REGIONAL IMPACT ASSESSMENT

RIVER MURRAY
SALINITY ZONING

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SUMMARY

- In order to control the salinity impacts of irrigation along the River Murray and to meet South Australia's obligations under the Murray-Darling Basin Agreement, it is proposed to introduce a system of zoning for control of transfers of water allocations on the basis of their salinity impact.
- A range of policy alternatives to manage River Murray salinity was considered. The combination of construction of salt interception schemes (SIS), zoning to direct the location of future irrigation developments, and the promotion of improved irrigation efficiency appears to be the most effective and efficient.
- The proposed policy generally denies transfers *into* the proposed High Salinity Impact Zone (HSIZ). It would not affect existing irrigation.
- Transfers of water into the HSIZ will be permitted for developments that can demonstrate significant legal, financial or other commitment to the development at the proposed location prior to 30 June 2003.
- New developments proposed in the HSIZ can proceed if the salinity impacts can be fully offset. This can include the purchase of water from elsewhere within the HSIZ.
- New developments are also permitted in areas protected by a SIS and in the Low Salinity Impact Zone (LSIZ);
- There is ample land suitable for irrigation development close to the river in the proposed LSIZ or behind SISs to provide for expansion of irrigation for many years ahead;
- Other factors, such as the cost of provision of infrastructure (electricity, roads) could be more important barriers to expansion of irrigation;
- Based on a projection of a similar level of expansion of irrigation to that experienced over the period 1988 – 2003, zoning is estimated to reduce the capital and net present value of total costs of construction and operation of SIS to less than 30% of those without zoning.
- Landholders in the HSIZ will have limited potential to expand their irrigation activity within the zone. However, like other would-be investors in irrigation, they can purchase land nearby in the LSIZ, or purchase water within the HSIZ.
- Some benefits to the floodplain are expected in terms of reduced rates of increase in groundwater levels. However other processes affect floodplains, and other measures will be necessary to provide protection for the River Murray floodplain, such as weir pool manipulation, environmental flows, and targeted local action.
- A financial analysis indicates that transferring a project proposed for a HSIZ location to a nearby area within the LSIZ is feasible when comparing the additional cost of water supply to the gross margins for most irrigated crops. However in many cases other costs for infrastructure (eg roads, electricity) will arise, and will determine outcomes;
- Zoning would have a relatively small regional economic impact compared to the overall level of economic activity;
- A coordinated strategy could be developed by the Government, Riverland Development Corporation, the Murraylands Regional Development Board, the relevant Councils and industry associations to identify areas in the LSIZ and SIS zones where future development might be promoted through

land use zoning and the provision of infrastructure. This approach could mitigate any negative impacts of the zoning strategy on local irrigation development.

- An evaluation of infrastructure requirements for the development of irrigation in the low salinity impact zones may be required, to assess other barriers to irrigation development and to the SA Strategic Plan export targets.

1 INTRODUCTION

The Murray-Darling Basin Agreement is an agreement entered into by the Australian, NSW, Victorian and SA Governments in 1987 “to promote and co-ordinate effective planning and management for the equitable efficient and sustainable use of the water, land and other environmental resources of the Murray-Darling Basin."

Under Schedule C of the Agreement, South Australia (SA) is accountable for the salinity impacts of all new developments and actions from 1 January 1988. SA needs to ensure that any actions that increase salinity in the river after this date, are offset by actions that reduce salinity by the same amount. The primary means for SA to off-set these impacts is by constructing and operating Salt Interception Schemes (SISs).

New South Wales (NSW) and Victoria have the same obligations, but SA faces a greater challenge to meet its obligations than the upstream States. Highly saline groundwater flowing toward the River Murray underlies much of the SA Riverland and Lower Murray irrigation areas, and drainage from irrigation causes an increase in the rate at which the groundwater discharges to the River, thereby increasing salinity. The same hydrogeological characteristics are not generally present in NSW and Victorian parts of the Murray-Darling Basin

Any action that causes an increase in salt load to the River, such as new irrigation, results in a salinity debit on the Murray-Darling Basin Commission salinity register. Any action that reduces salt loads to the River, such as the construction of schemes to intercept saline groundwater, results in a credit on the register. The salinity register uses a measure of salinity (Electrical Conductivity or ECs) at Morgan as the “currency” for credits and debits. SA is in credit as of 1 July 2004, and the credit is expected to increase following construction of the Bookpurnong and Loxton SISs. However the delayed impacts of irrigation will erode the amount of credits over time.

Expansion in irrigation in the region has depended upon the utilisation of previously unused water allocations, and interstate and intrastate permanent water trade of 89 Gigalitres (GL)[1] over the period 1988 to 2003.

Continuing expansion of irrigation in the Riverland and Lower Murray regions using River Murray water requires the capacity to trade water within and into the area. Further expansion in high salinity impact locations would require relatively large amounts of salinity credits, limiting the amount of future irrigation development that can be offset, unless large additional investments in salt interception are financially and technically possible.

- The salinity assessment of irrigation developments associated with transfers between 1988 and 2003 indicate that they will result in an increase in salinity at Morgan (a debit) of 9 EC averaged over 30 years, and a 100-year impact of 66 EC.

[1] 1 Gigalitre is 1000 Megaltres (ML) or 1 billion litres

2 POLICY ALTERNATIVES CONSIDERED

The primary objectives of a salinity management policy are to either prevent the salinity impacts of future irrigation development on the River Murray, or to offset those impacts. Possible alternatives were assessed by CSIRO Policy and Economic Research Unit in terms of their capacity to achieve the necessary level of salinity control, and their cost. They are discussed below.

2.1 Salt interception schemes (SISs)

SISs consist of a number of bores equipped with pumps close to the edge of the river valley, and a network of pipes to take the water to disposal ponds. The costs of SISs include capital costs of installation and replacement of scheme elements, operations costs – principally for electricity, and maintenance. The analysis indicated that proposed and potential SISs probably would have the capacity to meet foreseeable SA requirements from potential irrigation expansion. However, there are a number of concerns about capacity. One is that while all the four MDBC governments will assist in paying for the schemes, the other States can claim part of the salinity credits from them. Secondly, for local hydrogeological or other reasons, schemes may not be feasible in all potential areas. Further, finding suitable disposal sites will be a challenge.

2.2 Revegetation of cleared Mallee areas

Native mallee vegetation is very efficient in intercepting rainfall, reducing recharge to as little as 0.1 mm/year. Where it has been removed and replaced by shallow-rooted annual crops recharge may increase to as much as 20 mm/year. Revegetation would eventually reduce recharge rates to pre-clearance rates. The analysis was targeted on those areas where revegetation is likely to reduce river salt load most quickly. However, it showed that a minimum time lag of 50 years would occur before benefits were seen, and revegetating the 6000 hectares best-suited land could achieve a benefit of only 6 EC in 50 years.

2.3 Increased irrigation efficiency

Salinity impacts of irrigation arise from drainage, hence reducing drainage by increased efficiency addresses the cause of the problem. It is an attractive option because water saved could be used by the irrigator to increase production or sold to other irrigators for that purpose. Furthermore, it can be used to reduce impacts of existing irrigation, much of which is in high salinity impact areas. Reducing the drainage from all irrigation from 15% to 10% of applied water has a substantial potential to reduce impacts. However past efforts to increase irrigation efficiency have produced results, but require considerable resources. As a result programs to improve efficiency are seen as supporting, rather than primary strategies in salinity control.

2.4 Zoning to reduce new irrigation in high impact areas

Groundwater salinity close to the river is highly variable, salinity impacts reduce with distance from the river, and aquifer characteristics determining the rate of movement of groundwater vary spatially. As a result the impact of irrigation varies greatly with location, providing the basis for a salinity impact zoning system. The study showed that zoning has a large potential to reduce salinity impacts of new irrigation.

