

INTRODUCTION

Murrumbidgee Irrigation Ltd (MI) is an unlisted public company providing water supply, drainage and environmental services to approximately 3200 customer/shareholders in the MIA. The Company employs 170 staff and manages \$500 million of infrastructure assets servicing over \$2.5 billion in water entitlements.

The Murrumbidgee Irrigation Area (MIA) is one of the most diverse and productive regions in Australia contributing over \$5 billion annually to the national economy. The MIA was first established in 1912 following the commissioning of Burrinjuck Dam. Further expansion occurred in the 1970's with the completion of the Snowy Mountains Scheme and construction of Blowering Dam. The region has played a significant role in fostering cultural diversity with over 50 different nationalities now resident in the region. The region also played a significant role during and after WW1 and WW2 in terms of national security and repatriation.

In making this submission to the Productivity Commission, Murrumbidgee Irrigation Ltd continues to recognise its regional and national responsibilities to assist in recovering water for environmental purposes while maintaining regional production and well being.

Our submission firstly addresses the issues raised in the Productivity Commission issues paper, and secondly takes the opportunity to provide information on the benefits of the RiverReach concept that the Company has been advocating as a cost effective and efficient means of purchasing water for the environment. The latter is provided as an attachment.

MI is a member of the NSWIC and this submission complements that of the NSWIC.

Some facts on MIA value adding

Chicken meat - \$300 million annually, 1.2million chickens / wk and 1500 jobs (4500 Aus)

Feedlots - \$450 million, 75,000 cattle (150,000 through abattoir) and 800 jobs.

Wineries – 13 wineries, 1500 jobs, 60 containers / day, \$2.9 billion annually.

Citrus 130,000 tonnes – 1500 jobs and \$170M annually inc juicing and packing.

Sunrice - \$800 million annually, 1800 jobs (1,100 Aus),

Walnuts - \$35 million expanding to \$400 million in 10 years,

Vegetables – farm gate \$40 million annually.

Livestock (non-feedlot) – 650,000 hd

Also cereal crops, pulses and oilseeds.

BACKGROUND

The issues paper provides a good backdrop for thinking about the issues related to identifying market mechanisms for appropriate, effective, and efficient water recovery. However, we believe that there are two critical matters that would help put some of the issues in context.

- First, the structural adjustment being undertaken with water recovery is quite radical. The adjustment involves the very large scale transfer of resources from a market (mainly agriculture) to non-market sector (the environment). This contrasts with most adjustments that involve subjecting industries or sectors to greater market forces, and has special impacts, including:
 - ⇒ The sheer size of the budget available for water recovery relative to the impacted regions creates fears similar to those driven by an 'elephant in china shop'.
 - ⇒ Fear about the lack of market discipline on the demand for environmental water. For example, demand may be unlimited, and be driven by political imperatives rather than the objective of optimization of environmental, social, and economic assets.
 - ⇒ Fears about how the environmental water resources will be allocated and used. If they are at the right level and are managed well, they will likely deliver the required benefits for the environment and reduce pressure on water recovery. If not, the current process may be repeated (one way or another) and regional investors – who operate in highly competitive international markets – and communities will pay the price.
 - ⇒ The lack of clear benefits for use of those resources and the beneficiaries. Agricultural and regional communities have been "structurally adjusted" to enhance market outcomes for decades (without seeing much benefit from the processes). It is a bitter pill to be now targeted for shifting significant resources into the non-market sector without sharing in the benefits.
- Second is the massive impact of the drought. The largest drought in recorded history should be expected to have massive negative impacts on human, social, economic, and environmental assets. Given the massive impacts of the Federation drought at the turn of the 20th century, the performance in mitigating those impacts (for a much larger population) in the drought since the turn of the 21st century has been quite extra-ordinary, and should be a major consideration when evaluating the current situation with a view to changes needed to make improvements to water sharing and management of rural water systems. Formulating strategies to achieve objectives without reference to the drought will increase risks of getting things wrong in terms of meeting the objectives and managing adjustment towards those objectives. For example, we need:
 - ⇒ to have reliable information about the relative values of environmental, social, and economic assets in the basin and the trade-offs in terms of water sharing on those values. What are the impacts on those values of drought, dry sequences, wet sequences and floods? Are these impacts the same or are there important differences that would allow a better mix of strategies and policies to meet longer term objectives?
 - ⇒ to be able to assess the relative impacts of the drought (cyclical) as well as 'over-allocation' (structural) on the economic, social, and environmental assets within the basin. For example, the role of structural issues such as over-allocation might be very minor compared to the drought in the decline of environmental assets in the Coorong.
 - ⇒ to use such assessments to better inform the wider community, and help design policies to meet the challenges of achieving an optimal balance for the basin's social, environmental, and economic assets. For example, if 'over-allocation' and other structural issues are having a minor impact, is it appropriate, efficient or effective to use structural changes to attempt to address that situation?
 - ⇒ the need to consider 'pace of adjustment' issues for structural objectives in light of the drought. If the drought is imposing very large social and economic costs, is it appropriate, efficient or effective that policy exacerbate those costs?

COMMENTS ON THE ISSUES PAPER

The issues paper correctly makes the point that 'market operations' (focusing exclusively on purchase of entitlement) is being used in concert with other mechanisms such as investment in water savings and administrative reallocations under water sharing plans (eg, p3 and last paragraph p13). However, care needs to be taken to put the latter in historical context as well as going forward.

Historically the buy-back program was designed to substitute for rather than complement administrative re-allocation (even though administrative re-allocation had already taken place in some regions through water sharing plans). Going forward there was expected to be administrative re-allocation with future revisions to water sharing plans, and – eventually – the Basin Plan. However, the burden of contributions, between the Government and water users, for re-allocated water under water sharing and basin plans was agreed and reflected in the IGA. On this basis, the integration of buy-backs and administrative re-allocation has been achieved at the high level, although proponents of administrative reallocation continue to lobby for this process (with compensation for such acquisition ranging from market rates to zero).

MI takes this opportunity to re-iterate support for using buy-backs instead of administrative re-allocation because it allows for better allocative efficiency and market driven values for water acquisition to provide some discipline on the demand side of the exchange (leaving aside issues of fairness and equity which would also favour buy-back over acquisition by decree).

That said, we recognise the special challenges of buyback for maintaining delivery efficiency for service providers (as networks lose customers in an ad-hoc manner). Termination fees – along with investment programs such as the Sustainable Rural Water Use and Infrastructure Program and Irrigator-led proposals – will help finance adjustments at this level, however, significant challenges and costs will likely remain. These challenges and costs can be lowered through better efficiency and integration of buy-back and infrastructure programs

The problems of non-level playing fields in the buy-back program are endemic (well beyond the more highly publicised issues such as the 4 per cent limits and termination fees) and often unnecessary. An example is found in Box 2. The Basin Plan will effectively reset water access property rights (and redirect water from current owners to the environment) in 2014 in all jurisdictions except Victoria. This means that re-allocation in Victoria (within a Basin framework) is delayed by five years. In the context of strident calls for urgent environmental water on a very large scale, this creates risks that early re-allocation will be larger than if all States participated at the same time, with the possibility of equity transfer from other regions and States to Victoria. It is difficult to understand why such administrative impediments to fair and equitable outcomes continue after the Commonwealth has assumed responsibility for basin planning.

The discussion (paragraph 1 p12) needs some additional context. For example, the cap (or long term extraction limit) in the Murrumbidgee WSP is expected to provide the environment with over 50 per cent of average expected flows in the Murrumbidgee River. That can hardly be described as 'little left to the environment'. Also, the low inflows since 1997 (although worsened in recent years) have significantly reduced water availability for crucial economic and social assets as well as environmental assets, and the drought has also made evaluation of the performance of water sharing under the cap regime very difficult.

The observation (p12-13) that "depending on where the water is purchased, it may be intercepted by other users before it can be delivered" [to the buyer] is a major example of how differences in the current property rights system threaten the effectiveness of all forms of water savings and exchange of water via market mechanisms. Those differences must inform all strategies and mechanisms used for water recovery. What may be used successfully in one jurisdiction may not be in another. Ivory tower 'one-size-fits-all' solutions will result in losses through inefficiency and waste. This suggests the need for a wide portfolio of recovery methods and mechanisms.

The discussion of goals on page 13 is confusing for MI. As noted above, our understanding is that the Basin Plan will identify sustainable diversion limits for valleys and catchments in the basin, and the strategies of buy-back, investment in water savings, and – hopefully to a small extent – administrative reallocation are all strategies to reduce diversion limits to those identified as sustainable. We agree, however, with the implication that implementation of the strategies on a ‘no regrets’ basis before the Basin Plan process identifies levels of sustainable diversion is getting the ‘cart before the horse’.

The discussion of the current market for water (p15 and 16) needs to be placed in context of the drought. MI would assert that scarcity is far and away the most important driver of water values and prices. The price of water – as reflected in trade prices for annual allocation or ‘temporary transfers’ – has been driven to previously unanticipated highs because of the drought. That will have driven the price of entitlements up because entitlements are just a contract enabling the holder to access all future allocations related to the entitlement contract. Annual prices have reached \$1,000 per ML and averaged over \$400 per ML for much of the last three years. This would likely account for much of the increase in entitlement prices over the last few years.

The discussion of upgrading Infrastructure (p21) should include opportunities within the river systems rather than just irrigation areas. There are many opportunities for better water management and investments in water savings that are currently not receiving the attention they deserve in these areas because of a lack of incentives. For example, improvements to the Yanco Creek system on the Murrumbidgee River could improve the environment and generate significant water savings.

As part of the ACCC consultation on termination fees (p25), MI predicted that termination fees would be absorbed entirely by the buyer (ie, prices would increase to accommodate termination fees) and would therefore act as a distortion favouring the purchase of entitlements from efficient service providers by the environment. This was not accepted by the ACCC, but we believe that actual data is consistent with MI’s expectations before entitlement markets opened.

Specific questions

Is the focus on acquiring entitlements the best way of achieving the environment’s needs?

No, we believe that entitlements are just one of a suite of water products that should be exchanged to enable optimum maintenance of environmental assets and economic and social assets in the face of constraints on the availability of water. Ideally, that suite should include all products that can currently be traded plus additional products that can be beneficial in specific circumstances and locations (options, forward sale of allocation, RiverReach style products and covenants).

Is a ‘no regrets’ presumption a reasonable basis for purchasing entitlements, and at what point does this cease to be the case?

The ‘no regrets’ presumption was, perhaps, reasonable in light of the original budget provisions for purchasing entitlements in 2007-08 and 2008-09. However, with the dramatic increase in budget provisions in 2008-09 the ‘no regrets’ policy becomes very risky because accumulated expenditure increases from 5 to 20 per cent of the total. This means that over 50 per cent of total expenditure is now expected under ‘no regrets’ before the Basin Plan is prepared, and without particular reference to the needs of environmental water managers.

MI would recommend that that ‘no regrets’ should only be justified for a more gradual expenditure profile prior to the Basin Plan, where, say, accumulated expenditure would be no more than 25 per cent of budget prior to preparation of the plan. This allows for more ‘learning by doing’ during the ‘no regrets’ phase that should be followed by a much more knowledge based and strategic program after the Basin Plan that is consistent with plan objectives and the lessons learned from the ‘no regrets’ phase and other programs aimed at recovering water for the environment.

If urgent interventions consistent with value for money acquisition of water for environmental assets prior to the Basin Plan are justified then strategic purchase of annual allocation (eg, term lease or annual) would be more appropriate, and likely to be more efficient and accountable.

What are the arguments for continuing the buyback after the new Basin Plan is implemented in 2011, and associated state water sharing plans start to be implemented in 2014?

The buy-back program should be mostly implemented after the Basin Plan is established. Water sharing plans must be consistent with the basin plan. All of the programs aimed at acquiring water for the environment would be better if they were mainly informed by the basin plan. This can only be put into effect if purchases under the current 'no regrets' phase are not large relative to total acquisitions. The buy-backs and infrastructure investments for water savings would ideally account for most of the gap between current diversions and those identified as sustainable under the Basin Plan.

What implications do environmental demands across the Basin have on the targeting of purchases and the mechanisms and instruments that should ideally be used?

Unfortunately, at the moment MI is unable to discern the links between environmental demands and water purchases by type, locations, or mechanisms. The environmental demands, once specified and adequately constrained, should drive the mechanisms, source locations, volumes and timing by which water is acquired for the environment. MI, in partnership with the Murrumbidgee Catchment Management Authority, attempted to pilot this approach through the River Reach project under the Water Smart Australia program. The MCMA is currently finalising its modelling with a view to enabling the modelled demands to be matched with innovative water products developed by MI for meeting those demands. The findings should be made available within a month or two.

How should environmental water be allocated across competing projects and sites?

The answer to this question will be crucial to establishing ongoing confidence of water users in the programs to recover water for the environment. There is a clear risk that trade-offs between environmental objectives will not be easily reached and representatives of environmental assets will resort to continual re-allocation from current users rather than make difficult resource constrained decisions. In short, the environmental demands may become unlimited, especially if the current dry sequence continues.

Ideally, the allocation of environmental water should be value based and driven by environmental customers that represent the relevant assets. It could probably learn much from existing budget processes in terms of establishing an over-all resource constraint and negotiation of water budget shares in light of relative values and demands of those assets. For example, each environmental asset that is eligible to receive water formerly diverted for irrigation would have a responsible steward or manager. These managers could submit a water budget to the over-arching environmental water manager to obtain a share of the aggregate water budget, the submission may focus on the next water year with forecast needs for an horizon of, say, 10 years. The water budget would be linked to delivery of a 'condition' for the environmental asset (that is reasonable in light of current circumstances) that takes account of climate projections, and has strategies to deal with actual surpluses and deficits that will inevitably arise (as is the case for irrigation). Non-water acquisition activities (such as land use adjustments and reduction of over-inundation) and base environmental river flows should also be considered in the context of 'budget' processes for the use of environmental water. The overarching environmental manager could then match these bids with likely water availability (taking account of additions through buy-back, investment in savings, improved management etc), and frame an aggregate environmental water budget for the year and make plans for forecast out years. The process could be repeated annually, not unlike current financial budgets. The 'budget' should be published and disseminated to the community, with actual outcomes reported relative to expectations.

This is a ‘first glance’ suggestion that may or may not have merit on closer examination. However, whatever method chosen to allocate environmental water should have the key elements of budgeting to ration scarce resources. It should be value based and driven by responsible customers/environmental asset managers, and it should be transparent, monitored, and reviewed to ensure accountability of all managers (including the overarching environmental water manager). There is no reason why these processes should not be put in place for water recovered for environmental use to date. This would, again, enable ‘learning by doing’ and no doubt help the formulation of the Basin Plan and water sharing plans.

Should the buybacks be designed so as to reduce structural adjustment costs or should adjustment be addressed separately? If the former, are there particular buyback mechanisms that should be used to do this? If the latter, what approach should be used?

The buy-backs should not be an instrument to reduce the costs of structural adjustment. Rather it is a program to ensure the privatised costs of exchange are reflected in the exchange. When that exchange is made both the buyer and seller should be satisfied and require no further assistance (as for example when the Government buys land). The problem of adjustment relates to the losses that have arisen with downstream processing and businesses servicing both agriculture and the processors. It is reasonable that Government help with those adjustment costs on the same basis as for other policy induced structural adjustments, and this should be provided separately to the resourcing of the buy-back.

