CABINET - SUBJECTS FOR CONSIDERATION, 27 SEPTEMBER 2007 9:30 AM

1 **New Initiatives/Policy Matters**

Not Relevant

102 MWSCS07/065 Water Security 2007/08 (Karlene Maywald)
APPROVED

Not Relevant

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COVER SHEET

1.	**TITLE:**	**WATER SECURITY 2007/08**
2.	**MINISTER:**	Karlene Maywald **MINISTER FOR WATER SECURITY**
3.	**PURPOSE**	To update **C**abinet on current water availability scenarios for 2007/08 and seek approval for a range of short and medium water security measures.
4.	**RELEVANT GOVERNMENT POLICY and/or STRATEGIC PLAN TARGET**	There are no directly applicable **S**trategic Plan targets. However, the measures proposed by the submission are aimed at protecting the health and well-being of communities reliant on **R**iver Murray water for drinking and domestic purposes, and on protecting the **S**tate's economic base.
5.	**ICT COMPONENT**	There is no material **ICT** component.
6.	**RESOURCES REQUIRED FOR IMPLEMENTATION**	The adverse impact of additional expenditure on the budget for 2007/08 is estimated at $4.5 million ($3.4 million **D**WLBC and $1.1 million **DE**H). **S**A Water is <u>not</u> seeking additional funding or adjustments to budget targets. Profit forecasts indicate that budget targets can be met as there are favourable variances in other business activities.
7.	**COMMUNITY AND ENVIRONMENTAL IMPACT**	The proposal to waive 'top up' application fees will have a positive impact on businesses by relieving the financial burden on irrigators for costs that they would not normally have incurred.
8.	**RISKS**	There is a risk that, if record low inflows continue and appropriate measures are not taken, **S**A Water's off-takes from the **R**iver Murray – which deliver water to in excess of 90% of the state's population – would cease operating due to falling river levels.
9.	**CONSULTATION**	The proposed water security strategy has been discussed with and endorsed by the Water **S**ecurity Advisory Group. All relevant **S**A government agencies are represented at the chief executive level on the Water **S**ecurity Task **F**orce.

10. **COMMUNICATION STRATEGY**

A communication strategy specific to the Government's response to the drought along the River Murray is being developed in consultation with the Premier's Media Unit and the Minister for the River Murray.

11. **URGENCY**

Urgent

12. **RECOMMENDATIONS**

It is recommended that Cabinet:

- Endorse the overall water security strategy, noting that further specific approvals will be sought for any major projects;
- Endorse the recommendations of the Water Security Task Force, as set out in appendix 1 to this submission, for appropriate action by responsible agencies;
- Note the Minister for Environment and Conservation's intention to continue, as a River Murray drought response measure, to waive the prescribed fee on an application to transfer or convert a River Murray water allocation to 'top up' the water available to a water licence holder until 1 July 2008, or when the water restrictions have been removed, which ever comes first;
- Approve additional appropriation and expenditure authority of $3.498 million for the Department of Water, Land and Biodiversity Conservation, including costs associated with waiving top up application fees, and $1.085 million for the Department for Environment and Heritage in 2007/08 for costs associated with critical water security activities.

I declare that I have no actual or potential conflict of interest in relation to the proposals contained in this submission.

Hon Karlene Maywald
MINISTER FOR WATER SECURITY

24 September 2007

MINUTES forming ENCLOSURE to MWSCS07/065

TO: THE PREMIER FOR CABINET

RE: WATER SECURITY 2007/08

1. PROPOSAL

1.1. To update Cabinet on current water availability scenarios for 2007/08 and seek approval for a range of short and medium water security measures.

2. BACKGROUND

2.1. In response to record low inflows into the Murray-Darling basin, the Government convened a group of national water experts - the Water Security Advisory Group – in early November 2006. The group members are:

- Hon Karlene Maywald (chair)
- Mr Denis Flett
- Mr Don Blackmore
- Mr David Wotton
- Mr Denis Hussey
- Mr Jim Hallion

2.2. The SA Advisory Group has met on six occasions since then to review the work of the Water Security Task Force. The Water Security Task Force, chaired by Mr Paul Case, comprises the chief executives of Department of Water, Land and Biodiversity Conservation, Primary Industries and Resources SA, Department of Environment and Heritage, Department of Transport, Energy and Infrastructure, Department of Treasury and Finance, Department of Trade and Economic Development, SA Water and Department of Health.

2.3. In February 2007, on the recommendation of the Water Security Task Force and Water Security Advisory Group, Cabinet approved a strategy designed to ensure critical water needs would be met in 2007/08, given the record drought conditions in 2006/07. In summary, that strategy included the following key projects:

- Disconnection of selected wetlands to yield 30 GL in water savings (SA MDB NRM Board) (also a basin-wide contingency measure agreed by senior officials – refer below).
- Modifying the major pump stations below Lock 1 to enable them to operate as the river level falls – and to delay for as long as possible the need to construct a temporary weir (SA Water).
- Preparations to construct a temporary weir below Wellington, if necessary (SA Water) (also a basin-wide contingency measure agreed by senior officials – refer below).

- Pumping additional River Murray water into storages during 2006/07 to increase water in storage at the beginning of the 2007/08 year, as well as provide a buffer in the event of algal outbreaks in the river (SA Water) (also a basin-wide contingency measure agreed by senior officials – refer below)..
- Fast-tracking water filtration facilities for 15 communities that presently receive unfiltered River Murray water (SA Water).
- Alternative water supplies:
  - Pipeline to Clayton (SA Water)
  - Standpipes at Meningie, Hindmarsh Island Goolwa, Milang and Narrung.

2.4. An update on each of these projects is provide in the attached report to Cabinet (appendix 3).

National level

2.5. Given the basin-wide seriousness of the situation, the Prime Minister called a water summit on 7 November 2006. An outcome of that summit was to charge senior officials (the Senior Officials Group or SOG) with the task of reporting to First Ministers on contingency arrangements for providing basic water to cities and towns reliant on the River Murray.

2.6. Senior officials have reported to First Ministers on four occasions since December 2006.

3. DISCUSSION

3.1. The purpose of this submission is to update Cabinet on current water availability scenarios for 2007/08 and seek approval for a range of short and medium water security measures as set out in the attached report of the Water Security Task Force.

3.2. In summary, the Water Security Task Force's report to Cabinet indicates that, to date, the 2007-08 year is tracking as a severe drought, similar to that experienced in 2002/03. Coming after the record drought of last year, the real risk in 2007/08 has already been realised for irrigated agriculture along the River Murray in South Australia.

3.3. South Australia's critical urban water needs will be met in 2007/08 with a reduced likelihood of a need for level 5 water restrictions, although 2008/09 remains a risk.

3.4. The most significant emerging issue is salinity. As the weather heats up over summer, the risk of algal blooms will also be present. Using the 'dilution flow' available to SA, it will be possible to keep river salinity below 1400 EC, and hence palatable, for most of the 2007/08 year. Below Wellington, salinity, water levels and accessibility to water are already a serious problem that undoubtedly will worsen. The situation for the lower lakes is unlikely to recover in the next three years, and possibly in the next decade.

3.5. Current indications are that a decision to commence the construction of a temporary weir near Wellington will not need to be taken before June 2008. SA Water has continued to seek ways of avoiding having to construct a weir at all or, if that's not possible, to minimise the size and cost of the structure.

3.6. Given the risk of very low storages at the end of this year, the report highlights that securing an end-of-year reserve of water in storage to cope with demands during 2008/09 is a critical contingency measure. It should also be noted that the South Australian River Murray floodplain environment, including its wetlands, is in a perilous state of health.

3.7. The following sections of this submission highlight issues of particular concern and/or for Cabinet decision.

Forecast inflows in 2007/08

3.8. A total inflow of 357 GL (excluding Snowy Hydro releases) was received into the Murray-Darling basin storages during August 2007 compared to 101 GL during August 2006, and well below the long-term average of 1 480 GL. The inflows over the last three months have been better than at the same time last year due to continuing base flows but are still less than 25% of long term average inflows for the same period. Importantly the volume of water in storage is much lower, resulting in the total resources available being significantly lower than at the same time last year. At the end of August 2007, the storage volume was approximately 2000 GL (21% capacity) compared to 3610 GL (38% capacity) at the same time last year. The long-term average storage volume for the end of August is 6690 GL (71% capacity).

3.9. The total River Murray system inflow since June 2007 (excluding Snowy Hydro releases) has been only 1000 GL. If these inflow conditions were to persist at this level, and based on the assumptions used by the Murray-Darling Basin Commission (MDBC), there is a significant chance that storages at the end of May 2008 will be virtually empty. With an outlook for below median rainfall for the September to November period the chances of receiving high inflows remains extremely low. After having a dry May to July (inclusive) there is approximately a 63% chance of continuing low inflows for the remainder of the year.

3.10. Based on the end of August water resource assessment the current predicted minimum flow to South Australia for 2007/08 is 828 GL. This assumes minimum inflows for the rest of the year. Total inflows to the Murray system for the year (since 1 June 2007) have equated to approximately 90% dry inflow conditions. Under these low inflow probabilities the likelihood of South Australia receiving significant unregulated flows in addition to the predicted entitlement flow figures is low.

3.11. Under the sharing rules agreed by First Ministers, the predicted total flow to South Australia of 828 GL provides for a total of 120 GL available for consumptive diversions and 234 GL available for dilution and river restoration.

3.12. It is apparent that a series of average to good years will not lead to recovery. It will take "drought breaking" conditions in the Murray-Darling basin catchments before any real improvement is seen. This could well take a number of years. During this period, the availability of water for Adelaide will be heavily dependent on intakes in the Mt Lofty Ranges, and on-going restrictions are likely.

Water security strategy

3.13. The various projects and initiatives of the Water Security Task Force and Desalination Working Group (within South Australia) and the Senior Officials Group (basin-wide) are summarised in the following table. Together they form the emerging water security strategy for South Australia.

3.14. It can be seen that projects are underway to deal with water security in the short term (2007/08) and long term (approximately 2011/12 onward), and to deal with the medium term years until long term initiatives come on stream (2008/09 until about 2010/11).

3.15. The projects are also appropriately spread across initiatives to reduce or modify the demand for water, secure existing or identify additional water supplies and dealing with any water quality problems that are predicted to emerge.

3.16. Given the number of uncertain events and triggers that can influence water availability, there continues to be a need for a flexible and adaptive strategy for ensuring SA's water security. This enables new information and events to be incorporated into plans and decisions, increasing the effectiveness of the strategy while also lowering the potential cost.

	Demand control measures	**Measures to secure supply**	**Water quality measures**
SHORT TERM (2007/08)	Irrigation allocations	Close selected wetlands	Optimal use of dilution flows
	Urban water restrictions	Modify pumping	Preparations against algal blooms
	Industry water efficiency planning	Preparations for a temporary weir	Filtration plants to protect communities from algal blooms
	Restrict irrigators on SA Water system	Pump additional 60 GL into storages	
	Conserve non-mains water	Optimise pumping schedule for 2007/08	
	Rebates	Manage river operations	
		Alternative access to supplies	

	Demand control measures	Measures to secure supply	Water quality measures
		Environmental measures	
		Carry-over provision	
MEDIUM TERM (2008/09 +)		Emergency end-of-year reserve	
		Protect critical environmental assets	Drinking water contingency
		Review Water Proofing Adelaide	
LONG TERM		Desalination	
		Upper Spencer Gulf desalination	
		Increased storage capacity (Mt Bold)	
		National plan for water security	
		Long term strategic reserve of water	

3.17. These measures have all been endorsed by the Water Security Advisory Group. Further detail on each measure is set out in the attached report of the Water Security Task Force.

3.18. It is recommended that Cabinet endorse the overall water security strategy, on the basis that further separate approvals will be sought for major projects. In particular, further Cabinet approval will be sought for the commencement of construction of a weir or to secure an additional reserve of water. While noted in the above table of short, medium and long term water security strategies, the recommendations of the Desalination Working Group are subject to a separate reporting and approval process.

3.19. It is also proposed that Cabinet accept the report of the Water Security Task Force and endorse the various agency-level recommendations made. The full list of recommendations is attached at appendix 1. Any recommendations requiring more explicit approval by Cabinet are set out in detail below.

Water for critical urban demands

3.20. Despite the very low water inflows, provision of critical urban water supplies from the River Murray during the remainder of 2007/08 appears to be manageable based on available modelling. Contingency measures already in place mean that critical urban needs will be met in 2007/08.

3.21. However, significant risks remain for 2008/09. With Murray-Darling basin storages expected to be at critically low levels, the provision of water for critical urban needs in 2008/09 is yet to be settled. In addition, rising salinity levels are a risk for the suitability of water for drinking in 2008/09 (discussed further below). Toxic algal blooms remain a risk in both 2007/08 and 2008/09.

Temporary weir

3.22. It remains the case that, if inflows to the Murray Darling basin storages remain average or worse, the water levels in the lower lakes will continue to fall. Under these circumstances a temporary weir will be essential, not optional.

3.23. At the time of last briefing Cabinet it was predicted that, if it is required, the temporary weir would need to be in place by February 2008. This assumed that modification of SA Water's major pump stations below Lock 1 would be progressively completed to allow operation down to -1.5 metres AHD.

3.24. Although the original level of the weir was set at 0.1m AHD, there are design and construction time benefits, in addition to cost benefits, in setting a lower pool level if at all possible. However, a lower pool level may allow greater inflows of saline groundwater and increase the risk of acid-sulphate soil problems. These issues are currently being investigated.

3.25. If the potential issues of salinity and acid-sulphate soils can be satisfactorily managed, design work will be undertaken for an alternative weir design with a lower overflow level. The appearance of a lower level weir would be more in keeping with the temporary nature of the structure, and it may be feasible to utilise a location to the north of Pomanda Island to also shorten the length of the weir. This will involve further on-site testing, but this will not be undertaken until there is confirmation that the potential salinity and soil problems can be managed.

3.26. Detailed design of the original temporary weir concept is virtually complete. During the design phase, a number of issues have arisen regarding the design for the area of bed with the weakest strength. These have been satisfactorily resolved, however the embankment will be wider and lower in this part of the structure than originally envisaged in the concept design. Peer review of the design has been carried out by other consultants.

3.27. The timeframe for construction remains similar to that detailed in the concept design report. The timing of commencement of the works remains dependent on the forecast water levels in the lower reaches of the River Murray and Lake Alexandrina. The latest forecast predicts a -1.5m AHD water level in February 2009. Based on an 8 month period between the Cabinet decision to build the weir and closure of the weir at -1.5m AHD, the decision to build the weir can be delayed until mid June 2008. Even then, it may be desirable to wait until the winter and spring rains are known (ie September/October 2008) before making a final decision.

3.28. The June 2008 decision date is still matched to an operating level of -1.5m AHD. It is known that the pumping stations can operate down to -2.1m AHD (but with additional modifications to go below -1.5m), which gives some additional contingency in a decision date of June 2008.

3.29. The Commonwealth Department of Environment and Water Resources has established environment impact statement (EIS) guidelines for the proposed weir. The guidelines determine the complexity of the EIS and therefore the potential costs and time-frames for completion. The EIS must include the consideration of prudent and feasible alternatives to the weir and final configuration of the causeway, details on construction activities and rock sources, how the weir would be operated and how and when it would be removed. The impact assessment must also include a description of the existing environment and proposed mitigation measures with respect to matters of national environmental significance.

3.30. The Department of Environment and Heritage is undertaking the tender process for the completion of the EIS. The cost of undertaking the EIS is estimated at $700,000. However, a final cost will not be known until the competitive tender process has been completed.

Additional reserve of water

3.31. A reserve of water for critical urban needs in not required for 2007/08.

3.32. Senior officials are developing a proposal for a collective, basin-wide reserve for 2008/09, although there is yet to be full agreement on this matter. South Australia's officials will continue to press for a basin-wide reserve for critical human needs, also taking into account flows required to manage salinity at acceptable levels.

3.33. The Water Security Task Force will maintain a watching brief on water inflows and allocations to assess the viability of purchasing temporary water as the season progresses, with the intention of re-assess this option in late October. A watching brief will also be kept on Snowy Hydro storages to assess whether there is a likelihood of re-opening discussions on options over and above target water releases.

3.34. The Water Security Task Force has also initiated work, on a highly confidential basis, to assess the viability of South Australia securing more favourable access and/or management arrangements for existing upstream storage capacity either in the Murray-Darling Basin Commission or Snowy Hydro. The objective is to have arrangements that provide a basis for SA to have greater or sole control of a dedicated water resource in upstream storages that would secure supplies for SA under severe drought conditions.

Salinity

3.35. Increases in salinity impact on the quality and acceptability of water for drinking and other purposes, and may potentially lead to salinities beyond drinkable levels. Evidence suggests that salinity in the range 1000 - 2000 mg/L (1800 – 3600 EC) increasingly renders water unpalatable.

Most would regard salinity higher than 2000 mg/L (3600 EC) un-drinkable. The Department of Health in conjunction with SA Water is currently developing an upper limit for drinking water salinity. However, this investigation is not likely to change the position on health impact or palatability ranges.

3.36. Current modelling indicates that, by using the 'dilution flow' available to SA, it will be possible to keep river salinity below 1400 EC, and hence palatable, for most of the 2007/08 year.

3.37. Below Wellington, salinity, water levels and accessibility to water are already a serious problem that undoubtedly will worsen. The situation for the lower lakes is unlikely to recover in the next three years, and possibly in the next decade. A thorough joint Commonwealth/State examination of the future social, economic and environmental dependencies on the quality and water availability of the lower lakes is now required.

3.38. Although it is difficult to project salinities into 2008/09, salinities during the initial months of 2008/09 are likely to be influenced by the salt inflows during 2007/08 and hence the salt still travelling down the river. If resources are as low at the beginning of 2008/09 as they were this year, and low flows occur during the first few months of the water year, then it would be expected that salinities in the lower sections of the river would increase more rapidly than is predicted for 2007/08 as a result of salt already in the river.

3.39. South Australia's modelling of salinity has been validated in joint work with the Murray-Darling Basin Commission. The results of the joint modelling were presented to the Senior Officials Group on 14 September 2007. SA argued strongly for additional water to mitigate against higher salinity and further work is being undertaken to determine how an appropriate reserve can be accumulated to cover critical urban needs and water quality requirements.

3.40. Contingency planning is underway to deal with a situation where source water from River Murray reaches undrinkable salinity levels (2,000 mg/L or 3600 EC). Emergency drinking water would need to be provided to communities at 4 litres per person per day. Country townships receiving water directly from the river would be the first to be affected by rising salinity levels. However, in the absolute worst case, the whole of metropolitan Adelaide's population (approximately 1.1 million people) may require emergency drinking water.

3.41. At a rate of 4 litres per person per day, ample capacities of alternative source water have been identified. This includes bottled water, 'quarantining' a reservoir in the Adelaide Hills, spare capacity from Lower South East groundwater, Adelaide natural spring water, existing community rainwater tank supplies and commercial producers of a high volume of reverse osmosis water. In addition, mobile and high capacity reverse osmosis desalination units are available for hire or manufacture within short timeframe and to suit specific specifications. (Note these are capable of providing the 4 litres per person per day of drinking water, not for fulfilling all water needs.)

3.42. The most critical issue in the supply of emergency drinking water is the logistics of actually delivering the water to communities on a continuous basis for the duration a high salinity problem. SA Water could manage providing up to approximately 50,000 people (eg. five townships of 10,000 people) with emergency drinking water prior to State Emergency Management assistance being required.

3.43. SA Water has identified bottled water manufacturers and bulk water tanker providers (each of which requires prime movers, drivers and fuel in which to effectively deliver sufficient quantities of potable water). While there may be sufficient bulk water tankers in SA, the impacts of commandeering these from the transport companies (in particular wine industry) would be significant.

3.44. Should high saline water need to be distributed via SA Water's network, the following major issues will occur:

- Reuse from wastewater plants may not be practical depending on the target use tolerance to high salinities. As mains water salinity approaches 2000mg/L treated wastewater, salinity is likely to exceed 3000mg/L which would exceed the tolerance of many crops/plants.
- Re-use water normally supplied to major users at Virginia (vegetable growers) and Willunga (viticulture) will become saline and not acceptable for these activities.
- Re-use water / effluent used for parks and gardens etc (particularly along river townships) will become saline and not acceptable for these activities.
- Major industries reliant on lower salinity mains water would need to make alternative water supply arrangements or alternatively closed down.
- Increased rates of corrosion would occur on SA Water sewers, pumps, pumping mains and plants.
- Increased rates of corrosion would occur in household water heaters in particular.

Acid sulphate soils

3.45. The Department for Environment and Heritage engaged the CSIRO to undertake acid sulphate soil investigations in the lower lakes and river channel below Lock 1 as input into the Wellington weir environmental impact statement process. Recent surveys below Lock 1 indicate the risk from acid sulphate soil is greater than expected.

3.46. Most of the subaqueous soil materials sampled in the Murray River have an acid sulphate soil hazard risk ranging from moderate to severe. It is estimated that large quantities of sulphuric acid will be produced in the subaqueous acid sulphate soil if river levels lowered significantly and the adjacent wet soils were allowed to dry. In addition, salinity, wind erosion (e.g. aerial transport of fine granular surface flakes containing sulphuric material), mobilisation by rainfall events and malodorous problems may become serious issues.

3.47. At this stage there are several management options available, including:

- Preventing water re-entering dried wetlands.
- Inundating wetlands with water to stop acid sulphate soil formation.

- Cover acid sulphate soil areas with mulch/biodegradable matting to create anaerobic conditions.
- Fencing severe acid sulphate soil areas to exclude stock and humans.

3.48. The cost of dealing with the emerging acid sulphate soil situation are estimated below. The costs were unforeseen and are beyond DEH's capacity to absorb.

Action	Cost Estimate
Communication strategy for river and lake communities	$40 000
Rapid assessment of management options for wetlands below Lock 1. Identification of high priority sites for immediate action.	$30,000
Mitigation measures (fencing, mulch, pumping, blocking wetlands)	$170,000
Monitoring strategy	$60,000
TOTAL	$300,000

Waiver of top up application fees

3.49. In 2006-07, as a drought response measure, the prescribed application fee on an application to transfer or convert a water allocation to 'top up' the water available to a River Murray water licence holder was waived.

3.50. Under the *Natural Resources Management Act 2004* an application to transfer or convert a water allocation must be accompanied by the fee prescribed in the regulations, which is currently $324.00. Under regulation 42(2), the Minister for Environment and Conservation may waive payment of the whole or part of a fee.

3.51. A total of 993 applications for temporary water allocation transfer or annual conversion from holding to taking were received during 2006/07 for 'top up' purposes, which equates to $311,802 in application fees waived. It is anticipated that, given the volume of water available within South Australia and interstate is severely limited and is likely to remain so for some time, the number of 'top up' applications will increase in 2007/08. An initial estimate of 1200 applications represents a 20% increase over 2006/07. Current trading trends support this estimated increase.

3.52. Paying the prescribed fee for a water allocation transfer or conversion to 'top up' is an additional financial burden to the water user that they would not have normally incurred if water restrictions had not been implemented.

3.53. Waiver of the application fee will only apply to an annual transfer or annual conversion application that meets the 'top up' criteria and will not apply to any other application. Therefore, the budgeted revenue from other applications will not be affected.

3.54. During 2006-07, some funding was made available to cover forgone revenue and operational costs through the River Murray – Drought Management operating initiative. However, the costs were not factored in the 2007/08 Drought Management budget. Funding is now sought for the 2007/08 financial year.

Special legislation

3.55. It is clear that the public health benefits of continuing to reticulate water for washing and toilet flushing are such that SA Water should continue to supply water, even if that water was no longer drinkable due to high salinity or algal problems.

Clause 10 - Legal Professional Privilege

3.57. While the Government and SA Water can take steps to minimise its liability in the event that non-potable water needs to be reticulated, the best solution may be to legislate to enable water quality considerations to be taken into account under the Waterworks Act and to avoid liability in a situation where the quality of water is beyond SA Water's control or ability to treat.

3.58. If a weir needs to be constructed, it could also be helpful to have in place enabling legislation. Legislation may be essential in order to fast track initial works in the circumstances where the decision to construct is delayed such that it is not possible to comply with normal approval processes. Special legislation (or amendments to existing Acts) may also be appropriate to provide expanded or more sophisticated enforcement options, works such as wetland closure (protection from liabilities etc) and possibly other necessary works/measures.

3.59. Further consideration will be given to the legal issues raised by the full suite of short and medium term projects recommended in this report and, if necessary, further recommendations be made regarding the need for special or amending legislation.

Economic, financial and budgetary implications

3.60. It has been agreed with the Department of Treasury and Finance that expenditure on water security related activities be tracked and recorded by agencies. This only includes incremental expenditure (capital and operating) directly related to water security matters – ie existing salaries and agency overhead costs are excluded.

3.61. Due to the ongoing extreme dry conditions and significant water restrictions, it is anticipated that there will be additional annual water transfers and conversions to 'top up' the water allocations endorsed on River Murray water licences. Transfers or conversions of water allocation to 'top up' will be dependent on the price and availability of water.

3.62. At a cost of $324 per application, it is estimated that the Government would forgo around $390,000 of revenue based on an estimated 1200 applications, which is an increase of approximately 20% in applications from 2006-07.

3.63. The following table summarises, by agency, the approved budget expenditure, additional expenditure requirements and the consequential impact on the budget for 2007-08.

	2007-08 ($million)		
	Approved	Revised	Impact
Department of Water, Land and Biodiversity Conservation	2 929	6 427	3 498
Department for Environment and Heritage	-	1 085	1 085
SA Water	80 881	88 623	-
	83 810	96 135	4 483

3.64. As the table shows, the adverse impact on the budget of additional expenditure for 2007/08 is estimated at $4.5 million.

3.65. The additional costs for the Department of Water, Land and Biodiversity Conservation relates to expenditure associated with various activities including:

- licensing and compliance, including waiving fees for 'top up' allocations ($816,000) – discussed above;
- advisory groups on water security;
- communications and drought response measures;
- monitoring and scientific investigations; and
- wetland closures.

3.66. The Department for Environment and Heritage is required to incur expenditure on measures including:

- the environmental impact study on the proposed Wellington Weir ($700,000) – discussed above; and
- acid sulphate soil mitigation and monitoring ($170,000) – discussed above.

3.67. The forecasts for operating and capital expenditure by SA Water represent the latest estimates for the impact of the drought and water security measures in 2007/08. These issues will be monitored closely by SA Water and reported to Government by way of the monthly Board performance report.

3.68. While additional operating expenditure is forecast for SA Water based on current estimates, it should be noted that SA Water is not seeking additional funding or adjustments to budget (dividend) targets. From a whole of business perspective, at this point in time, profit forecasts indicate that budget targets can be met as a result of favourable variances in other business activities (ie revenue from development activity).

3.69. In addition, SA Water will be reviewing its financial position in respect of operating and capital activities with a view to balancing its budgets and ensuring reprioritisation of initiatives to help offset any budget pressures identified.

3.70. Further details on the cost of agencies' water security measures are provided at appendix 2.

South Australia's Strategic Plan

3.71. There are no directly applicable Strategic Plan targets. However, the measures proposed in this submission are aimed at protecting the health and well-being of communities reliant on River Murray water for drinking and domestic purposes, and on protecting the State's economic base.

Information and communication technology requirements

3.72. There are no ICT requirements.

Staffing implications

3.73. An additional 4.0 FTE employees is required by DWLBC to manage top up application fee processes.

Business Impact Statement

3.74. The proposal to waive 'top up' application fees will have a positive impact on businesses by relieving the financial burden on irrigators for costs that they would not normally have incurred.

Impact on the community and the environment

3.75. The impact of SA Water being unable to pump water to the 90% of the state's population that relies on River Murray water would be devastating, in terms of the impact on family and community well-being and on businesses that rely on water for some part of their operation. The cost to government of making alternative arrangements, such as tankering, also would be huge.

3.76. The ongoing drought in the Murray-Darling basin is having a significant effect on the river environment. The impact of the proposed measures is relatively insignificant, except for the possible construction of a weir. The environmental impact of a weir is being assessed under Commonwealth Environment Protection and Biodiversity Protection Act processes.

Impact on families and society

3.77. The proposal to waive 'top up' application fees will have a positive impact on families by relieving the financial burden on irrigators for costs that they would not normally have incurred.

Regional impact

3.78. The proposal to waive 'top up' application fees will be a positive impact in regions by relieving the financial burden on irrigators for costs that they would not normally have incurred.

Risk management strategy

3.79. There is a risk that, if record low inflows continue and appropriate measures are not taken, SA Water's off-takes from the River Murray – which deliver water to a significant proportion the state's population – would cease operating due to falling river levels.

3.80. The recommended water security strategy set out in this submission is specifically designed to manage this risk.

Consultation

3.81. The water security strategy has been discussed with and endorsed by the Water Security Advisory Group.

3.82. The water situation in South Australia, and proposed solutions, has also been discussed with senior officials from the Commonwealth, Murray-Darling Basin Commission, Victoria and New South Wales, as required.

3.83. All relevant SA government agencies are represented at the chief executive level on the Water Security Task Force.

3.84. An extensive community consultation program has been underway utilising the services of Hon Dean Brown and Hon Neil Andrew (refer also below). Consultation has also been undertaken with communities and landholders regarding the closure of selected wetlands.

Implementation plan

3.85. The Water Licensing Unit in the Department of Water, Land and Biodiversity Conservation will implement the waiving of the prescribed fee on applications to transfer or convert a water allocation to 'top up' a River Murray water licence until 1 July 2008 or when the water restrictions have been removed, which ever comes first. The implementation process will be undertaken in accordance with formal delegation processes under the *Natural Resources Management Act 2004* and will be regularly monitored to ensure consistency in approach and appropriateness.