2.5 Closing existing irrigation in high impact areas

Closing existing irrigation in the highest impact areas could be very effective in reducing salinity impacts. However the cost of doing so would be high because of the loss of established infrastructure and the value of well-established perennial crops. The cost was estimated to be 3 to 20 times as high as an equivalent impact reduction by salt interception. The social cost in terms of disruption of the livelihood of established irrigators would also be very high.

2.6 Dilution Flows

The principle of dilution is simple. By purchasing water presently being used out of the river, more would be left to dilute the salinity caused by irrigation. Because of the high price of permanent water allocations – about $1000 per ML, the costs of this strategy would be 10 to 100 times as high as fro the equivalent salt interception. Depending on flow conditions, 25000-145 000 ML/year would be required to reduce the times the 800 EC target at Morgan is exceeded from 15% (base case) to 5 %. The 500 GL environmental flows proposed under the Living Murray Initiative will be managed for environmental outcomes, and this may or may not align with salinity reduction objectives.

2.7 Market based instruments

Market based instruments include levies for irrigation to cover the cost of salt interception schemes, offsets and tradeable pollution rights. If levies were established based on the cost of operating SIS and varied according to impact, it is unlikely that the cost would be sufficient to affect the investment decisions of those seeking to establish new irrigation, ie they would continue to establish in high impact areas.

A system of tradeable pollution rights based on the impact of irrigation is attractive because it would allow market forces to determine the location of future irrigation in response to salinity impact. However such a system would have to be set up on a Murray-Darling Basin-wide basis because of interstate tradability of water. It is also likely to take many years to reach its potential, and initially would likely result in more uncertainty for investors.

Offsets are provided for in the proposed policy: for example, a development can proceed in the HSIZ, provided the salinity impacts can be offset by salinity credits generated from other actions (for example the purchase of water from within the HSIZ.).

2.8 Summary of alternatives

Salt interception is necessary because it is the only strategy that can intercept salt loads already in train from established irrigation. However it is unlikely that alone it can provide all the capacity required for SA to meet its MDBC responsibilities. Zoning and improved efficiency have the capacity to significantly reduce the amount of future salinity impacts and represent potentially cost-effective alternative to salt interception that would otherwise be required. Individual assessment of transfers provides less certainty for investors.

Revegetation has inadequate capacity. Closure of existing irrigation in high impact areas and dilution flows are far more costly alternatives than SIS. SIS cost-based levies would not achieve the desired outcome alone, and tradable salinity rights do not appear to be viable in the short term.

The most cost-effective policy mix, with greatest clarity for investors, appears to consist of SISs supported by salinity impact zoning, programs to improve irrigation efficiency.

3 POLICY PROPOSAL

A salinity zoning policy is proposed, with rules for allocating available salinity credits to offset future irrigation development. The proposal is consistent with the Basin Salinity Management Strategy and the South Australian River Murray Salinity Strategy.

The boundaries of the proposed HSIZ (figures 1 and 2) have been defined by modelling the impact on river salinity of irrigating land within 15 km of the edge of the floodplain. The boundary line corresponds with an impact of 0.02 tonnes/ha/day or 0.9 tonnes of salt/Megalitre (ML)/year, assuming an application rate of 8 ML/ha and 1.2 ML/ha drainage.

Essentially the policy is a set of rules for allocating available salinity credits to offset the future impacts of irrigation development. The policy will deny the allocation of salinity credits in areas of high salinity impact, but make credits available in areas of low impact. This policy will replace an interim zoning arrangement introduced from 1 July 2003 using the same basis for determining the outcome of applications for water transfers.

The policy is intended to provide the basis for sustainable development of irrigated horticulture and associated industrial and commercial activity in the region.

The policy will be put into effect under the *Water Allocation Plan for the River Murray Prescribed Watercourse* (River Murray WAP). The policy will replace the current interim zoning policy, approved by Cabinet in June 2003, and will be the basis for amendments to the River Murray WAP as part of its five-yearly review due to be completed before 1 July 2007. The policy will define high and low salinity impact zones (HSIZ and LSIZ) and areas protected by salt interception schemes (SIS). The following rules will apply in these zones:

- water transfers for new and expanded irrigation proposed in the LSIZ will be able to proceed, subject to the Minister holding the opinion that SA has sufficient salinity credits to offset their estimated salinity impacts.

- water transfers for new and expanded irrigation proposed in areas protected by salt interception schemes will be able to proceed, subject to the availability of groundwater interception and disposal capacity.

- salinity credits will not be made available to developments requiring the use of water in the HSIZ, unless there is evidence of significant legal, financial or other commitment to the development at the proposed location prior to 30 June 2003. Transfers ***into*** the HSIZ for developments without evidence of commitment will only be permitted if the impacts can be fully offset by the proponent. Transfers of water ***within*** the high impact zone can occur, provided the trade does not result in a net increase in salinity impacts.

In relation to the above, the government will monitor the expansion of irrigation and its salinity impacts, and schedule construction of SISs and take other measures to generate salinity credits to facilitate development in the LSIZ, and will monitor the performance of SISs to ensure that their capacity is adequate to account for development behind them.

3.1 Zoning model assumptions

The model assessing the impact of irrigation on river salinity assumes an average rate of irrigation of 8ML/Ha and an average drainage of 120mm/year. These are considered to be reasonable averages for the region. Modern premium wine grape irrigation practice uses less than 8ML/Ha, and best practice in the vine industry would result in less than 120 mm drainage. However other crops likely to expand in the immediate future are citrus and almonds, which have water requirements of 10 and 15ML/Ha respectively, and higher drainage. The model assumption of 120mm/yr represents an estimate of the regional average for likely major future crops and irrigation practice. In a zoning based approach it is not possible to vary the zone on the basis of individual crop irrigation practice, because irrigators need the flexibility to change between crops in response to market conditions.

An alternative would be to set the boundary between the HSIZ and LSIZ on 0.02 tonnes/ha/day but vary its location depending on the application rate. Each transfer application will be assessed on the basis of the irrigation rate proposed by the applicant for his particular project. Projects involving lower irrigation rates, such as premium grapes, could be located closer to the river than would be permitted under zoning, but projects with higher application rates, such as almonds would not be permitted as close to the river as under zoning. Irrigation application rates do not just vary with crops, but also with irrigation management practices, soil types, etc.

One difficulty in this approach is that transfer may be authorised on this basis, but market conditions may change, making the initial crop non-viable or less attractive than another with a greater water requirement and a higher irrigation rate. It would be possible to guard against this by making the transfer subject to a condition that the application rate cannot change. However this would mean that the licence prescribes the crops that can be grown or the application rates that can be used. This is not desirable and would result in very high administration and compliance costs.

It is important to note that the drainage volume for each transfer will be calculated as 10% of (trade volume/Ha + annual rainfall/Ha), because this is the agreed formula for assessing salinity impacts of trades for MDBC salinity register purposes. Therefore, it is not possible to allow for different drainage rates.

4 SUMMARY OF IMPACTS

- The salinity zoning policy will only affect new development proposals in the HSIZ;
- Exemptions are made for developments that can demonstrate significant legal, financial or other commitment to the development at the proposed location prior to 30 June 2003;
- The proposal will have essentially no impact on irrigators within the ex-Government Irrigation Trust areas, which have been subject to water supply infrastructure rehabilitation, provided that the current water supply infrastructure has the capacity to deliver water to the proposed development. [2]
- It will provide clear rules and conditions for sustainable irrigation development in the region, as sought by investors in irrigation;
- The rate of rise in value of un-irrigated land in the HSIZ may be slower relative to values of LSIZ land immediately beyond the zone boundary. These effects may take some time to emerge because of the availability of transfers *within* the HSIZ. Because of the limitations on movement of water into the HSIZ, the value of water held by those in that zone may increase;
- Land values in areas protected by salt interception schemes and in the LSIZ closest to the river may increase as a result of the salinity zoning policy, because there will be a high level of certainty that irrigation development can go ahead in these areas;
- Small-scale developments and expansions within the HSIZ are not expected to be affected, provided water can be traded from existing users within the HSIZ, as has been the case in recent years.
- Larger scale developments proposed in the HSIZ may face some difficulty in finding sufficient water within the zone. Alternatives would be to locate to an area protected by SISs or to a nearby location in the LSIZ. A financial analysis indicates that locating to a nearby area within the LSIZ is feasible when comparing the additional cost of water supply to the gross margins for the crops that are likely to expand in response to current market conditions. However other issues such as infrastructure costs and availability will determine individual project viability.
- There is ample land suitable for irrigation development close to the river in the proposed LSIZ or behind SISs to provide for expansion of irrigation for many years ahead;
- Zoning would have a relatively small economic impact compared to the overall level of regional economic activity;
- Additional costs arising on account of zoning would not preclude further expansion of irrigation in the region;
- Additional investment in salt interception infrastructure in key locations (some of which has been foreshadowed) will allow further development;
- Any potential negative impacts on future development could be reduced by an integrated approach to regional infrastructure planning.