The best way for the buy-back program to address structural adjustment is to use strategies that mitigate the need for adjustment (such as RiverReach style purchasing strategies that are well integrated with investment in water savings, and with well designed plans and efficient management of environmental water that maximises environmental returns at least cost).

Direct structural adjustment should be provided to assist with identifying best opportunities for business investment to substitute foregone investment and regional income due to water losses, and the formulation of strategies and programs to attract such investment.

Does the exit grant package for small block irrigators play a useful role in the overall buyback scheme? Should it be offered again?

Yes. It is probably the least well known aspect of the buy-back program but it targets the lowest return uses of water in areas that are the highest costs to service. Most of these water users are not subject to business market incentives and uses such as watering lawns and ‘hobby’ farming likely have low social, economic, and environmental value. It seems that this program will likely not be offered again, but the principle of targeting these areas for incentives to sell is something that MI would support.

What impact has the Restoring the Balance program had on the price of water entitlements to date? What, if any, impact has this had on the market for seasonal allocations?

As noted above the major impact on entitlement prices over the last decade has been scarcity of supply. The entry of the Government as a major buyer of entitlements over the last two years has placed upward pressure on what must be said to have been a very quiet market for entitlement. However, the big increases in entitlement prices were driven by scarcity of water prior to the Government’s entry to the market. For example, Murrumbidgee High Security entitlement increased from about \$1,800 per ML in 2006 to \$3,000 per ML in 2007 without the presence of the Government as a buyer (and that has not changed much since). Murrumbidgee general security entitlement had rarely been traded prior to the Government entering the market however it increased from about \$800 per ML to \$1,200 per ML after the buy-back. About half of this increase is likely due to termination fees.

That said, MI expects very substantial increases in entitlement prices as the buy-back continues, and ‘lower hanging fruit’ disappears.

The Government has not participated in temporary trade for seasonal allocation via buy-back. The only ways that the buy-back can have influenced temporary market prices is if the supply to that market were significantly reduced because the allocation accruing to bought-back entitlement previously found its way onto the temporary market, or increases in asking bids for annual allocation as the cost of capital rises. Since aggregate allocations have been so small in the last two years impacts from the former are likely to have been very small. Any upwards impact on temporary prices due to the increased cost of capital associated with higher entitlement prices is probably insignificant as price increases in temporary markets have swamped those seen in entitlement markets (due to scarcity).

The buy-back program, by focusing on lower security entitlements (that is, average yield is about 60 per cent over the long run and much lower than that during this drought), is signalling much greater influence on temporary market prices when more water becomes available (that is, annual allocation prices may not fall as much as expected prior to the buy-back program). To MI this is the right outcome, but entitlement purchase is the wrong mechanism because of its expense (because it buys security as well as water), the costs associated with transferring potentially unnecessary security to the environment, risks associated with potential mismatch, and negative impacts on regional infrastructure and investment, and pro-cyclical effects during the drought.

Table 1: Entitlements and average expected allocation by State

	Entitlement volume (ML)	% of total	Average Allocation (ML)	% of total	Average allocation % of entitlement
NSW	5,918,399	56%	3,833,296	50%	65%
Vic	4,176,568	39%	3,425,020	44%	82%
SA	514,500	5%	463,050	6%	90%
	10,609,467	100%	7,721,365	100%	73%

Source: Hyder Report

The buy-back program is a pro-cyclical policy tool when implemented during the drought, whereas investment in water savings is counter-cyclical. That is, the buy-back is emphasising the costs of the drought on water users and related communities. These costs will increase because of accelerated buy-back expenditures during the drought. At the same time adjustment costs will increase because of recent declines in economic growth in the rest of the economy due to the world financial crisis. Environmentalists will no doubt argue that the drought emphasises the need for water for the environment but it is unlikely that the environment would pay the prices for annual allocation that have been reached in the user markets - probably because environmental assets are much more resilient to annual climatic conditions than are crops and agricultural products.

MI recommends that the buy-back program be scaled back significantly to avoid the pro-cyclical impacts on regional communities, especially in light of difficult economic conditions for adjustment. We also recommend that the drought should be a motivation for concentration on other non-market mechanisms to recover water such as investment in water savings.

DEWHA is now publishing average prices paid for entitlements. What impact is this likely to have on bids in subsequent or one-off purchases?

Using average prices might be expected to contain growth in future price bids in current circumstances and put a floor in place if the value of entitlements declines. It is probably unlikely to have substantial impact in either area because potential sellers probably access better information via the bush telegraph.

Another effect may be an attempt to promote more confidence for stakeholders in the buy-back tender process by making purchases more accountable and transparent. If so, it does not seem to have been successful, and has likely added significantly to the already high transaction costs associated with the buy-back of entitlements. The problem is the perception that the major buyer (Government) is not driven by market forces and the resources can be used for political goals that may be unrelated to water recovery for the environment. One example of this is the current controversy about over-focus on NSW for entitlement purchases.

If Government is intent on operating outside existing water market places then it should provide the same information as is available from those markets.

How much influence would the choice of market mechanism used to purchase entitlements for environmental purposes have on the market for water?

MI agrees broadly with the current focus on purchasing entitlements with lower than average security. This approach is likely to stabilise water prices and rural production. In effect water returns to the environment will reduce production in times of 'plenty' and maintain production during drier sequences. The impact is likely to increase water prices during wetter years, without impacting greatly in very dry years.

However, we believe that better ways of achieving the same result are available. This belief is a central building block to MI's proposed RiverReach products which would enable entitlements with higher security to sell lower security products to the environment. This would enable more universal participation by sellers, greater flexibility in specification of water products, a willingness to sell more water to the environment at lower costs than for entitlement, and less risk of mismatch between acquired water and environmental demands. For example, once the demand profile for an environment is identified, potential suppliers will have an incentive to meet those demands using RiverReach products. Initial surveys of irrigators are very encouraging in terms of assessing potential support for such an approach.

What impact has the entrance of the Commonwealth (and other governments) into the market for water had on background trade in water between third parties?

The major impact on background trade to date has been the drought. However, the buy-back, due to acceleration, will have bigger impacts in future. While the drought persists the impact will be to increase scarcity and force up water and entitlement prices (perhaps unnecessarily).

How would speeding up or slowing down the Australian Government's water purchases influence the effects on trade between irrigators?

Speeding up the program will increase the pro-cyclical impacts on water markets and production during the drought. In short, the reduced economic activity, reduced assets values, and lower employment due to the drought will be worsened. It also increases entitlement prices (ie, costs of acquiring water) and the risks of mismatch between water demands and supply (in terms of timing, location, volume, distribution).

MI recommends slowing the pace of water purchase on the grounds of reducing potential pro-cyclical impacts (as well as other more structural considerations such as ensuring recovery mechanisms meet environmental water demands).

What are the advantages and disadvantages of the different market mechanisms that could be used to obtain water for the environment? In particular, how do they compare in terms of compliance and transaction costs and the ability to meet the differing watering needs of environmental assets?

Purchasing entitlements through a tender (or auction) process

MI believes the current tender process has significant shortcomings because of very high transaction costs, low capacity to match supply with demand, and low levels of transparency. It does little to overcome the fundamental problem of mistrust associated with Government intervention that has the capacity to significantly affect relative economic, social, and environmental welfare across and within regions.

Purchasing land and entitlements in the market place

This would appear to be justified if the purchase of the land and water had complementary and 'value for money' environmental benefits. But transaction costs would likely be high.

Purchasing seasonal allocations

In effect this means the purchase of water with 100 per cent security within one water year. Unfortunately the availability of water being supplied to temporary markets is very insecure (depending on climatic conditions). MI does not believe that the need to service environmental assets would show 'value for money' for a buyer faced with user driven prices during dry years. The equivalent would be the purchase of the most secure of high security entitlements (which the Government has generally avoided in its buy-back program to date).

That said, there may be times when there are urgent watering needs for the environment that can be met from annual allocation markets. At such times – when value for money is clear – the use of temporary markets for environmental water should be part of the suite of products used by the Government.

It is difficult to judge such needs in the absence of clear and accountable environmental watering plans and 'water budgets' for environmental assets. However, transaction costs are likely to be quite low as would risks of mismatch between supply and demand. Transparency would be enhanced if such transactions were conducted within existing water exchanges.

Leasing entitlements

The lease of entitlements would seem to enable better match between demand and supply at less financial risk (given climate variability). It also has the advantage of enabling a more flexible intervention strategy and transaction costs would be lower if the transactions are conducted using existing exchanges and processes.

Purchasing options contracts

Options would enable better risk management once demands are identified. They are part of the suite of products envisaged under RiverReach, and would enable better matching of supply and demand (once demands are better known). RiverReach extends on options via leases and permanent forward sale contracts. Transaction costs (although large in terms of initial design and establishment) are likely to be little different to those for existing markets.

Covenants

Covenants seem to provide similar flexibility to RiverReach products, and may be very useful in specific circumstances.

Subsidies for irrigators to leave irrigation

Subsidies should only be provided to target areas that are clearly justified (ie, where the social/economic benefits for society exceed the cost of the subsidy). This might be applicable in areas where there are special environmental benefits (eg, salinity mitigation) or social benefits (eg, peri-urban use of irrigation water) or in networks where the current costs of supply exceed the benefits.

Purchasing environmental services

These purchases may have a role in the right circumstances.

Are there other market mechanisms, not listed above, that the Commission should be considering?

RiverReach envisages forward sale contracts that would be the equivalent of permanent purchase of an entitlement (subject to the conditions agreed for transfer from the seller's to the buyer's water account).

Another approach that may be more efficient and effective would be if the Government advised regional delivery agencies (eg, MI in the MIA and Districts and State Water for river pumpers) of the volume of water expected for recovery within the region of responsibility and an acceptable financial cost per ML to make those recoveries (using market mechanisms and investment in savings). The regional delivery agencies could then be contracted to deliver the target water. This is likely to enable better match of mechanisms with jurisdictions, and more sensitivity to regional interests in terms of maintaining production and efficient supply networks. For example, it might ultimately prove to be the only way that RiverReach mechanisms can be delivered in a practical way. This approach would however require more coordination and communication between the overarching environmental buyers and managers of the relevant regional delivery agencies.

With the benefit of the experience gained from the three tenders under the RTB program:

- *What are the advantages and disadvantages of the chosen rolling tender process?*

It lacks flexibility, focuses on a small suite of products, has high transaction costs, lacks transparency, has inadequate accountability, has low community support, and it is not informed by specified demands.

The benefits are that it has focused on lower security entitlements (ie, purchased water that is likely to become available after the drought ends), and shown that water can be acquired through market mechanisms.

On balance, however, it gives little comfort to irrigators that after significant expenditure of resources the fundamental problem of delivering highly efficient environmental services at lowest possible cost (in terms of budget resources and costs to rural production) will be solved. This requires greater transparency in matching demands with purchases.

- *How could the tender process be improved?*

It needs to be informed by specified environmental demands that are warranted and achievable. Until basin plans are established the tender should focus on lease of entitlements rather than purchase. This would save budget resources and enable better risk management. The process should be informed by clear quantifiable limits for each region and entitlement type that is being demanded (and this should be public knowledge). The buyer should table a tender offer preferably through existing exchanges or a dedicated environmental water exchange. The suite of products needs to be expanded, including the use of more innovative mechanisms such as RiverReach products that enable better risk management.

- *How do you think an open market process would have fared instead?*

An open market process would be better. However, some stakeholders have asked for separation from existing markets. If that is the preferred approach then a separate 'environmental water exchange' operating alongside existing 'background' user markets would be greatly preferred.

What mix of market mechanisms and water products should the Australian Government be using to achieve its environmental objectives?

This is not easy to answer because of the absence of clearly specified demands in terms of locality, timing, volume and security. The environment must move to the management practices in the 'user' market where society is readily informed about the volumes and timing of water used for a range of end products and measurable benefits. Currently, water users are in the 'cross hairs' partly because this information is available for 'users' and does not always match the expectations and value judgments of some people. The environment is not being subject to such accountability and value judgments. It would not be unreasonable – from a management point of view – to suspend all future acquisition of environmental water (beyond current purchases of about 600 GL, including TLM purchases, and savings projects in the pipeline of about 400 GL) until the environmental managers are able to show the uses and benefits of all forms of environmental water in their portfolio, and how they will use, monitor, and report on the benefits of environmental water.

All that said, the suite of purchase products should be expanded, especially the inclusion of term leases and more innovative products such as those envisaged under RiverReach (which are characterized by triggers such as general security announced allocation to indicate catchment conditions, especially the level of water available).

What examples of the use of market mechanisms for purchasing water entitlements or similar property rights are you aware of, and what lessons can be learned from these that might apply to purchasing water in the Basin?

- How substantial are or were these purchasing programs (for example, in comparison to the total stock of property rights concerned or the size of the relevant market)?
- What institutional constraints might limit the degree to which those examples might apply to purchasing water in the Basin?

RiverReach is in its infancy, but MI will be happy to provide information about practical experience as soon as it becomes available.

Should water purchasing and infrastructure upgrades be coordinated and, if so, how?

Yes, but the challenge of integration lies in the long lead times associated with infrastructure upgrades and realization of project benefits, including water savings. If MI were rationalizing its network with a view to recovering water it would have a clear target for recovery, make the infrastructure investments the first priority, and use water purchases as the last mechanism to meet any gap between target savings and those realized through the infrastructure investments.

What potential is there for a more cost-reflective approach to pricing of water delivery to obviate the need for targeting purchases of water?

The potential is there but it is most unlikely to be realized. The best way to illustrate this is a thought experiment for such an approach under the on-river MDB water supply system. In this case – as for irrigation systems – if losses were accounted with delivery then downstream users would face significantly higher delivery costs than upstream. This would create incentives for upstream location of investment and diversions. That would not appeal to downstream users in the MDB, especially high population areas in South Australia, Victoria and NSW. The same pressures face irrigation supply networks. Also, cost reflective delivery prices would likely provide an incentive for particular entitlement holders to sell they would likely be too small relative to the value of entitlements to overcome ‘hold out’ problems.

On balance more cost reflective delivery prices are just part of an over-all suite of incentives and mechanisms that would be required to improve the efficiency and effectiveness of buy-back and water saving projects.

How well has the irrigator-led group proposal component of Restoring the Balance addressed the possibilities for taking group action that coordinates infrastructure upgrades and water sales? How could it be improved?

MI has had very little experience with this program to date, however, it has potential to be an important part of the suite of programs to address water recovery for the environment. In particular, it could assist with network rationalization while recovering water for the environment.

What impact is the 4 per cent limit having on the market for water entitlements?

It is currently forcing buyers to focus efforts away from Victoria. That is it is distorting the market, along with many other factors, especially institutional differences in terms of governance (and associated property rights), ownership, and operation. However, it is probably assisting irrigation delivery agencies and irrigation communities to manage the adjustments associated with loss of water.

What impact is it having on the effectiveness and efficiency of the Australian Government's purchasing programs (both under the RTB program and under The Living Murray)?

It is making effectiveness difficult to achieve because it is forcing water purchases away from the Murray (Victoria). This will either result in increased losses associated with delivery to Murray environmental assets or eventually increase the prices of NSW and SA entitlement on the Murray. It is probably also diminishing prospects of achieving better allocative efficiency.

To what extent are irrigators who wish to sell their entitlements being disadvantaged by the limit?