Communication strategy

3.86. A communication strategy specific to the Government's response to the drought along the River Murray is being developed in consultation with the Premier's Media Unit and the Minister for the River Murray.

3.87. The proposal to waive 'top up' application fees will be communicated by Ministerial announcement and through the media. In addition, letters will be sent to all River Murray water licence holders, water brokers and other relevant stakeholders informing them provisions under which the prescribed fee for water allocation transfers or conversions to 'top up' water allocations will be waived.

Executive Council

3.88. Executive Council consideration is not required.

4. RECOMMENDATIONS

It is recommended that Cabinet:

4.1. Endorse the overall water security strategy, noting that further specific approvals will be sought for any major projects;

4.2. Endorse the recommendations of the Water Security Task Force, as set out in appendix 1 to this submission, for appropriate action by responsible agencies;

4.3. Note the Minister for Environment and Conservation's intention to continue, as a River Murray drought response measure, to waive the prescribed fee on an application to transfer or convert a River Murray water allocation to 'top up' the water available to a water licence holder until 1 July 2008, or when the water restrictions have been removed, which ever comes first;

4.4. Approve additional appropriation and expenditure authority of $3.498 million for the Department of Water, Land and Biodiversity Conservation, including costs associated with waiving top up application fees, and $1.085 million for the Department for Environment and Heritage in 2007/08 for costs associated with critical water security activities.

Karlene Maywald
MINISTER FOR WATER SECURITY

24 September 2007

Deferred until Thursday

In Cabinet

27 SEP 2007

APPROVED
PREMIER

APPENDIX 1

Full list of recommendations - Water Security Task Force report to Cabinet

(Section numbers refer to the Water Security Task Force report)

1. Support for modelling and monitoring river and lake levels are imperative, particularly once realistic scenarios for 2008/09 are available (section 2.3).

2. Support for ongoing monitoring and modelling of salinities is imperative, particularly with respect to salt discharges and the movement of salt downstream of Lock 1 and the salinity of flow at the South Australian border (section 3.1.1).

3. Support for the development of strategies for river management to match demand, evaporation and local climatic conditions should continue (section 3.1.1).

4. Note the current activity on acid sulphate soil investigations, and the emerging risks associated with the presence of acid sulphate soils in wetlands and potentially the river channel (section3.3).

5. Note there are options available for managing acid sulphate soils below Lock 1, and that the Water Security Task Force will provide further recommendations on this matter (section3.3).

6. That the matter of irrigation restructuring, exacerbated in part by the current drought, should be addressed jointly with the Commonwealth Government as a matter of some urgency (section3.4 and section 4.1.1.1).

7. Information on water availability, lake levels and salinity that is timely and robust should continue to be made available and utilised by irrigators for business planning purposes (section 4.1.1.1).

8. The program for skilling irrigators through fact sheets and decision support tools for drought management, water budgeting, salinity management and water trade decisions should also be continued (section 4.1.1.1).

9. A carry-over policy for irrigators should be determined as soon as possible (section 4.1.1.1).

10. As a matter or urgency, the consideration of adjustment by lower lakes irrigators should be facilitated, and the investigation of groundwater recharge and access by Langhorne Creek irrigators should be resolved (s section 4.1.1.1).

11. Close monitoring of water availability and water use should continue, and water restriction levels reviewed monthly. Should inflows continue below drought (90% AEP) levels, it will be necessary to re-visit the recommended level of urban water restriction (section 4.1.2).

12. The buffer in Mt Lofty Ranges storages should target a minimum of 20 GL and, if conditions improve, the buffer should be allowed to increase rather than necessarily being used to reduce water restrictions (section 4.1.2).

13. It is recommended that irrigators using River Murray water via SA Water's reticulation system be restricted to the same percentage allocation as other River Murray irrigators plus an appropriate allowance for stock and domestic requirements (section 4.1.4).

14. That an enhanced rebate scheme be developed as an incentive for more efficient water use by households, taking into account the work already completed by DWLBC (section 4.1.6).

15. Approve the following principles for considering government support for accessing water supplies, isolating wetlands and wetland management:
    1) Government will maintain supplies on government owned and operated systems.
    2) Assistance may be provided for council water supply schemes equivalent to the community service obligation that would be paid if SA Water was operating the scheme.
    3) In general, individual households not on government owned and operated systems will need to make their own arrangements for water carting with private operators.
    4) Government will prepare contingency plans for emergency situations that are beyond the capacity of councils and individual householders – for example, if there was a widespread blue-green algae outbreak.
    5) Assistance for economic purposes will be made on a case by case basis, having regard to the economic value of services being protected and the costs involved.
    6) Impacter pays when the objective is to secure water savings or water quality objectives.
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16. It is recommended that an announcement be made as soon as possible that permanent facilities for carry-over of unused allocations will be implemented during the 2007/08 water year and will allow licensees to carry-over water for use in 2008/09 (section 4.2.10).

17. It is recommended that this proposed strategy for the use of dilution flow be adopted, including a monthly review of the situation to ensure that the greatest possible benefits are derived from the limited flows currently allocated to South Australia (section 4.3.1).

18. That a one-off trial release of highly saline water through the Goolwa and Mundoo barrages to quantify the potential benefits to be gained through the avoidance of contamination of the greater lakes area (section 4.3.2).

19. Note that the Water Security Task Force will undertake a new project to develop options for enhancing responsible water use by South Australian communities, including Adelaide and other River Murray dependent communities (section 5.1).

20. Continue to press to secure a basin wide reserve for critical human needs taking into account flows required to manage salinity at acceptable levels (section 5.2.1).

21. Pressure all other jurisdictions to include tributary water (including an additional 1500 GL currently in storage) within the gambit of the basin wide contingency measures (section 5.2.1).

22. Maintain a watching brief on water inflows and allocations to assess the viability of purchasing temporary water as the season progresses, and re-assess the position in late October (section 5.2.1).

23. Maintain a watching brief on Snowy storages as inflows of winter snows begin in spring to assess whether there is a likelihood of re-opening discussions on options over above target water releases (section 5.2.1).

24. Open discussions within SOG on the prospect of accessing Snowy Hydro dead storages under worst case scenarios for 2008/09 (section 5.2.1).

25. As a matter of urgency, consider holding back some of the dilution flow allocated to SA in 2007/08 (section 5.2.1).

26. That small allocations of water be made available for the protection of critical environmental assets, for example by using 7 GL of dilution flow (section 5.2.2).

27. Prior to making an environmental allocation, consideration be given to all the circumstances, including the availability of unregulated flows or other water (section 5.2.2).

28. That a formal process to monitor and drive the implementation of Water Proofing Adelaide be established and report regularly to Cabinet through the Minister for Environment and Conservation and the Minister for Water Security (section 5.2.3).

29. Note that it is difficult to attribute specific savings to specific actions in the Water Proofing Adelaide strategy (section 5.2.3).

30. That Water Proofing Adelaide be fully reviewed in light of new information regarding water security. This review would be consistent with initiative 63 of WPA and should encompass water security, some scenario planning and identification of specific proposals. It would need to consider any additional strategies and specific infrastructure proposals that have arisen as a result of the severe drought conditions and also considering environmental, water quality and cost issues in a holistic way. This review should commence in 2008 (section 5.2.3).

31. It is recommended that further consideration be given to the legal issues raised by the full suite of short and medium term projects recommended in this report and, if necessary, further recommendations be made regarding the need for special or amending legislation (section 7.2.2).

32. Responding to water security related issues as they arise is creating budget pressures for agencies, which will be pursued through the mid-year budget review process and/or by seeking explicit appropriation (section 7.5).

APPENDIX 2

Overall budget impact of water security related planning and impacts

Note that the attached forecasts for SA Water relate to the Corporation's drought/water security initiatives and, while additional expenditure may be necessary on some of these initiatives, it should not be assumed that the above will mean that the overall profit and capital budget will not be met. No budget adjustments are sought for 2007/08 by SA Water in regards to the above.

RIVER MURRAY DROUGHT IN SOUTH AUSTRALIA

2007 - 08 ESTIMATES

WATER SECURITY/DROUGHT MEASURE	2006-07 Estimate/ Actual $'000s	2007-08 Approved $'000s	2007-08 Estimated Outcome $'000s	2007-08 Budget Impact $'000s
Advisory Groups				
Water Security Advisory Group & High Level Officers Group	145	295	295	0
Water Security Taskforce & Technical Group	15	30	30	0
Community Liaison Managers	140	0	100	100
Ngarrindjeri Monitoring Agreement	100	0	70	70
Mannum to Border Monitoring Agreement	100	0	30	30
First Peoples - Emergency Dredging and Wetland Closures	0	0	20	20
Wellington Weir Local Knowledge Advisory Group	0	0	10	10
Sub-total	500	325	555	230
Communications Strategy and Drought Response				
Public Meetings	15	20	20	0
Media Campaign - Advertising, Mail Outs, Printing	315	325	446	121
DWLBC Drought Response Team	204	327	446	119
DWLBC Drought Response Team - Absorbed Costs	803	1 137	1 137	0
Sub-total	1 337	1 809	2 049	240
Licensing and Compliance				
Accelerating and Managing additional applications for 'Top-Up' water allocations	100	0	426	426
Lost revenue as a result of waiving fees to "Top up"	300	0	390	390
Managing Compliance & enforcement of Water Access for Irrigators	180	400	1 178	778
Education Program	100	105	176	71
Water Carryover	100	150	150	0
Meter Reading	135	0	50	50
Sub-total	915	655	2 370	1 715
Monitoring and Scientific Investigations				
Drought Flows Study, Salinity Scenarios	105	110	297	187
Groundwater Availability Angas Bremer	30	30	30	0
Monitoring and Information	20	0	838	838
Sub-total	155	140	1 165	1 025
Wetland Closures	0	0	128	128
Other				
Ral Ral Creek Drought relief	0	0	40	40
Regulations requiring water efficiency plans by Industrial Users of RMW and Regs applying domestic water restrictions	0	0	130	130
Acid sulfate soil mitigation and monitoring	0	0	300	300
Maintain ex-suitu populations of nationally endangered river Murray fish	0	0	50	50
Environmental impact study on proposed Wellington Weir			700	700
Investigate drought refuge options for the Finniss and Currency Creeks	0	0	25	25
Sub-total	0	0	1 245	1 245

WATER SECURITY/DROUGHT MEASURE	2006-07 Estimate/ Actual $'000s	2007-08 Approved $'000s	2007-08 Estimated Outcome $'000s	2007-08 Budget Impact $'000s
Water Sales Lost	**5 900**	**20 240**	**20 240**	**0**
Drought Response				
Communication Education Program	1 587	700	700	**0**
Water Restrictions Officers	635	1 976	1 976	**0**
RAA Hotline	496	440	440	**0**
Additional Burst/Choke Maintenance/PAC	1 586	0	0	**0**
Pumping/Treatment Costs - Additional/(Reduced)	5 100	0	1 820	**1 820**
Other	95	25	25	**0**
Sub-total	9 499	3 141	4 961	**1 820**
Water Security				
Water Quality Investigations	180	225	225	**0**
Bring Forward River Murray Pumping 60 GL	5 000	0	0	**0**
Water filtration plants	0	700	700	**0**
Wellington Weir Investigations	889	667	1 600	933
Pumping Stations Investigations	256	0	0	**0**
Low Lift Pump Stations (Operating Costs)	0	0	167	**167**
Water carting - Streaky Bay	0	0	110	**110**
Increasing No of audits for Water Efficiency	0	0	54	54
Water Licences	457	0	0	**0**
Backup Tankering & Raukkan Temporary Deep Water Intake	107	150	150	**0**
Sub-total	**6 889**	1 742	**3 006**	1 264
Impact of the Drought on Capital Plan				
Kangaroo Island Pipeline	467	0	0	**0**
CWQIP Stage 3^	11 941	48 100	45 956	**(2 144)**
CWQIP Stage 4	0	0	4 700	**4 700**
Hand Held Devices for the Water Conservation Officers	101	0	0	**0**
Clayton Pipeline	80	4 920	5 079	159
Lower Pumping Levels in the River Murray	0	2 000	500	**(1 500)**
Procure and install algal scum booms at high risk intake locations in River Murray	28	0	0	**0**
Install permanent PAC dosing facility at Morgan WTP	123	600	828	228
Mt Pleasant WTP PAC Dosing	0	0	871	871
Minor Plant	39	138	90	**(48)**
Mt Bold Investigations	0	0	1 182	1 182
Desalination Investigations	0	0	1 210	1 210
Sub-total	12 779	55 758	**60 416**	**4 658**
TOTAL	**32 074**	**83 810**	**96 135**	**12 325**

( ) denotes savings against approved budget

WATER SECURITY TASK FORCE

REPORT TO CABINET

September 2007

CONFIDENTIAL AND SUBJECT TO REVISION

Subject to Cabinet consideration

Commercial in confidence

Water Security Task Force – Working paper

TABLE OF CONTENTS

WATER SECURITY 2007/08
AUGUST 2007

EXECUTIVE SUMMARY

To date, the 2007-08 year is tracking as a severe drought, similar to that experienced in 2002-03.

Coming after the record drought of last year, the real risk in 2007-08 has already been realised for irrigated agriculture along the River Murray in South Australia. Production will be severely reduced, and in some cases permanent plantings have gone. If the drought in the Murray-Darling Basin continues, 2008-09 will be a major economic tipping point for permanent plantings, dairying and other irrigated agriculture.

The most significant emerging issue is salinity. As the weather heats up over summer, the risk of algal blooms will also be present. In the low flow conditions presently being experienced, the River Murray is being 'micro-managed.' Entitlement flows for this time of the year would be about 4000 megalitres per day (ML/day). South Australia is currently receiving 1120 ML/day. As a consequence, the river is flowing extremely slowly, increasing the risk of algal blooms, and at very low water levels and drawing in saline intrusions from surrounding ground waters which would be held in check by higher water levels.

Using the 'dilution flow' available to SA, it will be possible to keep river salinity below 1400 EC, and hence palatable, for most of the 2007/08 year.

Below Wellington, salinity, water levels and accessibility to water are already a serious problem that undoubtedly will worsen. The situation for the lower lakes is unlikely to recover in the next three years, and possibly in the next decade. A thorough joint Commonwealth/State examination of the future social, economic and environmental dependencies on the quality and water availability of the lower lakes is now required.

South Australia's critical urban water needs will be met in 2007/08 with a reduced likelihood of a need for level 5 water restrictions, although 2008/09 remains a risk. The allocations set for SA Water's pumping from the River Murray during 2007/08 remain at the minimum level required to meet critical urban supplies under level 5 restrictions, the need for which will be contingent on inflows to the Mt Lofty Ranges catchments during winter and spring 2007. Although the salinity of River Murray water above Wellington will impact on agricultural production in 2007/08, it may only become a problem for urban water supplies (in terms of palatability) in 2008/09.

Current indications are that a decision to commence the construction of a temporary weir near Wellington will not need to be taken before June 2008. Better than expected storage levels and inflows, revised losses and river management have combined to push out the date at which the river falls below the level of SA Water's pump intakes.

SA Water has continued to seek ways of avoiding having to construct a weir at all or, if that's not possible, to minimise the size and cost of the structure. It has been confirmed that SA Water's pump stations can be modified to work to -2.1 m AHD (rather than to the -1.5 m AHD previously calculated). In theory, this means that the size of a temporary weir (if necessary) could be reduced so that the river would be operated at the lower level. However, there is a risk of acid sulphate soil in the river banks being exposed, leading to catastrophic long term contamination of the river channel. The results of work presently being undertaken by the CSIRO are needed before a final decision can be made.

Given the risk of very low storages at the end of this year, the report highlights that securing an end-of-year (31 May 2008) reserve of water in storage to cope with demands during 2008/09 is a critical contingency measure. South Australia requires 201 GL to meet critical urban needs, and considerable more water will be necessary to manage salinity in 2008-09. SA is arguing at the basin level that all critical urban demands should be secured collectively. To date, other jurisdictions are only willing to set aside a reserve covering transmission losses (ie 'transport' water needed to deliver flows to SA) with urban demands to be secured from the market or from South Australia's share of water for dilution and losses. If the SA position for meeting critical urban needs for 2008-09 is not agreed SA will need to secure its own reserve, either by allocating from its share of 2007-08 flows, or by entering the market to attempt to secure additional water at record prices and with a risk that sufficient water cannot be secured.

South Australia should find and secure its own long term, permanent additional water supplies. A number of options, separately or in combination, are being investigated, including:

- Desalination.
- Increasing Mount Lofty Ranges storage (ie Mt Bold).
- Acquiring access to upstream storage either in the Murray-Darling Basin Commission storages, and/or Snowy Mountains Hydro storages.

On the basis that drought conditions may persist through 2007/08, this report also foreshadows contingency planning for 2008/09 and beyond.

It should also be noted that the South Australian River Murray floodplain environment, including its wetlands, is in a perilous state of health. The environmental impacts of prolonged drought conditions have been compounded by many preceding years of river regulation and over allocation across the Murray-Darling Basin system. As such, the environment has lost the resilience to withstand extended dry periods and is now experiencing species and habitat loss, increased saline groundwater intrusions and vegetation death on an unprecedented scale.

Providing for critical environmental needs, assessed on rigorous ecological criteria, is fundamental to the long-term survival of some species and ecological function and to the long-term viability and productivity of the communities and industries that are reliant on a healthy river. This may require the establishment of a specific emergency allocation for the environment.

In summary, the provision of critical urban water supplies from the River Murray during the remainder of 2007/08 appears to be manageable based on the modelling undertaken. Contingency measures already in place mean that critical urban needs will be met in 2007/08 and it is unlikely that a weir needs to be constructed this year. However, significant risks remain for 2008/09. An end of year reserve is needed to secure critical urban needs, and contingency plans still rely on the construction of a temporary weir. Salinity is emerging as a significant risk, particularly for 2008/09.

Action	2007-08	2008-09
Will we meet critical urban demand?	Yes	Yes
Commence building a weir?	No	Possibly
Salinity affecting urban water supply?	Yes, but manageable	Potentially serious, but possibly manageable

Planning is underway to deal with the medium and longer term – that is, from 2008/09 onward. The full range of short, medium and longer term options are summarised in the following table, and discussed in detail in the various sections of this report.

	Demand control measures	Measures to secure supply	Water quality measures
SHORT TERM (2007/08)	Irrigation allocations	Close selected wetlands	Optimal use of dilution flows
	Urban water restrictions	Modify pumping	Preparations against algal blooms
	Industry water efficiency planning	Preparations for a temporary weir	Filtration plants to protect communities from algal blooms
	Restrict irrigators on SA Water system	Pump additional 60 GL into storages	
	Conserve non-mains water	Optimise pumping schedule for 2007/08	
	Rebates	Manage river operations	
		Alternative access to supplies	
		Environmental measures	
		Carry-over provision	

	Demand control measures	Measures to secure supply	Water quality measures
MEDIUM TERM (2008/09 +)		Emergency end-of-year reserve	
		Protect critical environmental assets	Drinking water contingency
		Review Water Proofing Adelaide	
LONG TERM		Desalination	
		Upper Spencer Gulf desalination	
		Increased storage capacity (Mt Bold)	
		National plan for water security	
		Long term strategic reserve of water	

The following recommendations arise from that planning:

1. Support for modelling and monitoring river and lake levels are imperative, particularly once realistic scenarios for 2008/09 are available (section 2.3).

2. Support for ongoing monitoring and modelling of salinities is imperative, particularly with respect to salt discharges and the movement of salt downstream of Lock 1 and the salinity of flow at the South Australian border (section 3.1.1).

3. Support for the development of strategies for river management to match demand, evaporation and local climatic conditions should continue (section 3.1.1).

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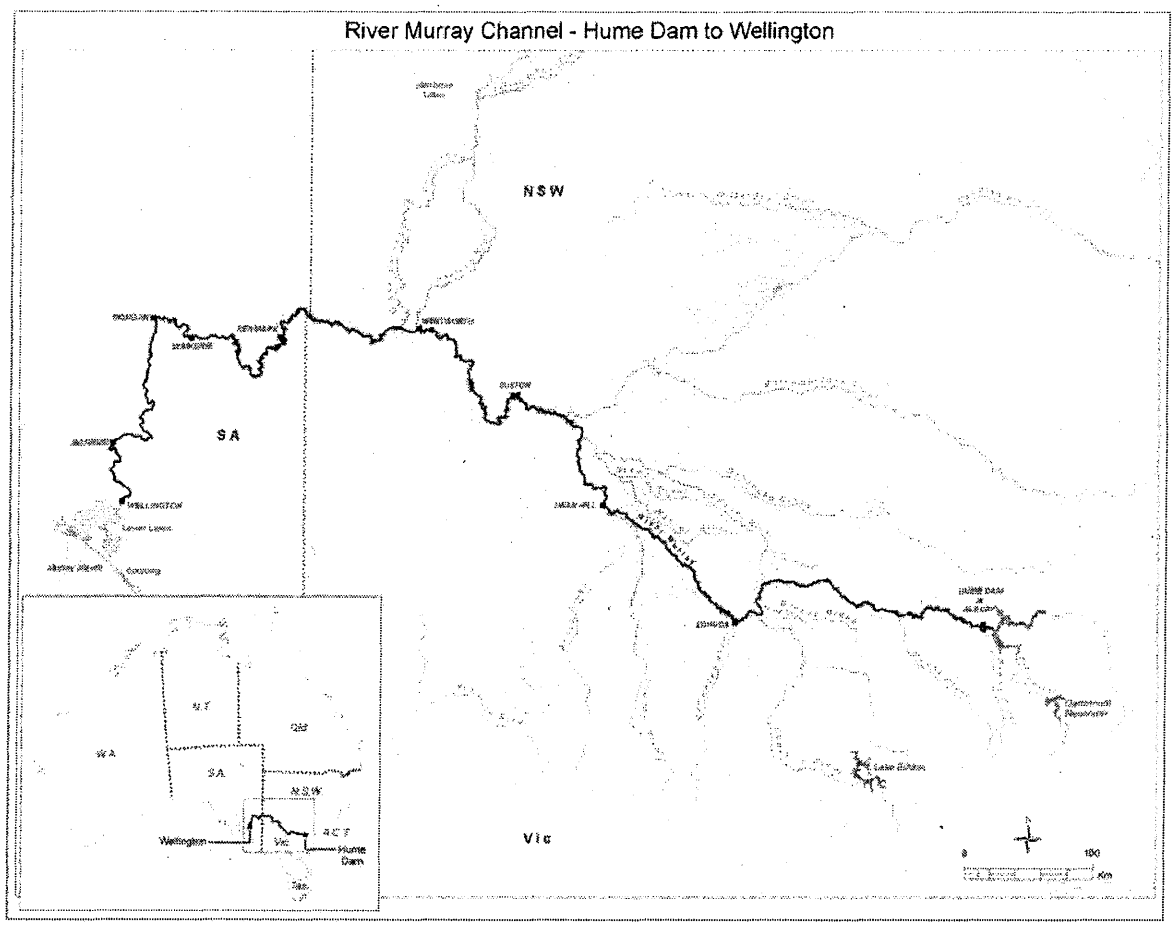
32. Responding to water security related issues as they arise is creating budget pressures for agencies, which will be pursued through the mid-year budget review process and/or by seeking explicit appropriation (section 7.5).

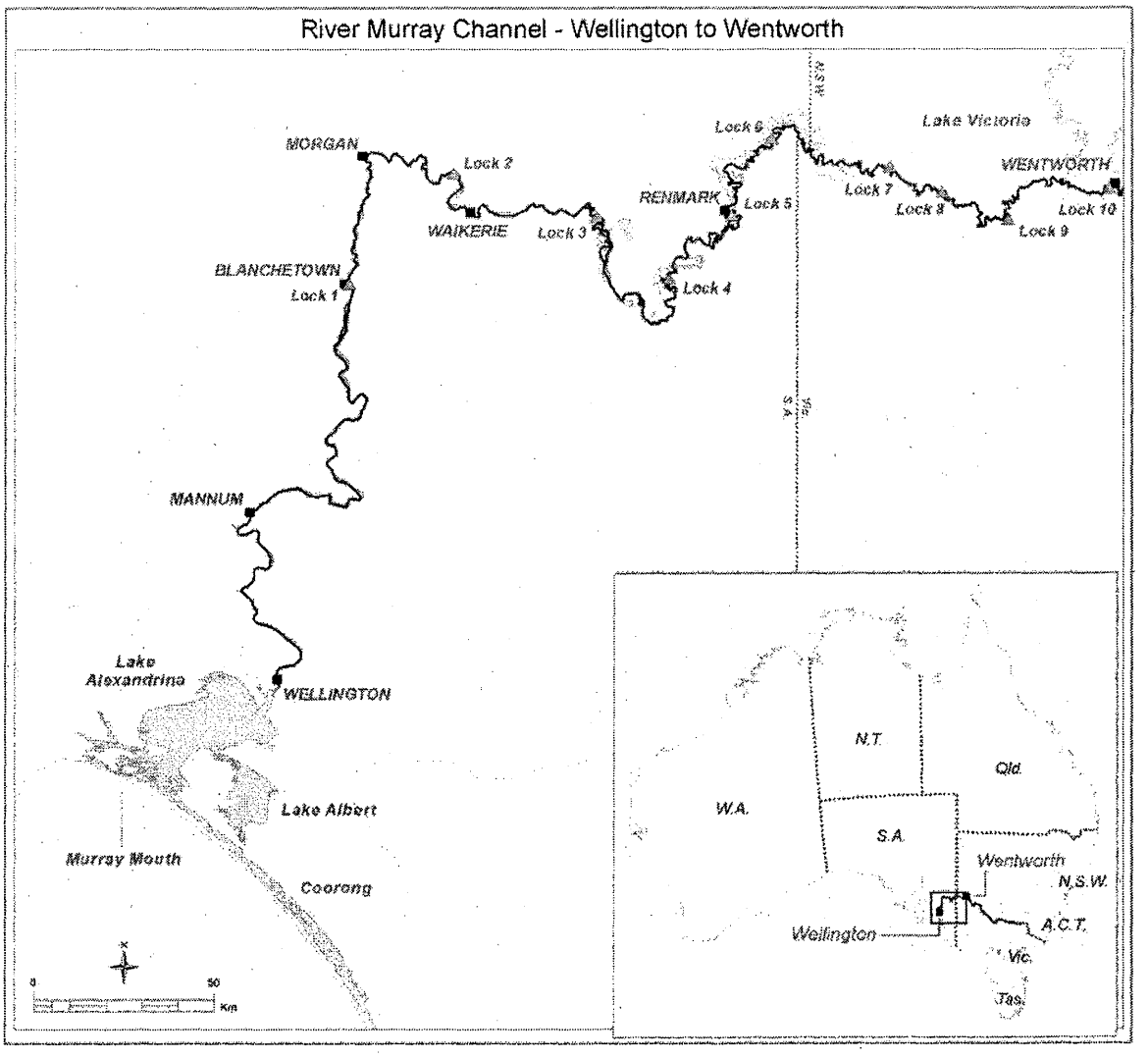
Glossary

AEP	Annual exceedance probability – the probability that a given inflow total will be exceeded in any one year. Minimum inflow corresponds to 100% AEP.
AHD	Australian height datum – national survey datum corresponding approximately to mean sea level.
EC	Electrical conductivity – a measure of water's ability to conduct electricity. EC units are used to express salinity levels in soil and water. When salt is dissolved in water the conductivity increases, so the more salt, the higher the EC value.
Gigalitre	1 billion litres or 1,000 megalitres or approximately 444 Olympic swimming pools
Megalitre	1 million litres, or a volume of approximately half an Olympic swimming pool

Map of the Murray-Darling Basin



Map of the River Murray in South Australia



WATER SECURITY 2007/08

REPORT AND WORKING PAPER
AUGUST 2007

1 BACKGROUND

The 2006/07 year was the driest year on record in both the Murray-Darling basin and the Mount Lofty Ranges – the two sources of water for 95% of South Australians.

In October 2006, the South Australian Government initiated contingency planning to deal with the dry conditions in 2006/07 and the predicted consequences for 2007/08. In November 2006, the Prime Minister convened a water summit which set in motion basin-wide contingency planning by senior officials from the Commonwealth, NSW, Victoria and SA.

In March 2007, the Government commissioned the Desalination Working Group to investigate desalination as a long-term option for securing Adelaide's water supplies. This is in addition to the SA Government's support for the upper Spencer Gulf desalination plant being investigated by BHP Billiton.

Contingency planning within SA and across the basin has resulted in a number of short, medium and long term projects and options for securing South Australia's water supplies. This report provides a progress report those projects, identifies additional emerging issues and highlights a series of policies decisions requiring Cabinet approval. On the basis that drought conditions may persist through 2007/08, this report also foreshadows contingency planning for 2008/09 and beyond.

1.1 Water Security Task Force and Water Security Advisory Group

In October 2006, the Government established the Water Security Task Force, chaired by Mr Paul Case and including the chief executives of the Department of the Premier and Cabinet, Department of Water, Land and Biodiversity Conservation, Primary Industries and Resources SA, Department for Environment and Heritage, Department for Transport, Energy and Infrastructure, Department of Treasury and Finance, Department of Trade and Economic Development and SA Water, to analyse likely water availability scenarios and identify contingency options for consideration by Cabinet. Since that time the Department of Health has been added to the Task Force membership.