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[2] This does not apply to major new developments (eg Block X in the Renmark Irrigation Trust) or major trade into a district to meet additional crop water requirements for mature crops, which could result from the proposed method of providing volumetric entitlements to irrigators in the Renmark Irrigation Trust.

- The salinity zoning policy will have some positive floodplain impact, because it directs new irrigation to locations behind SISs or further away from the river in the LSIZ. Complimentary policies, that address the whole range of issues affecting floodplain health, will however, need to be developed.

5 REGIONAL IMPACT ASSESSMENT

This Regional Impact Assessment Statement describes the expected social, financial and environmental impacts in the Riverland and Lower Murray regions of SA following the introduction of the salinity zoning policy.

5.1 Regions

Riverland and Lower Murray (Murraylands and Angas-Bremer irrigation areas using River Murray water)

5.2 Stakeholders

Irrigation industry, regional development organisations, local government, River Murray Catchment Water Management Board, Irrigators, other water users

5.3 Consulted

Irrigation industry leaders, River Murray Catchment Water Management Board (RMCWMB), Riverland Development Corporation (RDC), Murraylands Regional Development Board (MRDB), Local Government Councils, Member for Chaffey, Member for Hammond, Irrigation Trust executives, local irrigator group meeting.

5.4 Consultation

The Riverland Development Corporation took a lead role to coordinate consultation and provide formal comment and advice on the policy proposal from an industry and regional perspective. A workbook describing the zoning proposal was distributed to key stakeholders as the basis for consultation.

All existing River Murray water licence holders were advised of the proposal by letter and advised of the availability of the workbook from local council offices and on the website of the Department of Water, Land and Biodiversity Conservation (DWLBC). The following stakeholder group meetings have been held:

- Riverland Wine Industry Development Council Berri Nov 2003 - 50 people
- Taylorville irrigators Waikerie Nov 2003 - 30 people
- South Australian Murray Irrigators Swan Reach Jan 2004 - 10 people
- Qualco Sunlands Drainage Trust Inc Jan 04 - 10 people
- Riverland West Local Action Planning Group Jan 2004
- Riverland irrigator stakeholder representatives Berri 3 February 2004 – 60-70 people
- Murray Bridge 18 February 2004 – 30 people
- Riverland Councils, Berri, 15 April 2004

- River Murray Catchment Water Management Board December 2003, April 2004
- The draft Regional Impact Assessment was made available to the Riverland Development Corporation and Murraylands Regional Development Board who distributed the draft to their stakeholders. Responses to the draft were received from: RDC, RMCWMB, SA Murray Irrigators, the three Riverland councils, Rural City of Murray Bridge, Renmark Irrigation Trust (RIT), Central Irrigation Trust (CIT), Mid Murray LAP, SA Fresh Fruit Growers Association, Century Orchards, SA Murray Irrigators and Riverland Horticultural Council Inc.

5.5 Financial Factors

5.5.1 Current status

The Riverland Region includes the Loxton-Waikerie, Berri Barmera, and Renmark-Paringa Council areas. It is a well-established irrigated horticultural area, with substantial local processing of crops, particularly to produce wine, fruit juices and almond kernels. The area produces two thirds of the State's wine grapes and one third of State horticultural output.

Table 1. Financial indicators for Riverland Region

Farm-gate value of irrigated production 2001/02		$559M
Growth in value of agricultural production 1997 - 2001		79%
Growth in capital stock 1997 –2001 invested in different crops	Irrigated agriculture	$260.7M
	Wine grapes	$213.7M
	Table grapes	-0.7M
	Dried Fruit	-2.3M
	Almonds	$15.3M
	Citrus	3.3M
	Other nuts	$30.3M
Growth in total manufacturing investment 1997 – 2001		$146.6M

Sources: www.safoodonline.com/food_biz/scorecard/RiverlandScoreCard
Investment Trends in the Lower Murray Darling-Basin. Working Paper 58 Bureau of Transport and Regional Economics, 2003

As Table 1 indicates, economic activity in the Riverland is growing rapidly, at rates above the national average. The growth is based on high levels of investment in irrigated horticulture and associated manufacturing.

For the purpose of this document the Lower Murray includes the Mid Murray Council, Murray Bridge Rural Council and the Coorong District Council areas, the Karoonda East Murray and Southern Mallee District Council areas, and the Angas Bremer Irrigation Area. The area under irrigation, and the value of irrigated agriculture using River Murray water are lower than in the Riverland. The principal uses of irrigation water are for pasture for milk production on the Lower Murray swamps, horticulture

(potatoes, onions) on land adjacent to the river valley, and in vineyards in the Angas-Bremer area.

Table 2. Farm–gate value of irrigated agricultural production using River Murray water in Lower Murray regions 2000/01

Product	Value
Grapes#	$62M
Irrigated horticulture	$76M
Dairy	$60M
Total	$198M

Grapes in the Angas Bremer district are irrigated with a combination of local river water and groundwater as well as Murray water.

Source www.safoodonline.com/food_biz/scorecard/MurrayrlandsScoreCard

5.5.2 Advantages of the Region for Irrigated Agriculture

The Riverland and Lower Murray regions have a number of advantages over potential alternative locations where irrigation developers might seek to expand or initiate operations. Many of them arise from the length of time that the industry has been established in the area, and the scale of existing operations. These factors underlie recent growth in the region.

Specific favourable attributes of the Riverland and Lower Murray include:

- Adequate sunshine hours for vines, citrus, almonds and other crops, assisting ripening,
- Depth of local industry support services (irrigation technology designers and installers, horticultural advisory services, farm input suppliers)
- Basic infrastructure (roads, electricity, telecommunications)
- Existing processing infrastructure for the currently dominant crops and products.

For existing irrigators, favourable factors include:

- Familiarity with local soil, infrastructure, institutional conditions, and commercial networks.
- Proximity to existing operations, reducing travel and communications costs
- Avoidance of the need to establish relationships with new service and input providers, and marketing of products at a new location.

The factors favourable to irrigation in the region identified above will be taken into account by developers considering new or expanded irrigation projects in the context of the zoning policy.

5.5.3 Implications of not introducing zoning

The implications of not proceeding with the proposed policy include:

- *Potential for SA to breach its obligations under Schedule C of the Murray-Darling Basin Agreement to ensure that actions that increase salinity in the river are offset by actions that reduce salinity*. Irrigation development in high salinity impact locations will result in increased river salinity and, in some locations, in local floodplain degradation due to salinisation of the soils or high water-tables. This will have negative effects including financial impacts on down-stream irrigation, industrial and residential water users, and loss of amenity and recreation values of the regions. Much of Adelaide's reticulated water is provided from the Murray, and higher salinity levels have cost implications for some large-scale industrial water users. There is a high salinity management cost to the State, to individual irrigators, and to water users.