The limit imposes a queuing process and those that are outside the 'cut' must wait for the following year. This effect has been substantial in some cases.

Is a limit on outwards trade the best way to address concerns over possible socio-economic impacts on particular irrigation areas?

No, the best way would be to enable trade in products that are lower cost for government buyers (but deliver the right volume) and lower cost to agricultural production. This would be delivered very effectively if the Government water buyers embraced RiverReach style solutions.

Is the Commonwealth-Victorian agreement on the 4 per cent limit a satisfactory way to allow a greater quantity of entitlements to be purchased in Victoria?

No, it provides the Victorian government with a veto and limits Victoria to supplying not much more than 20 per cent of the buyback program (when Victoria holds 39 per cent of target entitlement and 44 per cent of target water, cf table 1 above). It distorts the market and reduces both the effectiveness and efficiency of the buyback. It is ironic that Victoria championed water trade as a means of improving allocative efficiency when many commentators suggested that trade would see water move to 'high value adding areas' in Victoria. It is interesting to see that support for trade evaporate as soon as the market hinted at not realizing those expectations.

What impact is the NSW Government's ban on sales of NSW entitlements to the Commonwealth for environmental purposes likely to have on the ability of the buyback to obtain water efficiently and effectively?

It distorts the market even more than the Victorian deal on the 4 per cent limit (and NSW holds 56 per cent of target entitlement and 50 per cent of target water). However we have sympathy with this action because the NSW government's hand was effectively forced by the actions of Victoria and the failure of the Commonwealth-Victorian deal to provide a level playing field.

How substantial are the impediments to trade in entitlements created by the imposition of termination fees?

Termination fees have not stopped trade but they have distorted purchases away from high to low termination fee areas (because prices are higher). The effect of the distortion is equal to the difference in termination fees for delivery of like-for-like services.

Is the potential for irrigation assets to be stranded a relevant concern? Should some buyback mechanisms be preferred over others because they have a lower propensity to lead to stranded assets?

Yes and yes.

Are termination fees likely to help or hinder the efficient use of, and investment in, irrigation infrastructure during the buybacks?

Termination fees should help to finance structural adjustments to irrigation systems that become ineffective or inefficient following ad-hoc buy-backs. However, the propensity to hold water within less efficient systems is not good for allocative efficiency. This should be urgently addressed by a method to enable greater standardization of termination fees by type of irrigation system.

How can the right incentives for investment in irrigation infrastructure be achieved during the buyback program?

Greater coordination of investment for efficiency and water savings with buy-back opportunities would be achievable through some sort of agreement to contract local delivery agencies to deliver a given quantity of water for the environment. The transaction costs would be still quite high but the benefits of integrating the recovery strategies would deliver better efficiency, lower costs and lower risks. The program would likely be more sensitive to identifying projects and market mechanisms that are more sensitive to maintaining higher values for water use.

What impact are termination fees likely to have on an irrigator's willingness to sell and the cost of the buyback?

Sellers have been shown to be willing to sell to the environment (and other external buyers) when they are offered the current market price per ML without termination fees plus the cost of termination fees. When termination fees are consistent with the present value of fixed delivery costs the net cost is the same for internal buyers because they meet the fixed delivery when they buy entitlement (to enable delivery).

The only problem arises when termination fees are higher than the present value of fixed delivery costs. In these cases the difference between the termination fee and the present value of fixed delivery costs will increase the net cost per ML for the buy-back program. It may also make the seller less willing to sell if prices tend to standardize for similar entitlements (but that does not appear to be happening yet).

Are the costs associated with trading water entitlements (including those associated with delays and lack of market information) higher than they should be?

Yes.

Are these costs a significant impediment to the efficient operation of government water buybacks and the water market more generally?

There are more substantial sources of ineffectiveness and inefficiency.

How might these costs be reduced?

Lean on State regulators to ensure that they and within State agencies responsible for trade meet certain minimum standards or access to Commonwealth grants will be withheld.

To what extent have the CPG's restricted or limited the design of current DEWHA purchasing mechanisms and the decision to buy only water entitlements?

Unknown, but MI has been told that budget provisions have been an important factor in focusing on entitlement purchase (ie, the budget is there now and must be used for permanent solutions because the budget provision may disappear as readily as it appeared).

What impact might the CPGs have on the Commonwealth's ability to use alternative purchasing mechanisms to buy water products other than water entitlements?

This is not known to MI.

Executive summary

The NSW Government has requested that the potential benefits of RiverReach be demonstrated in order to justify meeting the costs of establishing and administering the RiverReach program/system by Governments.

RiverReach proposes that irrigators be able to sell water using the same 'trigger' approach that water custodians use to supply water from catchment storages. That is, irrigators may retain higher security water (allocation in drier years) and permanently sell lower security water (allocation in wetter years). Given this flexibility irrigators could better identify which water is of least value to them in terms of production – and be more willing to sell this water to the environment. For its part, the environment could purchase greater volumes of water at lower costs (than if it is forced to only purchase current entitlements). A win-win outcome.

The benefits of RiverReach are expected to be:

1. An increase in the supply of at least 250,000 ML of water to the environment based on conservative estimates, including:
 - An additional 100,000 ML by enabling HS/high reliability entitlement holders to participate (beyond their ability to sell entitlement).
 - An additional 70,000 ML by enabling GS security entitlement holders to sell a new type of entitlement with a cap factor below the cap factor of their current permanent entitlement.
 - Survey results of both corporations and individual irrigators which suggest that RiverReach would mobilize between 300,000 and 538,000 ML of additional water for sale to the environment.
2. A lower cost of water for the environment of up to and perhaps more than \$128m through acquiring 250,000 ML of water through RiverReach
 - Purchase of this volume would likely cost at least \$2,120 per ML or a total cost of about \$530m¹ if acquired through entitlement purchase with 58 per cent cap factor.
 - Purchase of the same volume using RiverReach contracts with effective cap factor of 42 per cent is estimated to save about 14 per cent, meaning a total cost of about \$455m and a saving of about \$75m.
 - Conservatively, there is also potential for a further 10 per cent saving through mitigation of water price rises, saving approximately \$53m (based on survey of individual irrigators).
3. Greater water security and higher value of agricultural production through ability to sell 250,000 ML of RiverReach water at 42 per cent cap factor rather than the same volume through entitlement sale:
 - The benefit for sellers of retained security and associated higher value production is likely to be at least \$75m.
 - This would be significantly higher if consumer surplus (benefits to consumers above the market price per ML) were included.
4. More assurance and stability for regional communities from the sale of 250,000 ML of water via RiverReach
 - Significant non-financial political and social benefits including:
 - ⇒ Reduced stress about losses associated with water entitlements, people, and facilities leaving the district during a very difficult period when climate change and the drought are a major concern.

¹ All costs, values, and prices used in this paper are at \$2007-08 prices.

- ⇒ Potential to deliver extra water to the environment while minimizing political friction because of the potential for win-win outcomes for irrigators and the environment, and because of the strong irrigator and community support it enjoys.
 - Additional value of regional product equal to \$75m for downstream industries (which would be higher still if consumer surplus on farm were included).
5. Increased national product, and reduced budgetary pressures through financial savings and higher revenues.
- National increase in value added of about \$300m in total.
 - Effective budget savings of about \$151m, comprising:
 - ⇒ About \$94m, using extremely conservative estimates, through reduced net direct programmed expenditure savings (discounting cost savings by 50%).
 - ⇒ About \$57m, conservatively, in additional taxation revenue (from the additional national output of \$300m).

The key benefit is mobilizing additional water for the environment at lower costs than would be possible via entitlement purchase – as all the other benefits then follow.

River Reach is an innovative addition to the suite of products available to purchase water for the environment. It would fill environmental water accounts in the same manner as purchasing and holding entitlements.

Although this paper does not attempt to quantify the specific benefits to environmental assets from the use of RiverReach water:

- Identifying and quantifying specific environmental benefits is being investigated by the Murrumbidgee Catchment Management Authority.
- DWE is currently assessing and reporting on the yield, the hydrological aspects, and a set of environmental indicators for several RiverReach products.

1. Background.

River Reach has been developed through a project funded by the Commonwealth Government. An underlying objective of RiverReach is to provide greater choice and flexibility to all stakeholders in water markets, with consequent benefits for irrigators and dependent communities, the environment and environmental water buyers, and the nation. The NSW Government has requested that the potential benefits of RiverReach be demonstrated in order to justify meeting the costs of establishing and administering the RiverReach program/system by Governments.

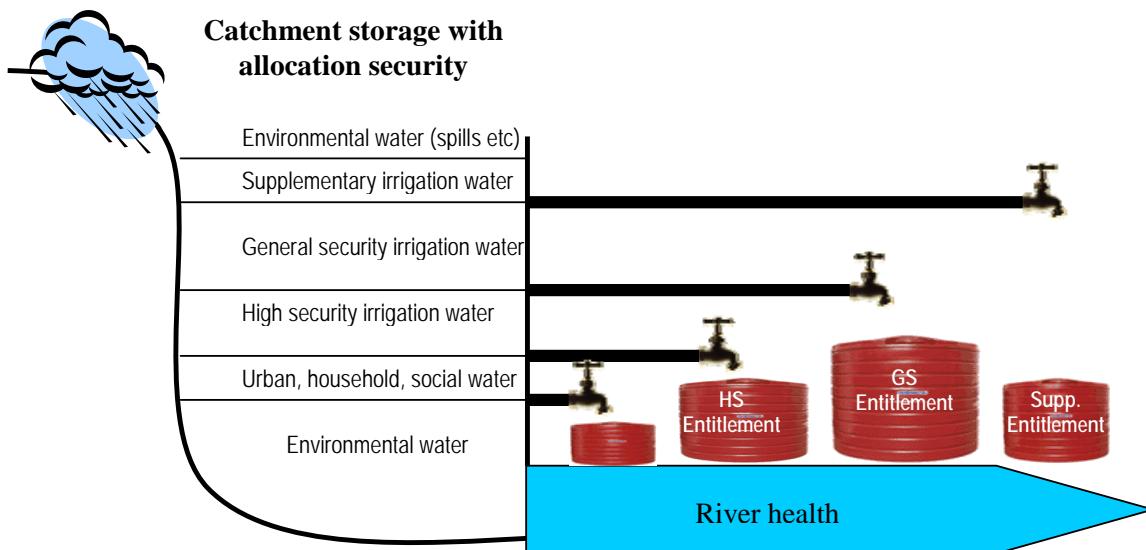
A brief description of RiverReach is required so that these benefits can be illustrated.

2. What is RiverReach?

Current regulated water collection and entitlement systems can be viewed as a series of water tanks. Water that is collected in the dam (the primary tank) is effectively transferred to a series of water entitlements (entitlement tanks) once sufficient water becomes available in the dam to meet all prior claims. In effect a progressive series of tanks are filled as more and more water becomes available in the dam, and the sequence of filling reflects the priority of access to available water. High security (HS) entitlements receive allocation first, general security (GS) entitlements receive allocations after HS needs have been met, and lower levels of security receive allocations after GS needs are met.

A key characteristic of this system is that the allocation of water is 'triggered' by the availability of water in the relevant dam or catchment storage (see figure 1).

Figure 1: The general structure of water entitlement and allocation in a regulated system



A major benefit of this 'trigger' approach to allocation of water is that it enables the custodians of water resources to reflect society's values in terms of water access and use. The water that is accorded the highest value use by society (such as urban water and base environmental flows) is supplied before high security entitlements (the next highest value use accorded by society), which in turn is supplied before lower security entitlements (which can have varying levels of security and therefore 'value').

RiverReach proposes that current entitlement holders be able to sell water using the same 'trigger' approach that water custodians use to supply water from catchment storages. That is, irrigators could sell water horizontally from their water entitlement 'tank' rather than the whole tank (sale of entitlement) or a vertical part of the tank (partial sale of entitlement) – see figure 2. The lower taps on the source entitlement tank correspond to high security water to the irrigator and the security of the water falls as the height of the tap increases.

Given this flexibility irrigators could better identify which water is of least value to them in terms of production – and be more willing to sell this water to the environment. For its part, the environment could purchase greater volumes of water at lower costs (than if it is forced to just purchase current entitlements). A win-win outcome.

Figure 2: Using a current source entitlement to deliver a RiverReach “entitlement”



It is important to note that Government currently focuses on the purchase of entitlements (permanent trades) rather than the temporary purchase of allocations. RiverReach proposes to enable perpetual contracts to govern the transfer of water to the buyer based on agreed trigger events. This perpetual contract is what is termed “RiverReach entitlement” because it is equivalent to a current water access entitlement, except it is supplied by an existing “source entitlement” rather than regulated storages. An example of the basic confirmations and associated distribution of water from the source entitlement for a perpetual RiverReach contract is shown at appendix 1.

The benefits of the RiverReach system relative to the purchase of equivalent water from current entitlements are expected to be:

1. An increase in the supply of water to the environment,
 2. A lower cost of water for the environment,
 3. Greater water security and higher value of agricultural production,
 4. More assurance, stability, and output values for regional communities, and
 5. Increased national product, and reduced budgetary pressures through financial savings and higher revenues.
3. Quantifying RiverReach benefits?

3.1 An increase in supply of water for sale to the environment

There are two key drivers that would see RiverReach increase the supply of water for sale to the environment. First, the mechanics and processes of the proposed RiverReach system would enable water from higher security entitlements to mobilize water into RiverReach products. Second, irrigators and current water entitlement holders have indicated a preference to sell water through a RiverReach mechanism rather than through sale of entitlements.

3.1.1 Mobilizing RiverReach water from higher security entitlements

RiverReach would enable owners of higher security water entitlements to design and supply a lower security “entitlement” and sell that water to the environment. That is, it opens a much larger supply side for permanent contracts to provide lower security water (which should result in lower costs and prices for that water – see next section).

The current Government strategy for the purchase of environmental water focuses only on permanent entitlements. The appropriate target entitlements are listed in table 1 of appendix 2. The total volume of these entitlements is 10,628,128 megalitres (ML), and average expected annual allocation of water to those entitlements is 7,721,365 ML. Of these entitlements 40 per cent (4,238,184 ML) are high security or high reliability (HS), and HS entitlements account for 52 per cent of annual allocation (4,001,873 ML).

However, the Commonwealth's purchasing strategy currently calls for a review of purchasing if more than 10 per cent of purchases are high security entitlements.² Assuming that the Government spends \$3b on the purchase of water entitlements at 2007-08 prices, this means that the purchase of high security entitlement is likely to be about 220,000 ML. This means that about 4,000,000 ML of high security entitlement and 3,750,000 ML of allocation would be effectively quarantined from purchase for environmental use under the Government's current purchasing strategy.

However, many high security entitlement holders have expressed interest in dealing with RiverReach products. A major reason is likely to be the fact that many HS entitlement holders with permanent plantings hold entitlements surplus to water needs on farm in most years because security of water is paramount to the business. But many (often smaller) businesses with permanent plants are facing difficult circumstances and may benefit greatly from an opportunity to either reduce their capital costs of water entitlement or redevelop by selling a perpetual RiverReach product. (See appendix 3 for more detail.)