To ensure decisions are based on the best possible information and advice, Government also has established a Water Security Advisory Group, chaired by Minister for Water Security, and comprising:

- Mr Don Blackmore – former chief executive of the Murray Darling Basin Commission and previous General Manager of River Murray Water;

- Mr Dennis Flett – former Murray-Darling Commissioner for Victoria, previous General Manager of Murray Goulbourn Water, and currently a consultant with Sinclair Knight Engineering;
- Mr Dennis Hussey – retired water economist (leader in this field in Australia).
- Mr David Wotton – current chairman of the SA Murray-Darling Basin Natural Resource Management Board;
- Mr Jim Hallion, Chief Executive, Department for Transport, Energy and Infrastructure.

Mr Wotton replaced Mr John Scanlon on 1 January 2007, following Mr Scanlon's departure overseas.

The role of the Water Security Advisory Group is to:

- review the work of the task force;
- suggest additional work and ideas, as required;
- review and comment on options presented.

In February 2007, on the recommendation of the Water Security Task Force and Water Security Advisory Group, Cabinet approved a strategy designed to ensure critical water needs would be met in 2007/08, given the record drought conditions in 2006/07. In summary, that strategy included the following key projects:

- Disconnection of selected wetlands to yield 30 GL in water savings (SA MDB NRM Board) (also a basin-wide contingency measure agreed by senior officials – refer below).
- Modifying the major pump stations below Lock 1 to enable them to operate as the river level falls – and to delay for as long as possible the need to construct a temporary weir (SA Water).
- Preparations to construct a temporary weir below Wellington, if necessary (SA Water) (also a basin-wide contingency measure agreed by senior officials – refer below).
- Pumping additional River Murray water into storages during 2006/07 to increase water in storage at the beginning of the 2007/08 year, as well as provide a buffer in the event of algal outbreaks in the river (SA Water) (also a basin-wide contingency measure agreed by senior officials – refer below)..
- Fast-tracking water filtration facilities for 15 communities that presently receive unfiltered River Murray water (SA Water).
- Alternative water supplies:
  - Pipeline to Clayton (SA Water)
  - Standpipes at Meningie, Hindmarsh Island and Narrung.

An update on each of these projects is provide subsequent sections of this report.

1.2 Desalination Working Group

On 6 March 2007, the Government established the Desalination Working Group (DWG) to research and report on:

- How desalination fits with the Water Proofing Adelaide strategy;
- Feasible options and optimal technology for seawater desalination;
- Options for sizing and location, and integration with the existing metropolitan Adelaide water supply system;
- The estimated capital and operating costs of desalination as a resource for metropolitan Adelaide, including funding options and implications;
- Environmental implications of constructing and operating a desalination plant, including in the context of climate change;
- Appropriate arrangements for constructing and operating a desalination plant.

The group is chaired by South Australia's independent Murray-Darling Basin Commissioner, Ian Kowalick, and has representatives of the Department of Treasury and Finance, Department of Transport, Energy and Infrastructure and SA Water.

The DWG is due to report in October 2007. However, its interim report to Cabinet indicated strong interest in desalination for metropolitan Adelaide and in the expansion of the existing Mt Bold reservoir.

1.3 Upper Spencer Gulf desalination

The SA Government supports the Upper Spencer Gulf desalination plant proposed by BHP Billiton. The government is working with BHP Billiton (BHPB) to secure water for the upper Spencer Gulf and northern Eyre Peninsula through desalination. This is covered further in section 6.3.

1.4 Senior Officials Group

The seriousness of the water situation resulted in a water summit being convened by the Prime Minister on 7 November 2006. At that summit senior officials were asked to examine contingency planning to secure urban water supplies for 2007-08 across the Murray-Darling basin.

In January 2007, the Prime Minister and the Premiers of New South Wales (NSW), Victoria and South Australia agreed to the recommendations of the first "*Murray Darling Basin Dry Inflow Contingency Planning Report*" and committed governments to regular reporting on water availability and implementation of contingency planning measures.

First Senior Officials Group report
20 December 2006
(Joint media statement by First Ministers released 12 January 2007)

In their first report to First Ministers, the Senior Officials Group (SOG) developed a range of possible scenarios and contingency plans to provide for priority demands. At that point in time, the shortfall to meet fully restricted critical urban requirements was 442 GL.

A range of water saving measures to cover the shortfall was agreed, including reducing or eliminating normal operational flow and storage targets, early pumping from the River Murray to the Mount Lofty Ranges storages, the disconnection of selected wetlands. In addition, parties agreed to suspend normal rules on the provision of dilution and losses to South Australia, and to continue preparations for the construction of a temporary weir near Wellington.

Second Senior Officials Group report
2 April 2007 (overview released 20 April 2007)

The second (April) report to First Ministers from SOG focussed on sharing the available water resources of the River Murray system for 2007-08. The report predicted, for the worst case scenario of inflows and losses, a volume of water which barely met fully restricted, critical urban needs.

SOG advised that fully restricted, critical urban needs in NSW were estimated to be 75 GL, in Victoria 53 GL and in South Australia 141 GL (taking into account 60 GL of early pumping into storages), a total of 269 GL to meet critical needs.

SOG further advised that to meet critical needs, certain measures would need to be implemented, including the closure of wetlands along the River Murray and the early pumping of 60 GL of water to the Mount Lofty Ranges storages. In addition, parties agreed that unless there was a significant improvement to storage levels, all outside water use for domestic purposes would be prohibited from 1 July 2007.

Third Senior Officials Group report
May 2007 (overview released 20 June 2007)

The third SOG report advised First Ministers that the water resource situation for the River Murray system remained critical, albeit with a marginal improvement since April 2007. At that time it was still possible that allocations for anything other than critical needs would be zero or very small.

The report focused on a range of issues, the key ones being a method for sharing additional resources (above critical needs) if these become available, and the need for some flexibility to allocate water in exceptional circumstances.

SOG proposed to First Ministers that the first 492 GL of improvement above the level of critical urban needs (269 GL) up until there is 761 GL of additional water available, each of the three States will receive 120 GL. Another 120 GL would be provided to

South Australia for dilution and losses and 13 GL repaid to the River Murray increased flows account for use for environmental purposes.

Of the next 739 GL of improvement above the level of critical urban needs (ie a total allocation of 1500 GL), 25% would be allocated to dilution and losses in South Australia, with the remaining 75% allocated to the three States in such a way that most rapidly allows the resumption of normal water sharing arrangements.

The next 700 GL of improvement above the level of critical urban needs (ie a total allocation of 2200 GL), is to be allocated in accordance with normal water sharing arrangements, with two provisos:

- The volumes already allocated to any State for diversion must not be reduced;
- 50% of the sum of the additional volumes which would be allocated to NSW and Victoria according to the normal water sharing arrangements must instead be allocated to South Australia.

These recommendations have had the effect of South Australia giving up water earlier on (in the extreme low probability range of inflows) to provide water for NSW and Victoria, and as improvements occur (in the higher probability range of inflows) NSW and Victoria give up water to South Australia to balance earlier contributions.

All jurisdictions were experiencing cases where prohibition of the taking of water from the River Murray system for some essential non-human needs would have lead to undue social and economic impacts. It was agreed that as long as States remained within their respective caps to meet fully restricted, critical urban needs, there should be some flexibility within agreed guidelines to allocate water to meet essential non-human needs.

The water sharing arrangement agreed in the third SOG report is represented graphically in the following diagram. The graph also indicates (vertical dashed line) water allocations made so far in the 2007/08 water year.

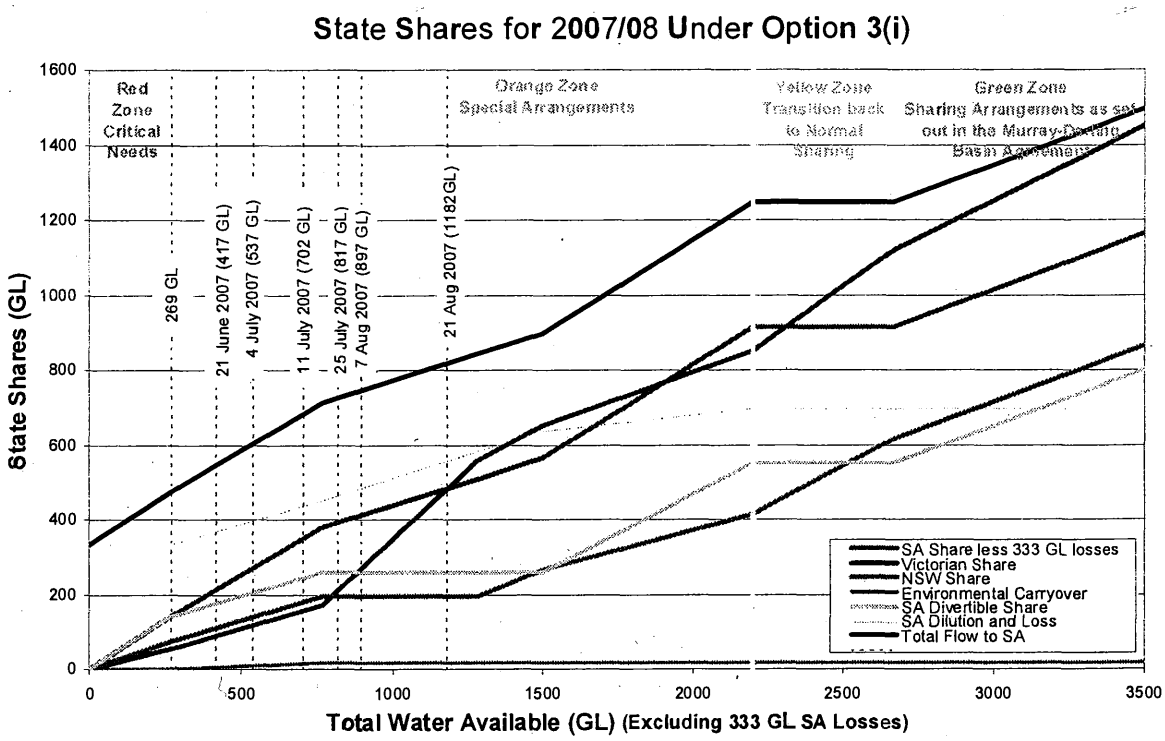


Figure 1 State shares for 2007/08

Senior Officials Group Update
June 2007 (released 17 July 2007)

This report simply updates First ministers on the current outlook which remains grim.

The report also notes the allocation of the first level of improved inflows above the level of critical urban needs (269 GL) of 148 GL, where NSW, Victoria and South Australia received 36 GL each for allocation, and the remaining 36 GL being provided to South Australia for dilution and losses.

SOG advised First Ministers that their next report would consider the case for setting aside some of the improved flows in 2007-08 for the delivery of critical urban needs for 2008-09.

Fourth Senior Officials Group Report
7 September (overview yet to be released)

SOG reported to First Ministers that the 2007-08 water availability outlook for the southern basin system is serious and has deteriorated through August.

SOG has made nine recommendations to First Ministers, of which recommendations 6 and 7 are of key importance to South Australia:

On **unregulated flows**, SOG invited First Ministers to:

6. NOTE that unregulated flows which occur in the southern Basin system while operating under the special water sharing arrangements agreed by First Ministers on 20 June 2007, will be managed as follows:

   I. Each State may use up to one third of forecast unregulated flows (as declared by the Murray-Darling Basin Commission in a 'unregulated flow forecast determination') to address its priority needs, including facilitation of water delivery for those purposes.

   II. To the extent it is practicable, flows unable to be captured for these purposes will be directed to highest priority river recovery and environmental watering needs.

South Australia had sought a 'hands off' approach to unregulated flows; however, the above recommendation will not seriously disadvantage the State.

On the need for an **end** of year (**31 May 08**) **reserve in storage**, SOG invited First Ministers to:

7. AGREE measures be taken in 2007-08 to ensure there is enough water available to run the river and for critical needs in 2008-09, as follows:
   I. In managing issues around dry inflow planning, markets should be used to the maximum extent possible.
   II. Arrangements (including the possibility of establishing a 'collective' reserve) should be established by the Murray-Darling Basin Commission in 2007-08 to ensure there is sufficient water in 2008-09 to enable operation of the river and delivery of agreed flows (including 696 GL dilution flow to South Australia), as well as provisions to manage projected poor water quality (particularly salinity and algal blooms).
   III. To assist South Australia to store additional reserves, South Australia should be permitted to store reserves in NSW and Victorian airspace in Murray System storages. (It is noted that South Australia is able to access some or all of the volume needed to meet critical requirements from volumes provided for dilution and loss purposes.) To assist the ACT, storage arrangements may need to be negotiated with NSW and Snowy Hydro Ltd.
   IV. Operational decisions on the measures to be adopted, including the source, volume and timing of establishing a collective reserve should be made by the Murray-Darling Basin Commission in September 2007, taking into account SOG recommendations.
   V. Jurisdictions are encouraged to allow water to be carried over from 2007-08 to 2008-09, which would be available in storages from the beginning of the 2008-09 water year. South Australian carryover held in NSW and Victorian airspace in Murray System storages should have the same priority for delivery as NSW and Victorian carryover. Delivery of any carry-over will depend on having sufficient water available to meet transmission losses.

In effect, part II of this recommendation promotes a 'collective reserve' to be held in storage at the end of May 2008 which, combined with predicted worst case catchment inflows with projected releases from Snowy Hydro Limited storages, would provide SA with a minimum inflow across the border of 696 GL.

Part III of recommendation 7 provides for South Australia to draw from the 696 GL the fully restricted urban demand of 201 GL.

If adopted, this would be a superior result achieved during SOG negotiations than what was initially proposed, and would provide some improvement in the situation for both South Australian irrigators during the remainder of 2007-08, and for the security of South Australian urban supplies in 2008-09.

However, it appears that Victoria has rejected this recommendation.

1.5 Summary of actions underway

The various projects and initiatives of the Water Security Task Force and Desalination Working Group (within South Australia) and the Senior Officials Group (basin-wide) are summarised in the following table.

It can be seen that projects are underway to deal with water security in the short term (2007/08) and long term (approximately 2011/12 onward), and to deal with the medium term years until long term initiatives come on stream (2008/09 until about 2010/11).

The projects are also appropriately spread across initiatives to reduce or modify the demand for water, secure existing or identify additional water supplies and dealing with any water quality problems that are predicted to emerge.

Note that some of the short term projects have ongoing benefits into the future – for example, changes in consumer water use brought about by water restrictions, education and/or rebates will have lasting benefits.

Table 1 Summary of actions underway

	Demand control measures	Measures to secure supply	Water quality measures
SHORT TERM (2007/08)	Reduced irrigation allocations	Close selected wetlands	Optimal use of dilution flows to minimise salinity increases
	Urban water restrictions	Modify pumping stations to operate at lower water levels	Preparations against algal blooms

	Demand control measures	Measures to secure supply	Water quality measures
	Industry water efficiency planning	Preparations for a temporary weir	Filtration plants to help protect river communities from algal blooms
	Restrict irrigators on SA Water system	Pump additional 60 GL into storages	
	Conserve non-mains water	Optimise pumping schedule for 2007/08	
	Rebates to encourage efficient water use	Manage river operations	
		Alternative access to supplies	
		Environmental measures	
		Carry-over provision	
MEDIUM TERM (2008/09 +)	Demand control measures	Emergency end-of-year reserve	Contingency planning for drinking water
		Protect critical environmental assets	
		Review Water Proofing Adelaide strategy	
LONG TERM		Desalination	
		Increased local storage capacity (Mt Bold)	
		Upper Spencer Gulf desalination	
		National plan for water security	
		Long term strategic reserve of water	

2 OUTLOOK FOR 2007/08

2.1 Climate forecast

The Bureau of Meteorology reports that winter across much of southern Australia has been dry, coming on top of dry conditions since 2002. Although autumn began positively, winter rains did not follow through. This has been exacerbated by record warm temperatures. Autumn and winter rainfall is shown in Figure 2.

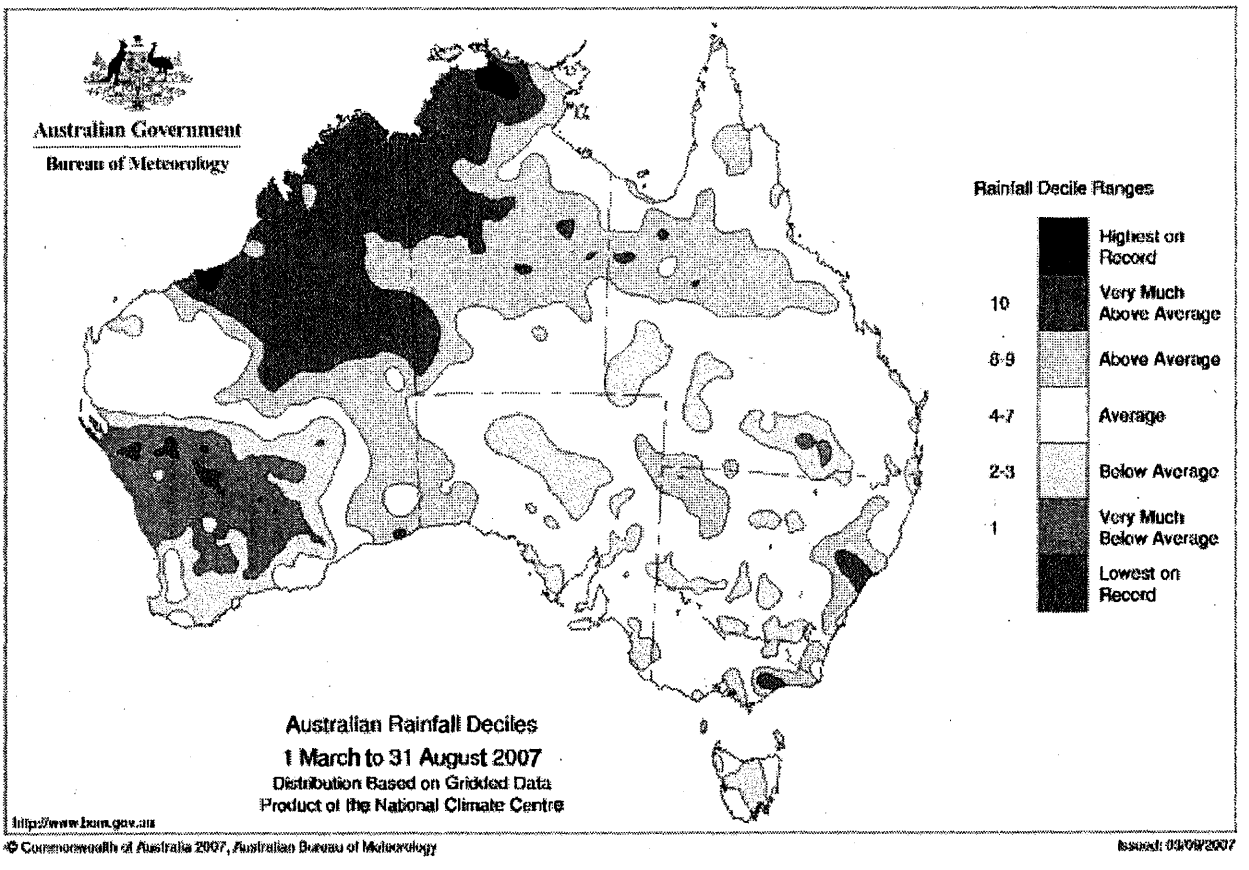


Figure 2 Rainfall March to August 2007

For south-eastern Australia, the outlook for spring (September to November) rainfall, generally shows no strong swings in the odds towards wetter or drier conditions. However, there is a moderate shift in the odds favouring a drier than average spring in some parts of SA, Victoria and Tasmania.

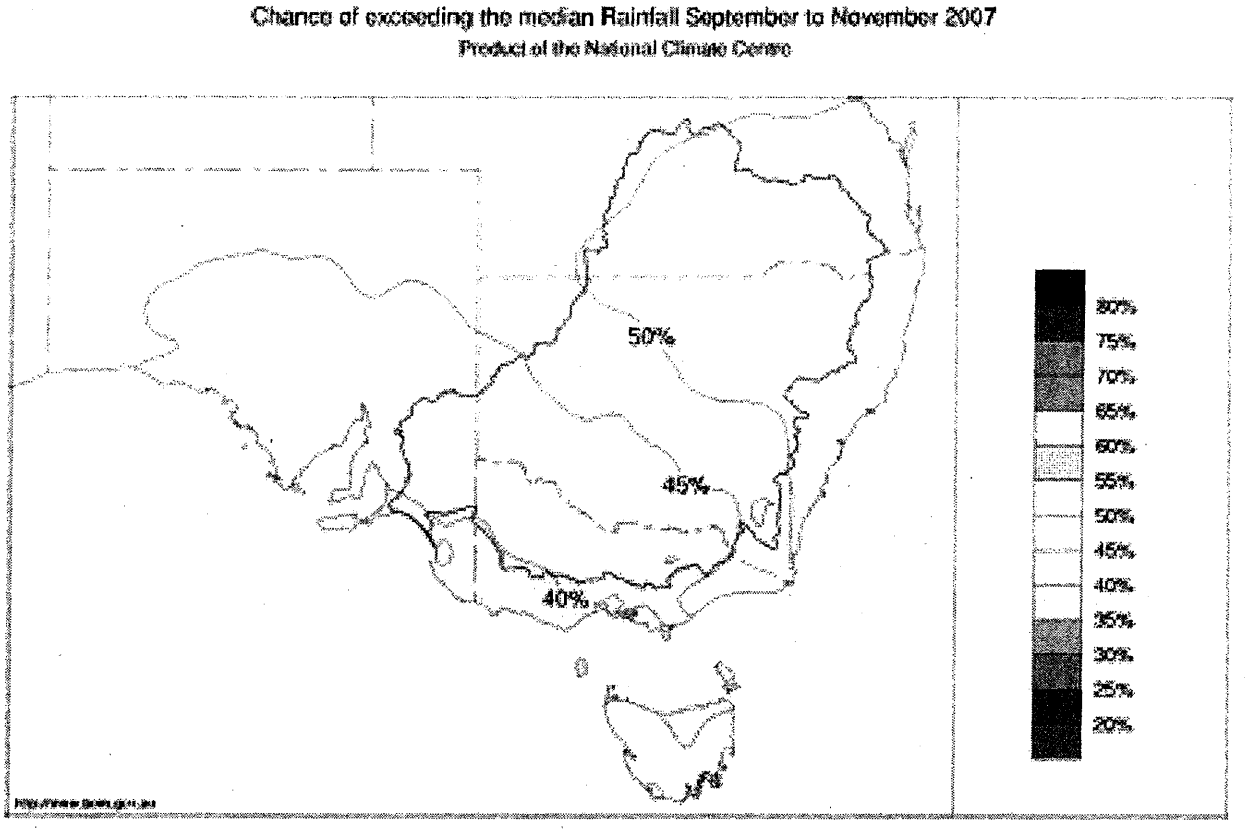


Figure 3 Chances of exceeding median rainfall in spring 2007

The chances of exceeding the median rainfall for the September to November period are between 35 and 40% in the southeast of South Australia together with parts of western and southern Victoria, and northern Tasmania (see Figure 3). This means that below-normal falls have a 60 to 65% chance of occurring. So in years with ocean patterns like the current ones, about six springs out of ten are expected to be drier than average in these parts of southeast Australia, while about four out of ten are expected to be wetter.

Over NSW and the remaining parts of SA, Victoria and Tasmania, the chances of accumulating at least average rain for spring are relatively close to 50%.

Although a period of El Niña weather patterns can be followed by a La Niña (high rainfall) event, indications are also that there is only "neutral" to weak chance of a La Niña event occurring.

South-eastern seasonal temperature outlook for spring 2007

The outlook for maximum temperatures in south-eastern Australia averaged over spring (September to November) shows a moderate shift in the odds favouring higher than average temperatures across Victoria and parts of South Australia.

Averaged over spring, the chances are between 60 and 65% for above-normal maximum temperatures over much of Victoria and adjacent areas of eastern and south-eastern SA (see Figure 4).

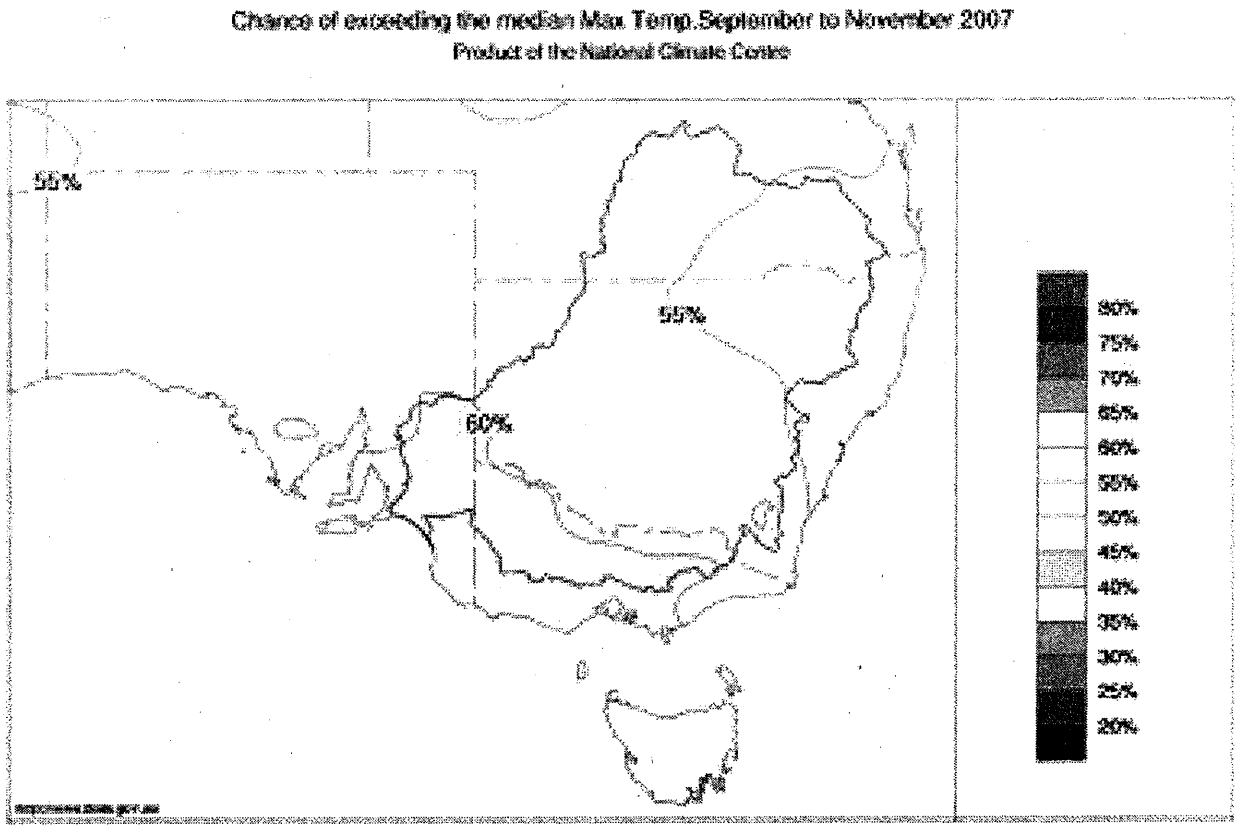


Figure 4 Chances of exceeding median maximum temperatures – spring 2007

So in years with ocean patterns like the current ones, about six September to November periods out of every ten are expected to be warmer than average over these parts of southeast Australia, with about four out of ten being cooler. In remaining areas, the chances of exceeding the average spring maximum temperature are between 50 and 60%.

2.2 Latest inflow predictions

2.2.1 MURRAY-DARLING BASIN – GENERAL OUTLOOK

Dartmouth Dam was built in the 1970's to improve the reliability of the Murray Darling Basin system. It supplements releases from Hume Dam and increases supplies to the River Murray system which is particularly important in dry seasons.

The Murray Darling Basin Agreement, however, is primarily focused on meeting the current year's demand for water, rather than taking a multi-year outlook. Clause 100 of the Agreement specifies that a minimum reserve of no more than 835 GL must be retained each year, a very small amount compared to the long term average diversions which currently exceed 4000 GL per year. As a result, the volume of water retained in MDBC storages is generally governed by the level of demand rather than any pro-active reserve strategy and there is no adaptive management of reserves during extended dry periods.

This is demonstrated by diversions from the system over the last 7 years, as shown in Figure 5.

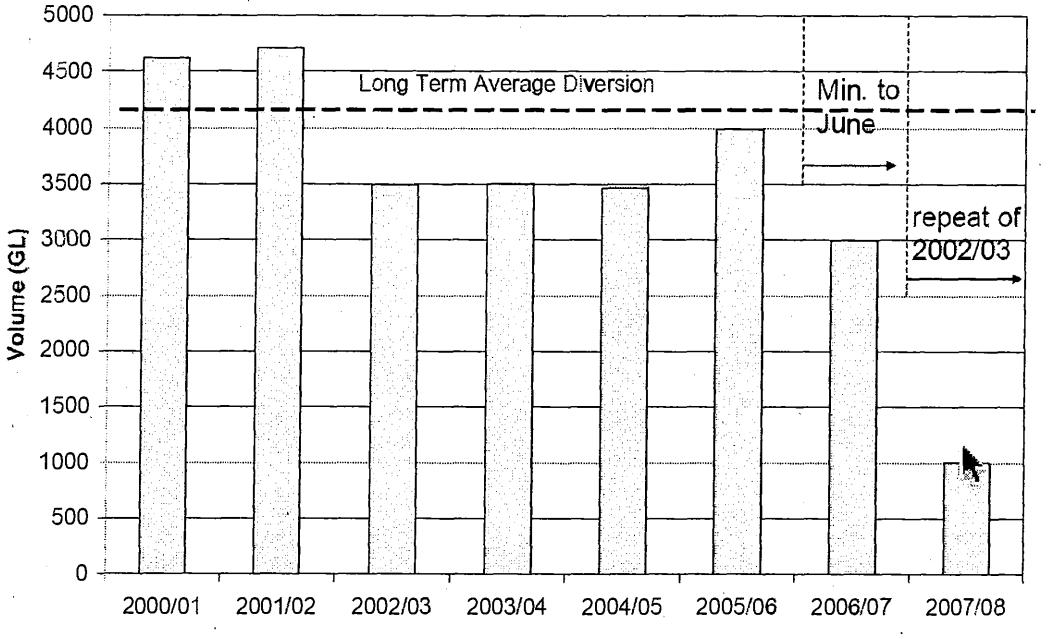


Figure 5 Total River Murray system diversions (Source: Murray-Darling Basin Commission)

The chart shows the net result of the current management paradigm - diversions were not reduced sufficiently during a period of drought to offset inflows less than 50% of the long-term average and we have ended the driest period on record with little or no water in storage in the Murray Darling Basin. The inherent weakness of the management framework that has been in place for many years has been exposed by the drought. The MDBC was not able to act to anticipate what could happen if we had a record-breaking drought, i.e. the Murray Darling Basin Agreement has not enabled contingency planning for improbable, but possible, events.