- *Increased costs and pressures on the State Budget for salt interception.* Existing and proposed Salt Interception Schemes (SIS) in areas of greatest salinity impact in the Riverland will reduce the flow of saline groundwater to the River, offset the impact of irrigation drainage in their immediate locality, and reduce floodplain degradation. Table 3 shows the capital costs of existing and proposed schemes, and indicates that the State Government has already spent or committed about $30M, not including operating costs. In addition there may be difficulty in finding suitable sites and capacity for saline groundwater disposal.

Table 3. Costs and EC credits for existing and proposed SISs

Salt Interception Scheme	EC credit at Morgan	Capital cost ($M)	SA Government contribution ($M)
Qualco	5.5	6.0	6.0
Bookpurnong	32.5 (Design)	11.1	6.3
Loxton	16.5 (Design)	21.4	5.8
Waikerie 1	13	10	2.5
Waikerie 2A	4.8	3.4	0.85
Waikerie 2B	3.9	1.5	nyd*
Woolpunda	40	24	6.0

*Not yet determined

Sources: Murray Darling Basin Commission Infrastructure Assets Valuation SMEC Victoria P/L Phil Cole DWLBC pers comm

[The costs of River Murray SISs are paid for by the Victorian, NSW, SA and Commonwealth governments. The four governments share the costs of overcoming the impacts of irrigation established before 1988, but each State is responsible for the costs of actions taken subsequently. Table 3 shows the costs of schemes and the salinity credits achieved or anticipated.]

The cost of salt interception to overcome the consequences of historical irrigation has been accepted as being a community or government responsibility because governments either promoted irrigation, or did not apply policies to restrict irrigation in the area. SISs are being designed and built to deal with the drainage from existing irrigation, with some capacity for future development in areas they serve.

In addition to their physical effects, SIS also provide a limited amount of salinity credits to offset the impacts of irrigation elsewhere in the Riverland and Lower Murray. However, the majority of water transfers have been into and in the proposed HSIZ. This is largely because existing development was generally sited close to the river to reduce water supply costs, and salinity impacts are greater closer to the river. Although much of the suitable land in the HSIZ has now been taken up for irrigation, continued expansion in this area could be expected in the absence of salinity zoning, necessitating increased expenditure on SIS.

CSIRO Policy and Economic Research Unit investigated the cost of alternative ways of countering salinity (Reducing the cost to South Australia of achieving agreed salinity targets in the River Murray. Jeffery Connor Folio No S/03/1211, December 2003). The study was conducted in 2003 and was based on then current figures for transfers since 1988, totalling 72 GL.

Table 4. Costs ($M) of Salt Interception Schemes required to deal with impacts of a projected expansion of 72 GL in water use for irrigation.

	Without Zoning	With Zoning	With Zoning and Efficiency
Capital cost of SIS	88	24.4	3.7
Net present value of total costs	127	35.2	5.3

Source: "Reducing the cost to South Australia of achieving agreed salinity targets in the River Murray". Jeffery Connor, CSIRO Policy and Economic Research Unit, Dec 2003

Table 4, derived from the CSIRO study, shows that zoning has the capacity to reduce the additional cost of future salinity impacts from irrigation to less than one third of what it would be without zoning. Thus it represents a cost-effective alternative to investment in salt interception that would otherwise be required over the 50-year timeframe of the study. The costs shown are in addition to the $24.4M capital cost and $35.2M present value of total costs of dealing with the impacts of existing irrigation. *Thus zoning has the effect of reducing the cost of salt interception to a level acceptable to the government, enabling future development of irrigation. Without zoning the costs of SIS schemes could well be unacceptable to MDBC governments.*

- The ability to expand salt interception in South Australia is not unlimited, because in some locations it is not possible to effectively

intercept groundwater. In addition difficulty is being encountered in location acceptable disposal sites and sufficient capacity for disposal of groundwater. Further, uncontrolled expansion of irrigation development behind SISs would cause their capacity to be exceeded.

5.5.4 Implications of the salinity zoning policy

The policy affects water transfers. In all cases the transfer proposals will be assessed to ensure that the SA Murray-Darling Basin (MDB) salinity account is kept in balance, ie that the State has sufficient salinity credits to offset the salinity debits.

The policy's implications vary according to the salinity impact zone of the source and destination of the water transferred. Regardless of the source of the water, there will be no implications for water being transferred in or into the LSIZ, subject to SA having sufficient credits to offset the impacts. For transfers between, within and into SIS zones there will be likewise no implications provided there is sufficient interception capacity in the receiving SIS. Transfers from one part of the HSIZ to another (within the HSIZ) will generally be permitted provided the impact in the receiving site is less than or equal at the source. Transfers into the HSIZ from any other zone will not be permitted except where there is evidence of substantial commitment to development of that site or the impacts can be fully offset by the proponent.

5.5.4.1 Irrigated Agricultural Development

One way to assess the impact of the policy is to examine the history of transfers since transferability was introduced and ask how the policy would have affected those transfers. It is noted that this approach is inherently a worst case approach in that it identifies the transfers that would not have been permitted and seeks to evaluate the cost of the opportunity lost on that account. In fact, people generally have alternatives, and will either quickly or progressively adapt to the changed policy. There may or may not be increased costs associated with alternative responses. Some landholders will not be able to adapt because of their particular circumstances.

Below, we first examine historical transfers into and within the HSIZ, since this is the area that the policy directly affects.

5.5.4.2 Transfers into and within the HSIZ

Landholders in the HSIZ will in most cases be able to initiate or expand irrigation by purchasing water from elsewhere in the HSIZ. Table 5 shows the pattern of transfers in the proposed HSIZ in the period 1998/99 to 2003/04.

Table 5. Changes in permanent water allocations by transfers in proposed High Salinity Impact Zone from 1998/89 to 2003/04

Allocation in 1998/99 (ML)	Licence numbers 1998/99	Number increasing/ (decreasing) water holding		% of licensees increasing/ (decreasing) water holding		Net volume gained (lost) by HSIZ (ML)		Average volume gained (ML)
0	0	26	(0)	na	na	9484	(0)	365
0.5 – 9.9	59	2	(1)	3	(1)	2.6	(2.5)	1.3
10 – 29.9	67	5	(13)	7	(19)	115	(208)	23
30 – 149.9	152	15	(27)	10	(18)	781	(1706)	52
150 - 9314	177	33	(46)	19	(26)	9657	(21,342)	293
All	455	81	(87)	15	(19)	20,040	(23,258)	247

na = not applicable
Source: DWLBC Water allocations database

Table 5 shows the numbers of licences held by landholders in the proposed HSIZ, and those who increased their water allocations between 1999 and 2004. The first row refers to landholders who were not licence holders in 1998/99, but were in 2003/04. The table shows that only 15% (or 3% annually) of existing HSIZ licensees increased their water holding over this period. The percentage of licensees who purchased water, and the average volume of water purchased both increased with the size of their 1998/99 holding.

Between 1998/99 and 2003/04 water would have been transferred without regard to zone, and the volumes shown are net volumes resulting from trade into, within and out of the HSIZ. (The DWLBC database does not currently enable the source of transferred water to be identified.) There were more (87) licensees trading water out than into or within (81), and more water (23,258ML) was transferred out of, than into or within (20,040ML) the HSIZ. Thus had the policy been in place, restricting transfers to within the HSIZ (and provided that salinity and floodplain impact at the site receiving the water were not greater than at the source locations), all of these transfers could have been permitted. A specific application for transfer may well fail because the salinity impact at the transfer site would be greater than at the source location. However, on average it is more likely that source locations would be of higher impact than destination sites, simply because existing holders of water allocations would have preferred sites close to the river.

Importantly, among 1998/99 licence holders, in all but the smallest size category, the volume of water sold was about twice as great as the volume purchased, ie over this period, existing licence holders were net sellers of water, and there were more sellers than buyers.