It is difficult to be certain about the quantities of water that would be mobilized for sale to the environment through this mechanism. However, it is known that an average annual water use on permanent plantings of about 75 per cent of entitlement would mean that all water in very dry years would be fully used. Even if we assume that all high security water holdings are fully utilized this means that on average about 1,000,000 ML would be surplus to farm needs. If RiverReach were able to mobilize just 10 per cent of that water then an additional 100,000 ML would be mobilized for sale to the environment.

A similar argument can be made for the benefits from using general security (GS) entitlements to supply RiverReach water to lower security perpetual contracts. In 2007-08 the Federal Government purchased 20,384 ML of lower security entitlements and the average expected allocation of those entitlements is 10,117 ML (or a cap factor of about 50%).³ However, GS entitlement in both the Murrumbidgee and Murray valleys have cap factor in excess of 50% and together they account for 3,573,508 ML of GS entitlement. If just 5 per cent of that water were to be mobilized into RiverReach contracts at 40% cap factor, then an additional 70,000 ML would be mobilized for sale to the environment.

3.1.2 Irrigator preferences to sell water via RiverReach

The RiverReach project conducted surveys of both Irrigation corporations and individual irrigators during a series of meetings in October and November 2008. The results support the expectations of the project personnel (developed through personal communications within the Murrumbidgee Irrigation area) that RiverReach is likely to have broad appeal and would mobilize significantly greater volumes of water for sale to the environment compared with the purchase of entitlements. The full report of the survey of corporations is shown at appendix 4, and key findings are summarized in figure 3.

² See Hyder Report, "Review of the 2007-08 Water Entitlement Purchases", Hyder Consulting, September 2008.

³ "Restoring the Balance in the Murray-Darling Basin Program", <http://www.environment.gov.au/water/mdb/entitlement-purchasing/overview.html>

Figure 3: Summary of key results from survey of irrigation corporations, October 2008

Corporation	Entitlement in corporation (GL = 1,000 ML)	Additional water from RiverReach (GL = 1,000 ML)	Mid range additional water (% of entitlement)
CICL	600	10-20	5.0%
MIL	1,600	40-50	2.8%
WM	63	10-20	23.8%
CIT	155	20-40	19.4%
Totals	2,418	80-130	4.3%

The four irrigation corporations estimated that RiverReach would mobilize an additional 80,000 to 130,000 ML for sale to the environment within their areas. These corporations together comprise about 2,418,000 ML of water entitlement. This means that RiverReach would be expected to mobilize an additional 3.3 to 5.3 per cent of water relative to their entitlement. If these results maintained consistency across the water entitlement targeted as appropriate for purchase by the Federal government then RiverReach could be expected to mobilize additional water for sale to the environment in the range of 330,000 ML and 538,000 ML.

These results were tested through survey of irrigators within each of these corporations at a series of shed meetings conducted in November 2008. The full report of the survey of individual irrigators is shown at appendix 5, and key findings are summarized in figure 4.

The survey of irrigators suggests that the irrigation corporations may have been quite conservative in their estimation of the relative attraction of RiverReach compared to entitlement sale. At current prices the irrigator survey suggests an additional 5.1 per cent of entitlement may be activated for sale to the environment via RiverReach. If this were repeated throughout the basin then about 510,000 ML of additional water may be activated by RiverReach.

Figure 4: Summary of key results from survey of individual irrigators, November 2008

	Considering sale of entitlement		Would consider RR sale		Difference (% of entitlement)
	ML	% of entitlement	ML	% of entitlement	
At current prices	922	2.8%	2,560	7.9%	5.1%

The survey results provide very solid support for the initial estimates formulated by the RiverReach project team shown in figure 5. However, the need for caution meant that the project team has used a very conservative estimate that the additional water likely to become available from RiverReach is about 250,000 ML.

Figure 5: Potential supply of RiverReach water

Potential River Reach sellers	Potential volume GL	Likelihood of participation	Estimated sales
Sunwater	10	50%	5
Private irrigators (Qld)	5	50%	2.5
MI	50	100%	50
CICL	50	100%	50
MIL	30	75%	22.5
Jemmalong	0	0%	0
Western Murray	15	75%	11.25
Private irrigators (NSW)	350	50%	175
Schemes & joint suppliers	5	20%	1
GMW	100	50%	50
NE Water	10	50%	5
Sunraysia	10	50%	5
Private irrigators (Vic)	250	50%	125
Private irrigators (SA)	40	50%	20
CIT	10	75%	7.5
Smaller traders	5	50%	2.5
TOTAL	940	57%	532.25

Sources: Murrumbidgee Irrigation. The data reflects potential savings – where that is known (eg, MI and CICL) and an estimate based on availability of about 10% of entitlement for RiverReach water adjusted for the probability of the relevant of entitlement holders participating in RiverReach

Drawing the above results together, the RiverReach project has concluded:

- Conservatively, about 100,000 ML of additional water may be mobilized through RiverReach, just by enabling HS or high reliability entitlement holders to participate (above and beyond their ability to sell water via entitlement sale).
- Conservatively, an additional 70,000 ML may be mobilized for sale to the environment, just by enabling GS security entitlement holders to sell cap factor of about 40 per cent rather than their entitlement.
- Survey results of both Corporations and individual irrigators suggest that at current prices RiverReach may mobilize between 300,000 and 538,000 ML of additional water for sale to the environment.
- On balance, the estimate used by the RiverReach project that the RiverReach system would raise an additional 250,000 ML for the environment seems very conservative.

3.2 Cost savings for environmental buyers

There are two key ways that would see RiverReach deliver cost savings to environmental buyers. First, there is the potential for RiverReach to enable environmental buyers to avoid the cost of buying unwanted or unneeded security when purchasing entitlement. Second, there is the price effect whereby potential suppliers have indicated that they would supply greater quantities of RiverReach water for a given price than for the sale of entitlement.

3.2.1 Avoiding additional costs of buying unwanted security

Appendix 2 explains the source of these benefits. In essence there are only limited types of entitlement that are currently considered appropriate for environmental purchase (see table 1 of appendix 2). Apart from high security or high reliability entitlement there are only 6 alternative cap factors available from lower security entitlement. This set of entitlements may force the environment to buy water via entitlements with higher levels of security than is needed.

Figure 6 shows the potential for RiverReach products to deliver savings if the level of security required by the environment is significantly below that required by irrigators.

The estimates show that the total cost of buying 250,000 ML of water through entitlement purchase might be about \$528m (total of column 5) if the entitlement has an average weighted cap factor of 58 per cent (weighted average of column 1 or column 4 divided by column 3).⁴

However, the total cost of purchasing 250,000 ML of water through RiverReach products with an average weighted cap factor of 42 per cent (weighted average of column 6) is estimated to be about \$453m (total of column 8).

This amounts to a saving of about \$75m or about 14 per cent compared to purchasing the same volume of water through buying entitlements.

⁴ The weighted average cap factor of appropriate entitlement for purchase by the environment for non high security or high reliability entitlement is 58 per cent (see Hyder Report, "Review of the 2007-08 Water Entitlement Purchases", Hyder Consulting, September 2008).

Figure 6: Potential savings from buying 250,000 ML using RiverReach products, 2007-08 prices

Entitlements		Purchasing entitlement			Purchasing RiverReach products		
Cap factor	Entitlement volume (ML)	Entitlement volume (ML)	Allocation purchased (ML)	Budget cost (\$m)	Cap factors	Allocation purchased (ML)	Budget cost (\$m)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
36%	509,500	34,245	12,328	\$21	25%	12,328	\$18
41%	437,000	29,372	12,043	\$21	30%	12,043	\$19
42%	1,225,275	82,355	34,589	\$62	35%	34,589	\$58
46%	626,000	42,076	19,355	\$36	40%	19,355	\$34
64%	1,903,000	127,907	81,861	\$176	45%	81,861	\$151
80%	1,670,508	112,281	89,825	\$212	50%	89,825	\$174
58%	6,371,283	428,236	250,000	\$528	42%	250,000	\$453

Source: Data in columns 1 to 5 is drawn from "Review of the 2007-08 Water Entitlement Purchases", Hyder Consulting, September 2008 (excluding Campaspe low security entitlement for which cap factor is not available and high security or high reliability entitlements which are assumed to be acquired only via entitlement purchase). The data is for lower security/reliability entitlements grouped here according to the cap factor of those entitlements.

Note: The estimates in columns 3 to 5 assume that purchase of the lower security entitlement is a pro-rata share of expected annual allocation (to deliver a 'target' average annual allocation of 250,000 ML). These assumptions may not be the same as actual outcomes but they are just used here to establish a benchmark to enable comparisons.

The cap factor of the RiverReach product (42%) is equal to water transferred to the environment as a percentage of the volume of source entitlement assigned to the RiverReach product.

Although the implied cap factor of the RiverReach products in the above table may seem very low at 42 per cent of the source entitlement, it is worth noting that the average cap factor of non-high security (or high reliability) entitlements purchased by the Federal government in 2007-08 was 50 per cent of entitlement. This figure excludes other purchases of entitlement with very low levels of cap factor such as the purchase of Murray Supplementary entitlement and some large agri-businesses on the Darling River.⁵

Also, the RiverReach project has supported ways to improve effective security of RiverReach environmental water in order to enhance environmental benefits. The idea is that benefits will be enhanced if the environmental water is not lost at the end of the water year, and environmental water managers can match water with needs over time rather than be forced to adopt an annual 'use it or lose it' strategy (which reflects an irrigation time period for security rather than that required by environmental assets).

To this end, it is proposed under RiverReach to design a way to provide carryover to the RiverReach water in the environmental account to effectively improve security over time, and enable a better match with environmental needs. The only qualification is to ensure that such carryover does not displace annual allocation to irrigators (as that would reduce their effective access right and security). The preferred method to deliver this outcome is to ensure that RiverReach water that has been carried over in the environmental account is the first water to spill when there is a dam spill.

3.2.2 Reducing the impacts of price increases from buying entitlement

The survey of irrigators at a series of shed meetings conducted in November 2008 also addressed potential for cost savings through sale and purchase of RiverReach products (see appendix 5). Specifically the survey attempted to find out the impacts of water price changes on the relative attractiveness to supply RiverReach products or entitlement to environmental buyers. Figure 7 summarizes the key findings from the survey.

⁵ It might be argued that the Commonwealth would not need RiverReach to buy lower security water. For example, it could just focus its buying on lower security entitlements to achieve the same result. However, the risk of this approach is that it would force disproportionate purchase of lower security entitlements which is likely to involve other costs such as:

- Reduction of potential supply sources for environmental water,
- Social and political friction that may arise from a focus on buying water from specific regions (because such entitlements tend to be catchment specific), and
- Driving water prices up disproportionately because of the focus on specific entitlements (and as a consequence regions/catchments).

The data suggests that a price increase in the order of 20 per cent may be required to mobilize the same volume of water via entitlement sale as would be available for sale via RiverReach. That is, there may be a significant direct impact on entitlement prices by enabling trade in RiverReach products – say, conservatively, in the order of 10 to 20 per cent.

Figure 7: Summary of key results from survey of individual irrigators, November 2008

	Considering sale of entitlement		Would consider RR sale		Difference (% of entitlement)
	ML	% of entitlement	ML	% of entitlement	
At current prices	922	2.8%	2,560	7.9%	5.1%
If prices increase by 20%	2,485	7.6%	5,182	15.9%	8.3%

In addition, the results of the survey suggest that the more entitlement that is purchased for the environment, the more attractive RiverReach becomes to suppliers and the greater the potential financial savings. RiverReach seems likely to mobilize an additional 5.1 per cent of entitlement for sale at current prices but that increases to 8.3 per cent if entitlement prices increase by 20 per cent.

Drawing the above findings together the RiverReach project has concluded that mobilizing an additional 250,000 ML for the environment:

- May cost about \$2,120 per ML or a total cost of about \$530m if acquired through entitlement purchase (at \$2007-08 prices).
- There seems to be potential for, say, a 14 per cent cost saving on this water due to the purchase of lower security but the same average volume of water, meaning a financial cost of \$455m and a saving of about \$75m.
- Conservatively⁶, there is also potential for 10 per cent saving through mitigation of water prices rises, which, if realized, would save a further \$53m.
- On this basis, it does not seem unreasonable to expect that total cost savings to environmental buyers may be in the order of \$128m through purchase of 250,000 ML of water via RiverReach.

Finally, it is worth noting that the estimates used for both additional volume of water activated for the environment and the price mitigation effects of RiverReach are about half the estimates suggested by the survey of irrigators and irrigation corporations. If both buyers and sellers realize significant benefits and therefore support RiverReach beyond the conservative numbers used here, then the savings and benefits could increase substantially.

3.3 Greater water security and higher value agricultural production

The key to irrigator benefits from RiverReach is that it enables them, as custodians of their water resources, to better reflect their values in terms of trading their water to the environment. The water that is accorded the highest value use by the irrigator (the highest security water) can be retained to underpin the highest value production while the water that is accorded lowest value (the lowest security water) can be traded to the environment.

In effect, RiverReach enables the separation of security and water, and allows stakeholders to better manage their risks by buying the appropriate level of security and water that is optimal for their business (environment and irrigation).

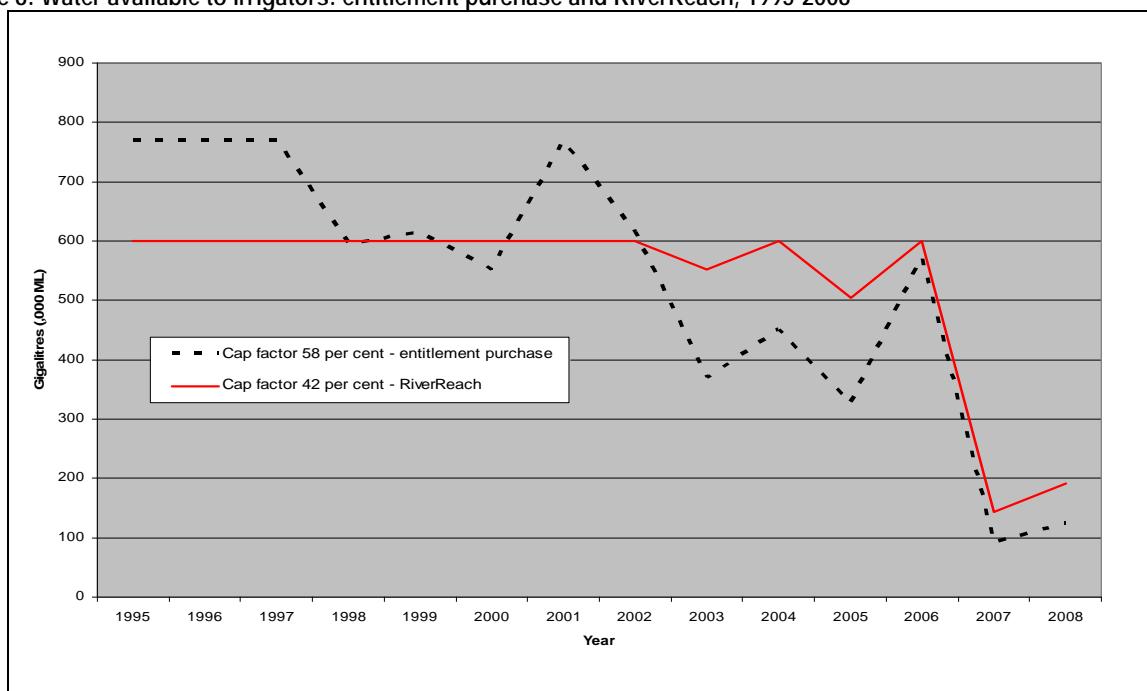
⁶ Note the estimated price saving used here is less than half that suggested by the RiverReach project survey of irrigators (see above).