Clearly it is very important to ensure that any new arrangements will be better at managing diversions and at ensuring that there is adequate warning of the need to reduce diversions to deal with drought conditions.

It has taken six years of drought to deplete the MDBC storages to the extent that special arrangements need to be made just to supply the very small volumes required to meet critical human needs. Recovery of the storage could take a similar period.

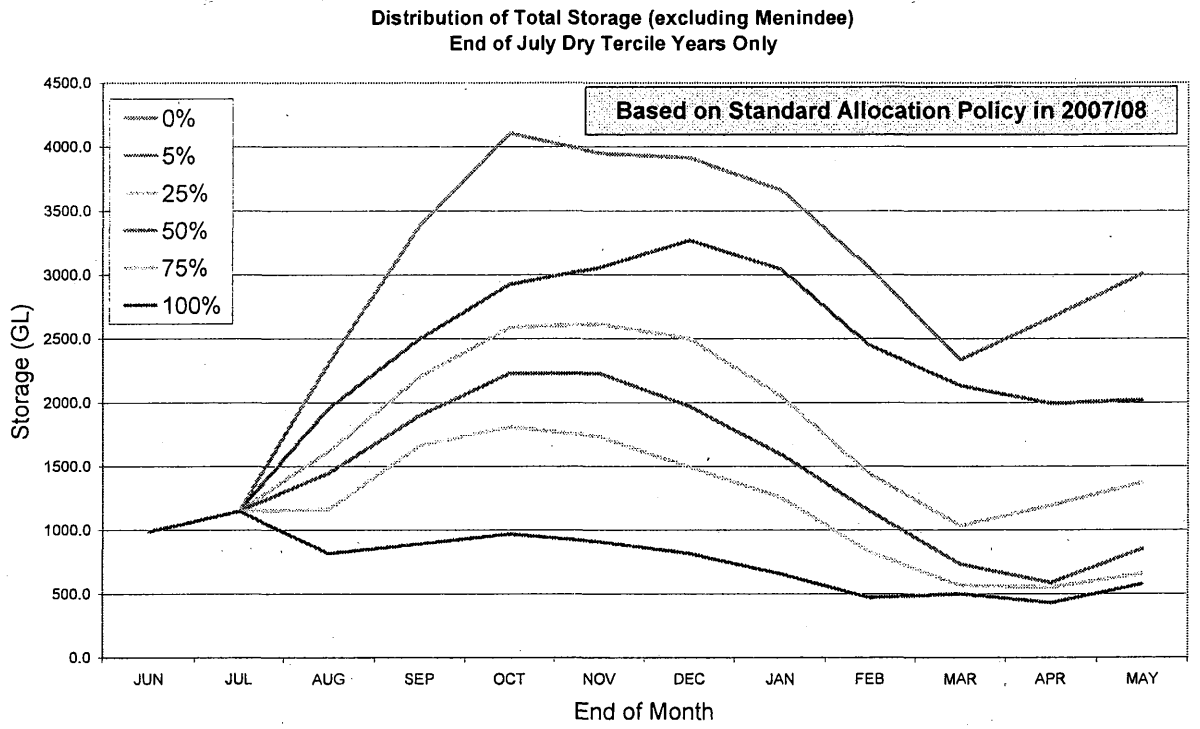


Figure 6 Distribution of total MDBC storage (Source: Murray-Darling Basin Commission)

Figure 6 shows expected changes in total MDBC storage levels for different inflow conditions for 2007/08, based on the standard water allocation policy. For average conditions (50% probability of exceedance) or worse the volume of water in storage at the end of the year will be less than at the start of the year. Even with very good conditions (5% probability of exceedance) the storages would only recover to around 2000 GL compared to the average level of more than 4500 GL at the end of the year.

Figure 6 is based on normal water sharing arrangements, and the outcome could change if special arrangements are made to specifically reserve water to recover the MDBC storages to normal levels. At this stage it appears that the only water that will be held back in an emergency end-of-year reserve will be the minimum amount required to supply critical human demands in the following year. This is likely to be around 1000 GL, or the same volume that was in storage at the start of 2007/08.

It is evident that a series of average to good years will not lead to recovery. It will take "drought breaking" conditions in the MDB catchments before any real improvement is seen. This could well take a number of years. During this period, the availability of water for Adelaide will be heavily dependent on intakes in the Mt Lofty Ranges, and on-going restrictions can be expected.

2.2.2 MURRAY-DARLING BASIN INFLOWS

A total inflow of 357 GL (excluding Snowy Hydro releases) was received into the Murray-Darling basin storages during August 2007 compared to 101 GL during August 2006, and well below the long-term average of 1 480 GL. The inflows over the last three months have been better than at the same time last year due to

continuing base flows but are still less than 25% of long term average inflows for the same period, Importantly the volume of water in storage is much lower resulting in the total resources available being significantly lower than at the same time last year. At the end of August 2007 the storage volume was approximately 2000 GL (21% capacity) compared to 3610 GL (38% capacity) at the same time last year. The long-term average storage volume for the end of August is 6 690 GL (71% capacity).

The total River Murray system inflow since June 2007 (excluding Snowy Hydro releases) has been only 1000 GL. If these inflow conditions were to persist at this level, and based on the assumptions used by the Murray-Darling Basin Commission (MDBC), there is a significant chance that storages at the end of May 2008 will be virtually empty. With an outlook for below median rainfall for the September to November period the chances of receiving high inflows remains extremely low. After having a dry May to July (inclusive) there is approximately a 63% chance of continuing low inflows for the remainder of the year.

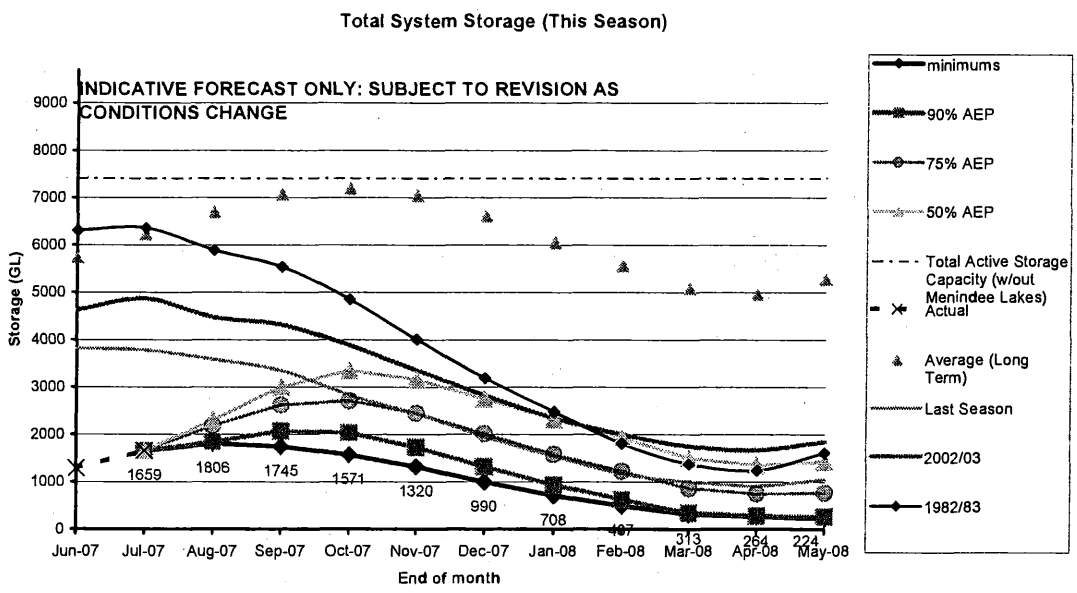


Figure 7 Forecast storage operations

The MDBC has provided updated predictions at different probabilities of the possible entitlement flow scenarios that may be received at the South Australian border by the end of June 2008. These predictions are based on a dry-tercile multi-history analysis of the end of July 2007 accounts and adjusted to reflect the revised water sharing arrangements agreed by First Ministers. The dry-tercile analysis is being used as the 2007 autumn period was extremely dry and there is a very strong correlation between a dry autumn and low total inflows for the full year. The predictions for flows by the end of June 2008 are:

100% AEP new minimum = 814 GL (since increased to 820 GL)
90% AEP 9 in 10 chance = 1 247 GL
75% AEP 3 in 4 chance = 1 255 GL
50% AEP 1 in 2 chance = 1 371 GL

The forecast flows do not take into account an emergency end-of-year reserve for South Australia and unregulated flows, which are likely under the wetter cases but the volumes cannot be confirmed. The Senior Officials Group is currently discussing options for the sharing of unregulated flows should they occur during 2007-08.

Based on the end of August water resource assessment the current predicted minimum flow to South Australia for 2007-08 is 828 GL. This assumes minimum inflows for the rest of the year. Total inflows to the Murray system for the year (since 1 June 2007) have equated to approximately 90% dry inflow conditions. Under these low inflow probabilities the likelihood of South Australia receiving significant unregulated flows in addition to the predicted entitlement flow figures is low.

Under the sharing rules agreed by First Ministers, the predicted total flow to South Australia of 828 GL provides for a total of 120 GL available for consumptive diversions and 234 GL available for dilution and river restoration.

2.2.3 MT LOFTY RANGES

Figure 8 shows that, although intakes in the Mt Lofty Ranges in July 2007 were close to the level 'budgeted' by SA Water (60% AEP) due to good rainfall, intakes in August were worse than the extreme drought level.

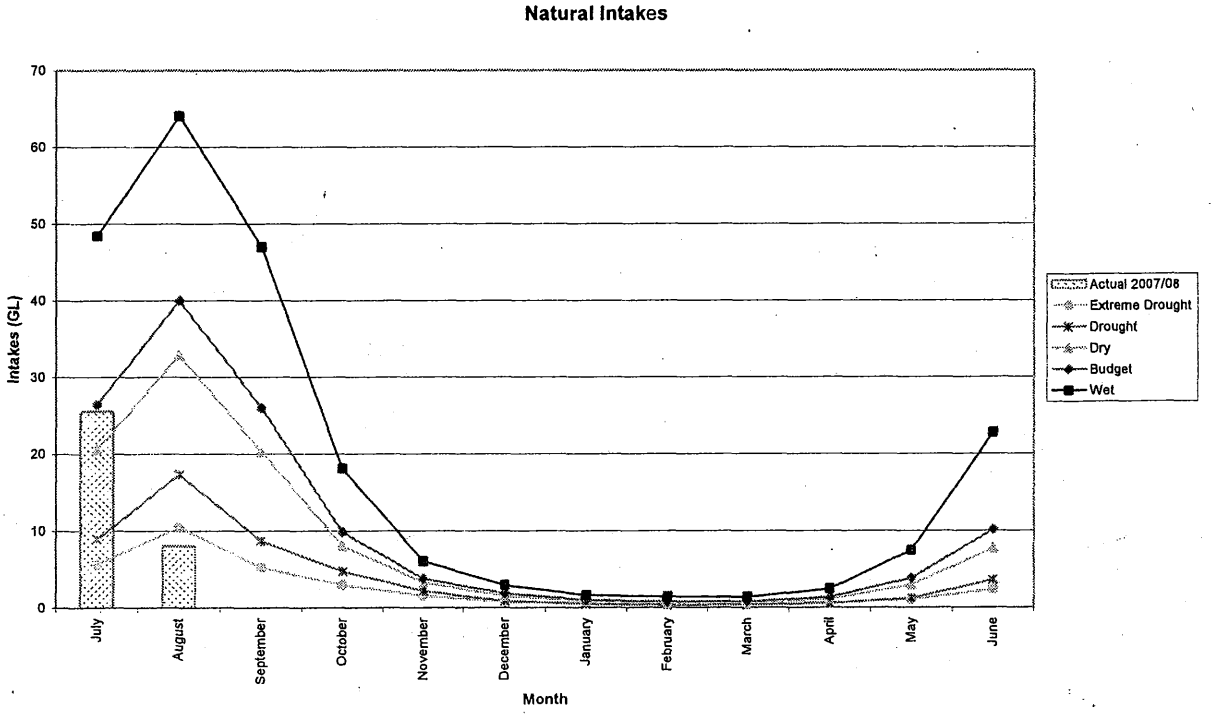


Figure 8 Intakes into Mt Lofty Ranges storages by month

Figure 9 below shows that, overall, Mt Lofty Ranges intakes are at drought level. In this chart, cumulative intakes from the Mt Lofty Ranges catchment (green bars) are plotted against predicted intakes in extreme drought through to wet scenarios. It can be seen that, as at the end of August, natural intakes are presently tracking at drought levels.

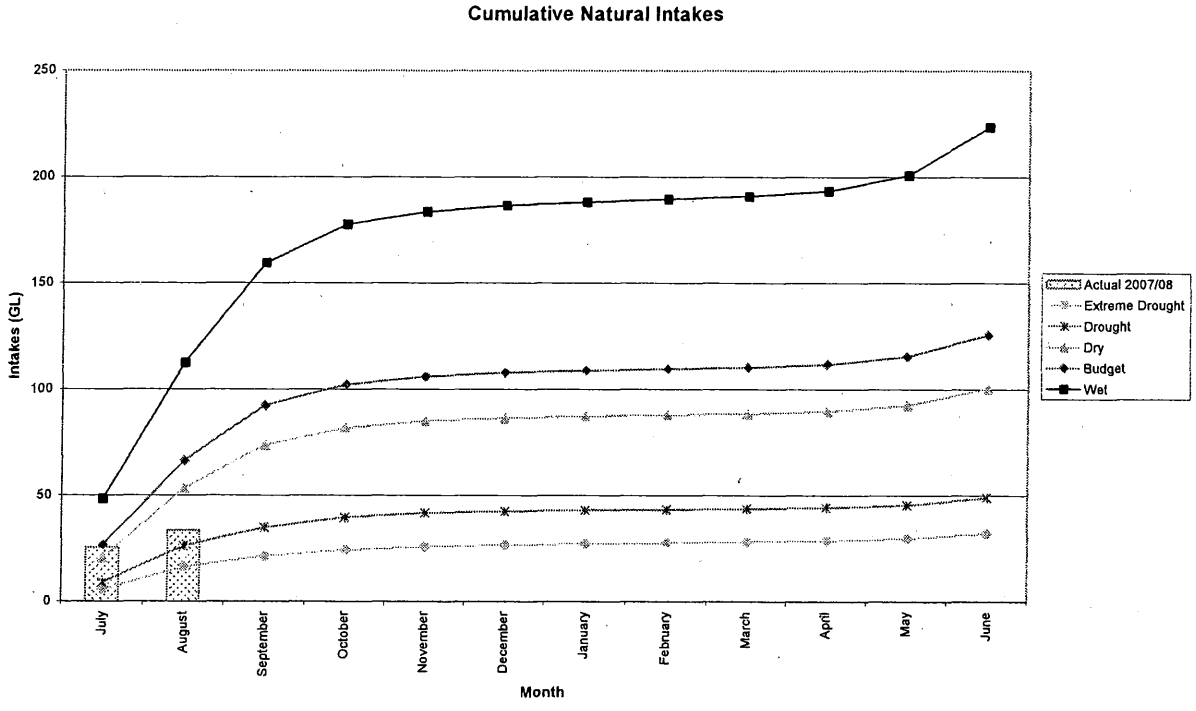


Figure 9 Cumulative natural intakes from Mt Lofty Ranges catchments

2.3 Modelling of water availability below Lock 1

The Dry Inflow Contingency Plan 2007/08 developed by the Senior Officials' Group (SOG) in December 2006 included a worst case scenario, defined as a repeat of 2006/07 catchment inflows, and resulted in a flow of 337 GL at the SA border. In April 2007, SOG updated this figure to 474 GL. More recent analyses by the MDBC based on current resource availability, has resulted in a series of resource improvement scenarios that translate into increased flow at the SA border. These have been analysed to evaluate potential changes in river and lake levels below Lock 1 and increases in salinity within SA.

Flow and salinity modelling has been undertaken using the MDBC BigMod model of the River Murray. Projections of river levels and subsequently salinity levels require a number of critical assumptions regarding flows, salt discharge, rainfall, evaporation losses, diversions (metropolitan Adelaide, country towns, domestic, stock and irrigation water supply).

Four scenarios for flow at the SA border based on probabilities for system inflows were evaluated as shown in Table 2 and were provided by MDBC for the period 1 July 2007 to 30 June 2008 from a dry tercile multi-history analysis. The annual exceedence probability (AEP) defines the probability of the occurrence of flow above the magnitude of that shown, for example, there is a 90% probability that the flow at the SA border will be greater than 1247 GL. The flows in Table 2 consist of entitlement only and do not include any unregulated flows.

Table 2 Entitlement flow scenarios

Scenario	Flow at SA border (GL)
100% AEP	814
90% AEP	1247
75% AEP	1255
50% AEP	1371

For each scenario, the required flow for each month was determined using the current agreed sharing rules, critical urban demands, losses (mean and worst case, the latter defined as a repeat of the maximum net evaporation year (1982) on record), allocations for irrigation, delivery of dilution flow and the need for a reserve for 2008/09 critical urban demands. Potential allocations were calculated based on the intra-annual timing of water availability.

Results are presented below for maximum net evaporation (1982) conditions and suggest that even under a 50% probability flow, water levels below Lock 1 and in the lower lakes could reach -0.45 m AHD by the end of 2007/08.

There are difficulties in presenting projections for a year in advance because the combination of assumptions can become quite complex. It is even more difficult to project further, such as into the 2008/09 water year.

At the beginning of July 2008, water levels in the lower lakes are likely to be low, even under the 50% AEP scenario. While some improvement can be expected during winter, if similar flows occur during 2008/09 then the water levels will continue to drop. Between September 2006 and May 2007 the lake level reduced by 0.75 m. A lowering of around 0.65 m is projected for next summer under the 50% AEP scenario shown, meaning that if similar flows occurred during 2008/09 then a further lowering of 0.65 m is possibly during the following summer. The average evaporation from the lower lakes is in the order of 700 to 800 GL per year (depending on water level). Inflows to the lakes would need to be at least this in order to just maintain water level.

In summary, without increased flows, salinities will continue to increase, particularly in the Lower River Murray below Lock 1 and the lower lakes, which is at the end of the system where the general benefit flow through is not available.

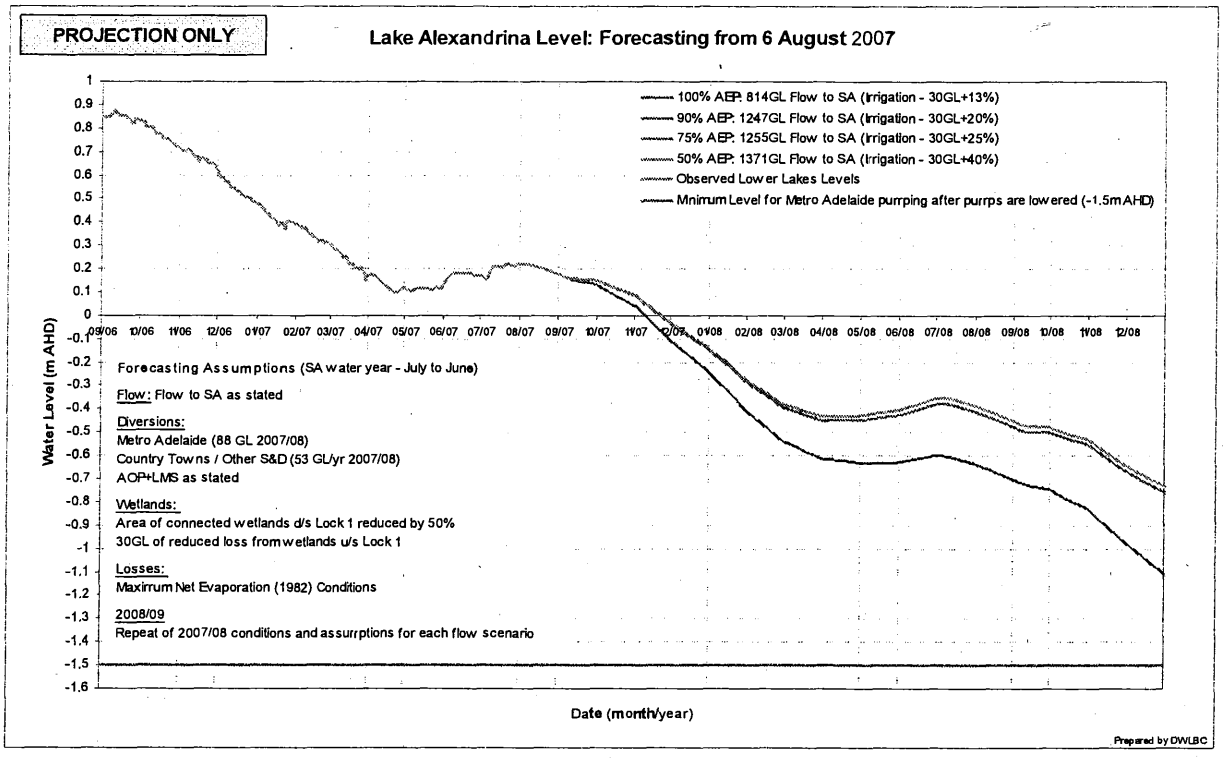


Figure 10 Lake Alexandrina draw down

A full size copy of Figure 10 is attached on page 112.

Recommendation:

Support for modelling and monitoring river and lake levels are imperative, particularly once realistic scenarios for 2008/09 are available.

2.4 Demands for water

While previously provided in the December 2006 report, for convenience the demands for water within South Australia are set out below.

2.4.1 URBAN SUPPLIES

In a normal year, SA Water provides between 200 GL and 250 GL per year to customers throughout South Australia, depending primarily on climatic conditions. On average 65% of this water is used by residential customers, 6% by commercial customers, 9% for industrial uses, 15% for primary production, 1% for non-commercial uses and 4% other uses including recreation areas and public institutions.

Approximately 50% of all residential use is considered to be used outdoors, but this amount can vary significantly from property to property depending on the number of occupants.

The key pipelines taking water from the River Murray for Adelaide and country South Australia are listed in appendix 1 on page 111.

Adelaide

The greater Adelaide area from Myponga in the south to the Barossa Valley in the north is served by water from two sources, natural intakes in the Mt Lofty Ranges and water piped from the River Murray from Mannum and Murray Bridge. Over the last 10 years the average extraction from the river has been 97 GL per year, while 118 GL per year has been harvested in the Mt Lofty Ranges.

While the consumer demand in Adelaide only varies by less than ±10% from year to year, the proportion from each of the two sources varies in accordance with the climatic conditions in the Mt Lofty Ranges, where natural run off can vary from as low as 30 GL to over 350 GL per year.

There are 10 storage reservoirs in the Mt Lofty Ranges with a total capacity of around 1 year supply, which is considerably less than storages for Sydney or Melbourne. Adelaide's local Mt Lofty Ranges catchments also have a much lower yield than catchments supplying the eastern states' capitals. As a consequence, demand and supply for Adelaide's water system is balanced annually rather than being managed on a multi-year basis as for the eastern capitals.

The reliability of Adelaide's water supply depends heavily on the storages within the Murray Darling Basin being able to deliver water to Adelaide when there is low intakes in the Mt Lofty Ranges.

Country South Australia

Except for the South East, the Far North and parts of Eyre Peninsula, which are served by independent groundwater sources, the remaining rural areas in South Australia are highly dependent on the River Murray. There are 26 local townships served directly from the river, including major centres such as Berri, Barmera, Loxton and Renmark. While these 26 local townships only use on average 6 GL of water per year, their location is such that it is very difficult to find alternative sources of water.

Critical urban needs

Minimum requirements for urban, stock and domestic water from the River Murray are based upon the assumptions that:

- Level 5 restrictions are in place across SA (ie no outside watering);
- Minimum inflows into Mt Lofty storages of 30GL;
- No environmental flows are returned in the Mt Lofty Ranges.

On this basis, 201GL of allocations from the River Murray will be needed to supply basic urban, stock and domestic needs – 181GL via SA Water supply, and 20GL sourced directly from the River.

2.4.2 PRIMARY PRODUCTION

In an average year, gross regional product (GRP) of the River Murray irrigation regions is estimated to be just over $2 billion. Irrigated agriculture in the region directly contributes $362 million (18%) to GRP, or around 0.7 per cent of gross state product[1].

A large proportion of the horticulture and viticulture is processed within the region. When including these processing activities and other impacted sectors such as transport, irrigated agriculture contributes $570 million (28%) to GRP[2]. This activity employs more than 7,770 PTEs, representing nearly 30 per cent of the region's total employment[2].

Irrigated agriculture from the River Murray in South Australia is heavily reliant on a secure water supply. Apart from some vegetable production such as potatoes and onions, many of the inputs into production are fixed (including delivery infrastructure, fruit trees, grape vines, on farm dairy infrastructure), and have a largely fixed demand for irrigation water for production. The demand for irrigation water by crop is summarised below in table 2.

Table 2: **Irrigated water** demands **in SA**

	Minimum Water Requirement (ML/ha)	Normal Water Requirement (ML/ha)	Aggregate Minimum Water Requirement (GL)	Aggregate Normal Water Requirement [(a)] (GL)
Citrus	5	10.2	39	80
Riverland Wine Grapes	2.5	8.2	59	193
Lakes Wine Grapes	0.4	2.5	3	19
Almonds	5.5	12.3	20	45
Stone Fruit	4	12.4	7	22
Swamps Pasture	4	9.6	18	43
Lakes & Other Pasture	3	9.6	21	68
Vegetables				19
		TOTAL	167	489

Around 489 GL of River Murray water is used by South Australian irrigators in an average production year, from an allocation totalling around 570 GL. Farm gate gross value of irrigated agriculture production along the River Murray in South Australia was estimated to be around $550 million in 2005/06. Around half this output came from wine grapes, with significant output from almonds, citrus, vegetables, dairy and stone fruit.

In 2006/07, with water restrictions at 60% of allocation, irrigated agricultural output fell significantly, totalling around an estimated $475 million. The fall in output was not as great as the proportionate allocation restriction due mainly to water trade and irrigator farm management responses. There were significant falls in output from wine grapes (including frost damage), vegetables and irrigated pasture activities.

[1] EconSearch (2004); The Economic Impact of Drought and Water Restrictions on River Murray Irrigation Industries and Regions, July 2004.

2.4.3 INDUSTRY

All industrial use of River Murray water, irrespective of whether it is obtained via SA Water infrastructure or pumped directly from the river under a water licence, is provided for under the 201 gigalitres allocated for critical urban needs under the worst-case scenario for South Australia.

The water used by SA Water industrial/ commercial customers is accounted for in the 181 gigalitres allocated for metropolitan Adelaide and country towns under the worst-case scenario. Licensed industrial use of River Murray water (with 100% access) amounts to approximately 5.5 gigalitres per annum and is accounted for under the 20 gigalitres allocated for stock and domestic water use (both licensed and riparian) under the worst-case scenario.

2.4.4 ENVIRONMENT

During 2006/07, the regulating structures on 27 managed wetlands were closed early to achieve evaporative savings of around 15 gigalitres. Early closure was at variance with the accredited water management regimes for those sites and it was recognised at the time that prolonged closure could result in serious long-term ecological damage as a result of saline groundwater intrusion, acidification and vegetation health decline. Ongoing savings from managed wetlands beyond 2006/07 were not factored into any water resource assessments. Some sites are now showing signs of ecological decline and it is imperative that they are refilled to prevent long-term ecological damage. A minimum volume of 7 gigalitres is required to refill and provide for annual evaporative losses to managed wetlands that are currently exhibiting signs of stress.

Currently 12.8 gigalitres of environmental water is set aside at the Basin wide level for use during 2007/08 at the Living Murray icon sites. This water is outside water allocated to SA and is the full carry-over amount from River Murray increased flows (Snowy water). Following the annual MDBC Environmental Watering Group (EWG) water bid meeting on 2 July, watering actions were prioritised across icon sites. Highest priority actions include pumping to four sites on the Chowilla floodplain (2 gigalitres) and barrage fishway releases between September 2007 and February 2008 (5.6 gigalitres). Fishway releases will only occur if appropriate lake levels can be maintained.

Re-watering of river red gum sites watered during 2005/06 is a high priority use for environmental water. Total water requirements are around **3** gigalitres. This would require pumping of water into bunded floodplain areas.

The Coorong is critically stressed due to an absence of freshwater flows into the estuarine area adjacent to the barrages. Barrage releases to remove salt from the lakes provide opportunities to achieve the dual objective of freshening and extending the area of the Coorong estuary. Any releases should be undertaken to optimise these dual objectives.