Thus provided:

- transfers were matched on the basis of their salinity impact,
- transferors did not transfer water out of the HSIZ and,

- the tendency for the volume of water available for transfer in the HSIZ to be greater than the volume being sought continues,

the policy would not restrict transfers in the HSIZ, and on the basis of recent history would not prevent existing licence holders expand their production, because more water was available for transfer than was being sought within the HSIZ.

In relation to second point, sites within the HSIZ are likely to continue to be more attractive to irrigators, particularly small scale operators, than LSIZ sites because they are generally closer to the river, and are closer to existing development and associated infrastructure. Following introduction of the policy, HSIZ landholders will only be able to source water from within the HSIZ. However LSIZ landholders will still be able to purchase water from interstate, which is cheaper. This segmentation of the water market will likely result in the price of water inside the HSIZ rising, creating an incentive for HSIZ irrigators to sell water inside rather than outside the zone.

In relation to third point, sources of water transferred have included water not previously used, water used for low value crops, water released by irrigators who have improved their efficiency, and water sold by people leaving particular industries – generally industries with low returns per ML of water. Because of the high value of water, and the extent of transfers in recent years, it is likely that little water is still being applied to low value crops. It is not expected that further improvements in water use efficiency will result in large volumes of water becoming available within the HSIZ. Hence availability of water inside the HSIZ is likely to decline, except to the extent that it is offset by improvement in irrigation efficiency.

Table 6. Volumes of permanent water acquired by existing HSIZ licensees and landholders without allocations between 1998/99 and 2003/04

Volume gained (ML)	Number purchasing water	Percent of licensees increasing holding	Total volume gained by group (ML)	Average volume gained by individuals (ML)	% of total volume gained by group
0.5 – 9.9	10	12	8	0.8	0.04
10 – 29.9	13	16	233	17.9	1.16
30 – 149.9	30	37	2194	73.1	10.97
>150	29	35	17 566	605.7	87.83
All	82	100	20 001	243.9	100.00

Source: DWLBC water allocations database.

Table 6 indicates that 82 HSIZ landholders acquired an allocation between 1998/99 and 2003/04 (of whom 26 had no previous allocation – Table 5). The table provides the best available indication of the likely pattern of intentions of HSIZ landholders to acquire water in the future. Of the 82, 10 (12%) acquired an average of only 0.8ML. This group may include new landholders on rural living allotments. A further 13 (16%) acquired between 10 and 30ML, sufficient to irrigate between 1.5 and 4 Ha of grapes. 29

(35%) of HSIZ water purchasers acquired an average of 606ML, sufficient to irrigate almost 100Ha of grapes. This group collectively acquired 88% of the volume transferred to HSIZ landholders.

The pattern of acquisition by existing licensees and new entrant irrigators is quite similar. Those seeking small volumes (less than 30ML) collectively sought only about 1.2% of the water transferred within and into the HSIZ, hence their requirements could be met by transfers from within the HSIZ following introduction of the policy. Those seeking volumes of up to 150ML collectively only acquired about 12% of the total volume, hence should also be accommodated through transfers within the HSIZ. Thus it is likely that existing irrigators seeking to undertake small expansions of production, or to change to a higher water use crop in response to changing market conditions, and landholders without water seeking to start a small-scale irrigation project, will be able to do so.

It will be among the applicants (roughly 9 each year) seeking volumes of water greater than 150ML (sufficient for more than 25 Ha of grapes) that difficulty in acquiring water may arise, largely because they are looking to purchase large parcels of water, and this demand may not be met from within the HSIZ.

5.5.4.3 Transfers in all zones

The following section is based on a study by PIRSA (*The socio-economic impacts of implementing a zoning policy in the South Australian Murray Darling Basin, May 2004 Primary Industries and Resources SA*). It assesses the impact of the policy by examining the destination of water transfers over the period 1988 – 2003.

As Table 7 shows, in the period 1988-2003 58.2 GL, or almost 80% of water transferred was to sites in the proposed HSIZ. Of this, 30.5 GL, or more than half, went to sites behind existing and currently proposed SIS. This development would have been able to proceed, either immediately where the SIS was already installed, or later when the SIS construction was approved, provided sufficient capacity was available in the scheme. A further 15.4 GL, over 20% of the transferred volume went to the LSIZ. That is, half of the transfers, representing over 60% of the total volume transferred went either to locations in the HSIZ behind existing or proposed SISs, or to the LSIZ, and hence would not have been affected by the policy. The balance of transfers, representing 37.6% of the volume transferred, would have been restricted to seeking water from within the HSIZ, rather than from wider sources, and may have found greater difficulty.

Table 7. Distribution of transferred River Murray water 1988 – 2003

Location of transferred water	Number	Volume (GL)[1]	% of total volume transferred
LSIZ	100	15.4	20.9
HSIZ sites behind existing and currently proposed SIS[2]	98	30.5	41.5
HSIZ sites not behind existing or currently proposed SIS[2]	198	27.7	37.6
Total	396	73.6	100.0

1 Volumes above exclude transfers into the former State Government Irrigation Trusts, where the transfer is to the Trust rather than to an individual irrigator, and the precise location of use of the transferred water is unknown.
2 These figures do not include transfers into the areas likely to be served by the proposed Murtho and Pike SISs, the boundaries of which have not yet been defined. They therefore over-estimate the negative impact of the policy.

Source: DWLBC water licence database

In order to estimate the financial impact of the policy, the additional costs that would be faced by those developers who would have been obliged to move to a LSIZ site from the HSIZ site where their development actually occurred, are compared with the gross margins per ML of water for the principal crops, shown in Table 8.

Table 8. Commodity returns to water

	Variable Costs Inc. Water ($/Ha)	Yield (t/Ha)	Price ($/t)	Gross Return ($/Ha)	Water Demand (Ml/Ha)	Gross Margin/Ml Water ($/Ml)
Almonds	$7,096	3	$6,000	$18,000	14.5	$752
Premium Grapes	$3,937	20	$ 650	$13,000	6.3	$1,439
Non-Premium Grapes	$4,953	35	$ 300	$10,500	7.5	$740
Valencia Oranges	$6,252	40	$ 215	$8,600	9.8	$240
Navel Oranges	$7,730	40	$ 315	$12,600	9.8	$497
Dried Apricots	$13,441	20	$ 865	$17,304	12.2	$316
Potatoes	$9,901	30	$ 550	$16,500	4.9	$1,347

Source: The socio-economic impacts of implementing a zoning policy in the South Australian Murray Darling Basin, August 2004. PIRSA

Crops with high gross margins/ha have a greater capacity to absorb additional costs than crops with low gross margins. Table 9 shows how the cost of supplying water varies according to the volume of water pumped annually and the additional distance the water would have to be pumped in order to take it from a site in the HSIZ to one in the LSIZ. The costs include those for the pump, pipeline and electricity.

Table 9. Annualised additional cost of supplying water to irrigated areas as a result of zoning policy

		Annualised total cost of providing water ($/ML pa)			
Distance to relocate from HSIZ to LSIZ (Km)		2	4	6	8
Volume of water used annually (ML/year)	50	264	507	750	995
	250	113	205	299	392
	500	70	119	168	217
	2000	48	75	102	129
	5000	39	58	76	95

Source: The socio-economic impacts of implementing a zoning policy in the South Australian Murray Darling Basin, August 2004. PIRSA

As indicated above, existing small and moderate scale irrigators are likely to be able to obtain the water they need for their generally modest scale expansions from within the HSIZ. The financial costs of expansion to areas more remote from the river are likely only to be encountered by the small number – about 9 annually in the recent past - who wish to undertake large-scale projects. The difficulty they may face would be in assembling the volume of water they require from sources within the HSIZ. For this group the figures in Table 9 are part of the information upon which their investment decisions will be made. In the absence of existing local infrastructure, eg roads and electricity supply, these costs may be much greater.

Table 10 shows where particular crops, at various scales of production, would be unprofitable on account of increased water supply costs alone, should it be necessary for the project to be relocated away from the river to move beyond the HSIZ. In many cases these costs could be avoided by locating the project to a different area where the HSIZ boundary was closer to the river.

