (i.e. dilution flow);
    - changes to salt accessions (surface drainage and groundwater inflows) at arrival point.
- Reducing the root zone drainage rates of irrigation in High Impact Zones can provide significant salinity credits (up to $1000/ML).
- Water Trade is recognised to have significant links with Basin Salinity Management Strategy of the Murray-Darling Basin, through the requirement to assess salinity impacts of irrigation developments in the tri-state Mallee zone of the Lower Murray Darling Basin.
- Significant effort has been invested by the Commission to develop salinity impact assessment tools (SIMRAT) to account for the salinity effects (credits and debits) of the changing irrigation footprint on river salinity.
- While SIMRAT has been developed to assess the salinity impacts of interstate water trade and irrigation developments in the Mallee region, an extended version of SIMRAT tool has to be developed for assessing the salinity impacts in other areas.

- It should be noted that clear salinity impact zoning should be in place, particularly if the traded water is being used for irrigation to reduce the externalities of water trade.
- Significant improvement in water use efficiency (particularly in irrigation) reduces the externalities of water trade.

6.9 Salinity references

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7. Water quality and riverine health

7.1 Water Quality Monitoring Program

The Water Quality Monitoring Program is a long term program which provides the baseline information on the current status and trends in water quality in the River Murray. Data from the program, collected at 35 locations along the Murray Valley going back to 1978, is available from the Commission by emailing datarequest@mdbc.gov.au.

7.2 Sustainable Rivers Audit

The Sustainable Rivers Audit (SRA) is a river health assessment program that started in July 2004. It aims to provide consistent, Basin-wide information on the health of the Basin's rivers in order to promote sustainable land and water management. To achieve this, the program has now developed indicators and methods for river health assessment that are robust and consistent across catchments (and jurisdictions) and will be used repeatedly over time.

SRA pilot audit technical reports are available on request from the MDBC.

8. MDBC Strategic Investigation and Education

The Murray-Darling Basin Commission undertook research over the last decade under its Strategic Investigation and Education Riverine, Dryland and Irrigated Regions Programs. The following highlights some of the key research outcomes from these programs relevant to this study.

8.1 Irrigated Regions Program

Over $40 million has been invested in over 50 individual projects as part of the MDBC Irrigated Regions Program since 1992. The more recent focus of this investment has been towards the strategic development of sustainable irrigation practices within an Integrated Catchment Management context. A number of frameworks using a risk management approach were developed to support future public investment in irrigated agriculture, including approving irrigation development proposals, optimising water use, managing water quality and investment to improve water use efficiency.

See **Attachment 22** for the proceedings of an MDBC Irrigation Forum held in November 2002 that outlines projects and progress. A paper titled *Irrigation within Integrated Catchment Management,* presented at the 2005 ANCID Conference, provides a recent overview of some of the key findings of the Irrigated Regions Program research.

Water use efficiency

The Irrigated Regions Program looked at the potential for improving water use efficiency across the Basin. The study found that there is a significant opportunity to improve water use efficiency (WUE) with the Basin with potential savings being in the order of 900-3000 Gl. However, the level of farm WUE improvement is slow at about one per cent per annum.

The study found that, in general, farmers will adopt new technologies for WUE if they perceive net benefits from investment in upgrading their irrigation practices. It found that substantial gains in WUE are technically possible in many areas of the MDB, however, whether these technical gains are realised will depend upon:

- The capacity of irrigators and irrigation communities to accommodate the major structural transformation that will be required in irrigated agriculture, and to emerge from this process as an even more highly competitive sector able to capitalise on commercial opportunities.
- The willingness and cooperation of irrigators, governments and the community to change attitudes and create a more supportive and facilitative environment for change.
- Implementation of new approaches to the management of change at all levels.
- Creation of an investment environment built upon improved certainty, risk sharing, mutual benefit, partnerships for commercial investment and institutions that facilitate this investment.

The paper at **Attachment 23** provides further information about this study.

Channel Seepage

The Australian National Committee of Irrigation and Drainage (ANCID) completed a project in partnership with the MDBC to provide best practice information on channel seepage measurement and remediation, and to develop a suitable user support system.

The reports from this project are available for download from the ANCID website at http://www.ancid.org.au/publications/index.html.

8.2 Dryland Program

A number of dryland program research projects are of potential interest to this study.

Sediments and nutrients

Sediments and nutrients in the rivers of the Murray-Darling Basin: targeting the future (**Attachment 24**) summarises the findings of a project that used budgets, which account for the inputs, storage, transport and loss of material in a river system.