Quantifying the value of retained security to irrigators is thus a mirror image of the savings made by environmental buyers through buying water with a lower level of security. That is, if irrigators choose to sell water at the cap factors outlined above using RiverReach products, the financial value that they would be putting on the retained security is at least \$75m (ignoring consumer surplus).⁷ The value of this security for irrigators is explained in section 1 of appendix 2 which relates the security of water entitlement to cap factor, temporary trade prices, and annual revenue from water entitlement.

The value in terms of water available for production is demonstrated by figure 8. It shows the water available to irrigators with a total volume of entitlement of 1,200 GL under two scenarios that deliver an average of 250,000 ML of water to the environment. The first is for the sale of 430,000 ML of entitlements that deliver an average cap factor of 58 per cent (as per figure 6). The second is a RiverReach product that reflects the cap factor of 42 per cent shown at figure 6 (ie, 250,000 ML of water drawn from a source entitlement of 600,000 ML).

The chart confirms two important aspects of RiverReach benefits for the irrigator (or seller). Firstly, annual water available is more certain (i.e., it is less variable year on year than under 'entitlement purchase'), and secondly more water is retained on farm for agricultural production in drier years (when the value of production is higher). These benefits come at a cost to the irrigator of providing more water to the environment than under the 'entitlement purchase' scenario in wetter years (when the value of water to irrigators is lowest).

Figure 8: Water available to irrigators: entitlement purchase and RiverReach, 1995-2008



Source: The data uses GS announced allocations for the period 1995-2008 drawn from the Murrumbidgee Valley IQQM model scenario for 'current conditions' for WSP arrangements.

Note: It is assumed that of the 1,200 GL of entitlement is available. The scenario "entitlement purchase" sees 430 GL of entitlement sold with a cap factor of 58 per cent (ie, it delivers 250 GL to the environment on average). The scenario "RiverReach" sees 600 GL of entitlement assigned to a RiverReach product that delivers 250 GL on average (ie, has an effective cap factor of 42 per cent).

Putting a financial value on the water retained in drier years less water transferred to the environment in wetter years is difficult because it is an individual decision (and will vary significantly). But a practical example of this value for irrigators can be gleaned by the fact that water prices in 2007 and 2008 have averaged about \$600 per ML (in \$2007-08). If 120,000 ML were available on farm through RiverReach then additional production values would exceed \$72m in those years alone. But, 2007 and 2008 have been the driest years experienced over the period from 1897-2008 (see Chart 6 of appendix 2).

Drawing on the above discussion it seems reasonable, and very conservative, to conclude on balance that:

⁷ Consumer surplus arises because the benefits from assets or goods consumed by individuals exceed the clearing market price (which is effectively set by individuals that cannot generate such surpluses, and therefore sell at that point). In the interests of conservatism these estimates ignore consumer surplus.

- The benefit for sellers of retained security when selling 250,000 ML of RiverReach water at 42 per cent cap factor is likely to be at least \$75m, when compared to the security retained via entitlement sale at 58 per cent cap factor.

3.4 Greater security and assurance for regional communities

While there is broad support for getting additional water to the environment, the flipside of reducing water entitlement available to irrigators – thus reducing irrigators water security – and letting highly valuable water to ‘leave the district’ are causing concern. In particular, there are real fears that such losses may cause already-small communities to lose facilities and critical mass.

Although these sentiments have not been quantified by the RiverReach project team, they are evident regularly in the media and through discussions at the many shed meetings conducted for River Reach, and with community organizations such as Local Councils.

River Reach will deliver significant assurance to irrigator communities through both non-financial social and political benefits, and additional income through the maintenance of higher value farm production.

The non-financial social and political benefits include:

- Reduced stress about losses associated with water entitlement, people, and facilities leaving the district during a very difficult period when climate change and the drought are concerning major concern.
- Potential to deliver extra water to the environment while minimizing political friction because of the potential for win-win outcomes for irrigators and the environment, and because of the strong irrigator and community support it enjoys.

Financial benefits arising from additional farm gate benefits of RiverReach equal to at least \$75m would include:

- Additional value of regional product equal to \$75m based on a regional multiplier on agriculture production of 2.⁸ This would be higher still if consumer surplus on farm were included.

3.5 National benefits and budget savings

3.5.1 National benefits

The national benefits of the additional value added of \$75m at the farm gate would likely add a total of \$300m to national production. (This is based on a multiple of 4⁹ used to estimate the total benefits to national value added for a given level of additional agricultural production.)

This \$300m is accounted as \$75m at the farm gate, \$75m at the regional level, and \$150m for all areas (mainly urban) outside the region.

Generally about 60-70 per cent of value added is in the form of wages and salaries (employment), and 30-40 per cent in the form of profits (dividends and reinvestment).

3.5.2 Direct budget savings

At a direct level, the budget savings to RiverReach will correspond to the savings to environmental buyers due to the purchase of lower security water products, and the benefits of avoiding price increases to entice water supply to the environment.

⁸ Typically a regional multiple for regional value added relative to farm value added is from 1.8 to 2.2.

⁹ Typically the national multiple for value added from additional farm value ranges from 4 to 5.

- From above the total direct cost savings to budget may be in the order of \$128m through purchase of 250,000 ML of water via RiverReach.
- The value of these savings in current prices will depend on when they are realized. Even if we assume substantial delay¹⁰ and discounted the savings by a total of 20 per cent (which seems very high given known opportunities) the 'real' savings would still be about \$103m.¹¹

Such savings are likely to be extremely valuable in the difficult financial circumstances facing the government, and in terms of the alternative activities that such savings can be used for such as health, education and other very important social services.

However, introducing RiverReach is not likely to be costless. There would be establishment costs for registration and administrative processes as well as ongoing annual costs for each State and the Commonwealth in administering RiverReach.

It may be estimated that the establishment costs could be as much as \$1m (to enable adequate registration and administration in NSW, Queensland, Victoria, NSW and the Commonwealth) based on a fixed cost of about \$250,000 in each jurisdiction. The annual cost in each jurisdiction may be as much as one full time staff equivalent at an annual cost of, say, \$100,000 in current prices.

Using a real discount rate of 5 per cent this means that the capitalized cost of the annual administration of RiverReach would be about \$8m (\$2m in each jurisdiction).

- The total capitalized cost of establishing and administering RiverReach may be as much as \$9m.¹²
- Very conservative estimates would therefore still see net savings of about \$94m.

3.5.3 Indirect budget savings (additions to revenue from taxation)

- Goods and service tax on \$300m additional national value added is likely raise another \$30m for Government.
- Assuming that income tax on the additional wages and salaries and profits (after GST) averages as low as 10 per cent (which is extremely conservative) then a further \$27m would be added to Government revenue.

Drawing on the above the total budget savings (additions to net revenue) may therefore be:

- A total of about \$151m, comprising:
 - ⇒ About \$94m, conservatively, in direct programmed expenditure savings
 - ⇒ About \$57m, conservatively, in additional taxation revenue.

¹⁰ The greater the delay in realizing future income the greater the discounting required and the less value that future income has relative to present values.

¹¹ It is not practical at this stage to speculate with any degree of accuracy about when the savings – estimated at about \$128m – might become available.

¹² This analysis is not comprehensive because the administrative costs of the program of entitlement purchases have not been included, whereas the savings are estimated against the costs of entitlement purchase. It is very likely that the costs of entitlement purchase are greater than the expected costs of administering RiverReach which would mean that RiverReach savings are understated. Also, given the resources available in the entitlement purchase program it is very likely that the marginal costs of administering RiverReach are overstated.

The above discussion demonstrates that the benefits of RiverReach are potentially very large. Of these benefits the most critical is from mobilizing additional water for the environment at lower costs than would be possible via entitlement purchase. Once this outcome is achieved, all the other benefits quantified above can be expected to follow.

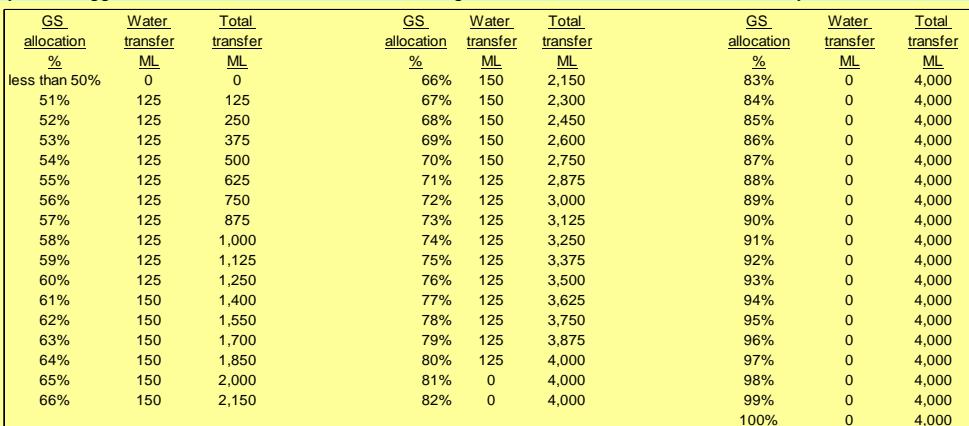
A final note on environmental outcomes

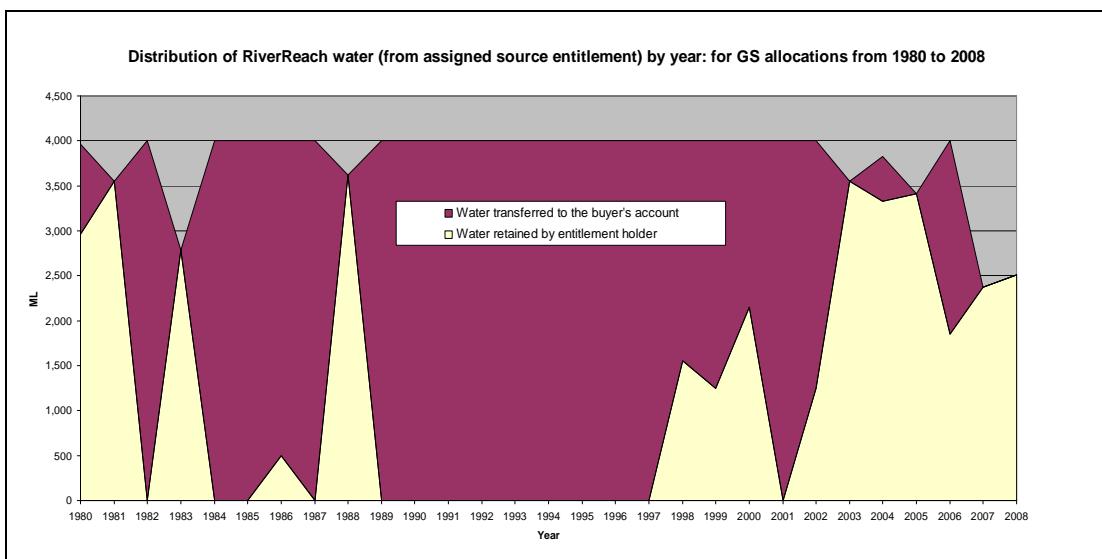
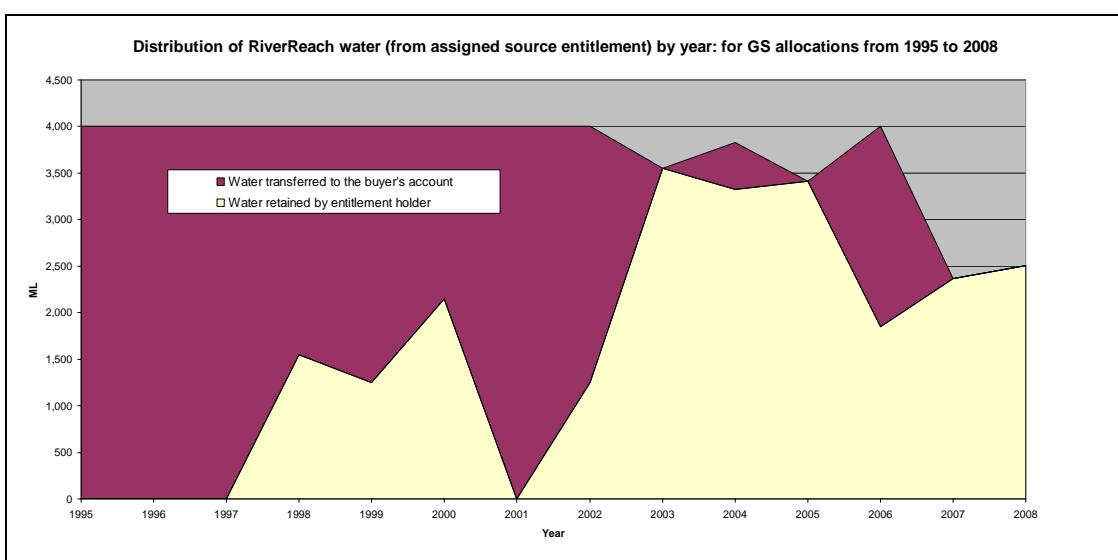
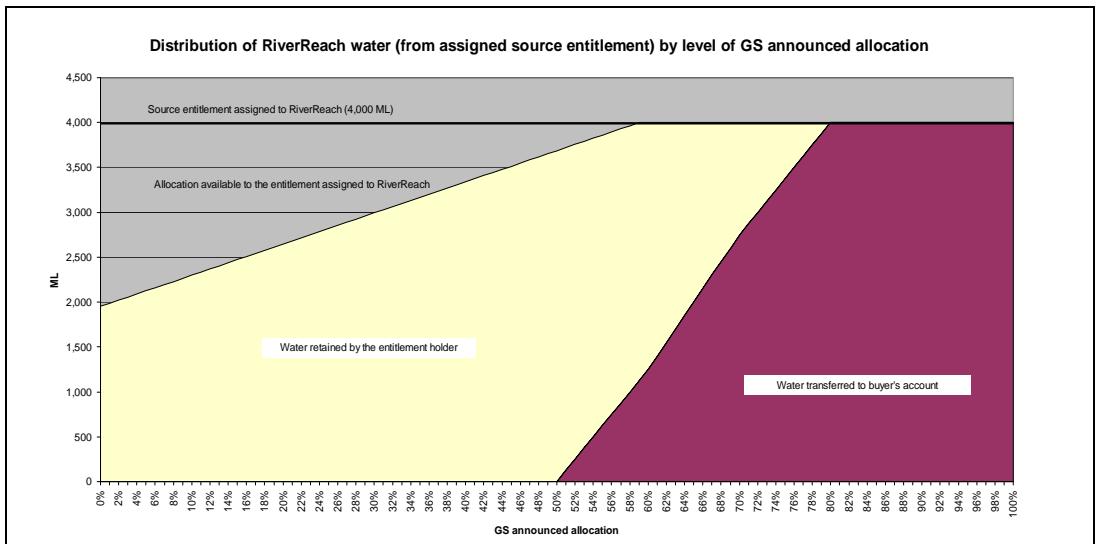
River Reach is simply an innovative addition to the suite of products available to purchase water for the environment. It is a mechanism to fill environmental water accounts in the same manner as purchasing and holding entitlements.