Table 10. Crops and situations where water supply costs not recovered

	Distance to Relocate (Km)			
Development Size (Ml)	2	4	6	8
50	Valencias	Valencias Navels Apricots	Almonds Valencias Navels Apricots Non-Premium Grapes	Almonds Valencias Navels Apricots Non-Premium Grapes
250			Valencias Apricots	Valencias Apricots
500				
2000				
5000				

Source: The socio-economic impacts of implementing a zoning policy in the South Australian Murray Darling Basin, August 2004. PIRSA

Table 11 presents the results of applying the policy to water trades in the period 1988 to 2003, and makes use of the data in tables 8 and 9 to estimate the impacts resulting from loss of those projects that would have been financially unviable on account of the increase in water supply costs (cost of water provision/ML exceeds gross margin/ML), and the impacts resulting from the increased costs to projects that still remained viable.

Table 11. Regional financial Impacts arising from increased costs of water supply

	Change in Sales to Final Demand ($m/annum)	**Value Added ($m/annum)**	**Employment (No of jobs)**
Opportunity costs of projects made non-viable	-0.6	-0.7	-13
Impacts on viable projects	-1.4	-1.1	-20
Total Impact	-2.0	-1.8	-33

Source: The socio-economic Impacts of implementing a zoning policy in the South Australian Murray Darling Basin,August 2004. PIRSA

In relation to the overall level of current regional economic activity of over $750M/annum in farm gate value, and the projected future growth in irrigation enabled by the construction of SISs and zoning, these indicative impacts are small. A number of issues need to be taken into account in considering Table 11. The figures are relevant to developments whose proponents are considering purchasing a site in the HSIZ, find it difficult to obtain water by transfer from within the HSIZ, and seek the nearest alternative site just beyond the edge of the HSIZ. As discussed elsewhere,

it is likely that many of these will be able to obtain water from within the HSIZ, hence the results represent a worst-case outcome. Further, such developers, particularly those considering large projects, will in practice, take a regional perspective in seeking and assessing alternative development sites. They may find that relocating the project to a LSIZ site much closer to the river in a different reach, or behind a SIS, is cost-effective and far more attractive than seeking a site further from the river behind an initially proposed HSIZ location. It is noteworthy that a number of large-scale vine, almond and vegetable projects have been established in the LSIZ in recent years. Of these, two or three have made use of existing infrastructure to reduce their costs. Nonetheless, there will be some developers who do not find such sites and who face not only the additional costs of water supply, but also other infrastructure costs.

The majority of water transfers into the HSIZ in the recent past have been for expansions of existing activities. For these irrigators, the option to expand on the existing landholding, (or by acquiring land from neighbours) is the most attractive, and in many cases will be achievable through transfers of HSIZ water, with only marginal additional water supply costs. There may, however be some existing HSIZ irrigators who are unable to obtain the desired water transfer from within the HSIZ, and will either forgo the expansion or choose to expand onto a LSIZ site in reasonable proximity to their existing landholding. These irrigators will face the increased cost of water supply, and possibly other infrastructure costs.

Table 12 shows the area of potentially irrigable land at different distances from either the edge of the HSIZ or the edge of River Murray floodplain. For the purposes of this table potentially irrigable means land classified suitable for the production of almonds using PIRSA soil assessment, that is not currently irrigated, not under native vegetation, and not zoned for municipal use. Almonds were chosen as a crop whose soil requirements lie between those of the two other regionally dominant crops, vines, which are less specific, and citrus, which are more demanding in their soil requirements.

Table 12. Areas of land suitable for almond cultivation at various distances from HSIZ

Distance from edge of HSIZ or Murray Floodplain (km)	1	2	3	4	5	Total
Location	Area (ha)					
Border to Lock 6	276	167	168	172	94	878
Lock 6 to Lock 5	1114	1108	708	546	307	3783
Lock 5 to Lock 4	2383	2356	2072	1063	285	8158
Lock 4 to Lock 5	3396	3938	3577	3399	3929	18239
Lock 3 to Lock 2	3289	2565	2457	2053	1155	11518
Lock 2 to Morgan	202	362	359	278	296	1496
Morgan to Lock 1	651	363	363	114	97	1587
Lock 1 to Murray Bridge	4815	3671	3357	3458	3547	18847
Murray Bridge to Mouth	2194	1964	1146	1000	780	7084
Total	18 320	16 494	14 205	12 082	10 489	71 590

Source: Matt Miles, Information and Analysis Section, Department of Environment and Heritage

Table 12 indicates that there are over 18,000 ha of land with soils suitable for almonds less than 1 km from the river where there is no HSIZ, or from the boundary of the HSIZ. This is not intended to imply that all this land could be used for almonds, for which other factors such as sunshine hours, land aspect, susceptibility to frost, etc are significant or decisive, but rather to give an indication of the extent of land with soils suitable for the range of crops presently irrigated in the Lower Murray and Riverland.

This area is enough to accommodate more than twice the volume of water transferred between 1988 and 2003. This excludes land within areas protected by SIS, which will also be available for development. It is recognised that a number of factors will substantially reduce the actual area that it is financially viable to irrigate. These include the specific requirements of individual crops, availability of infrastructure, and the ease or difficulty locating a large parcel of land suitable for a major development (all or which apply in the HSIZ). However, recognising that irrigation already extends to well beyond the edge the HSIZ in some locations, eg Loxton, it would still appear that there is adequate land in close proximity to the HSIZ to meet future requirements for expansion of irrigation.

The following conclusions arise from applying the policy to the transfers of water over the 1988 – 2003 period:

- zoning would have a small financial impact compared to the overall level of regional economic activity;
- additional costs arising on account of zoning would not preclude further expansion of irrigation in the region. However because of the cost of

infrastructure it is likely that future development will be focussed behind existing irrigation areas with spare water supply capacity,
- there is an adequate area of low salinity impact land within reasonable distance of the river to provide for expansion of irrigation for many years ahead;
- additional investment in salt interception infrastructure in key locations (some of which has been foreshadowed) will allow further development.

Collectively these factors mean that the risk that water would be transferred to locations outside the region only on account of zoning is small.

5.5.4.4 Regional confidence/sustainable growth

Trends in water trade

Bureau of Transport and Regional Economics Working Paper no 58 (Investment Trends in the Lower Murray-Darling Basin) 2003, notes that the introduction of water trading has resulted in net movement of permanent allocations from NSW and Victoria to the Riverland. This largely reflects that there is both available freehold land and processing capacity in the Riverland, where water is used for much higher value crops than in the interstate source locations.

Implementation of salinity zoning will enable such transfers to continue, while meeting SA's obligations under the Murray-Darling Basin Agreement. Salinity zoning provides certainty to potential developers: their choice is limited to low impact locations, but the salinity impacts of their development can be offset and salinity will not be a barrier to their investment.

Projecting historical trends for the Riverland and Lower Murray forward 10 years would result in transfer of sufficient water to support expansion of the irrigated area by over 9000 ha (a 25% increase over the current area) in the region, which with flow-on effects to other sectors, would increase the added value by $271M annually and create over 5000 jobs. It cannot, of course, be assumed that historical trends will continue. For example, there are opportunities to use River Murray water diverted from SA Water pipelines to other locations. The extent to which water traded flows to the Riverland and Lower Murray will depend on the full range of factors relevant to investors. However, *without installation of SISs to provide the salinity credits to offset the impacts of this development, and zoning to limit the future capital requirements for SIS, this development would not be able to proceed in the Riverland and Lower Murray.*

Coordinated regional response

A coordinated strategy could be developed by the Government, Riverland Development Corporation, the Murraylands Regional Development Board, the relevant Councils and industry associations to identify areas in the LSIZ and SIS zones where future development might be promoted through land use zoning and the provision of infrastructure. This approach could

mitigate any negative impacts of the zoning strategy on local irrigation development.