3 ISSUES ARISING SINCE LAST REPORT TO CABINET

3.1 Salinity

3.1.1 PREDICTED SALINITY LEVELS

The modelling of four scenarios for increased flow at the SA border described in section 2.2 also produced salinity projections within SA.

Under entitlement flow conditions when all weir pool water levels vary within their normal operating range, base load salt inflows remain generally constant. However, as the river level below Lock 1 drops, additional salt discharges are likely. The amount of additional salt discharging into the river is directly linked to the river level drawdown itself, although salt discharge is likely to lag river level drawdown. A regional groundwater model developed by DWLBC was used to determine the additional salt entering the river due to groundwater discharge for a given drawdown scenario.

Results at a number of locations for the scenarios modelled are presented below for the maximum net evaporation (1982) conditions. Salinities in the Lower River Murray could reach 1000 to 1200 EC by the end of 2007.

Flows in the River Murray in SA have been low for a number of months and travel times for water in the river have increased, leading to the higher salinities observed. The movement of salt and the continuing increases in salinity are evident in the modelled results. For example, under the 100% AEP scenario of 814 GL it can be seen that salinity at Morgan is projected to peak at 1020 EC in early October. This peak then moves downstream, accumulating more salt and reaching Swan Reach in early November (1100 EC), Mannum in mid-January (1300 EC) and Murray Bridge in later February (1400 EC).

The longer the flows remain low, the higher the likely salinities, particularly in the reaches containing the Metro Adelaide and Country Town pipelines. With the higher flow scenarios the reduction in peak salinity at these locations is evident. Although the salinity may rise more quickly as the already accumulated salt is pushed through the system, this higher salinity water will be replaced by water with less accumulated salt and the salinity should then decrease.

Although it is difficult to project salinities into 2008/09, salinities during the initial months of 2008/09 are likely to be influenced by the salt inflows during 2007/08 and hence the salt still travelling down the river. The magnitude of salinity peaks will likely be determined by how soon increased flows reach SA. If resources are as low at the beginning of 2008/09 as they were in 2007/08 and low flows occur during the first few months of the water year then it would be expected that salinities in the lower sections of the river would increase more rapidly than is predicted for 2007/08 as a result of salt already in the river.

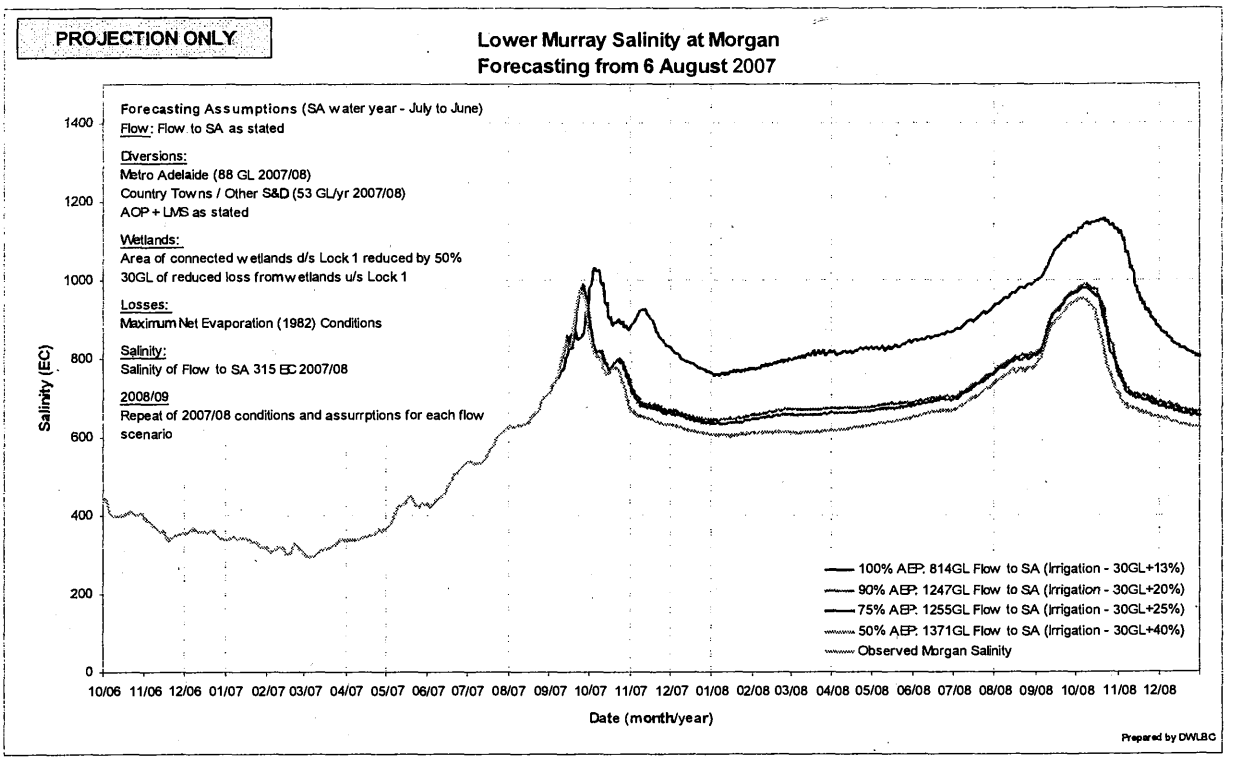


Figure 11 Salinity at Morgan

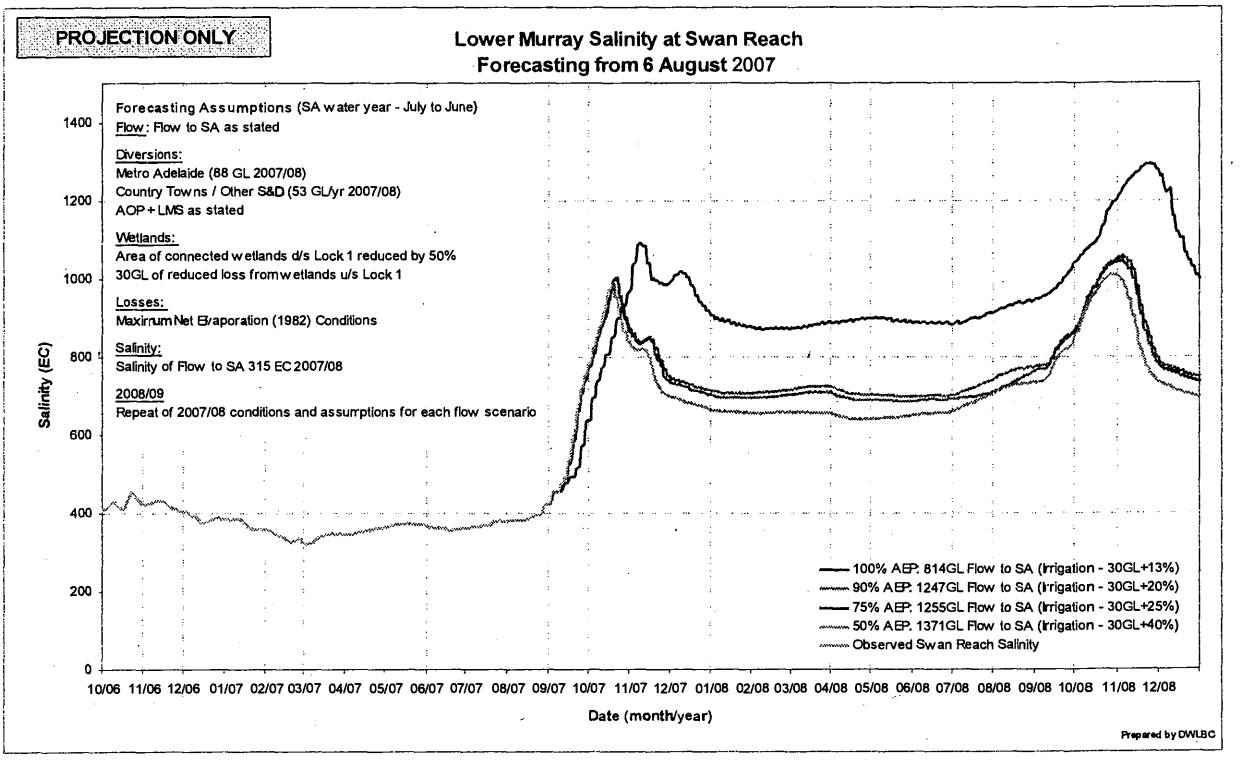


Figure 12 Salinity at Swan Reach

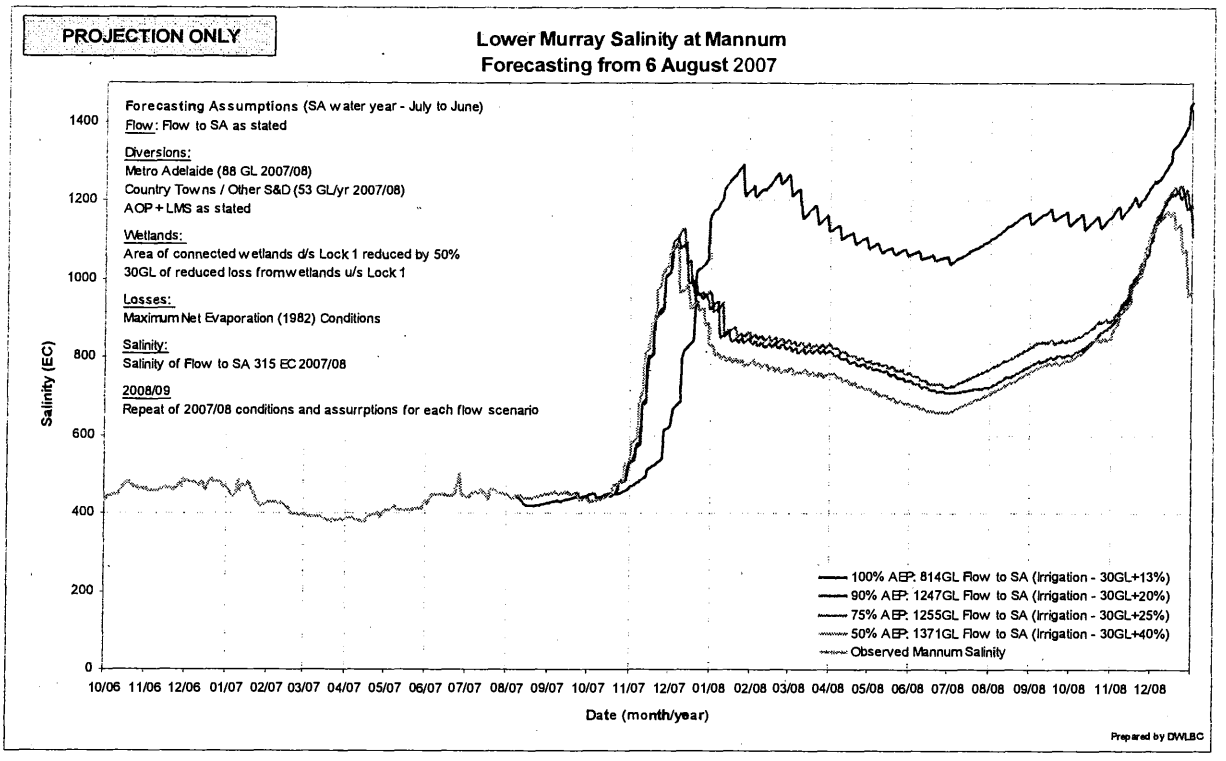


Figure 13 Salinity at Mannum

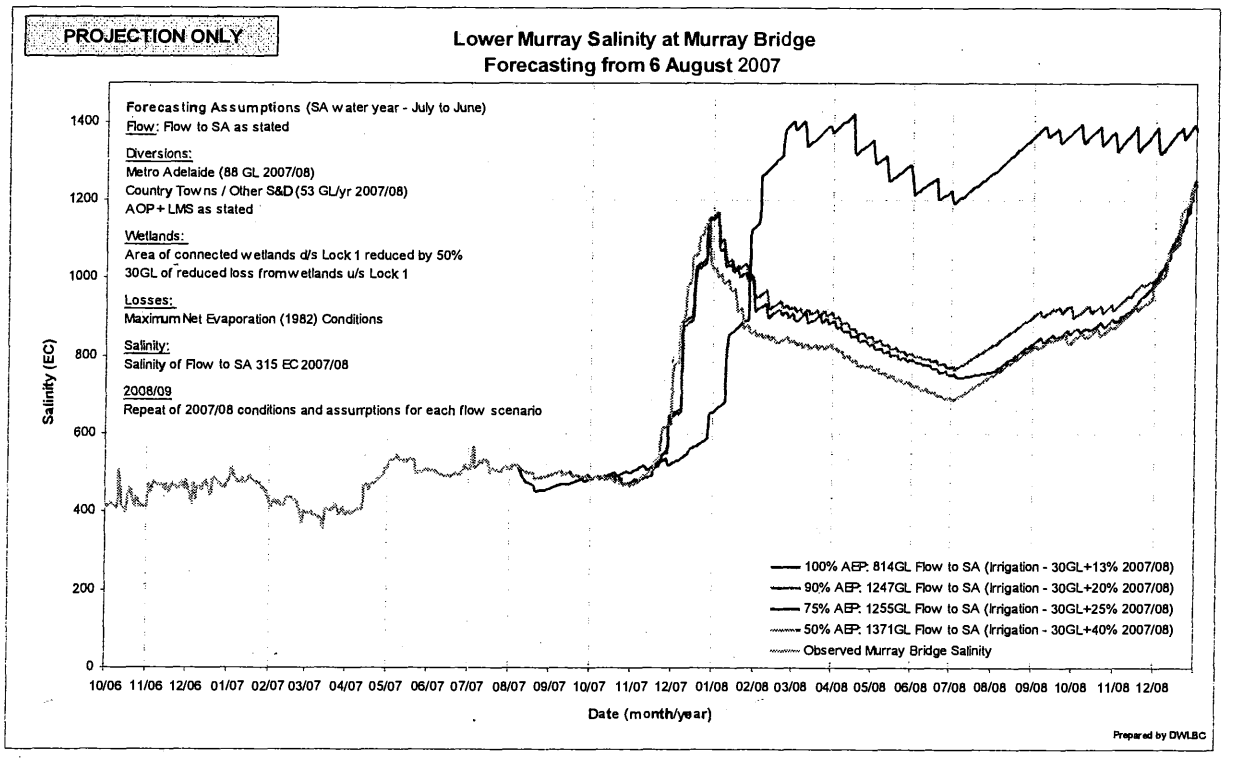


Figure 14 Salinity at Murray Bridge

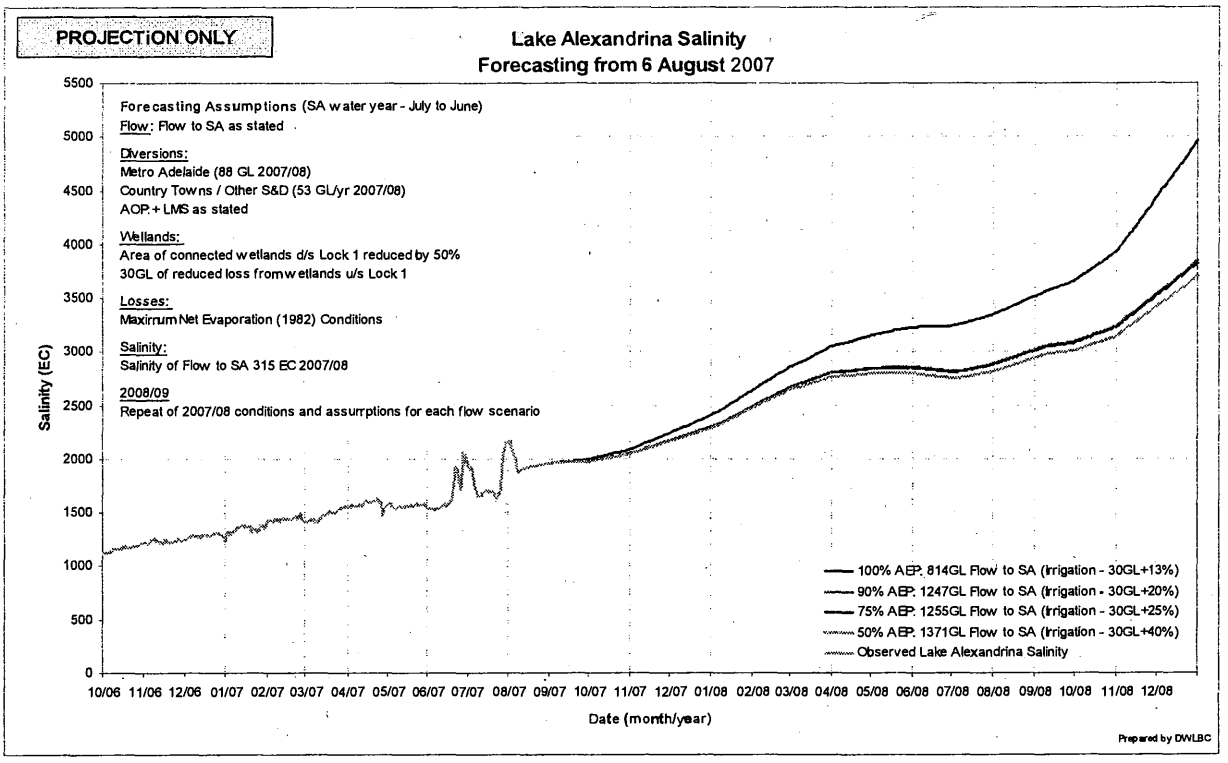


Figure 15 Salinity in Lake Alexandrina

Full size copies of the graphs above are attached from page 113.

South Australia's modelling of salinity has been validated in joint work with the MDBC. The results of the joint salinity modelling – which are consistent with the above modelling results – were presented to the Senior Officials Group on 14 September 2007. SA argued strongly for additional water to mitigate against higher salinity and further work is being undertaken to determine how an appropriate reserve can be accumulated to cover critical urban needs and water quality requirements.

Recommendations:

Support for ongoing monitoring and modelling of salinities is imperative, particularly with respect to salt discharges and the movement of salt downstream of Lock 1 and the salinity of flow at the South Australian border.

Support for the development of strategies for river management to match demand, evaporation and local climatic conditions should continue.

3.1.2 IMPACTS OF HIGH SALINITY – PRIMARY PRODUCTION

The following observations are based on the most recent River Murray salinity forecasting figures provided by DWLBC. Higher salinity levels are being experienced

in the lower lakes near the barrages due to seawater intrusion. The potential impacts outlined below assume continuing low flow scenarios; any increase in flows will lessen these impacts.

An emerging issue of concern is the rate and extent of salinity increases in the lower lakes due, primarily, to seawater intrusion up from the barrages. While there are other potential water quality issues for this lake system salinity remains the more significant at this time. The uncertainty is whether this saline front could eventually reach and impact water off-takes up the river (Tailem Bend, Murray Bridge and Mannum) and when this could occur. This and other potential issues arising from deteriorating water quality within the lower lakes are being investigated and monitored

Irrigation impacts - The severity of salinity impacts on irrigators will depend on the magnitude of salinity increases and the type of agriculture undertaken. Major impacts are expected for lower lakes' irrigators as salinity levels are predicted to rise above thresholds at which many crops will suffer yield declines. In the Lower Murray (Mannum-Wellington) region the predicted salinity increases (above 1000 EC) may cause impacts on pastures and some sensitive vegetable crops (e.g. lettuces) Large areas (ca. 4200 ha) of pasture are flood-irrigated in the Lower Murray region. In the upper river (Riverland), impacts are likely to be low-moderate as the salinity levels are below thresholds for impacts on the predominant horticulture crops (e.g. fruit trees, vines) grown in this region.

Estimating the economic impact of the predicted salinity increases on irrigators is not straightforward, as the impact is influenced by all of the following factors: crop type, soil type, irrigation system, leaching fraction and quantity of water applied. The study by McLean, Biswas and Schrale (2007) showed that with normal water applications, a range of soil types and assuming the water salinity level at Morgan was 1000EC, the losses from all irrigated crops from Sunraysia to the lower lakes varied between $70 and $110 million, depending on leaching efficiency (100% and 70% respectively). The economic impact will be most severe in the lower lakes where salinity rises are greatest. The information above relates to the impact of saline conditions on productivity. Irrespective of salinity levels, if the absolute quantity of water available for irrigation remains low, the production of crops will be reduced to varying degrees, A reduction to 0.4ML/Ha for vines, 3ML/Ha for Lucerne pasture and 4 ML/Ha for Swamp pasture in the lower lakes area will keep crops alive but result in zero yield. The current water allocation (13%) may not meet these minimum requirements. In the case of livestock farming, additional feed costs may well be high and possibly uneconomic.

Stock watering impacts - The maximum saline concentration water can reach before livestock production begins to be impacted is 3600EC for pigs and poultry and 5400EC for dairy cattle. Beef cattle production begins to be impacted after salinity levels reach 7100EC. Younger stock may have lower salinity tolerances.

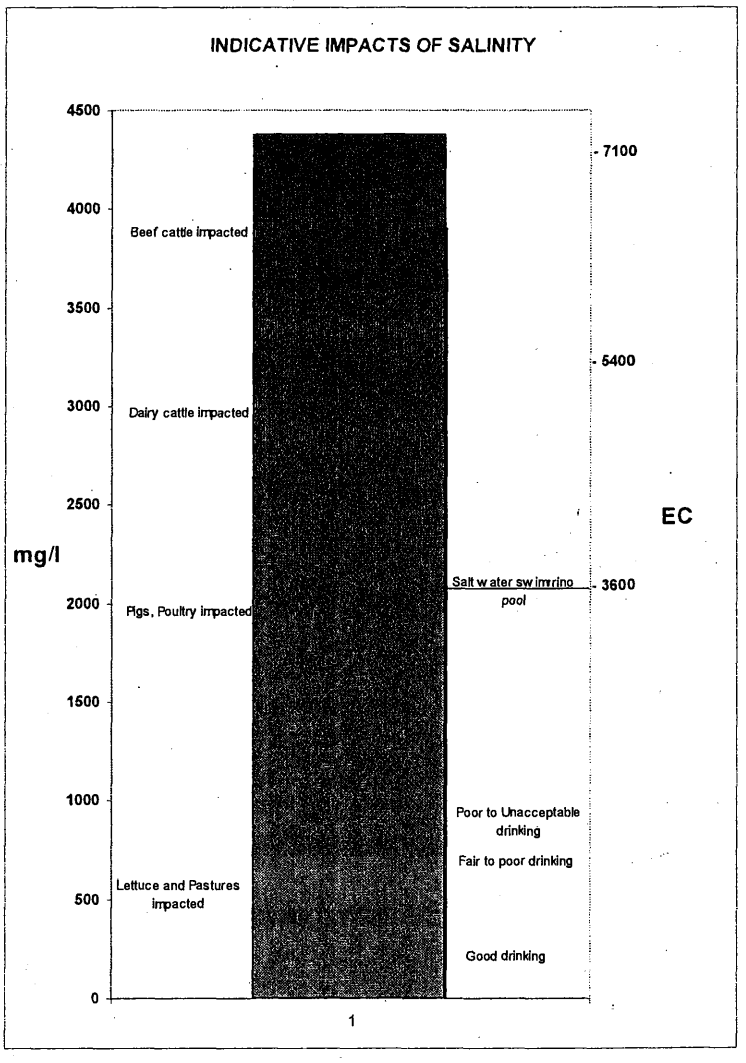
The main river channel salinity is predicted to remain at levels which are satisfactory for stock purposes. The salinity of Lake Alexandrina near the barrages is already at levels (>7000 EC) that stock water quality is impacted and alternative water supplies are being sourced. The salinity in other areas of the lakes (2000-2500 EC) is

currently suitable for stock watering but impacts will become more widespread as salinity further increases.

The dairy industry in the lower lakes area consists of 15 dairy operators producing 39ML of milk from 5700 dairy cows. The milk production is valued at $15.6 million. Other livestock production in the region is valued at $19 million. If suitable quality water can not be obtained this industry will be severely impacted. Small desalination plants are currently being investigated by some stock owners to address this issue. A desalination plant producing 6kL/hr has an estimated capital cost of $70,000 (plus installation, electricity connection, discharge infrastructure) and an annual operating cost of $7000/yr. The present need for these plants appears to be limited to the lower lakes, particularly Lake Albert, near barrages, and eastern side of Lake Alexandrina.

3.1.3 IMPACTS OF HIGH SALINITY – URBAN

In drinking water, total dissolved solids (TDS) are used as a measure of salinity and are expressed in mg/L. TDS include sodium, potassium, calcium and magnesium cations and chloride, sulphate, bicarbonate, carbonate and nitrate anions. TDS are commonly quantified by measuring the electrical conductivity (EC) of the solution (in µS/cm) and then converting EC units to mg/L by applying a multiplication factor. The factor for River Murray water is approximately 0.6, meaning that TDS (as mg/L) is 60% of the EC (as µS /cm). As a general rule, the drinking water industry refers to mg/L while irrigators refer to EC units.



Increases in salinity (TDS) concentrations will impact on the quality and acceptability of water for drinking and other purposes, and may potentially lead to salinities beyond drinkable levels. Evidence suggests that TDS in the range 1000 - 2000 mg/L increasingly renders water unpalatable. Most would regard TDS higher than 2000 mg/L un-drinkable. The Department of Health in conjunction with SA Water is currently developing an upper limit for drinking water TDS. As part of the review, the

Department of Health is investigating the health impacts of individual constituents of TDS, such as sodium. However, this investigation is not likely to change the position on health impact or palatability ranges (referred to above) in terms of TDS and EC values.

Public health impacts – There has been no credible evidence linking high concentrations of salt (total dissolved solids, TDS) in drinking water to detrimental health outcomes. However increases in salinity concentrations will impact on the quality and acceptability of water for drinking and other purposes. The essential issue is that salinity increases decrease the palatability of drinking water. The Australian Drinking Water Guidelines categorise drinking water palatability in relation to total dissolved solids (TDS) concentration as:

< 830 EC – good,
830 – 1330 EC – fair,
1330 – 1670 EC – poor, and
> 1670 EC – unacceptable[2].

The World Health Organization has not set specific limits but also note that as concentrations increase above 2000 EC, the water will become increasingly unpalatable

Median TDS concentrations in the River Murray (to Tailem Bend) have historically been mostly below 830 EC. TDS concentrations are predicted to increase above this level by December 2007, and peak at 1400 EC at Murray Bridge under worst case scenarios. This increase could cause some public concern depending on the rate of salinity increase and individual people's sensitivity to it. The impact could be particularly felt in areas receiving water directly from the River Murray (not able to be diluted with Mt Lofty ranges reservoir water). It is noted that some rural centres that do not source water from the River Murray in South Australia are already receiving water with salinities > 1400 EC. This needs to be considered in making decisions about impacts of TDS in River Murray drinking water supplies.

Based on the current salinity forecasts (up to June 2008), TDS levels greater than 1670 EC are not predicted to be reached for the major River Murray supplies. It is noted that some unusual salinity spikes have been observed at the Tailem Bend off take but these are still less than this threshold. Small communities sourcing water from the lower lakes (e.g. Raukkan) could need alternative drinking water supplies.

Higher river salinities (>1670EC), although not currently predicted to occur (up to June 2008), could lead to people either not drinking sufficient water or turning to less saline but unsafe alternatives. Health issues could also be possible for dialysis patients receiving water of TDS greater than 2500 EC. The Department of Health and SA Water will liaise with The Queen Elizabeth Hospital renal dialysis unit regarding notification and management of this possibility.

It is very important to note that the salinity of raw water cannot be lowered through traditional treatment processes. To achieve a decrease in salinity delivered to the treatment plant SA Water would need to invest into expensive reverse osmosis or

[2] Total dissolved solids is conventionally used to describe the salt content of drinking water. A conversion factor can be used to covert EC salinity units (µS/cm) to Total Dissolved Solids units in mg/L. TDS = EC x 0.6; EC = TDS/0.6.

related technology. Increased salt concentration increases alkalinity, so more chemicals are needed to counter this effect. Depending on the pH management systems already available at treatment plants, upgrades may be required and possibly other types of dosing. This could cost thousands of dollars. In some cases (such as the directly affected 19 country treatment plants along the River Murray) this effort would involve entirely new installations of pH management systems, estimated at several hundred thousand dollars per plant. Other follow-on operational costs are difficult to predict at this stage.

Domestic water supply infrastructure impacts – A recent SA Water paper researched impacts to consumer water supply infrastructure. Hot water systems fitted with magnesium anodes have an increased risk of gassing (which could lead to minor explosion or scalding) if salinity levels increase above 1000 EC and increased risk of corrosion. This 1000 EC salinity level could be marginally exceeded during the early part of summer but, on average, levels in the river are predicted to be lower. This risk would be more likely to apply to areas which directly receive River Murray water. Where River Murray water is mixed with Mt Lofty Ranges reservoir water supplies at modest levels of salinity, impacts are less likely in the short-term. Increased frequency and duration of drought conditions and the subsequently higher reliance on River Murray water due to decreased run-off from the MLR watershed could increase salinity levels in Mt Lofty Ranges storages over time (medium-long term).

Urban/domestic irrigation impacts – If salinity increases above 1000 EC there may be salt impacts on lawns and gardens. At higher salinities, greater volumes of water are needed to wash salts below the plant root zone.

Commercial/industrial impacts – Increased salinity and other water quality problems will impact on most non primary production businesses. These costs cannot be quantifiable to any reasonable degree due to insufficient technical data (as highlighted by a report from The Allen Consulting Group in 2004 titled *Independent Review of Salinity Cost Functions for the River Murray*).