This paper does not attempt to quantify the specific benefits to environmental assets from the use of RiverReach water. The potential for identifying and quantifying these benefits is addressed in a separate ongoing study under the RiverReach project (being conducted by the Murrumbidgee Catchment Management Authority). We will report as progress is made, as this work may be helpful for the development of Environmental Watering Plans at State and Federal level.

In addition, we understand that the Murrumbidgee IQQM model can model the yield, the hydrological aspects, and a set of environmental indicators associated with RiverReach and the purchase of entitlements. This modeling would be invaluable and is currently being conducted by the DWE modeling section. It is proposed to make reports and findings from this modeling available to all stakeholders.

Appendix 1: An example of basic confirmations (and water distributions) for a perpetual RiverReach contract

Source water access licence (WAL) entitlement type:	Murrumbidgee Irrigation Conveyance Access licence		
Licence number of source entitlement:	abcdxyz		
Total volume or share of source entitlement:	223,000 ML		
Owner's name and address:	Murrumbidgee Irrigation, Dunn Avenue, Leeton, NSW, 2705		
Owner's contact details:	Brett Tucker, Executive Director, Murrumbidgee Irrigation, Dunn Ave, Leeton, NSW, 2705 Ph: 69620194 Fax: 6962XXXX Email: Tuckerb@mirrigation.com.au		
Catchment of source WAL (source entitlement):	Murrumbidgee Valley Regulated River		
Registration authority for source WAL (source entitlement):	Department of Water, NSW, Government		
Operations manager for catchment of source WAL (entitlement):	State Water Corporation, NSW		
Type of RiverReach contract proposed for sale:	Forward sale		
Term of RiverReach contract proposed for sale:	Perpetual		
Volume of source entitlement assigned to RiverReach contract:	4,000 ML		
Trigger index to signal water transfer from seller to buyer's account	Murrumbidgee Valley General Security announced allocation		
Proposed triggers and volume of water to be transferred from seller to buyer's account:			
When general security allocation is less than or equal:	50% all allocation will be retained by Murrumbidgee Irrigation		
When general security announced allocation exceeds:	50% 125 ML will be transferred to the buyer's WAL account for each percentage point of allocation between 50 and 60 per cent		
When general security announced allocation exceeds:	60% 150 ML will be transferred to the buyer's WAL account for each percentage point of allocation between 60 and 70 per cent		
When general security announced allocation exceeds:	70% 125 ML will be transferred to the buyer's WAL account for each percentage point of allocation between 70 and 80 per cent		
When general security announced allocation exceeds:	80% all allocation will have been transferred to the buyer's water account		
Specifically these triggers and volumes will result in the following transfers and volume of water in the buyer's water account			
			
Expected annual average volume of water to be transferred from seller to buyer's account under alternative scenarios for trigger index:			
Time period for outcomes under Murrumbidgee WSP current conditions	1995-2008	1980-2008	1897-2008
Average announced GS allocation	65%	74%	78%
Average expected annual water transfer to buyer's water account	2,032 ML	2,516 ML	2,703 ML
Implied cap factor of RiverReach contract	51%	63%	68%
Proposed sale price of share in entitlement assigned to RiverReach (per ML of entitlement):	\$1,000 per ML		
Total proposed sale price of share in entitlement assigned to RiverReach:	\$4,000,000		
Buyer's name and address:			
Buyer's contact details:			
Buyer's water access licence (WAL) entitlement type:			
Licence number of buyer's entitlement:			



Some issues and approaches to quantifying RiverReach benefits

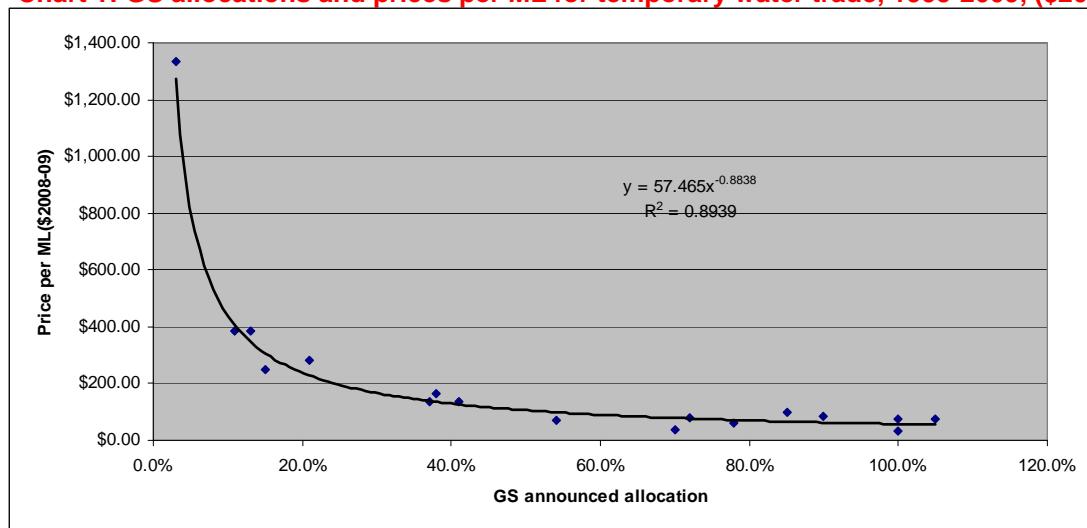
1. Entitlement values: relationship with cap factor

There seems to be a clear relationship between cap factor and entitlement price at theoretical, practical and quantitative levels.

In theory cap factor reflects the expected 'security' of annual allocation relative to entitlement volume. A high cap factor (average allocation relative to entitlement over the very long term) for entitlement requires high and relatively constant annual allocation. For example, HS entitlement in the Murrumbidgee Valley with cap factor of 95 per cent would expect to receive a minimum annual allocation each year of 95 per cent of water entitlement under the Murrumbidgee Water Sharing Plan (WSP). This allocation would be anticipated in all years except when conditions are so dry that emergency allocation measures are triggered. This outcome is quite consistent for high security entitlement throughout the basin. Lower security products, however, would expect to receive an average annual allocation below that of high security entitlement with relatively unstable allocations. For instance, general security (GS) entitlement in the Murrumbidgee Valley has a cap factor of about 65 per cent under the WSP, but allocations can be expected to range between 12 and 100 per cent of entitlement under current conditions estimates using the IQQM model.

The expected value of annual water allocations drives the value of water entitlements, and cap factor is a key driver of the value of allocation. When conditions are very dry and water supply, as reflected in allocation is low, the annual price of water is very high (because demand significantly outstrips supply). On the other hand in wet conditions the gap between demand and supply is considerably less and the annual price of water remains relatively low. The following charts show the relationship between annual water prices and allocation in the Murrumbidgee Valley from 1995-2009, and the resultant impacts on annual revenue for HS and GS entitlement.

Chart 1: GS allocations and prices per ML for temporary water trade, 1995-2009, (\$2008-09)



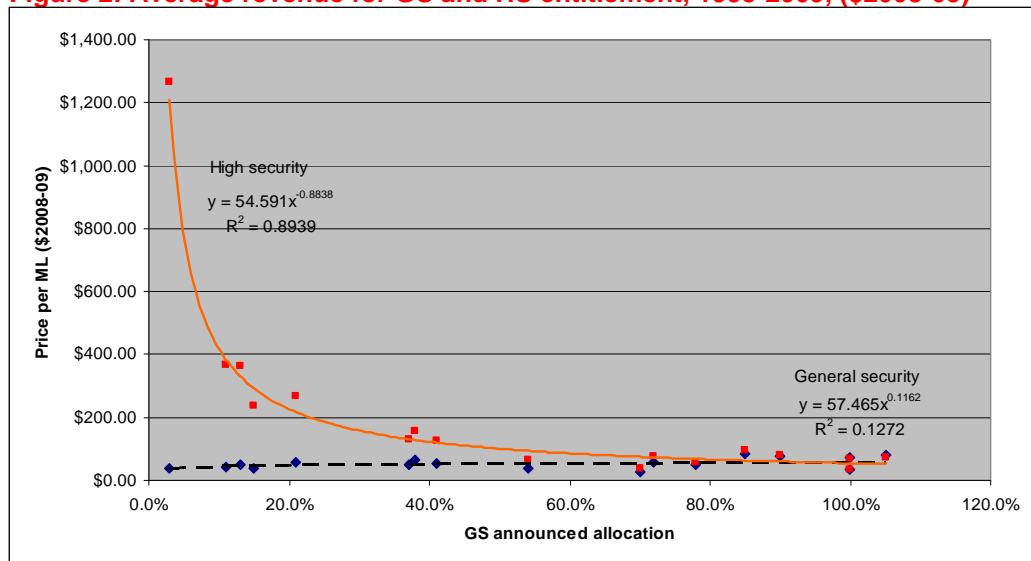
Data sources: ABARE and Murrumbidgee Water Exchange

The actual relationship between annual allocations and annual water values per ML (temporary trade prices) shown at chart 1 is not particularly important (as prices are ultimately a matter of judgment for buyers and sellers). The important outcome here is that there is clearly a relationship between allocation scarcity and the price per ML of water.

Given this relationship, not surprisingly, entitlements with high cap factor and greater annual stability of allocation will have significantly higher value in dry years, and that is reflected in the relative value of the entitlements (see chart 2). This difference in annual value per ML of water received for the different types of

entitlement is reflected in relative entitlement values. Currently HS entitlement in the Murrumbidgee Valley is trading at about \$2,900 per ML whereas GS entitlement is about \$1,300 per ML.

Figure 2: Average revenue for GS and HS entitlement, 1995-2009, (\$2008-09)



Data sources: ABARE and Murrumbidgee Water Exchange

In practice there is also recognition that cap factor is a critical determinant of entitlement values. The purchasing strategy of the Department of Environment, Water, Heritage, and the Arts (DEWHA) specifically takes account of cap factors in determining the value for money when purchasing entitlement. Each entitlement is compared against benchmark estimates of prevailing market prices after taking account of cap factor and other factors including: conveyancing costs per ML, encumbrances against entitlement that could reduce water allocations, and delivery and storage costs.¹³ Of these price determinants cap factor is the only standard enables ready comparison of all entitlement types. All other price determinants listed can vary within a given entitlement type.

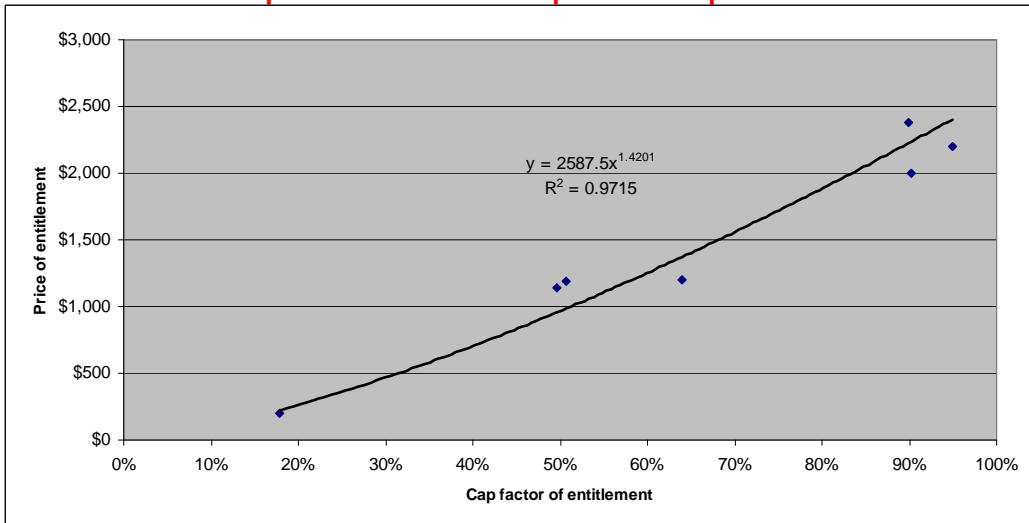
Given the theory and practice it is not surprising that the data also suggests that cap factor is a major determinant of entitlement value and market prices. Chart 3 shows the relationship between cap factor and entitlement price for the Commonwealth Government's 2007-08 purchasing program, and for other known environmental water purchases in that period.

Note: The existence of factors other than cap factor in assessing the value for money price of entitlements means that deviations in the relationship between cap factor and entitlement price would be expected. Also, the data that is publicly available from the environmental purchase program is not perfect for this exercise because it is limited and involves combinations of water entitlements, long term cap equivalent and costs (eg, NSW total, Victorian total, high security total and so on). That said, the more detailed data is likely to reflect a similar range of values for entitlements with equivalent cap factor (as is shown at chart 3) because deviations between valleys and jurisdictions in factors such as delivery costs, the relative scarcity of water, and the returns to irrigation water affect water values in user markets as well as the prices under Government tender. Also, the Commonwealth's buying strategy insists that its value for money criteria be assessed through comparison with entitlement values in user markets (see Hyder Report¹⁴).

¹³ See "Review of the 2007-08 Water Entitlement Purchases, Final Report, Hyder Consulting in association with Access Economics, 24 September 2008.

¹⁴ "Review of the 2007-08 Water Entitlement Purchases, Final Report, Hyder Consulting in association with Access Economics, 24 September 2008.

Chart 3: Relationship between entitlement price and cap factor 2007-08



Sources: MDBC Restoring the Balance in the Murray-Darling Basin Program (water entitlement purchasing), 2007-08 water purchases, MDBC website; Murrumbidgee Irrigation, and NSW Department of Water and Energy Water Share Register for Permanent Trading, Dept of Water and Energy Website.

Again, the actual relationship between cap factor and entitlement values per ML is not particularly important as such prices are ultimately a matter of judgment for buyers and sellers, and there is a range of exchanges that have been made above and below the trend line. Nevertheless, the relationship and variations are quite consistent with market prices for water throughout the Southern Connected Basin. On this basis, it is reasonable to write a general equation to define the relationship.

$$\text{Equation (1): } P_E = C.Q_{E^*}^x$$

Where, P_E is the price per ML of entitlement E ,
 Q_{E^*} is the cap factor of the entitlement E (average annual allocation relative to entitlement),
 C is a constant that reflects the value of entitlement when cap factor is 100%, and
 x determines the shape of the curve and rate of decline in value as cap factor falls.

The importance of this equation – whatever judgments are made about the specific values for variables which, as noted earlier, is a matter of judgment by buyers and sellers – is that we can use the relationship to determine a corresponding price per ML of ‘real water’ (or allocation) that is expected to be received by entitlements with varying cap factors.

This can be derived because the price of the expected water to be received (i.e., ‘real water’) is equal to the price per ML of entitlement divided by the cap factor of that entitlement. That is, we divide both sides of equation (1) by Q_{E^*} and we get: $P_w = P_E / Q_{E^*} = C.Q_{E^*}^{(x-1)}$ where P_w is the capital value per ML of ‘real water’ expected to be received. This relationship is shown at chart 4 which reflects the equation $P_w = 2587.5.Q_{E^*}^{0.4201}$. It shows that it is significantly cheaper to buy one megalitre of ‘real’ lower security water than it is to buy one megalitre of ‘real’ higher security water.