An evaluation of infrastructure requirements for the development of irrigation in the low salinity impact zones may be required, to assess other barriers to irrigation development and to the SA Strategic Plan export targets.

Rural land values

Rural land values represent or are affected by investors' anticipation of what income can be gained from the use of the land. That evaluation is affected by:

- The range of products that the land will produce
- The presence of infrastructure relevant to the production and processing of the rural product
- Changes in technology that make a product possible to produce, or affect the cost of production
- Government programs affecting the viability of particular industry sectors
- The size of the market for the products
- The potential for overseas producers to supply the market
- The value of the $A in relation to overseas currencies.

These factors make prediction of the impact of zoning on land values highly speculative. In the Riverland region irrigable land currently fetches about $3000 - $5000/ha for parcels of less than 100Ha and $1000/Ha for larger parcels, depending on proximity to infrastructure and other characteristics. Broadacre dry land without irrigation potential fetches between $400 and $500/ha. Land associated with a water licence tends to attract a higher valuation than adjoining irrigable land not associated with a water licence, regardless of the volume of water on the licence.

However it can be expected that following zoning there will be winners and losers. Land values in the LSIZ immediately behind the HSIZ boundary and areas protected by salt interception schemes may increase as a result of the salinity zoning policy, because there is certainty that irrigation development can go ahead in these areas. This may be particularly true where the HSIZ is narrow and the distance from the river is short, eg on the southern bank of the river downstream of Loxton, where the distance that water must pumped is least.

Holders of irrigated land in the HSIZ may experience an increase in value of both their land and water because of the prohibition of transfers into the zone. Because transfers will still be available within the HSIZ, but only if the salinity impact is less than at the source site, land values more remote from the river may to rise relative to those closer to the River.

In general downstream landholders will be less disadvantaged than those upstream because the salinity impacts are lower and the HSIZ is narrower

downstream. Small scale irrigators, and those proposing to grow low margin crops, will be more disadvantaged by the need to move proposed irrigation to sites more distant from the River, because of the economies of scale in provision of water supply.

In relation to the above it should be noted that anecdotal evidence from land agents in the Sunraysia area suggests that following introduction of salinity zoning there in 1993, there was no obvious response in terms of land values.

5.6 Social Factors

5.6.1 Current Status

With the exception of Renmark and Paringa where population grew by 5.9 and 12.3% respectively, much of the Riverland region experienced a loss of population over the period 1991 – 2001. However regional taxable income grew by 40.2% over the same period, a rate well above the national average (31.0%), principally due - directly and indirectly - to the horticultural industry, which achieved the greatest growth in numbers employed. The growth in regional taxable income was due partly to an increase in the number of taxpayers (up 8.6%) during a period when regional unemployment declined from 17.3 to 7.2%, and partly due to an increase in mean taxable income of 29% between 1990/01 and 1999/00 (compared to national increase of 21%). The extent of recent investment in productive capacity, and the fact that there is a delay between investment and flow of benefits (eg from planting to maturity and full productivity) means that mean taxable income is likely to continue to rise for some time, even in the absence of expansion of irrigation.

Comparable figures are not available for the Lower Murray Region. There has been an expansion in irrigation activity, which would have driven similar trends, but there has been less focus on wine grape plantation, so that the flow of future financial benefits is likely to be somewhat less.

5.6.2 Impact of doing nothing

There would be growing uncertainty about future irrigation development in the Riverland and Lower Murray, because limited salinity credits are available. For instance, one large investor proposing to irrigate in a high impact location could prevent any existing irrigators or smaller investors from expanding or starting a new irrigation development, because no more credits would be available. Such a scenario may be divisive and more difficult to manage than the proposed zoning.

There would also be a considerable loss of economic development and associated employment opportunities.

5.6.3 Implications of the salinity zoning policy

Except within the HSIZ, landholders will be able to transfer water with little restriction. Landholders in the HSIZ will in most cases be able to initiate or expand irrigation by purchasing water from elsewhere in the HSIZ, provided the salinity impact of use at the new location is no greater than at the source location (or if there is evidence of prior commitment to irrigation on that land).

More generally, salinity zoning and construction of SISs will provide greater opportunity for continued sustainable irrigation development in the Riverland and Lower Murray regions while at the same time meeting SA's salinity obligations and river salinity targets. This increased opportunity for further development will benefit regional communities.

5.7 Environmental Factors

5.7.1 Current Status

The main environmental impact of increased salinity appears to be a deterioration of floodplain health. Floodplains have important environmental values: they form often the only corridor of remnant vegetation in the Basin and are important habitat areas. They also provide an important function for the health of the River: without a healthy floodplain, the River's health is at risk.

Irrigation development, and in particular the recent rapid expansion of irrigation within the Murray-Darling Basin has caused major environmental impacts. The regulation of the river to support diversions has resulted in a reversal of seasonal flow patterns and has caused inundation and/or increased groundwater levels in floodplains. The diversions have also resulted in reduced frequency and extent of flooding, which are important for maintaining floodplain biodiversity and habitat and to flush out the salts that build up in the soil over time.

Irrigation drainage not only results in increased salt loads to the River, but also increases groundwater levels in floodplains, therefore contributing to floodplain salinisation.

Recent investment in salt interception infrastructure, irrigation water supply infrastructure and on-farm water management technologies have ensured that irrigation drainage and its salinity impacts are reduced. In some areas, where the floodplain is now protected from irrigation impacts by a salt interception scheme, floodplain health appears to be recovering.

5.7.2 Implications of doing nothing

Only a small portion of the ultimate impacts (about one-fifth) of recent irrigation developments is currently affecting the floodplain and River, so

further deterioration of floodplain health can be expected, even if no further irrigation development occurs, particularly in areas not protected by SISs.

Without a salinity zoning policy, irrigation developments will continue in high salinity impact locations, and the future salt loads from these developments will contribute to further floodplain salinisation.

5.7.3 Implications of the salinity zoning policy

Floodplain health is a complex issue, depending on many factors, such as seasonal variation, frequency and duration of major river flow events, weir pool level management, land management adjacent to the floodplain and on the floodplain itself and saline groundwater inflow. Without protection by SISs, irrigation developments near the river will affect the biodiversity and habitat value of the adjacent floodplains by raising the groundwater table.

The proposed salinity zoning policies will have some positive floodplain effect because they will direct future irrigation developments to locations further away from the river, thereby reducing the floodplain salinity risk by delaying and/or dispersing the impact over a wider area, or to locations behind existing SISs. New SISs will be designed to address both river salinity and rising saline groundwater on the floodplain resulting from irrigation development as per the South Australian River Murray Salinity Strategy (2001) These schemes may provide additional protection for the floodplain.

Complimentary floodplain protection policies will need to be developed over time, that take a holistic approach to floodplain protection, addressing the whole range of issues that affect floodplain health. This will also require further investment in knowledge and modelling capabilities to better understand all the factors that impact on floodplain health.

The zoning policy could result in irrigation to expand into areas more distant from the river, and hence for energy consumption for pumping and greenhouse gas emissions to increase. However, there are substantial areas of land suitable for irrigation closer to the river than areas currently being irrigated, indicating that other issues in addition to distance from the river are influencing investment decisions. The construction of SISs and likely associated concentration of development into SIS zones offers the possibility of cooperative construction of water supply systems, with some opportunity for greater efficiency in pumping. Hence overall, the effect of zoning in increasing greenhouse emissions is likely to be small.

Zoning of transfers is not expected to increase or decrease the use of water, only to change the spatial distribution of its use. However one of the methods of reducing salinity impact is to reduce irrigation drainage, and policies and strategies directed to that end will be continued and further developed.