Plastic, rubber, brass and copper plumbing infrastructure (both amenity and production related) are expected to be at low risk although higher rates of blockage are a possibility for narrow pipes. Construction activity using concrete and cement is not expected to be adversely affected. Cooling towers, boilers and heat exchanges are also considered to be at low risk. Stainless steel fittings and hot water systems are expected to be at increased risk of corrosion and accelerated wear-out.

Elevated water hardness is likely to lead to greater volumes of cleaning agent being used in cleaning/wash down processes and/or upgrading to more expensive cleaning agents. Poorer initial water quality, combined with increased use of cleaning agents, will negatively impact on wastewater quality and reusability. This is likely to increase the costs associated with trade waste water disposal. More significant costs are likely for businesses that treat and recycle waste water on site (notably wineries and food processing). Anecdotal evidence suggests these businesses are likely to have difficulties meeting the Environment Protection Authority's water disposal/environmental standards.

Businesses needing high quality water (e.g. food and beverage manufactures) will need to consider water carting and/or the uptake of water treatment systems (e.g. reverse osmosis devices). Water treatment systems are already in use by many businesses that require high quality water, however, a broader uptake is a possibility. The cost of water treatment systems will depend on the quality of the business' source water and the volume requiring treatment. A number of domestic suppliers have indicated that water treatment system purchase costs could range from around $40,000 for a basic non-automated system capable of treating 5,000 litres per day (ie suitable for a small user) up to $150,000 for a basic non-automated system capable of treating 500,000 litres per day (ie suitable for a very large user). Note that these are only very rough indicative costs – the cost will vary depending on the specific requirements of each customer. Businesses adopting water treatment systems will also incur significant additional costs through higher energy use. Domestic suppliers have indicated that the current waiting period to design and install a water treatment system is around 3 months and this could increase substantially if the water situation worsens, hence businesses should plan well in advance. Although the uptake of water treatment systems would be a significant cost for businesses, there are also benefits to the SA economy because a number of SA based water technology companies are very well placed to capitalise on the new supply opportunities.

The cumulative cost impact of salinity will hit exporters and import competing business the hardest as these businesses will have relatively little ability to pass higher costs to consumers without losing sales. Domestically orientated businesses (eg retail trade, construction) will have greater scope to pass higher costs to consumers and will therefore be less negatively affected.

Tourism – Increased salinity and other water quality issues could add to the existing negative effects of low River Murray and lower lakes water levels on tourism via further loss of amenity and/or environmental damage.

Wastewater system impacts – High salinity wastewater is not expected to affect sewage treatment if changes are relatively gradual. There is a risk of increased rates of corrosion of sewers, pumps and susceptible pumping mains. Biosolids (dried sludge) would have a higher salt content and be less suitable or more restricted in re-use applications. The may be an increased risk of odour at wastewater treatment plants. Where treated effluent is released into streams, there is a risk of adverse environmental impacts. This will be exacerbated if re-use is limited and environmental discharges increase. There should be no adverse impact on marine receiving waters.

Re-use scheme impacts – Metropolitan wastewater systems will be partially buffered by the water storage reservoirs. However, wastewater in metropolitan sewerage networks would eventually reach and exceed River Murray salinities if high saline water continued to be extracted from the river. Eventually recycled water salinity is likely to be high enough that irrigation management measures will not be effective and most irrigation schemes would be unable to continue. Schemes involving 100% land disposal (eg Myponga, Gumeracha and Mannum) would not be able to be continued.

3.1.4 IMPACTS OF HIGH SALINITY – ECOLOGICAL

Modelling by DWLBC (see 4.8.1) suggests that for worst case scenarios, average salinity levels in the lower lakes is predicted to steadily increase and exceed 3000EC by June 2008. Higher salinity levels near the barrages due to seawater intrusion will also likely continue. If salinity continued to rise over future growing seasons, it is highly likely that many aquatic species in the Lakes will be adversely affected.

When salinities are around 2000EC in most Australian freshwater wetlands some ecological impacts are expected. The severity of impact relates to the degree of salinity change and tolerance of key species.

Maintaining habitat in the lakes is essential, submerged aquatic plants form habitat for fish and fauna and assist in maintaining water quality. Species such as, *Schoenoplectus* spp, *Vallisineria* spp and Myriophyllum spp. are adversely affected by salinities over 2500EC. If these species die and no recruitment occurs, these species and habitats will undergo adverse change.

Other freshwater aquatic plants such as *Baumea* spp, Typha spp and Phragmites spp can tolerate higher salinities between 5000EC – 10,000EC, although reduced growth rates, development of shoots and suppression of reproduction can occur at lower salinity ranges.

Macro-invertebrates are important for ecological processes in the lakes, these species generally show a reduction in diversity when salinities exceed 2500EC, significant impacts may occur if lower lakes salinities were to exceed 5000EC. Salinities exceeding 5000EC may also have impacts on small bodied freshwater native fish communities (e.g. Southern Pygmy Perch).

As a guide to salinity tolerance in the Lake system, a 2006 report by Phillips and Muller "Ecological Character of the Coorong, Lakes Alexandrina and Albert Wetland of International Importance", states that salinity in Lake Alexandrina should be maintained below 700EC and Lake Albert below 1,400EC, based on a five year average. Current monitoring shows current salinities are already above these thresholds (2000 EC in Lakes Alexandrina and 2400 EC in Lake Albert). The tributary wetlands of Tookayerta Creek should be maintained below 500EC, Finniss River <1200EC, Currency Creek <2400EC and Bremer <2500EC, all based at a summer or drought peak, based on a five year average. This range is suggested as the ideal operating regime to maintain ecological processes and restore the Lake system.

The high salinity levels coupled with low Lake levels and future outlooks suggest that ecological process are not operating in the desired range for the ecosystem currently.

The projected worse case salinity peak at Morgan of 1020 EC in Oct07 and at Murray Bridge of 1400 EC in Jan08 is unlikely to have detrimental impacts on any of the biota living in the river.

Mt Lofty Ranges streams are used to convey water supplied from the River Murray to reservoirs. Impacts of the predicted river salinity rises on these streams are expected

to be negligible up to 1500 EC, given their ephemeral nature and elevated salinity levels (relative to the River Murray) over the warmer months.

3.2 Other water quality impacts

A range of other water quality issues may arise as river levels fall and/or temperatures rise during spring and summer.

Algal bloom impacts – Physical conditions in the river (low flows, temperature stratification, low turbidity) are conducive to algal bloom formation although nutrient levels are low compared to historical data. Small algal blooms have been noted along the river recently and these may cause local activities inconvenience for water extraction and limit primary contact recreation. There is potential for larger scale algal bloom formation and SA Water is monitoring the risks closely and preparing for this possibilities (refer section 4.3.4).

An emerging concern is increased observations of *Cylindrospermopsis raciborskii* algae in the River Murray. This is a tropical species, however numbers are increasing and this species is becoming more dominant in South Australia (although at low numbers currently). This species does not contain a taste and odour component, however it is a toxin producer (Cylindrospermopsin – the toxin from this species, is more toxic than the saxitoxin produced by *Anabaena circinalis*). The *Cylindrospermopsis* cells also live about 1 metre below the surface, so detection may be more difficult than for *A.circinalis*. The presence of this species is a concern as normal sampling and monitoring protocols are not designed to capture this species. Changes to the SA Water monitoring program have been implemented, which includes sampling at depth.

All algal bloom incidents, including detection of Cylindrospermopsin, are reportable under the water/wastewater incident notification and communication protocol which notifies relevant agencies and Ministers and triggers appropriate action to protect drinking water supplies, public health and the environment.

The economic impacts of an algal bloom are substantial. It costs upwards of $1000 per day per (major) treatment plant to add carbon to inflow water in order to reduce the amount of geosmin (taste and odour compound) and toxins from entering the treatment plant. Furthermore, increased sampling would cost around $3000 per week per treatment plant. SA Water currently has 6 major water treatment plants along the Murray, plus 4 minor and 10 unfiltered plants. The major and minor treatment plants have the capability to add carbon to inflow water, however the 10 currently unfiltered supplies do not. Therefore the risk to public health is a greater concern than the economic costs of the bloom.

If a large bloom occurs, toxin levels in the Murray may present problems for stock and domestic supplies, irrigators and also for recreational activity. If this occurs, water will need to be trucked in to the River communities at a significant cost.

It is proposed to set aside portion of the dilution and river restoration flow volume that has been allocated to South Australia under the agreed sharing rules to provide a

contingency allowance to assist in flushing and breaking up algal blooms should they occur.

Low dissolved oxygen impacts - Temperature and salinity stratification due to low flows could result in depletion of dissolved oxygen in the bottom waters and deeper pools of the river. The breakdown of organic material in the water and sediments consumes oxygen, which is not replenished due to a lack of mixing in a stratified water column. These anoxic bottom waters could result in large amount of phosphorus being released from the sediments which may trigger algal blooms or influence exponential growth of already established algal blooms. Current nutrient levels in the Murray will limit blue green algal growth, however large fluxes of nutrients from benthic sediments may result in extreme algal numbers. Persistent low dissolved oxygen (<5mg/L) levels would result in fish kills and possible flow on effects in the Mt Lofty Ranges streams or reservoirs may need to be considered.

Dissolved iron and manganese compounds may also need to be managed by drinking water treatment plants under these circumstances. Treatment plant performance is also dependent on other parameters such as an increase in dissolved organic carbon (DOC) and a decrease in turbidity. Current DOC levels are low but any significant increases (e.g. following a large algal bloom) may need to be managed. In addition, it is already becoming more difficult to treat water at some sites along the river due to lower than normal turbidity. This is because there are a limited number of particles for alum to bind with, reducing capacity for flocculation. SA Water may have to investigate a process recently patented in France, which essentially increases the turbidity in raw water through dosing with sand granules or diatomaceous earth. This technology would involve a significant capital investment of several million dollars per plant.

3.3 Acid sulphate soils

The South Australian Department for Environment and Heritage (DEH) engaged the CSIRO to undertake acid sulphate soil investigations in the lower lakes and river channel below Lock 1. This work was commissioned to provide input into the Wellington weir EIS process. Recent surveys below Lock 1 indicate the risk from acid sulphate soil is greater than expected. The science behind acid sulphate soil and required management options are evolving; therefore there is no definitive answer to this complex issue.

CSIRO have completed surveys below Lock 1 and the lower lakes, particularly in wetlands that have become detached from the river channel, and have provided DEH with progress reports. Laboratory testing of samples is required before final reports are provided. Initial results below Lock 1 include:

- Most of the subaqueous soil materials sampled in the Murray River contained high contents of pyrite with an acid sulphate soil hazard risk ranging from moderate to severe. It is estimated that large quantities of sulphuric acid will be produced in the subaqueous acid sulphate soil to a depth of > 50 cm if the river levels lowered significantly and the adjacent wet soils were allowed to dry. In addition, salinity, wind erosion (e.g. aerial transport of fine granular

surface flakes containing sulphuric material and salt efflorescences), mobilisation by rainfall events and malodorous problems may become serious issues.

- It is expected that the greatest potential for acid generation will be where no calcrete deposits exist, that is, with increasing distance from the soft limestones that occur along the margins of the incised river valley.
- The sulphidic material has the potential to produce sulphuric acid in amounts that are beyond the capacity of the soil materials to neutralise.
- Around 75% of samples investigated have a net acid generation potential. Hence, the sulphidic material has an acid sulphate soil hazard ranging from moderate to severe.
- Murray River water has some alkalinity, but this is thought to be of little use, except perhaps for neutralisation of the surface few centimetres of acidified soil. Water movement through the fine pores of heavy clays is very slow.

Management of the acidification

CSIRO have highlighted concerns to stock and humans, these are:

1. Prevent stock and humans from entering exposed areas to limit pugging and mixing of surface layers with subsoil.
2. Prevention of stock ingesting wind blown salt efflorescences and fine granular surface layers containing sulphuric material (pH < 4.
3. Prevent human access because of risk of skin exposure to very acidic materials.
4. Water quality issues in the future for ecosystems and potable water.

At this stage there are several management options available, these include:

1. Preventing water re-entering dried wetlands.
2. Inundating wetlands with water to stop acid sulphate soil formation.
3. Cover acid sulphate soil areas with mulch/biodegradable matting to create anaerobic conditions.
4. Fencing severe acid sulphate soil areas to exclude stock and humans.

Lime is typically used in acid sulphate soil management, however, the amount of lime (calcium carbonate) needed to neutralise potential acid production will be high because of the high soil buffering capacities, there will be significant difficulties with application and it is expected not to be possible to incorporate neutralising materials into the heavy clays.

Monitoring strategy

The monitoring strategy should be based on data from the current acid sulphate soil investigations, especially the identification of acid sulphate soil "hot spots".

1. Identify the various subtypes of acid sulphate soil currently formed and predicted when the area continues to be drained, partially drained or reflooded.
2. Develop a plan for re-hydrating the acidified materials.
3. Determine key trigger values to identify the onset of acidification and other acid sulphate soil related problems (e.g. changes in pH, alkalinity, presence of indicator minerals etc.)

4. Careful monitoring of soils and waters as the water recedes from the wetlands and banks along the river and trigger values for soils and water should be established.

Cost estimates

The cost of dealing with the emerging acid sulphate soil situation are estimated in Table 3 below.

Table 3 Cost estimates for acid sulphate soil mitigation

Action	Cost Estimate
Communication strategy for river and lake communities	$40 000
Rapid assessment of management options for wetlands below Lock 1. Identification of high priority sites for immediate action.	$30,000
Mitigation measures (fencing, mulch, pumping, blocking wetlands)	$170,000
Monitoring strategy	$60,000
TOTAL	$300,000

Recommendations

Note the current activity on acid sulphate soil investigations, and the emerging risks associated with the presence of acid sulphate soils in wetlands and potentially the river channel.

Note there are options available for managing acid sulphate soils below Lock 1, and that the Water Security Task Force will provide further recommendations on this matter.

3.4 Comprehensive restructuring of irrigated agriculture

It is widely recognised that the historical pattern of development along the River Murray restricts the options for further development and that South Australia has had a declining share of new investment along the River Murray corridor. In the past ten years South Australia has 'captured' only 20GL of about 140GL of permanent entitlements traded downstream to the horticultural districts, most going to Sunraysia (Vic.). This situation can only become worse for South Australia with National Water Plan funds rebuilding infrastructure and freeing-up irrigation water in NSW in particular, leading to even fiercer competition for investment.

Major irrigated industries along the South Australian River Murray (wine grapes, citrus and dairy) have been facing market pressures to undertake fundamental reform. These pressures are exacerbated by the current (and likely future) drought conditions, increasing both the pace and scale of impacts. There now exists a chance drive 'generational change' in terms of industry restructuring and re-investment and new development of sustainable irrigated agriculture with improved financial, environmental and social outcomes.

While there is presently a particular focus on the lower lakes, due to the current and likely on-going threat to water access and rising salinity levels, a broader consideration of restructuring and reinvestment must include the entire River Murray corridor: Management of short to medium term impacts of industry restructuring within and around current areas, including the Riverland as well as the lower lakes; longer term irrigation industry renewal in and around existing areas and identification of new areas for sustainable major developments.

The current 'worst case' or 'most-likely case' outlooks for water allocations raise the possibility of wide-spread crop failure and death of permanent plantings, leading to significant numbers of irrigators exiting the industry. A region-wide, integrated response to dealing with issues such as management of 'abandoned' land and encouraging re-investment (property build-up to increase scale and efficiencies) to maintain the regional communities and economy should be considered.

In the longer term, a water constrained environment (due to drought, return of environmental water to the River Murray or climate change) may place restrictions on irrigated agriculture in the broader Murray-Darling Basin, but irrigated horticulture in South Australia (efficient, high-value and value-added) can expand with minimal ecological impacts to achieve critical scale.

This is due, in large part, to the recent changes to the definition of water rights and the expansion of the interstate water trade market. South Australia now has access to a huge water market and water entitlement products for expansion of sustainable irrigation and management of risk. This can be through a combination of restructuring of existing irrigation areas and re-location or new development in alternative, low (salt etc) impact areas with efficient new infrastructure.

There is also an assumption that the current national initiatives will effectively deal with over allocation in the upstream States and that improvements in environmental flows, via TBL and other programs, will improve the water resource security and quality for South Australia. Some additional water policy instruments will also assist, such as the permanent establishment of carry-over provisions for South Australian licences and the provision of improved, transparent water trade information systems.

There is now a need to address the impediments to renewal and expansion of existing industries and coordinate strategies for economic diversification which will deliver improved competitiveness and Triple Bottom Line outcomes for South Australia.

Recommendation:

That the matter of irrigation restructuring, exacerbated in part by the current drought, should be addressed jointly with the Commonwealth Government as a matter of some urgency.

4 SHORT TERM CONTINGENCY PLANNING (2007/08)

4.1 Demand control measures

4.1.1 IRRIGATION ALLOCATIONS

The agreed sharing rules for water in excess of the requirements for critical human needs progressively provided each jurisdiction with 120 GL for consumptive purposes. Once this commitment was reached, it was agreed that 25% of further improvements would be allocated to dilution and losses in South Australia, with the remaining 75% allocated to the three States in such a way that most rapidly allows the resumption of normal water sharing arrangements.

Under these sharing rules South Australia has been allocated to date120 GL for consumptive purposes. This has allowed allocations of 30 GL for carry-over from 2006-07 and 16% licence allocations from 1 October 2007 (13% until that date).

Probabilities of improvement in the currently extremely low allocation of 13% have been calculated based on the predicted flow to South Australia under different system inflow probabilities. These probabilities of improvement figures are very dependent on the assumptions used to account for the impact of factors such as securing a reserve for 2008-09 and changes in urban demand.

The current best estimates for the probabilities of improvement in licence allocations as the year progresses are provided below in Table 4

Table 4 Predicted maximum allocations for 2007/08 with different inflow probabilities (based on end of July 2007 water resources assessment)

Inflow Probability (AEP)	Predicted maximum end of month allocation		
	October	December	February
100% (minimum inflows)	16%	16%	16%
90% (expected 9 years in 10)	16%	18%	20%
75% (expected 3 years in 4)	18%	25%	34%
50% (expected 5 years in 10)	30%	32%	41%

Note: These probabilities have been calculated on the basis of securing a 200 GL reserve for 2008-09 progressively from September 2007 and no further demands for urban use beyond the volume agreed by First Ministers.

These figures demonstrate that there is a high probability that licence allocations will be significantly less than the allocations received last year.

4.1.1.1 *Irrigator response and impacts*

The economic impact of low allocations in 2007/08 is likely to be significant for the regional economies of the Riverland, Lower Murray Reclaimed Irrigation Area and the Lower lakes and Langhorne Creek areas.

While unlikely in 2007/08, the death of all perennial River Murray irrigated plantings in South Australia would cost the State in the order of $1.5 billion according to estimates made by the Australian Bureau of Agricultural and Resource Economics (ABARE).

Under a more likely scenario, for example if allocations are only sufficient for crop survival (or approximately 30% when most crop production/ survival only decisions are made), then farm gate production of around $500 million can be expected to be lost this year. As irrigated agriculture comprises around 28% of these regional economies, and employs more than 7,770 people directly, the regional impacts can be expected to be significant. The longer term economic and social impacts may be more severe.

Figure 16 below highlights a potential profile of water demand by irrigators at various allocation levels. It should be noted that some irrigators (e.g. some almond and grape growers) may be willing to purchase water for production purposes even at very low allocations. On the other hand, it should also be noted that significant structural issues were identified in the Riverland prior to the onset of drought conditions, and that some irrigators may judge that selling water is a better use of their enterprise's resources.

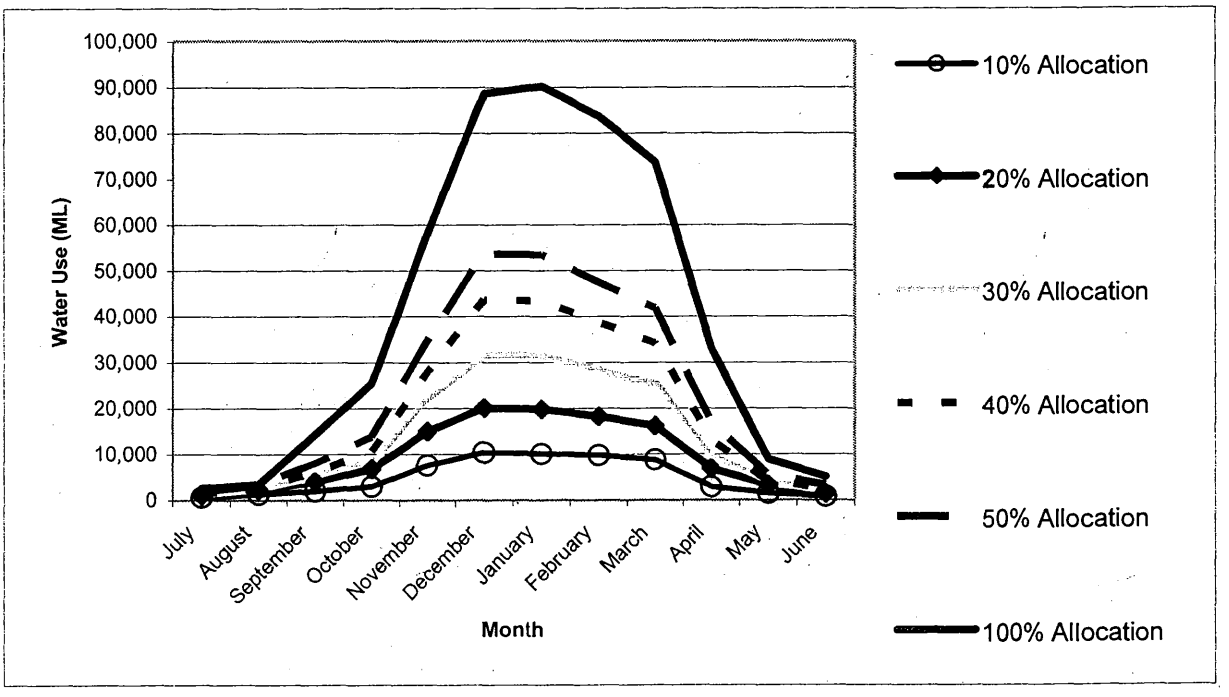


Figure 16 Potential irrigation water use profiles 2007/08

The irrigation sector is, in the main, focussing more on surviving 2007/08 and beyond, rather than production for 2007/08 because of the combination of: low current allocations; the poor outlook for timely allocation increases sufficient for higher production yields; and the poor outlook for both lower lakes levels and salinity. Current allocations to irrigators (16%) are insufficient to ensure that all irrigated crops survive.

Response strategies chosen by irrigators to these low allocations can be expected to vary considerably given:

- Their location – irrigators below Wellington face prohibitive water levels and salinity levels;
- Farm activities – including the high value of assets sunk in perennial plants, dairy cows and on-farm equipment and the high costs of both future production lost and re-establishment if plants die or cows are culled.
- Irrigator expectations on the scale and timing of any increase in water allocations compared to water demands for both plant survival and production;
- The aspirations, financial situation and managerial skills of individual firms; and
- Irrigator expectations on the returns to water use on their enterprises compared to water leasing or permanent sale at a time of extraordinarily high water prices.

Farmers have limited farm management responses available to mitigate the impact of low allocations. For horticulture/viticulture, these include altered irrigation strategies and plant pruning to enable partial crop yields or plant survival and decisions to let some plant patches to die. For dairy farmers, while feed purchases may be possible as a substitute for irrigated pasture, the price of feed grain is currently also at very high levels. Agistment of cows (eg to the South East) is a short term response option.

In addition, projected water levels in the lower reaches of the river are likely to make water access expensive or impossible for many users in 2007/08 and projected salinity levels may mean that use will be restricted for many, even if some level of access is maintained. It is likely that significant adjustment will occur in these areas over the next 12 months.

- Dairy farmers from the lower lakes area are currently confronted with decisions regarding long term viability given that both poor salinity and water levels (let alone allocations) will preclude normal production operations for the foreseeable future.
- Most Langhorne Creek irrigators may keep crops alive crops or have some production through the 2007/08 season through a mixed strategy of accessing groundwater resources and rainfall reliance. However, there may be opportunities in 2007/08 and beyond to better manage water security risk for irrigators through aquifer re-charge and facilitating groundwater water use by some irrigators who currently have neither existing access rights nor water infrastructure to deliver from groundwater resources.

The current water allocation and trade system offers both an opportunity for water access for high value water use activities such as plant survival or limited crop production, but also an opportunity for water lease/sales that may significantly offset the financial impacts of reduced production for ongoing firms or the reduction in other

asset values for firms considering exit. Irrigators, who may be thought to be in the best position to judge the value of water use in their enterprises, are making these decisions.

Analysis by Primary Industries SA (PIRSA) suggests the potential demand for water by irrigators at low allocations is very high (figure 2). Assuming irrigators would choose to re-establish with existing land uses, some irrigators may value water at between $3,000-$13,000 per megalitre at low allocations to avoid crop destruction and re-establishment. Many irrigators cannot be expected to have the access to finances to secure water if it reached such extraordinary prices, even if they had the inclination. It should also be noted that while the temporary lease price of water reached an extraordinary $500 per megalitre last irrigation season reflecting the marginal value to irrigators in ensuring crop production, it has historically ranged between $50-$100 per megalitre.

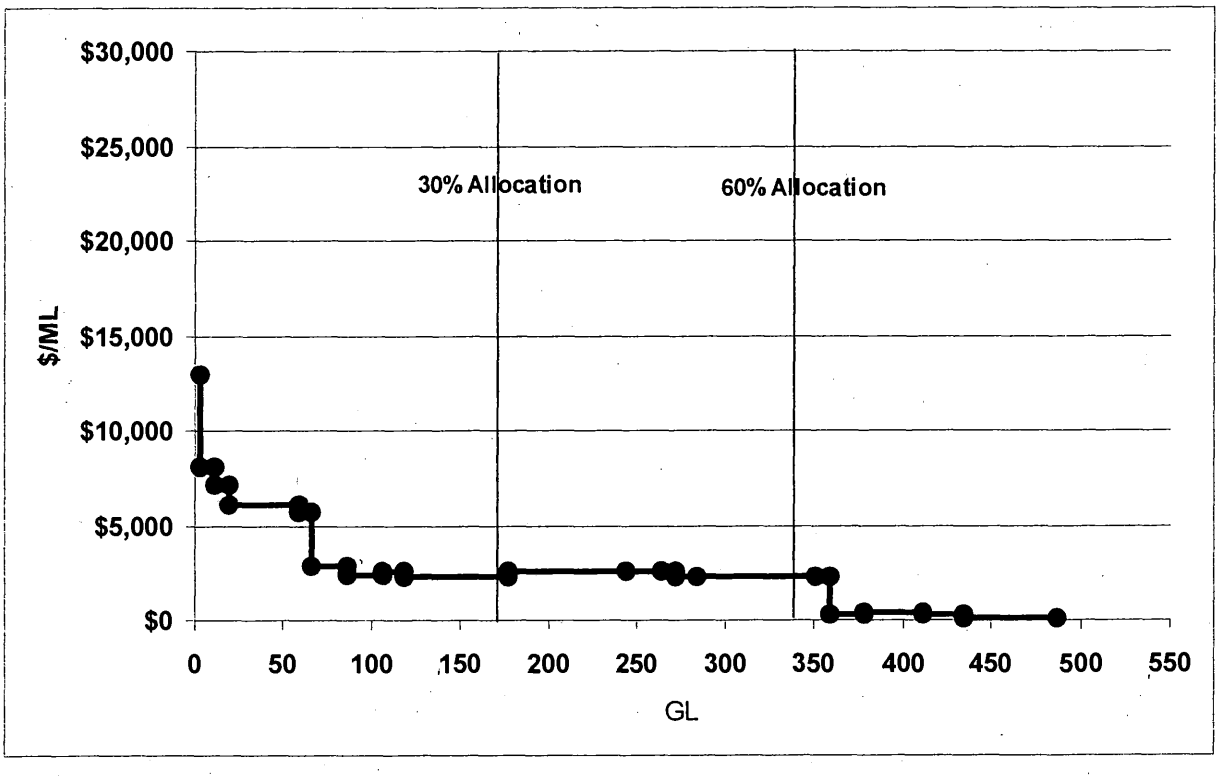


Figure 17 Demand for water by SA Murray irrigators

This significant variation in the potential value of water for irrigation highlights the

- The potential high priority of water for irrigation at low availability; and
- The importance in irrigators receiving and utilising robust, timely information on potential water availability for their business planning purposes.

The need to provide irrigators with increased flexibility to manage their own risk given the potential costs of very low water allocations has also been highlighted by ABARE. Interregional and intraregional water trade will assist in this regard, as would the continued availability of a carryover facility. For example, irrigation allocations may increase late in the 2007/08 season, as is suggested in Table * above, when most irrigators will either have little use for water, nor currently expect it to be received. A

carryover facility would provide the added flexibility in ensuring water for production or survival in 2008/09 – a limited, but potentially useful irrigator's "strategic reserve".

Irrigator water demand over the longer term will incorporate expectations on water availability over the next several years, the profitability of water use over this period compared to opportunities provided for water trade in the short term and any structural adjustment incentives. The Cabinet Submission "River Murray Drought Response, Recovery and Renewal (Phase 1)" directly addresses these issues.

RECOMMENDATIONS:

Information on water availability, lake levels and salinity that is timely and robust should continue to be made available and utilised by irrigators for business planning purposes.

The program for skilling irrigators through fact sheets and decision support tools for drought management, water budgeting, salinity management and water trade decisions should also be continued.

A carry-over policy for irrigators should be determined as soon as possible.

The matter of irrigation restructuring, exacerbated in part by the current drought, should be addressed jointly with the Commonwealth Government as a matter of some urgency.