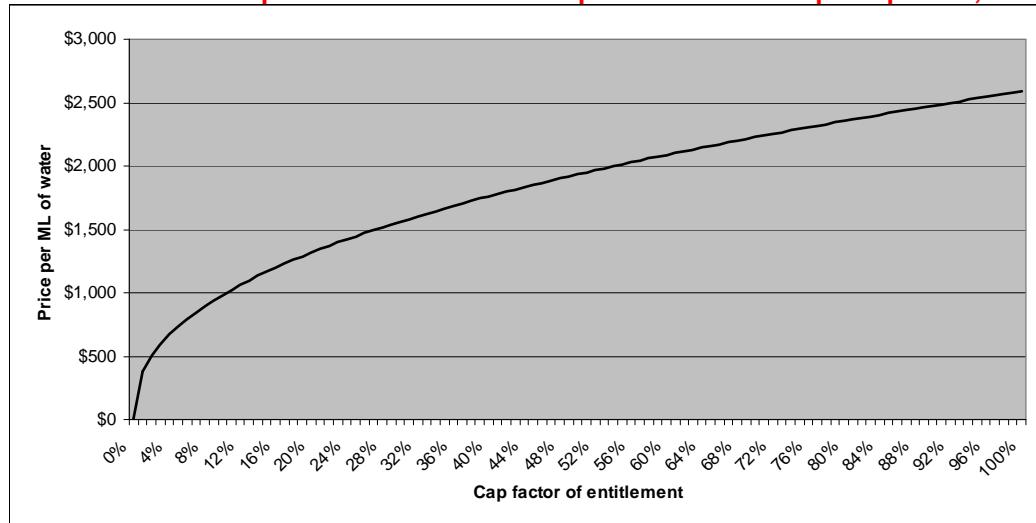
The reason for the difference in value of the low cap factor ‘real water’ and the high cap factor ‘real water’ is because of the relative instability of annual allocations to low cap factor entitlements.

This difference in value is ultimately driven by the value of security to the water user. The demand for water is determined by net benefits derived from its use. For irrigated agriculture this will reflect the annual value of production from using an extra ML of water and the share of water in production costs. As the price of annual water increases the demand for water will fall as activities with lower returns are squeezed out. Also, the demand response to price changes would be expected to be relatively greater as water prices become less.

This is because the demand for water in activities with relatively high value production per ML and low water cost shares (such as horticulture) will be much less sensitive to water prices than activities with lower value production per ML and high water cost shares (such as pastures and annual cropping).¹⁵

The importance for RiverReach is that it affords the opportunity for the environment to buy water at lower cost to the extent that it can avoid buying unnecessary security, and it affords irrigators the opportunity to sell lower value water while retaining security.

Chart 4: Relationship between entitlement cap factor and water price per ML, 2007-08



2. Estimating benefits using the relationship between cap factor and the cost of 'real water'

The level of community benefits will depend on the extent to which the environment requires the level of security or cap factor that is demanded by irrigators. If the environment does not require as much security as irrigators then there are opportunities to make budgetary savings by focusing environmental purchases on lower cap factor products that have less security than higher cap factor products.

The level of security required by users will be determined by the demand profile of the assets that need to be serviced by the water. This would include the level and timing (or regularity) of watering needs, the resilience of the assets to sub-optimal watering conditions, and the values at risk if critical watering needs are not met.

- For irrigators the demand profile is generally quite short term. Business assets are likely to be at risk if irrigation water is not available for periods of 2 to 3 years (and sometimes shorter depending on the capital structure of the business). Water needs for agriculture are usually assessed on an annual basis, but in practice water can become critical within a few weeks because the resilience of irrigation assets to dry conditions is usually very low. The value of assets at risk depends on the type of asset (e.g., shutting down part of an annual crop will generally not have the same level of cost as shutting down part of a crop with permanent plants but costs are very high in both cases). Once the assets are in place the losses associated with an absence of water are usually very high and immediate. In this context, it is worth noting that the current suite of water entitlements were designed with the security needs of irrigation in mind rather than the security needs of the environment. Table 1 shows the current suite of entitlements considered appropriate for purchase under the Commonwealth program of water entitlement purchase.

¹⁵ See, for example, ABARE (2007), Purchasing Water in the Murray Darling Basin, Report for the Department of Environment and Water Resources.

Table 1: Appropriate entitlement for environmental purchase, 2007-08

State	Catchment	Entitlement type	Entitlement volume	Cap factor	Average Allocation
NSW	Gwyder	General security	509,500	36%	183,420
NSW	McQuarrie-Bogan	General security	632,428	42%	265,620
NSW	Lachlan	General security	592,847	42%	248,996
NSW	Lachlan	High security	26,472	100%	26,472
NSW	Murrumbidgee	General security	1,903,000	64%	1,217,920
NSW	Murrumbidgee	High security	378,000	95%	359,100
NSW	Murray	General security	1,670,508	80%	1,336,406
NSW	Murray	High security	198,011	95%	188,110
NSW	Lower Darling	High security	7,633	95%	7,251
Vic	Campaspe	Low reliability	18,661	na	na
Vic	Campaspe	High reliability	37,118	95%	35,262
Vic	Goulburn	Low reliability	626,000	46%	287,960
Vic	Goulburn	High reliability	1,615,000	95%	1,534,250
Vic	Murray	Low reliability	437,000	41%	179,170
Vic	Murray	High reliability	1,435,000	95%	1,363,250
Vic	Ovens	High reliability	26,450	95%	25,128
SA	Murray	High security	514,500	90%	463,050
			10,628,128	73%	7,721,365
NSW			5,918,399	65%	3,833,296
Vic			4,195,229	82%	3,425,020
SA			514,500	90%	463,050
General security or low reliability			6,389,944	58%	3,719,492
High security of high reliability			4,238,184	94%	4,001,873

Source: "Review of the 2007-08 Water Entitlement Purchases", Hyder Consulting, September 2008.

Note: Average allocation should be interpreted as average expected useable allocation over the long term. The cap factor for Campaspe low reliability entitlement is not known.

- The required security for environmental assets is less clear. However, it is probably much less than that required for irrigated agriculture because of the greater intervals between watering needs (and the importance of quite rapid dewatering on occasion), and the greater resilience of environmental assets to dry conditions. Also, in practice the DEWHA buying strategy calls for a review if the purchase of HS entitlement exceeds 10 per cent total entitlement. This suggests an acknowledgment that, on balance, the security needs of the environment are lower than for irrigators (as HS entitlement is about 40 per cent of regulated water access entitlement in the Murray Darling basin and 52 per cent of expected allocations – see table 1).

It might be argued that the Commonwealth would not need RiverReach to buy lower security water. For example, it could just focus its buying on lower security entitlements to achieve the same result. However, the risk of this approach is that it would force disproportionate purchase of lower security entitlements which is likely to involve other costs such as:

- Reduction of potential supply sources for environmental water,
- Social and political friction that may arise from a focus on buying water from specific regions (because such entitlements tend to be catchment specific), and
- Driving water prices up disproportionately because of the focus on specific entitlements (and as a consequence regions/catchments).

On this basis, the gains for RiverReach products for the Government lie in:

- The potential to buy least cost 'real' environmental water by avoiding the purchase of buying unwanted security.*

Budget savings would likely be significant (depending on potential to purchase lower security water). Table 2 (columns 3 to 5) provides estimates of the cost of 250,000 ML of 'real water' that might be purchased through the environmental water under the buy-back program - based on the equation $P_w = 2587.5.Q_E^{0.4201}$ (at 2007-08 prices). These results can be compared with the estimated cost of RiverReach products using the same equation with lower levels of security (columns 6 to 8). (This equation to value 'real water' may not be acceptable to all users, however, any equation would likely see a significant value placed on security and

therefore a significant financial saving if such security is not needed for each ML of 'real water' purchased by the environment.)

The estimates in Table 2 show that the total cost of buying 250,000 ML of water through entitlement purchase might be about \$528m (total of column 5) if the entitlement has an average weighted cap factor of 58 per cent (weighted average of column 1 or column 4 divided by column 3).

However, the total cost of purchasing 250,000 ML of water through RiverReach products with an average weighted cap factor of 42 per cent (weighted average of column 6) is estimated to be about \$453m (total of column 8).

This amounts to a saving of about \$75m or about 14 per cent compared to purchasing the same volume of water through buying entitlements.

Table 2: Potential cost savings from buying 250,000 ML using RiverReach products, 2007-08 prices

Entitlements		Purchasing entitlement			Purchasing RiverReach products		
Cap factor	Entitlement volume (ML)	Entitlement volume (ML)	Allocation purchased (ML)	Budget cost (\$m)	Cap factors	Allocation purchased (ML)	Budget cost (\$m)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
36%	509,500	34,245	12,328	\$21	25%	12,328	\$18
41%	437,000	29,372	12,043	\$21	30%	12,043	\$19
42%	1,225,275	82,355	34,589	\$62	35%	34,589	\$58
46%	626,000	42,076	19,355	\$36	40%	19,355	\$34
64%	1,903,000	127,907	81,861	\$176	45%	81,861	\$151
80%	1,670,508	112,281	89,825	\$212	50%	89,825	\$174
58%	6,371,283	428,236	250,000	\$528	42%	250,000	\$453

Source: Data in columns 1 to 5 is drawn from "Review of the 2007-08 Water Entitlement Purchases", Hyder Consulting, September 2008 (excluding Campaspe low security entitlement for which cap factor is not available and high security or high reliability entitlements which are assumed to be acquired only via entitlement purchase). The data is for lower security/reliability entitlements grouped here according to the cap factor of those entitlements.

Note: The estimates in columns 3 to 5 assume that purchase of the lower security entitlement is a pro-rata share of expected annual allocation (to deliver a 'target' average annual allocation of 250,000 ML). These assumptions may not be the same as actual outcomes but they are just used here to establish a benchmark to enable comparisons.

The cap factor of the RiverReach product (42%) is equal to water transferred to the environment as a percentage of the volume of source entitlement assigned to the RiverReach product.

Also, it should be noted that although the average weighted cap factor of the RiverReach products (at 42 per cent) is much lower than that assumed under environmental purchases (58 per cent), the RiverReach project has supported ways to improve effective security in order to enhance environmental benefits. The idea is that benefits will be enhanced if the environmental water is not lost at the end of the water year, and environmental water managers can match water with needs over time rather than be forced to adopt an annual 'use it or lose it' strategy (which, again, reflects an irrigation time period for security rather than that of the environment).

To this end, it is proposed under RiverReach to design a way to provide carryover to the RiverReach water in the environmental account to effectively improve security over time, and enable a better match with environmental needs. The only qualification is to ensure that such carryover does not displace annual allocation to irrigators (as that would reduce their effective access right). The preferred method to deliver this outcome is to ensure that carry over RiverReach water in the environmental account is the first water to spill when there is a dam spill.

2. The benefits of retaining higher security water on farm to support maintenance of higher value agricultural production.

The benefit to irrigators of retaining security, while selling a given volume of water to the environment, is that it underpins the maintenance of higher value farm production in dry sequences.

The value of that security can be discerned from the estimates in Table 2. That is, if irrigators choose to sell water at the cap factors outlined in table 2 using RiverReach products, the financial value that they would be putting on the retained security is \$75m.

In other words, although the Government makes a financial saving of \$75m (because it is buying water without buying the associated entitlement security), irrigators would still meet the cost of the security that the Government does not want. The cost does not disappear nor does the service. RiverReach is not making something out of nothing. Rather it is enabling the separation of security and water and allowing stakeholders to better manage their risks by buying the appropriate level of security and water that is optimal for their business (environment or irrigation).

The value of this security for irrigators is explained in section 1 which relates the security of water entitlement to cap factor, temporary trade prices, and annual revenue from water entitlement.

The value in terms of water available for production are shown in Chart 5. It shows the water available to irrigators with a total volume of entitlement of 1,200 GL under two scenarios that deliver an average of 250,000 ML of water to the environment. The first is for the entitlements that deliver an average cap factor of 58 per cent (as per table 2). The second is a RiverReach product that reflects the cap factor of 42 per cent shown at table 2 (ie, 250,000 ML of water drawn from a source entitlement of 600,000 ML).

The chart confirms two important aspects of RiverReach benefits for the irrigator (or seller). Firstly, annual water available is more certain (i.e., it is less variable year on year than under 'entitlement purchase'), and secondly more water is retained on farm for agricultural production in drier years (when the value of production is higher).

These benefits come at a cost to the irrigator of providing more water to the environment than under the 'entitlement purchase' scenario in wetter years (when the value of water to irrigators is lowest).

Putting a financial value on the water retained in drier years less water transferred to the environment in wetter years is somewhat difficult because it relies on values for water over a range of years and climatic conditions (cf Chart 1). However, the potential value for irrigators can be gleaned by the fact that water prices in 2007 and 2008 have averaged about \$600 per ML (in \$2007-08). If 120,000 ML were available on farm through RiverReach then additional production values would exceed \$72m in those years alone.

That said, if the same scenarios in Chart 5 are run for the period 1897 to 2008 the irrigators participating in RiverReach would on average give up more water in wetter years than they would retain on farm in drier years (see Chart 6). That is, the environment may yield a water benefit – but the irrigators still yield the benefits of security (greater certainty and more water in drier years).

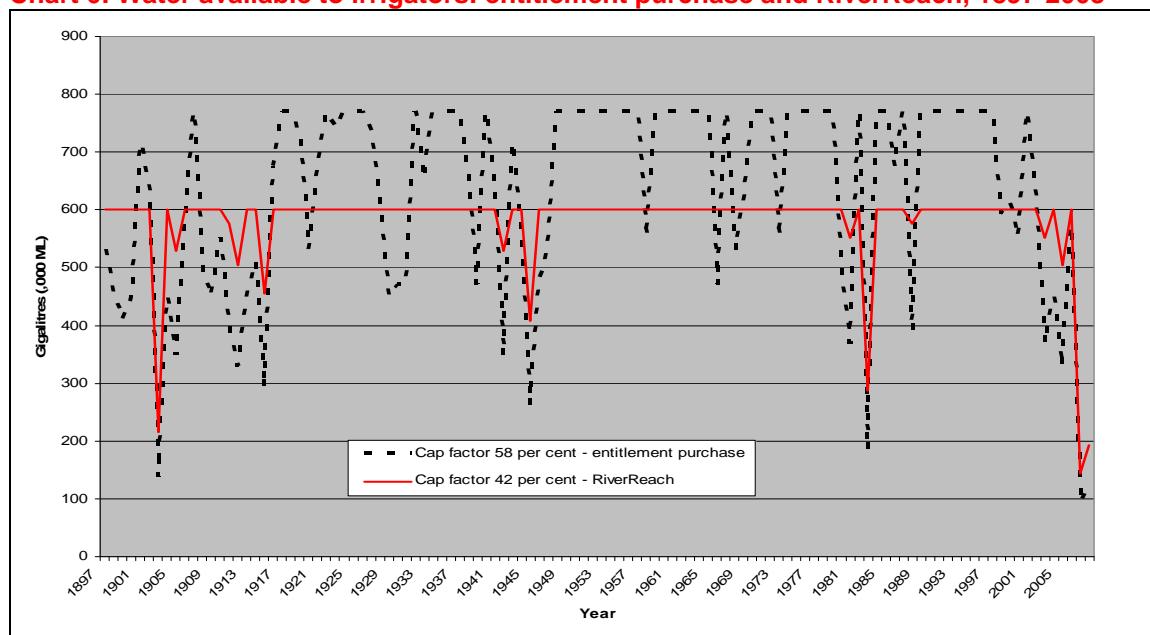
Chart 5: Water available to irrigators: entitlement purchase and RiverReach, 1995-2008



Source: The data uses GS announced allocations for the period 1995-2008 drawn from the Murrumbidgee Valley IQQM model scenario for 'current conditions' for WSP arrangements.