5.8 Coordination

During the development of the policy package there has been consultation with the Office of Regional Affairs to ensure consistency with the Regional Impact Assessment Statements (RIAS) policy. Primary Industries and Resources SA has been closely involved in the development of the salinity manatgement policies. Department of Environment and Heritage has cooperated by developing the model assessing the impact of irrigation on salt loads to the river, and the zone mapping. The Riverland Development Corporation provided coordination of consultation and independent scientific critique of the basis of the zoning.

The proposed action has the support of Planning SA, as the formal definition and recognition of high and low salinity impact areas will assist with the preparation of planning policy and its inclusion in Development Plans. The Minister of Planning and Urban Development initiated a River Murray Salinity Ministerial Plan Amendment Report (PAR) in January 2004. Planning SA is working closely with DWLBC, the Murray and Mallee Local Government Association and with other relevant councils to achieve a consistent approach.

6 CONCLUSION

Table 13 outlines a summary evaluation of the proposed zoning policy

Table 13. Summary evaluation of zoning policy

Impact Area	Zoning	No Zoning
Location of new development	In LSIZ and SIS Zones, subject to availability of salinity credits	Unrestricted, but subject to availability of salinity credits
Continuation of existing development	Unaffected	Unaffected
Redevelopment for new crops	Limited to the extent that any additional water required would need to be sourced from within HSIZ.	Unaffected
Equity	All new irrigation subject to same locational limitation	A few large developments in High impact area would use up all salinity credits
Certainty for developers	Provides a much higher degree of clarity and certainty than for no zoning, but still subject to availability of salinity credits	Does not provide certainty; each proposal would have to be assessed individually for impact
Ability to import water during drought restriction periods	Unaffected	Unaffected
Landholders in High Impact Zone	Ability to develop irrigation limited to the extent that any additional water required would need to be sourced from within HSIZ.	Would enable some to develop irrigation, but only within limits of available salinity credits
Cost of irrigation development	Higher in some locations	Unaffected
Regional potential future development	Subject to availability of salinity credits, but substantially greater than for no zoning, because any development in LSIZ will have lower impact than in HSIZ and require less salinity credits	Substantially less, determined by salinity impact of specific projects and availability of salinity credits
Added value from future development	$271M annually #	Substantially less, determined by salinity impact of specific projects and availability of salinity credits
New jobs from future development	5000#	
Capital cost of SISs	$24.4M*	$88M*
Net present value of total SIS costs	$35.2M*	$127M*
Floodplain values	Directs new development to locations behind SISs or further away from the river in LSIZ.	No protection, except behind SISs, provided capacity is not exceeded

 # From PIRSA study. Assumes a growth of 9000 ha of irrigation, comparable with growth from the level of transfers over the 15 years from 1988 – 2003.
**From CSIRO Policy and Economic Research Unit study. Same assumptions as above.*

As identified earlier the region has a number of attributes that make it highly suitable for expansion of irrigation. A coordinated strategy could be developed by the SA Government with the Riverland Development Corporation, the Lower Murray Regional Development Board, the relevant Councils and industry associations to identify areas in the LSIZ and SIS zones where such development might be promoted through land use zoning and the provision of infrastructure. Factors to be considered would include those relating to land use suitability for crops (eg soil type, susceptibility to frost), cost effective provision of infrastructure (water supply, SIS, electricity, roads, telecommunications), impacts on regional biodiversity and the minimisation of incompatible land uses.

An evaluation of infrastructure requirements for the development of irrigation in the low salinity impact zones may be required, to assess other barriers to irrigation development and to the SA Strategic Plan export targets.

Such an approach would illustrate that the region was focussed on sustainable development of irrigation and may well more than offset any negative impacts of salinity zoning.

The government will construct salt interception schemes with spare capacity for future irrigation development, which will greatly reduce the impact of the HSIZ. In addition, the provisions for irrigation developments to proceed in the HSIZ where there is evidence of commitment to development prior to 30 June 2003, will also reduce the impact of the policy.

Appendix 1: Results of consultation on RIAS and responses to issues raised

Respondent	***Issue***	***Response***
Riverland Development Corporation (RDC)	Concern at increased compliance costs and loss of future development	Compliance costs should affect only small number of potential developments
River Murray Catchment Water Management Board (RMCWMB)	Need media campaign to advise of impact of policy	Communication strategy planned following adoption by Minister
Riverland Councils,	Impacts of policy will be higher that suggested because of delay in building SISs	In areas where SIS are proposed, resolution of future capacity will be given priority. However disposal capacity is emerging as an issue
Riverland Councils, RDC, RMCWMB, Riverland Horticultural Council	Capacity and boundaries of SISs zones need to be determined and published to allow future irrigation development	The capacity and boundaries are being refined as part of final design
Riverland Councils, RDC, RMCWMB	Areas where future development in the LSIZ is to be promoted need to be identified. The costs of this work and of building the necessary infrastructure have not been identified. State government needs to make provision for costs of infrastructure and be involved in infrastructure planning strategy	SIS zone boundaries and capacities will be made public before the policies come into force.
Riverland Councils	Community needs to be better advised of consequences of policy	Communication strategy planned following adoption by Minister. RIAS to be placed on DWLBC website
Riverland Councils	Need to assist large irrigators to better manage their irrigation practices	Larger irrigators are often better managers already. Many initiatives already in place or about to commence to target improved irrigation efficiency.
SA Murray Irrigators (SAMI)	RIAS shows lack of understanding of what motivates developers	Recognised that a range of factors in addition to gross margins affect crop decisions

SAMI, RMCWMB, Century Orchards	Report does not accurately reflect amount of available land, given that other factors, (eg infrastructure) apart from soil suitability affect investment decisions	Report amended to note that other factors in addition to soil suitability affect investment decisions
SAMI	Report does not note the likely rise in LSIZ land values	RIAS revised to comment on land values
SAMI, RMCWMB, Central Irrigation Trust, Riverland Horticultural Council	Report does not examine impact on established irrigators in HSIZ who may need to change to higher water use crop, or increase area of current crop	Report amended to address this
SAMI	Assessing impact in terms of gross margins ignores fact that many development proposals have a very low Internal Rate of Return	Recognised that gross margins are not the only factor affecting crop decisions, but attempting to model the wide range of factors would be highly speculative.
SAMI	Gross margins data not up to date	Figures reviewed and revised by PIRSA
SAMI	Could family businesses be given opportunity to have a 10 – 20% increase in allocation to maintain viability	Revised report indicates that small businesses are unlikely to be affected because of ability to transfer water within HSIZ
SAMI	Independent RIAS should be produced. Need to involve developers in process.	Process has been transparent and has sought comment from relevant stakeholders. Report is based largely on PIRSA and CSIRO reports
Riverland Horticultural Council (RHC)	Zoning should be based on best practice	Zoning requires a single line based on average water use of the range of crops
Riverland Horticultural Council	Should be a twelve month moratorium on zoning to allow more consultation and remove impediments to development	A moratorium would create further uncertainty and speculation
Century Orchards, RHC	Report understates cost impact of zoning	Report amended to note other costs
Murraylands Regional Development Board	Consultation inadequate Inadequate preparation of stakeholders	There was extensive consultation, as noted in RIAS
SA Fresh Fruit Growers	Costs of salt interception schemes should be shared equally among	Costs sharing not part of proposal

Association (SAFFGA)	irrigators	
RMCWMB	Report should give a more detailed examination of impacts at local level and over time (short term costs v long term benefits)	Prediction of impacts at local level and over longer time frame would be highly speculative
Rural City of Murray Bridge	Salinity Impact Zoning should be incorporated into Development Plans	This is being implemented
Renmark Irrigation Trust	Trust area should be treated as SIS area in view of CDS schemes that intercept drainage	Operation of CDS and potential interception capacity will be investigated.
Central Irrigation Trust	Zoning will promote irrigation of vines etc watered from Lower Lakes, which will result in demand to protect lower river and lake water quality, in turn placing additional demands for restriction on upstream water users	Flow into SA is already managed to meet a range of objectives, including keeping the Murray Mouth open. Zoning is not expected to require changes to the operation of flow into SA.