As a matter or urgency, the consideration of adjustment by lower lakes irrigators should be facilitated, and the investigation of groundwater recharge and access by Langhorne Creek irrigators should be resolved.

4.1.2 URBAN WATER RESTRICTIONS

Intakes into Mt Lofty Ranges storages to the end of June 2007 resulted in an additional volume of approximately 11 GL at the end of the 2006/07 water year.

While inflows to the Mount Lofty storages over the April to June period followed the long term average, the July inflows of 25.6 GL were below the long term average of 33 GL, but above the extreme drought case of 5.6 GL. The August inflows of 8 GL were below the extreme drought level of 10.5 GL. On a cumulative basis, year to date total inflow is 33.6 GL which is below the long term average but above the drought (90% AEP) case of 26.1 GL.

Overall, Mt Lofty Ranges intakes are at drought level as shown in Figure 9 on page 20. Under the Water Resources Act, SA Water's licence to pump from the River Murray for 2007/08 is restricted to 121GL, 90GL for the metropolitan area licence and 31GL for the country licence. The adopted pumping strategy for this water is discussed in section 4.2.5.

Areas reliant on River Murray water have been on level 3 water restrictions since 1 January 2007. In the period 1 January to 30 June 2007, water savings were 21 ML compared to the same period during the 2002 drought year. Average daily water consumption in the Adelaide metropolitan area was 417 ML. From 1 July 2007 a temporary cessation of domestic outside watering has applied, with daily metropolitan consumption at 279 ML.

Demand on the River Murray and Mt Lofty Ranges systems are at their lowest during winter, and rise to a peak over summer. This can be seen in Figure 18, which plots projected demands on SA Water's system at levels 3 to 5 water restrictions. It can be seen that, at present, actual demand is within predicted levels.

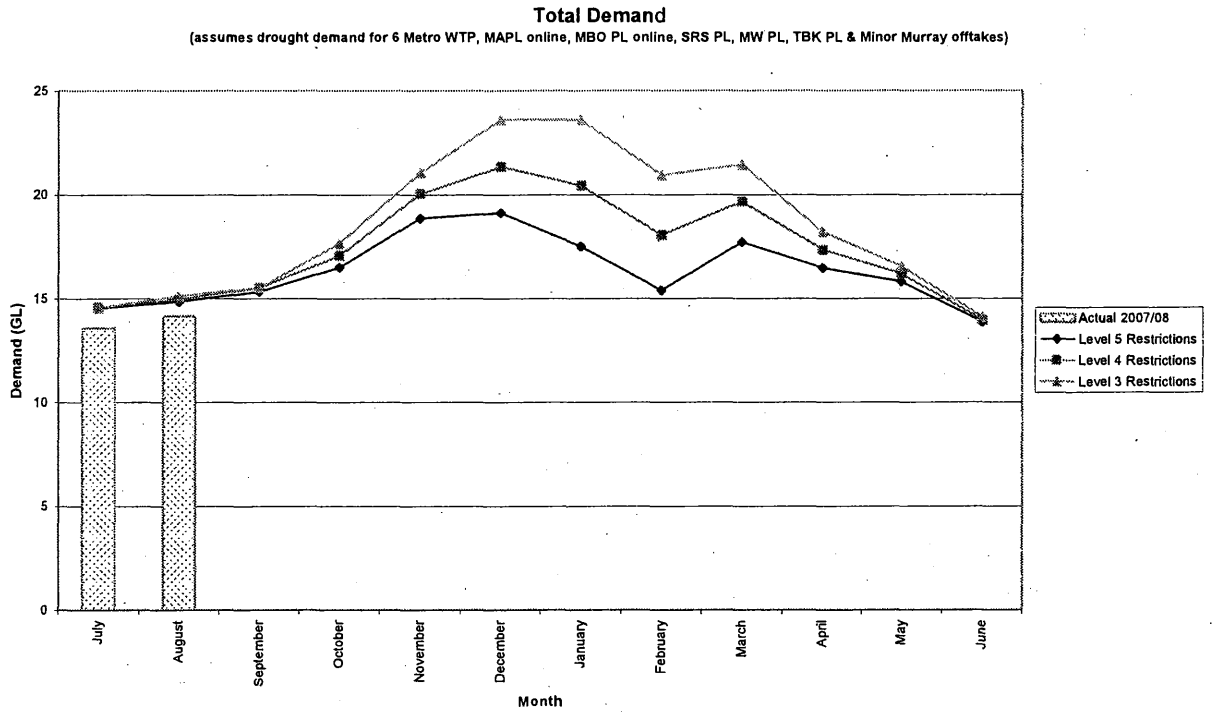


Figure 18 Projected water demand under levels 3 to 5 water restrictions

Given the predictions for the River Murray and its recovery, it is prudent to maintain a buffer volume in Mt Lofty Ranges storages by the end of the 2007/08 year. The critical issue at this stage is the provision of a significant buffer during the summer period in case of algal blooms, which are predicted to be more likely this year.

Based on intakes to date, under the extreme drought case (a repeat of 2006/07), it is predicted that level 3 and level 4 restrictions would not result in deficits below the minimum storage level and, in fact, will result in a small buffer of approximately 14 GL and 23 GL respectively. However, at this stage, it is not possible to reduce the level of restrictions below level 3 without significantly eroding these minor surpluses.

Under the less extreme drought intake scenario (that is, the type of drought that might occur 1 year in 10), level 3 restrictions will leave a buffer of approximately 20 GL and the buffer for level 4 would be approximately 30 GL.

Current predictions based on the extreme drought case indicate that a 30 GL buffer would remain in March 2008. A buffer of this size should be sufficient to provide up to 60 days water supply to Adelaide without drawing from the river. However, this also means using 50 per cent of the 60 GL early pumping (which was originally sought as a buffer against water quality problems) and all 11 GL of the improved start to the year. This also increases Adelaide's exposure for the whole of 2008/09.

The Morgan-Whyalla system would have approximately 2 – 3 weeks of supply from the northern reservoirs (Bundaleer, Beetaloo and Baroota). However, this is separate to the buffer storage referred to above. It is also lower quality water, but is suitable for human consumption in an emergency.

The remaining systems (eg Tailem Bend to Keith) have no significant storage. In the event of a major algal bloom in the river that is beyond the treatment capability of the water filtration plants, contingency plans to supply drinking water will need to be activated.

At this stage of the 2007/08 year, a buffer of 30 GL is anticipated if existing water restrictions are maintained. Dropping back to level 3 restrictions would result in a 20 GL buffer (assuming continuing drought conditions). Hence it is not considered necessary to maintain the current cessation on outdoor watering. However, should inflows continue below drought (90% AEP) levels, it will be necessary to re-visit this recommendation. Further advice will be provided in October 2007.

In relaxing the cessation of outside watering, it is proposed that some outdoor watering be allowed using drippers and hand-held hoses during limited hours. More specifically, it is proposed that consumers be able to use drippers or hand held hoses with a trigger nozzle for 3 hours per week, from either 6 am to 9 am or 5 pm to 8 pm. It is proposed that the same odds and evens system on weekends that was in operation last summer will apply again (evens on Saturday and odds on Sunday). The current ban on sprinklers would remain, although households could continue using buckets and watering cans at any time of the day. Work with industry to improve their water efficiency will continue.

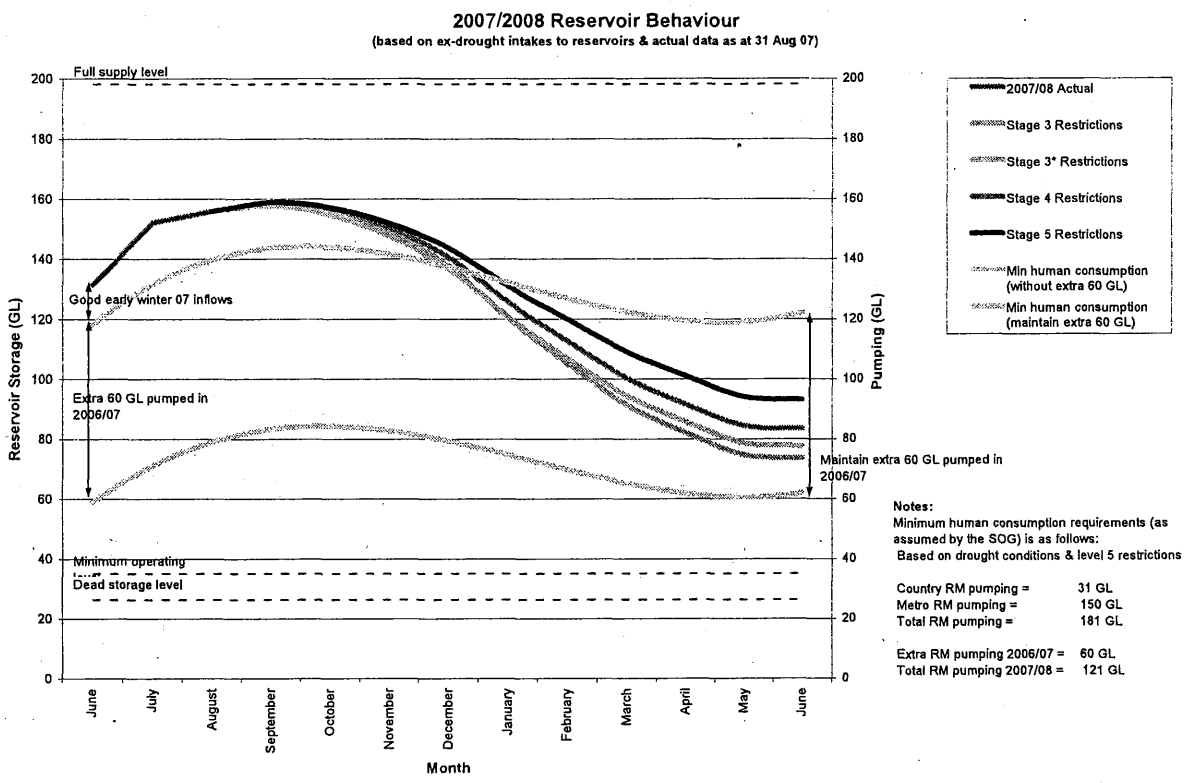


Figure 19 Reservoir behaviour under extreme drought conditions

Figure 19 illustrates anticipated reservoir levels (under the extreme drought scenario) for different levels of water restrictions. Reservoir behaviour under the more relaxed level of restrictions proposed above are indicated by the yellow line, along with the relative impacts of level 3, 4 and 5 restrictions. It can also be seen that, on the basis of current water availability, under extreme drought in the Mt Lofty Ranges, all levels of urban water restriction entail eating into the 60 GL of early pumping and thus reducing the buffer available to Adelaide in the event of a water quality problem.

This is also true, although less so, for the less extreme drought situation (the current trajectory of inflows in the Mt Lofty Ranges) as illustrated in Figure 20.

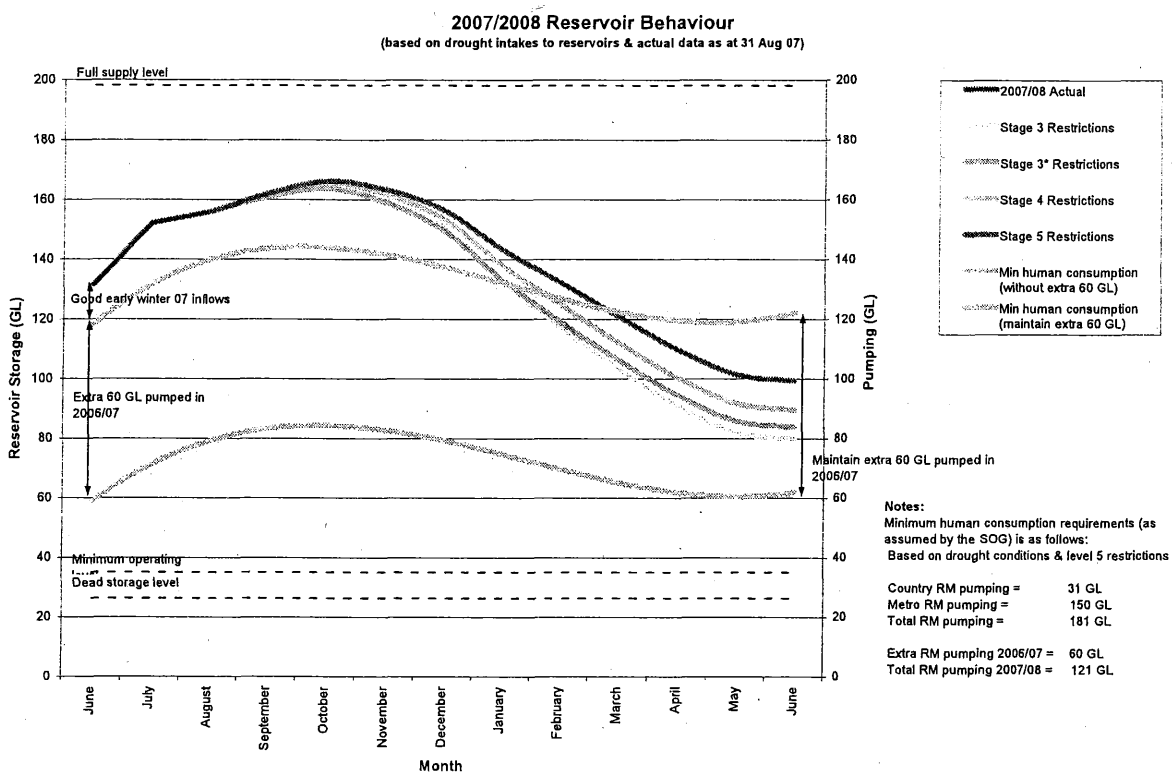


Figure 20 Reservoir behaviour under drought conditions (90% AEP)

Close monitoring of water availability and water use will continue, and restrictions will be reviewed monthly. In particular, an analysis will be made when the normal winter inflow period in the Mt Lofty Ranges has ended (October 2007) to determine whether restrictions need to be increased over the summer months. Should inflows continue below drought (90% AEP) levels, it will be necessary to re-visit the recommended level of restriction. SA Water will provide further advice in October 2007.

Recommendations:

Close monitoring of water availability and water use should continue, and water restriction levels reviewed monthly. Should inflows continue below drought (90% AER) levels, it will be necessary to re-visit the recommended level of urban water restriction.

The buffer in Mt Lofty Ranges storages should target a minimum of 20 GL and, if conditions improve, the buffer should be allowed to increase rather than necessarily being used to reduce water restrictions.

4.1.3 INDUSTRY WATER USE

Following the release of the Senior Official's Group's second report, the Prime Minister and Premiers of South Australia, New South Wales and Victoria released a joint statement on 20 April 2007, which indicated, among other things, that:

- industrial users of water from the River Murray system should be required to adopt stringent water savings measures and that major users should be required to develop water efficiency plans incorporating industry best practice water efficiency targets from 1 July 2007; and
- all outside water use for domestic purposes dependent on River Murray supplies should be prohibited from 1 July 2007.

The South Australian Government has acted on these measures. In doing so, from 1 July 2007, all industrial users of River Murray water are being treated the same way, regardless of whether they obtain water via SA Water infrastructure or by pumping directly from the River Murray under a water licence.

Licensed River Murray industrial users are able to access 100% of their licensed water allocation during 2007-08. There are two mains reasons for this:

- Given that the small amount used by industries pumping directly from the river is accounted for in South Australia's worst-case scenario, this logically means that such use would also be accounted for in any scenario that is an improvement on the worst-case situation.
- In addition, unlike many irrigated plants and irrigated enterprises, which may survive a short period without irrigation particularly if rainfall occurs during that period, most licensed industrial users could not survive without a constant supply of water for any length of time. This is because of the integrated nature of their production systems and lack of any alternative water supply.

However, access to 100% of licensed water allocations, is subject to all River Murray licensed industrial users preparing and submitting water efficiency plans that identify where they can make water savings in any area of their operations. This requirement will be a condition of their water licence.

In addition, from 1 July 2007, all River Murray licensed industrial users have been, and will continue to be, subject to the same restrictions on the outside use of water for gardens, lawns and other purposes as those applying to domestic users. The same requirements with respect to water efficiency planning and outside watering also apply to industries taking water via SA Water infrastructure.

Regulations under the *Natural Resources Management Act 2004* and *Waterworks Act 1932* requiring the preparation of water efficiency plans, were approved by Her Excellency the Governor in Executive Council and published in the Government Gazette on Thursday, 28 June 2007.

Water efficiency plans consist of two parts:

- The first part will address 'non-process' water, that is, water used in bathrooms (eg hand basins and showers), kitchens, toilets, air conditioning (eg cooling towers), and via some internal hoses. Water saving devices for non-process

water include the installation of dual flush toilets, low flow showers and low flow aerators in basins and sinks.

- The second part will address 'process' water, that is, water used in any production the business may undertake, such as the production of steel, wine, food products etc. For example, in intensive animal farming enterprises, process water would include the wash down water. In a metal fabrication factory, the process water would include the cooling water. Water savings measures for process water will vary with the particular industry and processes involved.

Implementation of water efficiency planning is focussing on large industrial SA Water customers (approximately 50) and all industrial users who pump directly from the River Murray (approximately 110) to achieve the greatest savings for least cost and administrative burden. In addition, all SA Government agencies, statutory authorities etc will also be required to develop water efficiency plans. Negotiations with Local Government are underway, with a view to extending water efficiency planning to all local councils.

SA Water and the Department of Water, Land and Biodiversity Conservation are working closely with industries to assist them in the preparation of their water efficiency plans.

In addition, as a next step, the State Government will work with key industry groups and associations to further refine water efficiency planning and implementation. This second stage will identify any necessary policies, additional regulations and/ or incentives to achieve longer-term water saving measures with the minimum of red tape.

4.1.4 IRRIGATORS ON SA WATER SYSTEM

There are three possible classes of irrigator attached to SA Water's infrastructure:

Transport agreements

A number of irrigators have agreements with SA Water for peak or off-peak transportation of water. Off-peak agreements are in most cases for the period from April to October; peak agreements cover November to March.

There are a total of 118 off-peak agreements, and 7 peak agreements. The majority of off-peak and peak agreements are for properties located in the Barossa Valley and Clare. There are two agreements for properties in Baroota and one agreement for a property on the Yorke Peninsula. There are a number of situations where a single agreement covers several parcels of land. The volume of water involved is 2,983 ML of off-peak transportation and 123 ML of peak transportation for a total of 3,106 ML per annum.

These irrigators have their own water licences (with a permanent, temporary or leased allocation) with only transportation provided via SA Water's infrastructure. These irrigators would therefore be subject to the same restrictions on their water licences as any other River Murray irrigator.

Some irrigators may obtain their licenced water by leasing water from SA Water. Typically the leases are in the order of 2 ML to 20 ML. The maximum total volume of water made available by SA Water is 1 GL per annum. The water entitlement is transferred for a specified period to the irrigator's licence from SA Water's holding licence, and the irrigator is therefore subject to the same restrictions as any other River Murray irrigation licence. As a matter of detail, SA Water leases the water entitlement with any risk associated with reduced allocations borne by the lessee.

The Department of Water, Land and Biodiversity Conservation (DWLBC) undertakes any necessary compliance and enforcement activities as the department administering the *Natural Resource Management Act 2004*. SA Water does, however, provide DWLBC with data from meter readings to assist compliance activities.

In the case of a property with only an off-peak agreement, the water meter is locked outside the April to October period. Some properties have both a peak and off-peak agreement allowing them to transport water all year round. If there were zero water allocations or a prohibition on pumping, it would be theoretically possible for SA Water to lock these irrigators' water meters. This is not practical if there is an allocation, however small.

It is also not known what purpose the transported water is used for – ie a house, stock watering or irrigation. In the case of an off-peak transport agreement, where water meters are locked outside the off-peak period, it is probably less likely that a house or stock are connected, although the irrigator may use some water to fill storage tanks that serve a home or stock.

Clare Valley scheme

Irrigators in the Clare Valley can have either a transport agreement with SA Water OR they can be part of the scheme associated with the pipeline completed in 2004 to provide filtered and treated River Murray water to townships in the Clare Valley. Irrigators with a transport agreement are covered in the section above.

To obtain a Clare Valley scheme irrigation supply, a customer must first obtain a permit under the *Natural Resource Management Act 2004* to use imported water (permits are issued by DWLBC). If there is available capacity and a permit has been obtained, SA Water will provide an irrigation connection subject to payment of the necessary fees and the customer entering into a water supply agreement.

Irrigators in the Clare Valley scheme use water from SA Water's country licence and, apart from the requirement to have a permit to import water, are not treated any differently to any other SA Water customers. The total number of Clare Valley scheme irrigation agreements is 79, involving a contracted quantity 1,294 ML of water. There are a number of situations where a single agreement covers several parcels of land.

Irrigators in the Clare Valley scheme pay state wide water prices, that is, 50 cents per kilolitre for the first 125 kL and $1.16 per kL above that.

DWLBC undertakes any necessary compliance and enforcement activities associated with the permit to import water. SA Water provides DWLBC with data from meter readings to assist compliance activities.

Other irrigators

There are an unknown number of other potential irrigators in areas such as the Barossa Valley, Fleurieu Peninsula, Adelaide Hills and other parts of the state who have a connection to SA Water's infrastructure – ie a water meter.

In common with the vast majority of other properties with a water meter, there has never been a requirement to specify what the water is used for. Water could therefore be used for any or all of a house, stock watering, some form of irrigation (eg vineyard, olives or a market garden) or even industry (eg winery, packing shed).

These irrigators pay state wide water prices, that is, 50 cents per kilolitre for the first 125 kL and $1.16 per kL above that.

Discussion

There has not previously been a need to restrict irrigators from SA Water's system so there are no established policies or procedures for reference.

As noted above, irrigators that have a transport agreement with SA Water use licenced River Murray water and are therefore already subject to the same restrictions as all other River Murray irrigators. No other restriction is considered necessary for this group, and they are not considered further in this briefing.

Existing water restrictions already deal with dams and tanks on farms. The restrictions specify that a farm dam or tank must not be filled with water unless it is being used for domestic or stock consumption or fire-fighting. A permit is required to fill a dam or tank for any other reason. It is therefore considered that the dams and tanks are already dealt with insofar as a permit would be required to be able to irrigate from a tank or dam.

The recently introduced water efficiency planning regulations cover any 'industrial' operations that might be associated with irrigation, such as a packing shed or winery. This form of water use is therefore not considered further in this briefing.

In the case of either Clare Valley scheme irrigators and other irrigators, it is noteworthy that they differ from licenced River Murray irrigators in that:

- They do not have a tradeable commodity in the form of a River Murray water licence;
- They pay full state wide prices for the water they use. This is likely to mean that water is being used efficiently and directed to high value crops;
- Depending on their location, the proportion of River Murray water they use may vary (ie a proportion may be sourced from the Mt Lofty Ranges);
- Their enterprises have never previously been required to take into account the risk of not being able to access the full amount of water. While noting the seriousness of the current situation, from a business perspective, these

businesses may be unprepared for and may lack skills for dealing with such a situation. .

There may therefore be considerable opposition to the application of restrictions on irrigators on SA Water's system. To the extent that enterprises are unprepared for restrictions, there may be a higher than anticipated rate of business failure. It is not known how many or what type of enterprises might be involved.

Options for restricting

Given that irrigators from SA Water's system do not have set allocations, it is not possible to apply a blanket percentage of allocation in the way that River Murray irrigation licences are restricted.

Where a permit to import water is involved (Clare Valley scheme only), controlling irrigation from the Clare Valley scheme could theoretically be achieved by reducing the quantity of water they are allowed to import. While advice has not be sought from Department of Water, Land and Biodiversity Conservation, it is considered unlikely that this is a viable course of action since actions to restrict water for reasons other than salinity may be invalid. This may, of course, change if the River Murray becomes increasingly saline.

While the Clare Valley scheme irrigators are known to SA Water, it is not known how many other properties with a water meter may also be irrigating. The number of properties – and the lack of information about them – also makes individualised attention impractical.

If it is considered desirable to restrict irrigation from SA Water's system, one course of action is to Gazette a general water restriction that prohibited irrigation except with a permit. In assessing a permit application, SA Water could start with the applicant's average annual water use, take into account any homes or stock watering on the property, and then apply a restriction to the remaining annual quantity of water. The restriction could be set as a percentage – which could be the percentage applying to River Murray licence holders (currently 13% but will be 16% from 1 October) or another figure considered more appropriate taking into account the differences from River Murray irrigators. Property owners would need to monitor their own water use to ensure they did not exceed the total allowed under the permit.

For example, for a property that used 5 ML per annum on average, an allowance of 1 ML might be needed to cover domestic and stock use, and a percentage restriction applied to the remain 4 ML.

An alternative is to require irrigators on SA Water's system to comply with water efficiency planning rather than apply a percentage restriction to their water use. This could be accomplished by Gazetting a water restriction that prohibited irrigation except with a permit, and making the development of water efficiency plans a condition of obtaining a permit to irrigate. This would be broadly consistent with the approach taken with industrial water use (except that has been done via regulation rather than permit) and has potential benefits in encouraging longer term efficiency. However, auditing of water efficiency plans would be resource intensive and would require prioritisation against other water conservation field activities. Alternatively, it

would be less resource intensive for SA Water to simply spot check a percentage of properties as a means of enforcement and/or investigate calls to the drought hotline.

Recommendations:

It is recommended that irrigators using River Murray water via SA Water's reticulation system be restricted to the same percentage allocation as other River Murray irrigators plus an appropriate allowance for stock and domestic requirements.

4.1.5 CONSERVATION OF NON-MAINS WATER

Following a period of stakeholder consultation in March/April 2007, it is considered appropriate and timely to put in place water conservation measures for non-mains water (eg bore) users in metropolitan Adelaide. These measures would not apply to alternative sources (ie rainwater tanks, stormwater reuse schemes and waste water reuse schemes). The measures to be applied are the same as those generally applying to SA Water customers when water restrictions are not in place.

It is proposed to make a Regulation under s169 (2) of the Natural Resources Management Act 2004 to introduce water conservation measures as that would apply to:
Watering gardens, grounds and plant nurseries;
Cleaning motor vehicles and boats;
Hosing down paved areas; and
Construction sites.

In the case of watering gardens, grounds and plant nurseries etc, a person must not use water to water any external portion of a public or private garden, recreational area, sports ground or plant nursery unless the water is applied—

- by hand (through a hand-held hose or from a bucket or watering can); or
- through a drip-feed irrigation (means an irrigation system that delivers water to plants in drops or other small quantities by means of underground or surface pipes or tubes); or
- through a micro-spray system (means an irrigation system that delivers water through water-misting spray heads at a flow rate of not more than 0.5 litres of water per minute per outlet); or
- through a sprinkler system, but only where the watering takes place after 5pm and before 10am (or, if daylight saving is in force, after 6pm and before 10am).

The difference in water times between daylight saving times and winter is based on two factors. First, the 10 am time should give all customers the opportunity to water during daylight in the morning. However, to extend beyond this time during daylight saving will mean that watering times will begin to encroach on the hot middle of the

day when evaporation will be higher. Secondly, while 6 pm will allow for a second daylight watering during daylight saving it will be dark by this time in winter. Going to 5 pm in the winter months allows an extra daytime watering to occur all year round. It should be noted that even with the shorter permitted watering period during daylight saving the number of daylight hours are greater. Hence, there are effectively more daylight hours in which to water.

It is considered that these criteria are consistent with good water practices, ie they minimise evaporation, encourage low water use devices and prevent the use of hoses without positive shut off capacity. The proposed measures also complement the objectives of reclaimed water and stormwater harvesting schemes of reducing stress on our freshwater resources and helping save our natural water systems.

The penalties under the NRM Act are identical to those available for contravention of similar regulations under the *Waterworks Act 1932* and the Waterworks Regulations 1996.

It is proposed that SA Water and DWLBC will work together to ensure a seamless service to members of the public in administering these regulations. Additional funding in the order of $205,000 for 07/08 is needed to properly communicate and administer these arrangements. Ongoing funding requirements will be considered in March 2008 following assessment of the resourcing impacts of the measures.

4.1.6 REBATES FOR URBAN WATER USERS

SA Water, in collaboration with DWLBC and other agencies, has been asked to prepared advice on an appropriate package of incentives for better urban water use. This advice will be submitted separately.

The Water Security Task Force has previously considered the following potential enhancements to the rainwater tank and plumbing rebate scheme and to the existing SA Water drought response rebate scheme.

Table 5 Potential enhancements to the rainwater tank rebate scheme

	Current	Recommended amended approach
General	Rebate only available to homes built (or for which application for building approval was lodged) prior to 1 July 2006.	Retain current criterion.
	Only one rebate permitted per property.	Retain current criterion, and clarify that only one rainwater tank will be rebated.
Rebate limit	• $200 (for tank only) • $600 (for plumbing only) • $800 (for tank and plumbing)	• $200 to $400 (for tank only, see below) • $700 (plumbing only) • $1000 (tank and plumbing)

	Current	Recommended amended approach
Tank only - a new or replacement tank connected to an existing approved plumbing connection type	Tank only limit of $200 for a tank of 1 kilolitre or larger	Tank only limit of $200 to $400: • $200 for a tank of 1 to less than 3 kilolitres • $300 for a 3 to less than 9 kilolitre tank • $400 for a tank of at least 9 kilolitres.
Plumbing only- new plumbing of an existing tank to an approved connection type	Plumbing only limit of $600 for rainwater supply to at least one approved connection type*	Plumbing only limit of $500 to $700: • $500 for rainwater supply to one connection type if a seamless automatic switching mechanism is NOT installed; • $700 for connection to one connection type if EITHER a seamless automatic switching mechanism is installed, OR, if rainwater tank supply is connected to 2 or more connection types.
Tank and plumbing - new plumbing of a new rainwater tank to an approved connection type	Subject to limits outlined above for tank and plumbing with a combined limit of $800.	Individual components subject to overall limit indicated above, however a combined (tank and plumbing) limit of $1000**.