Note: It is assumed that of the 1,200 GL of entitlement is available. The scenario "entitlement purchase" sees 430 GL of entitlement sold with a cap factor of 58 per cent (ie, it delivers 250 GL to the environment on average). The scenario "RiverReach" sees 600 GL of entitlement assigned to a RiverReach product that delivers 250 GL on average (ie, has an effective cap factor of 42 per cent).

Chart 6: Water available to irrigators: entitlement purchase and RiverReach, 1897-2008



Source: The data uses GS announced allocations for the period 1995-2008 drawn from the Murrumbidgee Valley IQQM model scenario for 'current conditions' for WSP arrangements.

Note: It is assumed that of the 1,200 GL of entitlement is available. The scenario "entitlement purchase" sees 430 GL of entitlement sold with a cap factor of 58 per cent (ie, it delivers 250 GL to the environment on average). The scenario "RiverReach" sees 600 GL of entitlement assigned to a RiverReach product that delivers 250 GL on average (ie, has an effective cap factor of 42 per cent).

On balance, it does not seem unreasonable to assume that the \$75m paid for by irrigators to retain security under RiverReach is likely to be matched – at least - by higher value farm production.

If that is the case an additional value of \$75m for farm gate production would likely add an additional value of \$75m to regional production. (This is based on the typical multiples of about 2 for estimating regional value added given value added by agriculture.)

The additional value added of \$150m in the irrigation region (being farm gate plus downstream regional industries) would likely add a further \$150m to national product. (This is based on a typical multiple of about 4 used to estimate national value added for a given level of agricultural value production.)

On this basis, the value of security for irrigators would yield total value added of about \$300m of which \$150m would accrue to regional areas, and of that \$75m would be benefits at the farm gate.

It is worth noting that sellers will not always have the same relative value for security (e.g., farms with smaller amounts of water entitlement relative to farm area may not see much decline in the marginal value of water allocation and therefore may not see much benefit to RiverReach). However, the potential to establish a market mechanism such as RiverReach that enables exchange between irrigators and the environment on a basis that is least cost to both parties would seem to have obvious benefits to the environment, to government, to irrigators and to irrigation dependent communities.

3. The potential to expand the base for potential water purchase.

In practice any of the RiverReach products could be supplied by any water entitlements as long as the water is available in the source entitlement to meet the RiverReach commitment.

What this means is that the source of water that is likely to become available for purchase by the environment would likely expand significantly under RiverReach. For example, if purchase of water from high security entitlements is constrained to just 10 per cent of the total – as is implied by the Hyder Report - then extending the opportunity to entitlement owners to supply and sell a lower security permanent product sourced from the high security entitlement must expand the base for potential purchase. The same can be said for lower security entitlements. As long as the RiverReach product can be supplied by an existing entitlement the potential for purchase of environmental water is expanded (because the RiverReach product is a supplement to entitlement purchase not a replacement).

There is a further mechanism by which RiverReach could expand the base for supply of water for purchase by the environment. This increase in supply is driven by the attractiveness of RiverReach to entitlement owners as a means of selling water compared to sale of entitlement. That is, if entitlement owners have a strong preference for selling water via RiverReach then it is likely that they will make more water available for a given price than they would through entitlement sale.

The RiverReach project conducted a survey of irrigators at a series of shed meetings in November 2008 (see appendix 5). The survey attempted to establish the relative attractiveness to supply RiverReach products or sale of entitlement. The following table summarizes the key findings from the survey.

Summary of key results from survey of individual irrigators, November 2008

	Considering sale of entitlement		Would consider RR sale		Difference (% of entitlement)
	ML	% of entitlement	ML	% of entitlement	
At current prices	922	2.8%	2,560	7.9%	5.1%
If prices increase by 20%	2,485	7.6%	5,182	15.9%	8.3%

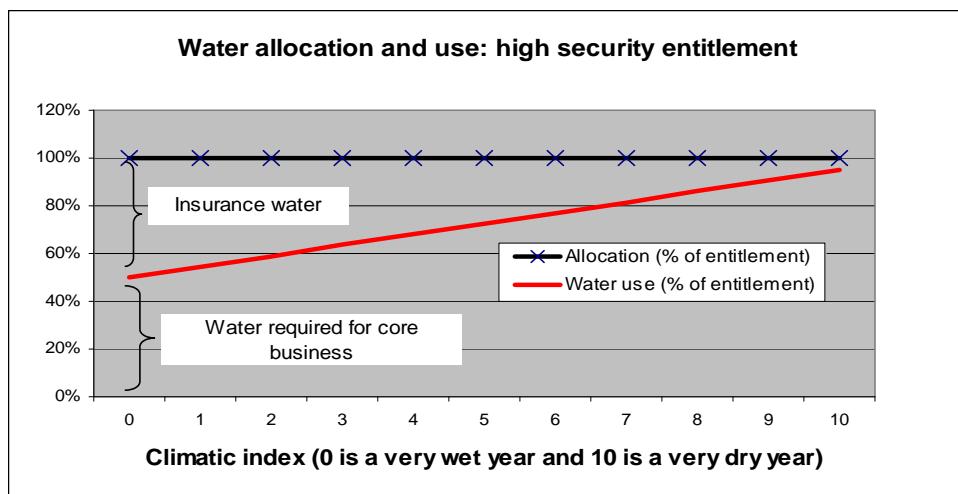
The survey results suggest that the volume of water for sale to the environment at current prices via RiverReach could require a 20 per cent price increase to mobilize via entitlement sale. In other words, there may be a significant direct impact on water and entitlement prices by enabling trade in RiverReach products.

The results also suggest that RiverReach would mobilize an additional 5.1 per cent of entitlement for sale via RiverReach at current prices but that increases to 8.3 per cent if entitlement prices increase by 20 per cent. That is, the more entitlement that is purchased for the environment, the more attractive RiverReach becomes to suppliers and the greater the potential financial savings.

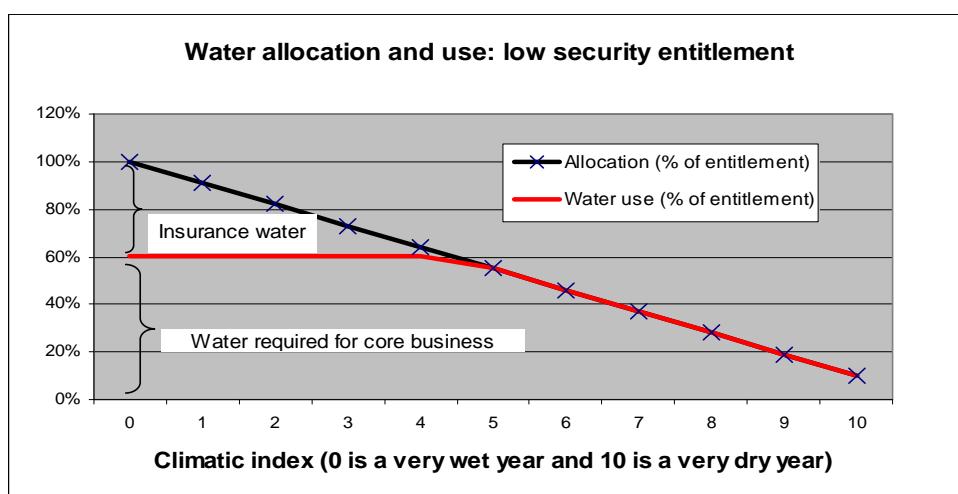
Appendix 3: Why would irrigator's be interested in selling water using perpetual RiverReach contracts?

The entitlements issued to farmers (both high security and normal security) were not designed with the needs of the environment in mind. In fact, they were designed more as insurance mechanisms for supporting agricultural water use in the face of Australia's often dry climate.

High security water entitlement was intended to ensure that owners have sufficient water to maintain long lived and expensive assets in the face of the driest expected year (eg, household, horticulture, dairying, and industrial assets). In wet years there is less demand for irrigation water than dry years because more water is provided by nature. As a result there are surpluses in all years except the driest. These surpluses are effectively insurance water. The following chart illustrates a typical use profile for high security entitlement:



General security entitlement was intended to make water available for uses that can be scaled back at lower cost if the water is not available (such as annual cropping). Generally surpluses are only available in wetter years. The main insurance mechanism for these water users is the size of the entitlement. If the entitlement is large enough then a reasonable volume of water is available even at low allocations (dry years) but that means higher surpluses – or lower value uses - in higher allocation (wetter) years.



In both cases, historical water use tended to be much less than the size of the tanks (and the water that was made available each year). For example, historic water use by permanent plantings averaged about 55 per cent of allocation. This water that is surplus to farm needs is currently traded annually on temporary markets (involving the sale of annual allocation).

RiverReach provides irrigators the opportunity to identify the insurance water that they currently hold and sell that water through a perpetual contract that enables them to retain sufficient water on farm to meet core, higher value, business needs. By selling the less valuable water permanently they would be able to effectively reduce the capital costs of holding water entitlement and or finance alternative on-farm strategies such as water savings and other redevelopment.

It is acknowledged that many irrigators will be satisfied with continuing the current practice of selling surplus water on temporary markets.

Also, of those who are interested in RiverReach most will seek to ensure security of water on-farm and would therefore be likely to retain some level of insurance water that – if unused – would be placed on temporary markets.

However, given the opportunity that RiverReach presents, it is very likely that significant portions of water that is currently 'insurance' would be mobilised for sale to the environment. This conclusion is supported by the RiverReach survey of individual irrigators conducted in November 2008 (see appendix 5).

Central Irrigation Trust

Key questions and responses:

- *Are you supportive of the River Reach concept?*
- Yes and provided it does not lead to increased overall activation. Clearly the success of RR rests upon the governments' enthusiasm to play as the key buyer.
- *Is your corporation or are your irrigators likely to participate?*
- The Trust cannot participate but customers are likely to. CIT will play a role as facilitator of RR deals
- *What volumes seem feasible?*
- 20-40GL
- *As an industry leader would you consider investing?*
- This would require the support of customers and this must be approached on a district-by-district basis

Footnotes:

- CIT represent 155GL of entitlement (SA HS)
- In talking about benefits to sellers include access to capital up-front
- CIT customers strongly supporting family farms and abhor MIS

Western Murray Irrigation

- *Are you supportive of the River Reach concept?*
- Yes and it is a good concept and provides more flexibility for irrigators.
- *Is your corporation or are your irrigators likely to participate?*
- WMI cannot participate but members are likely to participate in some way. WMI would consider role as facilitator of RR deals.
- *What volumes seem feasible?*
- 10-20GL
- *As an industry leader would you consider investing?*
- Potentially

Footnotes:

- WMI represent 63GL
- No water of their own – can only facilitate deals on behalf of shareholders
- RR contracts require an exit clause in the case of any future compulsory acquisition by government

- Bank dealings – transactions cash-based, banks need to release charges over water, 3rd parties who have an interest must be comfortable with compensation for release. Charge over water must be maintained.

Murray Irrigation Limited

Key questions and responses:

- *Are you supportive of the River Reach concept?*
- Yes
- *Is your corporation or are your irrigators likely to participate?*
- Yes although ownership of loss allowance different to MI so potential MIL dealings in RR products will be different.
- *What volumes seem feasible?*
- 40-50GL
- *As an industry leader would you consider investing?*
- Yes.

Footnotes:

- MIL represent approx. 1600GL (including conveyance allowance)
- Have some concerns with the environment being able to carry over 100% - 3rd party impacts and unfair advantage over other buyers

Coleambally Irrigation Cooperative Limited

Key questions and responses:

- *Are you supportive of the River Reach concept?*
- Yes although some clear nervousness to commit to much beyond this seemingly due to increasing number of CICL customers looking to permanently sell. This is a marked change from solid support to date but not irretrievable.
- *Is your corporation or are your irrigators likely to participate?*
- CICL claim they cannot deal in conveyance allowance but can facilitate deals if customers support. Nervous about predicting how customers would react.
- *What volumes seem feasible?*
- 10-20GL
- *As an industry leader would you consider investing?*
- Yes

Footnotes:

- CICL represent 600GL of entitlement (including conveyance allowance)

The survey form was as follows:

SURVEY OF IRRIGATOR INTEREST IN RIVERREACH PRODUCTS

This survey is anonymous and confidential.

The purpose of the survey is to gauge the interest of irrigators in RiverReach. The survey is non binding.

1. Please indicate the type and volume of water entitlement that you own.

(please insert number of ML in relevant boxes)

High security ML General security ML Other ML

2. What percentage of your base entitlement would you consider selling to the environment?

(please insert %. If you are not interested mark 0% or leave box empty)

At current prices? % If prices were 20% higher? %

3. Which product would you prefer to sell to the environment? (please tick relevant box).

Permanent entitlement A RiverReach product

4. Would you be interested in using RiverReach to sell water to the environment? (please tick relevant box)

Not interested at all	Marginally interested	Interested	Very interested

5. What percentage of your base entitlement would you consider using for a RiverReach product? (please insert %. If you are not interested mark 0% or leave box empty)

At current prices? % If prices were 20% higher? %

6. If you are interested in selling a RiverReach product to the environment: (please tick relevant box)

(a) what product would be of interest to you? (can be both)

Single tap Multiple tap

(b) for how long would you consider selling a RiverReach product? (please tick, can be both).

In perpetuity Lease

If lease, state the preferred period of lease years

SUMMARY OF QUESTIONNAIRE RESULTS AT RIVERREACH WORKSHOPS

Q 1: Details of respondents

There were a total of 72 respondents to the survey

The respondents reported 32,522 ML of entitlement comprising:

22,970 ML of high reliability entitlement (a)
9,552 ML of low reliability entitlement (b)

Q 2: Propensity to sell entitlement

About 2.8% or 922 ML of this entitlement is being considered for sale at current (permanent) prices

About 7.6% or 2,485 ML of this entitlement would be considered for sale if the permanent price increased by 20%

Q 3: Preferred method of sale

6% of respondents would prefer to sell permanent entitlement rather than a RiverReach product

94% of respondents would prefer to sell a RiverReach product rather than permanent entitlement

Q 4: Level of interest in RiverReach

4% of respondents reported "no interest" in using RiverReach

29% of respondents reported a "marginal interest" in using RiverReach

44% of respondents reported being "interested" in using RiverReach

23% of respondents reported being "very interested" in using RiverReach

Q 5: Propensity to sell RiverReach

About 7.9% or 2,560 ML of entitlement would be considered for use on a RiverReach product at current prices

About 15.9% or 5,182 ML of entitlement would be considered for use on a RiverReach product if prices rise by 20%

Q 6: Of the respondents interested in RiverReach products:

(a) 42% would be most interested in a single tap RiverReach product
58% would be most interested in a multi-tap RiverReach product

(b) 2% would be most interested in a perpetual exchange of water via the RiverReach product
98% would be most interested in a term lease to exchange water via the RiverReach product

The average preferred period of lease was reported as being 4 years

Notes:

(a) Includes NSW Murrumbidgee and Murray High Security, and South Australian Murray Water Right

(b) Includes NSW Murrumbidgee General Security and NSW Murray General Security