Groundwater

The *1990-2000 Murray-Darling Basin Groundwater Status Report* found that since the mid-1990s there has been an increase in groundwater extraction in areas of useable supply. Due to a sequence of drier than average years, there has also been a reduction in groundwater recharge and hence a decline in groundwater levels in parts of the Basin. A summary of this work is provided at **Attachment 25**.

Projections of groundwater extraction rates and implications for future demand and competition for surface water (**Attachment 26**) was a project undertaken to determine the impact of groundwater use on the integrity of the Cap given the interconnected nature of surface and groundwater resources.

8.3 Riverine Program

The *Rivers Program Publications Reference Kit* (**Attachment 27**) provides a summary of all Riverine Program projects completed between 1990 and 2000. This kit also includes summary documents for particular themes, including *Managing Catchments* and *Managing Rivers*. Some of the work summarised includes irrigation water as a source of nutrients to MDB waterways, and ecological requirements for environmental flows.

9. Basin Communities

The MDBC Basin Communities program has funded the project *Quantifying and valuing land use change for Integrated Catchment Management evaluation in the Murray-Darling Basin 1996/97 – 2000/01* completed by the CSIRO (**Attachment 28**). This study provides a broad scale assessment of the distribution and dynamics of agricultural land use and the economic returns to agricultural use of land and water resources in the Basin over this time period.

Results from this study include that, per megalitre of irrigation water, the highest returns are obtained from those land uses that have high to moderate returns and lower water requirements per hectare, including cut flowers, vegetables, fruit, grapes and tree nuts. The large water users (dairy, cotton and rice) have moderate returns per megalitre. Beef and sheep pasture, legumes, and oilseeds, for example, have low returns per megalitre because although they have low water requirements, their returns are very low.

The study also found that, geographically, the economic returns to agriculture largely follow the distribution of water from both rainfall and irrigation. High value agriculture is concentrated in the region stretching from the River Murray in South Australia, curving east around the southern, eastern and north-eastern parts of the MDB. The drier interior of the MDB has very low returns to agriculture per hectare.

LIST OF ATTACHMENTS TO SUBMISSION 31 FROM MURRAY DARLING BASIN COMMISSION

All MDBC Publications expect where stated otherwise

1	MDBC Annual Report 2004-2005
2	Water Audit Monitoring Report 2003/04, Special Audit NSW Barwon-Darling/Lower Darling Cap Valley
3	Living Murray Business Plan, 1 April 2005
4	The Living Murray: Foundation report on the significant ecological assets targeted in the First Step Decision, May 2005
5	The Living Murray Environmental Watering Plan
6	The Lower Lakes, Coorong and Murray Mouth
7	The Barmah-Millewa Forest
8	The Gunbower Koondrook-Perricoota Forest
9	The Chowilla Floodplain (including Lindsay-Wallpoola)
10	The Hattah Lakes
11	The River Murray Channel
12	The Living Murray Environmental Watering Plan
13	The Living Murray Environmental Works and Measures Program
14	BDA Group, 2003, A market approach to the Living Murray initiative: a discussion paper
15	The Living Murray Creating markets for the environment: A report to the MDBC from the Economics Branch (DPI) and the Economic Theory Centre (University of Melbourne)
16	The Living Murray: Scoping of economic issues in the Living Murray, with an emphasis on the irrigation sector
17	Review of Environmental Impacts of Flow Regulation and Other Water Resource Developments in the River Murray and Lower Darling River Systems, Final report to MDBC by Fluvial Systems Pty Ltd
18	Basin Salinity Management Strategy 2001-2015
19	Basin Salinity Management Strategy 2003-2004 Annual Implementation Report
20	Report of the Independent Audit Group for Salinity
21	Dryland and urban salinity costs across the Murray-Darling Basin
22	MDBC Irrigation Forum Proceedings: 13-15 Nov 2002
23	Benyon N., Kingham O. & White D, 2002, *The Potential for Improving Water Use Efficiency*
24	Sediments and nutrients in the rivers of the MDB: Targeting the future
25	MDB Groundwater Status: an Overview 1990-2000
26	Projections of Groundwater Extraction Rates and implications for Future Demand and Competition for Surface Water
27	Rivers Program: Publications Reference Kit
28	CSIRO Land and Water, 2004, Quantifying and valuing land use change for Integrated Catchment Management evaluation in the MDB 1996/97 – 2000/01