*Approved connection type: a toilet, all laundry cold water outlets or a hot water system.

Table 6 Potential measure for an expanded drought response rebate scheme

Measure	Comment	Recommendation on when rebate should apply
Low flow showerhead*		Any time.
Flow restrictors*		Any time.
Garden tap timer*	Although tap timers may save water if used properly, water use may increase if they are incorrectly used. Information on the rebate scheme will need to highlight this and also promote coupling timers with efficient watering systems (e.g. drippers).	During normal Level 3 restrictions, or higher if limited drippers and subsurface irrigation is permitted.
Drip watering or subsurface irrigation system (eg weep hose)	This measure will foster better garden watering habits compared to sprinkler use.	As above.
Irrigation rain or soil moisture sensor	This measure will foster better garden watering habits.	As above.
Soil wetting agents	Information should stress the need for following the product instructions.	During normal Level 3 restrictions, or higher except during full bans on garden watering (including full ban on bucket watering).
Mulch (organic, and inorganic forms)	Subject to provision that a claim for mulch is accompanied with receipt for other items eligible to receive a rebate (i.e. other than mulch)**.	As above.

Measure	Comment	Recommendation on when rebate should apply
Compost bin/mulch bin	Promotes long-term use of compost as a soil conditioner and use of mulch.	As above.
Grey water system (temporary)	As a temporary measure when garden watering is not permitted. Only for simple systems (those which do not involve installation of a permanent infrastructure requiring plumber-installation). Information should stress the need for appropriate management e.g. to ensure plants are not damaged and that grey water is generally not to be sprayed, or used on edible fruit and vegetables. (SA Water and Dept of Health websites contain relevant information).	As above.
Swimming pool cover	As a temporary measure if pool filling is restricted. Not for newly built swimming pools (those for which planning approval sought since introduction of Level 3 restrictions).	During normal Level 3 restrictions, or higher.

* Measure already included in SA Water's drought Response Rebate Scheme.
** This stipulation is intended to reduce the incidence of subsidising those who under normal circumstances purchase mulch on a regular (e.g. annual) basis. (ABS survey data suggests that more than 50% of SA householders may use mulch).

Recommendation:

Note that an enhanced rebate scheme is being developed as an incentive for more efficient water use by households, taking into account the work already completed by DWLBC and SA Water.

4.2 Supply security measures

4.2.1 WETLAND CLOSURES

The report on drought contingency planning provided to First Ministers by the Senior Officials Group on 21 December 2006 recommended a number of measures to save water for 2007/08 in the event that low inflows continued. One of the measures related to the temporary disconnection of wetlands for an evaporative water saving of 75 gigalitres. This figure has since been revised down to 55 gigalitres.

South Australia has submitted a proposal to the Murray-Darling Basin Commission seeking funding to undertake temporary disconnections at six sites to achieve an annual evaporative saving of 36 gigalitres at an estimated cost of $4.1 million. The location of the wetlands is shown on page 129.

Note that an initial proposal to disconnect nine sites was submitted to the Australian Government seeking EPBC approval in June 2007, but was subsequently withdrawn due to an EPBC decision that the action was 'controlled' on the basis of concern for two wetlands located in the Riverland Ramsar site. This initial referral was withdrawn and a new proposal submitted to disconnect seven sites. The EPBC decision has been provided and the action has now been approved.

One of the sites, Gurra Gurra Lakes, has since been removed from the list of sites prioritised for disconnection following advice from CSIRO Land and Water regarding acidification risk.

Infrastructure

It is anticipated that construction of permanent regulating structures at Murbko South will commence on 10 September. Once the structures are completed at Murbko South, construction of the structure will commence at Nelwart Swamp. The construction of a temporary earthen bank at Lake Bonney is scheduled to commence on 24 September and the pipeline construction to commence on 15 October. The pipeline will take up to three months to construct and a temporary alternative water supply will need to be provided to people extracting from the Lake in the meantime. Tenders have been received for the design and construction of the permanent regulating structure at Yatco Lagoon and construction can commence in early September, subject to agreement on an alternative water access. To date, there is not an agreed feasible option.

Salinity Impacts

Salinity testing was undertaken in Lake Bonney and Chambers Creek on 18 July, following concerns from a Chambers Creek water extractor that salinity levels had risen in the vicinity of his domestic pump. It is clear from the current salinity levels in Chambers Creek that very small fluctuations in the Lock 3 weir pool is drawing water from Lake Bonney into the river channel. This is likely to be an ongoing problem until the Lake is disconnected.

Triggers for refill

Currently, the trigger for refilling disconnected sites is a return to SA entitlement flow of 1850 gigalitres. However, it is now clear that water quality and ecological triggers will need to be developed on a site by site basis, particularly in the light of recent information regarding acid sulphate potential. While the development of triggers for refill will impact on the volume of evaporative savings that can be achieved through temporary disconnections, this approach is consistent with the principles of adaptive management and will ensure that any environmental harm is minimised. This approach is also consistent with the principles for wetland disconnections being considered by the Murray-Darling Basin Strategy Committee.

It should be noted that a number of managed wetlands are showing disturbing signs of salinisation and ecological deterioration as result of prolonged closure. Based on ecological triggers, these sites should also be refilled as those triggers are activated. Evaporative savings from managed wetlands during 2007/08 have bot been included in water resource assessments to date.

Funding

The chief executive of the MDBC, Dr Wendy Craik, wrote to the Minister on 14 June and advised that funds of $2.445m have been approved for the nine wetlands excluding alternative water supplies and subject to the following conditions:

- The necessary ERBC approvals;

- The design, construction and operations and maintenance of permanent structures will be in accordance with the provisions of the MDB Agreement;
- New assets to be included on the River Murray water asset register;
- Assessment and risks associated with potential acid sulphate soils are acceptable; and
- Regular reporting of the monitoring results to the MDBC.

Discussions were subsequently held in relation to the funding of alternative water supplies and the MDBC Strategy Committee considered a cost-sharing and funding cap proposal by the Commission office out of session (OoS). The decision on the OoS was that 100% of the cost of providing alternative water supplies to existing users would be included in the MDBC funding for wetland closures, with the ongoing operation and maintenance costs to be borne by the jurisdiction undertaking the work (or other arrangements as determined by that jurisdiction

The revised project proposal to temporarily disconnect six wetlands has now been considered by the Commission office and Dr Craik has approved funding.

Native title and Aboriginal heritage

The current status of agreements with Aboriginal communities on native title and Aboriginal heritage matters is set out in appendix **4** on page 118.

4.2.2 MODIFICATIONS TO SA WATER'S PUMP STATIONS

Major Pump Stations

Investigations have confirmed that the existing pumping stations start having operational difficulties when the water level drops to around -0.3m AHD. Solutions to progressively extend the operating range down to -1.5m AHD have been developed and progress on implementation is detailed below. It is intended that the temporary weir would be completed prior to the water level reaching -1.5m AHD, so this would be the minimum level at which the pumping stations would ever need to operate.

Murray Bridge PS

- Current limit of operation -0.3m (Nov 2007)
- Initial solution is the installation of anti-vortex plates and vacuum priming, which allows operation down to -1.5m.
- Full project approval has been obtained from SA Water's Board on 6 August 2007. Request for quotation documentation is currently being prepared to permit quotations to be sought from two SA Water Construction Panel Contractors. It is anticipated that a contractor will be engaged to undertake the works in mid September 2007.
- River levels will be monitored to determine on site construction start date.
- Tests carried out on 7th June confirm the initial modifications will allow pump operation down to -2.1m.
- A possible second stage modification is a closed pump inlet – this is yet to be tested

Mannum PS

- Current limit of operation -0.4m (Dec 2007)
- Solution is the construction of a low lift pumping station on the bank on the River Murray adjacent to the existing intake structure
- Four pumps have been selected and ordered due to their long lead time. These pumps are due to arrive at Mannum in mid October 2007
- Concept design has been completed and contract price procurement has commenced. Request for quotation documentation is currently being prepared and is to be issued prior to 24 August 2007 for pricing.
- SA Water's board endorsed the project on the 6 August 2007 for submission to Cabinet and Public Works Committee for approval. Cabinet submission documentation is currently being prepared.
- River levels will be monitored to determine on-site construction start date

Swan Reach PS

- Current limit of operation -0.85m (Feb 2008)
- Initial solution is motor cooling, which allows operation down to -1.6m
- Concept design being commenced to permit approval to be obtained for the project.
- The second stage is a low lift pumping station
- Tailem Bend PS
- Current limit of operation -0.3m (Nov 2007)
- Initial solution is vacuum priming, which allows operation down to -1.1m
- Concept design being commenced to permit approval to be obtained for the project.
- Second stage is low lift pumping station. Taking a less conservative river draw down curve, because we can "borrow" a pump from Mannum

Minor Pump Stations

Investigations have also been undertaken at other inlet structures and pump stations associated with SA Water country pump stations where stations are located below Lock 1. These investigations have determined the lowest operating limits of each pump station and the actions necessary to ensure water extraction continues. These investigations cover the following sites:

- Swan Reach (township)
- Neeta-Cowirra
- Wall
- Pompoota
- Mypolonga
- Jervois
- Clayton

Initial works have been implemented at some sites to ensure continued extraction. A second series of work will be implemented should river levels progress to the limits of these modifications. The equipment and materials required for these second series of works have been identified to have minimal lead times allowing these works to be implemented in short time frames.

4.2.3 PREPARATIONS FOR A TEMPORARY WEIR NEAR WELLINGTON

It remains the case that with continued average inflows to the Murray Darling Basin storages the water levels in the lower lakes will continue to fall. Under these circumstances a temporary weir will be essential, not optional.

At the time of last briefing Cabinet it was predicted that, if it is required, the temporary weir would need to be in place by February 2008. This assumed that modification of SA Water's major pump stations below Lock 1 would be progressively completed to allow operation down to -1.5 metres AHD.

The following factors have contributed to the completion date for the temporary weir being further pushed out to February 2009:

1. **Additional local information** – extra local inflow, revised losses (particularly the impact of wetlands disconnecting as river levels fall) and revised river operations.

2. **Improved storage level and inflows** – At the end of February, the Murray-Darling Basin Commission advised that the total water available in the River Murray would be higher than previously thought, due to lower than anticipated losses, inflows in January 2007 and hence better storage at the end of the water year.
3. **Updated predictions for 2007/08** – The Senior Officials Group recommended to First Ministers in August 2007 that, based on minimum inflows for the remainder of the year, the minimum flow to South Australia would be 819 GL. This is a significant improvement on the previous worst case of 474 GL, but even so the water levels in the lakes continue to fall, albeit at a slower rate.

4.2.3.1 Optimal level of weir

Although the original level of the weir pool was set at 0.1m AHD, there are design and construction time benefits, in addition to cost benefits, in setting a lower pool level. However, a lower pool level may allow greater inflows of saline groundwater and increase the risk of acid-sulphate soil problems and these issues are currently being investigated.

If the potential issues of salinity and acid-sulphate soils can be satisfactorily managed, design work will be undertaken for an alternative weir with a lower overflow level. The appearance of a lower level weir would be more in keeping with the temporary nature of the structure, and it may be feasible to utilise a location to the north of Pomanda Island to also shorten the length of the weir. This will involve further on-site testing, but this will not be undertaken until there is confirmation that the potential problems can be managed.

4.2.3.2 Design

Detail design of the temporary weir with an overflow at 0.1m AHD is virtually complete. During the design phase, a number of issues have arisen regarding the design for the area of bed with the weakest strength. These have been satisfactorily resolved, however the embankment will be wider and lower in this part of the

structure than envisaged in the concept design. Geotextiles are now not planned to be used. Peer review of the design has been carried by other consultants.

4.2.3.3 Timing of construction

The timeframe for construction remains similar to that detailed in the concept design report. The timing of commencement of the works remains dependent on the forecast water levels in the lower reaches of the River Murray and Lake Alexandrina. The latest forecast predicts a -1.5m AHD water level in February 2009. Based on an 8 month period between the Cabinet decision to build the weir and closure of the weir at -1.5m AHD, the decision to build the weir can be delayed until mid June 2008.

It should be noted that:

- As the projected completion date of mid February 2009 is 17 months away, the assumption of 90th percentile evaporation and 10th percentile rainfall is conservative, but using the previous worst case for net evaporation (in 1982) only delays the required completion date by about a month

- The modelled worst case is for 549 GL in 2008/09. This is based on the current recommendation to First Ministers that water be put into an end-of-year reserve in 2007/08 in order to be able to guarantee the 549 GL in 2008/09. If we experience minimum inflows to the Murray-Darling basin for the rest of 2007/08, then the 549 GL cannot be guaranteed. The risk of this is small, but the advice to delay a decision to June 2008 is on a slightly different basis to earlier dates which were based on absolute worst case scenarios.

- The June 2008 decision date is still matched to an operating level of -1.5m AHD. It is known that the pumping stations can operate down to -2.1m AHD (but with additional modifications to go below -1.5m), which gives some additional contingency in a decision date of June 2008.

4.2.3.4 EPBC Act referral

The South Australian Government replied to the Commonwealth Department of Environment and Water Resources in response to the draft environment impact statement (EIS) guidelines for the proposed weir at Pomanda Island, near Wellington on 17 August 2007

The guidelines determine the complexity of the EIS and therefore the potential costs and time-frames for completion. The EIS must include the consideration of prudent and feasible alternatives to the weir and final configuration of the causeway, details on construction activities and rock sources, how the weir would be operated and how and when it would be removed.

The impact assessment must include a description of the existing environment and proposed mitigation measures with respect to matters of national environmental significance.

The Commonwealth Department of Environment and Water Resources has considered the South Australian submission and the public comments and posted the

final guidelines on the 6 September 2007. The South Australian Government (DEH) is undertaking the tender process for the completion of the EIS.

The cost of undertaking the EIS is estimated at $700,000. However, a final cost will not be known until the competitive tender process has been completed.

The Department for Environment and Heritage are currently undertaking investigations on acid sulphate soils, modelling lake dynamics in response to drought, key species requirements, and LIDAR acquisition for the lakes and river channel below Lock 1.

4.2.3.5 Aboriginal heritage and native title negotiations

Although an agreement with the Ngarrindjerri community has been reached on the process for heritage approval, a decision on aboriginal heritage is being delayed due to the current lack of detailed environmental impact information.

Aboriginal communities have queried delays in receiving information on the temporary weir. An offer to brief them on the delays has been made.

The current status of agreements with Aboriginal communities on native title and Aboriginal heritage matters is set out in appendix 4 on page 118.

4.2.4 PUMPING 60 GL INTO STORAGE 2006/07

SA Water completed the task of pumping additional water into the metropolitan reservoirs to safeguard against continuing drought and potential water quality problems as a result of the low river flows.

A total of 57GL was pumped into the storages compared with the target of 60GL. This was a good outcome given the failure of a number of pumping units and motors due to the long pumping hours and interruptions to pumping schedules because of essential Electranet maintenance on critical power infrastructure.

Due to good intakes in May/June, total storage holdings at end June 2007 were 67% compared with the target of approx 60% (with the additional forecast 60GL pumping).

This initiative is now complete.

4.2.5 PUMPING SCHEDULE FOR 2007/08

Under the Natural Resources Management Act, SA Water's licence to pump from the River Murray for 2007/08 is restricted to 121GL, 90GL for the metropolitan area licence and 31GL for the country licence.

There is no provision for water to be pumped in advance to replenish the 60 GL pumped in 2006-07 to provide a buffer against water quality issues in the river.

The adopted pumping model to safeguard against ongoing drought and water quality deterioration in the River Murray is to pump early and achieve maximum storage levels by December 2007 and then pump to demand thereafter. The model assumes worst case scenario of drought inflows and level 5 water restrictions.

A target pumping curve has been developed using the drought inflow model as shown in Figure 21. Pumping will be cut back if inflows exceed drought levels, to give a balance between water security and the risk of spilling.

Based on the above strategy, the model also shows that with Level 5 restrictions in place, there is sufficient storage in the metropolitan storages to meet the customer demands during 2007/08.

The pumping schedule for 2007/08 for the major pipelines is illustrated in Figure 21.

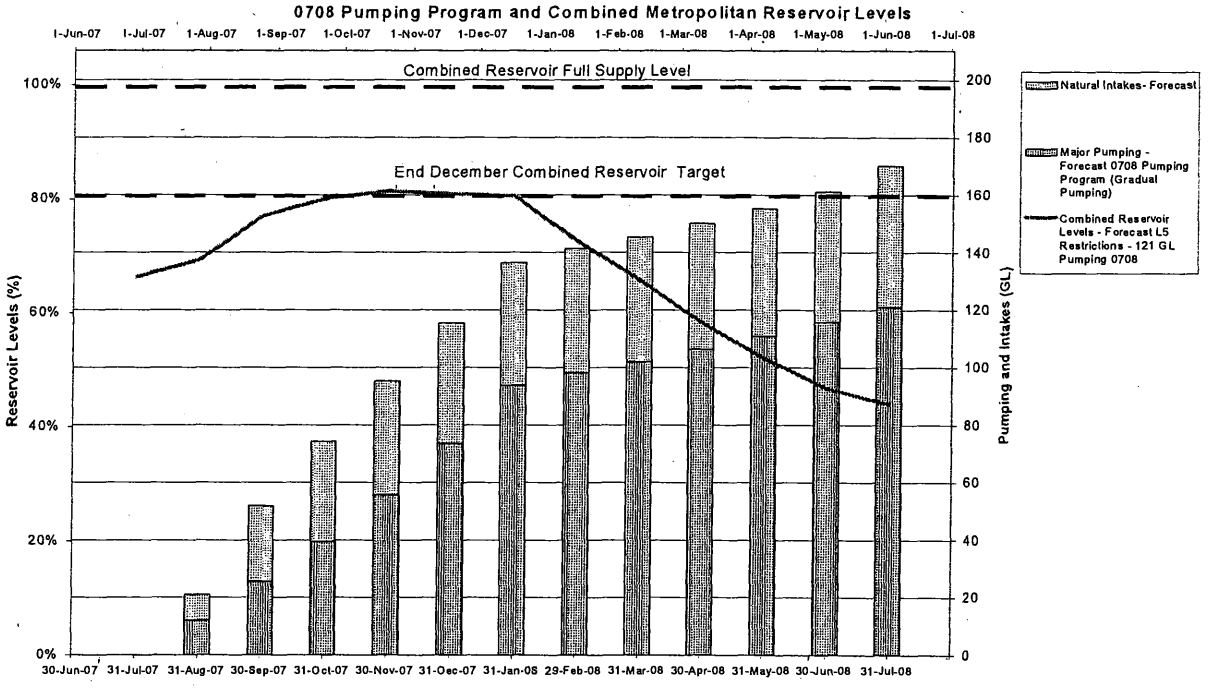


Figure 21 2007/08 pumping program

During July 2007 natural inflows were significantly higher than the drought model and, as a result, pumping from the river was cut back to minimise the risk of spill. A similar strategy is being employed for August 2007.

The reduced pumping has also allowed essential winter maintenance to be performed which will greatly assist in reducing the risk of failure during the higher pumping periods.

At end July 2007 the reservoir storages were above target at 77% compared with the target of 69%. The higher than forecast inflows and lower demands has allowed a higher pumping regime to be used on the Swan Reach Stockwell pipeline to replenish South Para reservoir system which was lower than the other reservoirs.

This is offset by reduced pumping on the Murray Bridge Onkaparinga pipeline due to higher holdings (90%) in Mt Bold at end of July 2007.

4.2.6 RIVER OPERATIONS

The primary driver of managing the flow to South Australia has been to just meet the anticipated demands downstream to Wellington and effectively to have minimal water flowing past Wellington into the lower lakes. Under the First Minister's agreement, South Australia has been allocated sufficient water to just meet the predicted losses between the border and Wellington and the demands for urban, private stock and domestic and minimal irrigation extractions. The flow required just to meet these estimated demands in July was approximately 950 ML/day and in August was approximately 1 100 ML/day. The River Murray in South Australia has not been operated at these extreme low flows at any time since the river was regulated with the locks and weirs.

In practice it has not been possible just to match flow to the state with anticipated demands as it has also been necessary to minimise the water quality and environmental impacts that will occur with significantly reduced flows. It is essential to maintain weir pool levels, at least downstream to Lock 1, to ensure that saline and nutrient rich water is not drawn from backwaters which could lead to serious water quality problems.

It has become evident over this period that the minimum flow to SA required to ensure weir pool levels are maintained is approximately 1 150 ML/day and it has been necessary to order this flow. A sufficient flow to the state has been requested to enable weir pool levels to be maintained but this has necessitated the delivery of approximately 6 GL more water than required under the sharing arrangements to just meet demands and losses. It is anticipated that this additional volume will be subtracted from the volumes required for delivery in future months and this should not affect river operations.

Downstream of Lock 1 it has not been possible to maintain the barrage weir pool level although this has not fallen to the extent predicted under 'worst case' conditions. The improved water level in the lower lakes has been as a result of a combination of local rainfall, local surface water inflows and greater than anticipated flows over Lock 1. It is believed that the greater than predicted Lock 1 flows have predominantly been as a result of rainfall through the Riverland area.

Water levels in Lake Alexandrina currently remain at 0.24m AHD compared to 0.84m AHD at the same time last year. It is expected that water levels will start to decline as evaporation increases from September onwards. Based on the predicted flow scenarios outlined earlier water levels will continue to decline.

A key river management issue has been the leakage of seawater through and over the barrages as a result of low lake levels and storm events. The water level in the lower lakes has fallen to the extent that the seawater level on the downstream side of the barrages is higher for much of the time. The barrages were not designed to cope

with there extended periods of 'reverse head' and as a result seawater has been leaking through, and sometimes during storm events, over the barrages.

This leakage has had a serious impact on salinity in areas in the vicinity of the barrages and through wind action this high salinity water is being mixed further upstream into the main body of Lake Alexandrina causing elevated salinities.

Considerable work has been undertaken to minimise this leakage and it is now considered that there are no practical options to further reduce the leakage. A trial release of water through the barrages is planned if and when weather conditions permit in an attempt to minimise this problem.

The salinity and water level monitoring network is being substantially upgraded and the 'real time' results are being made available on the internet to assist water users. New monitoring stations are being installed at 9 locations between Goolwa barrage and upstream of Murray Bridge. In addition regular detailed salinity surveys are being undertaken to provide more extensive information to assist water users in planning water supply options.

During 2007-08 it is necessary to plan for receiving below entitlement flows (1 850 GL/year) because of ongoing drought conditions. The River Murray has not been operated under extremely low flows for a significant period of time. In low flow years South Australia's dependence on the River Murray increases, therefore it has been necessary to review the requirements on a month-by-month basis to ensure that flows match demands.

The demands include water for metropolitan Adelaide, country towns, irrigation, river maintenance requirements, stock and domestic water allocations. During August 2007 the flow to South Australia will be maintained at about 1 120 ML/day, compared to the normal August entitlement flow of 4 000 ML/day. The current operating strategy aims to keep weir pool levels immediately upstream of the Locks at the normal pool level, or as close as possible. There has been some issues with maintaining the pool level above Lock 6 but as the flow is scheduled to increase in September 2007 to approximately 2 000 ML/day and the weir pool level should start to increase back towards the normal full supply level.

There has been a gradual flattening of the weir pools meaning that there is very little gradient. In order to re-establish this gradient additional water would be required above what is currently available to South Australia. The table below outlines the weir pool levels at 24 August 2007 compared to the full supply level.

Table 7 Weir pool levels at 24 August 2007

	Actual Water Levels at 24/8/07		Full Supply Level Level	Variation from Pool Level
	U/S mAHD	D/S m AHD	U/S of Weir m AHD	U/S of Weir m AHD
Lock 6	19.18	16.25	19.25	-0.07
Lock 5	16.32	13.23	16.30	0.02
Lock 4	13.21	9.89	13.20	0.01
Lock 3	9.79	6.26	9.80	0.00
Lock 2	6.20	3.27	6.10	0.10
Lock 1	3.26	0.20	3.20	0.06
Lake Alexandrina	0.24			
Lake Albert (Meningie)	0.23			
Goolwa				

Because of the reductions to daily flows salinity levels have been steadily increasing from March 2007. It is expected that salinity levels will continue to increase should low flow conditions persist. Salinity levels will also be sensitive to how the River Murray is operated and salinity levels at the border.

South Australia requires more water for dilution flows across the border as the travel times are very long, meaning that the river water has more time to pick up salt.

Water Levels in Lake Alexandrina currently remain at 0.24m AHD compared to 0.84m AHD at the same time last year. It is expected that water levels will start to decline as evaporation increases from September onwards. Based on the predicted flow scenarios outlined earlier water levels will continue to decline.

4.2.7 PRINCIPLES FOR GOVERNMENT SUPPORT FOR WATER SUPPLIES

A set of principles has been applied in guiding consideration of government support for accessing water supplies, isolating wetlands and wetland management. These principles have been tailored to the policy objective underlying the government intervention, and assume the underlying intent of economic efficiency consistent with the SA Government Guidelines for the Evaluation of Public Sector Initiatives.

If the policy objective is to ensure access to water supplies (e.g. water carting, dredging and pump lowering, building a pipeline, roadside assistance), then the set of principles enunciated below have been applied under what is essentially a "user pays" system either through SA Water charges or users more directly.

1. Government will maintain supplies on government owned and operated systems.
2. Assistance may be provided for council water supply schemes equivalent to the community service obligation that would be paid if SA Water was operating the scheme.
3. In general, individual households not on government owned and operated systems will need to make their own arrangements for water carting with private operators.
4. Government will prepare contingency plans for emergency situations that are beyond the capacity of councils and individual householders – for example, if there was a widespread blue-green algae outbreak.

5. Assistance for economic purposes will be made on a case by case basis, having regard to the economic value of services being protected and the costs involved.

If the policy objective is to secure water savings or water quality objectives (e.g. through wetland isolation), then the "impacter pays" principle has been applied. For example, wetland isolation under consideration for the underlying objective of a water saving for subsequent water security needs, may also impact on irrigator access. In such cases, application of impacter pays would suggest government or the MDBC (the impacter) may pay to alleviate or find alternative water supplies for the impacted irrigator. This application of this principle is consistent with both the MDBC *Cost sharing for on-ground works* (MDBC, 1996) and current agreements made with the MDBC with respect to wetland isolation under the national dry inflow contingency planning work.

If the policy objective is to ensure an environmental objective, for example through wetland management, then the principle of "beneficiary pays" has been applied. The broad public community can be expected to be the beneficiary of such actions and hence pay for the government intervention. If concurrent arrangements such as augmentation of proposed structures to provide additional benefits for irrigator productivity are proposed, then under a "beneficiary pays" principle, the irrigator could pay for the augmentation under a share based on the ensuing irrigator to environmental benefits.

Recommendation:

Approve the following principles for considering government support for accessing water supplies, isolating wetlands and wetland management:

1. Government will maintain supplies on government owned and operated systems.
2. Assistance may be provided for council water supply schemes equivalent to the community service obligation that would be paid if SA Water was operating the scheme.
3. In general, individual households not on government owned and operated systems will need to make their own arrangements for water carting with private operators.
4. Government will prepare contingency plans for emergency situations that are beyond the capacity of councils and individual householders – for example, if there was a widespread blue-green algae outbreak.
5. Assistance for economic purposes will be made on a case by case basis, having regard to the economic value of services being protected and the costs involved.
6. Impacter pays when the objective is to secure water savings or water quality objectives.
7. Beneficiary pays where the goal is to ensure an environmental objective.

4.2.8 ALTERNATIVE SUPPLIES

4.2.8.1 Clayton pipeline

Construction of the Clayton pipeline commenced on 6 August 2007, as programmed in the project schedule. Construction has commenced approximately 1.5km from Clayton and progressing towards Milang.

4.2.9 ENVIRONMENTAL MEASURES

Over the past 10 years, South Australia has invested heavily in infrastructure to enable the reinstatement of wetting and drying regimes that mimic natural water level variation in 29 wetlands along the length of the River Murray. This investment has been supported by community groups and individuals who have committed thousands of volunteer hours to monitoring and managing these sites to achieve significant, measurable improvement in biodiversity and ecological health. All of these wetlands have now been licensed (or are in the process of seeking licenses), based on accredited wetland management plans and associated monitoring plans.

In late 2006, a decision was taken to close regulators on 27 of these wetlands to achieve evaporative water savings. This decision was at variance with the existing River Murray Drought Water Allocation Policy that provided the same allocation to wetlands as that provided to irrigators. As a result of the closures, wetland evaporative savings of around 15 gigalitres were achieved during 2006-07, representing an allocation of only 40 per cent. At the time, it was recognised that an extended drying phase would potentially impact on the long-term health of some of these sites, largely due to saline groundwater inflows and loss of vegetation and species diversity. Since the closures, there has been no water provided to these sites to enable the maintenance of basic ecological function and condition. As a result, many of these wetlands are now in a perilous ecological state. It is critical that these sites are refilled to prevent irreversible ecological damage. The proposal for use of dilution flows (refer section 4.3.1) recognises the high priority that needs to be given to refilling of critically threatened wetlands.

4.2.10 CARRY-OVER

A significant element of any plan to make water users more responsible for their water use is the provision of 'carry-over' facilities to allow licensees to conserve water for use in later years.

A 'once-off' carry-over facility was implemented in 2006-07 allowing a total of up to 30 GL of water allocations to be carried forward for use in 2007-08. Due to the legislation at the time, this could only be implemented through an administrative procedure and its applicability was limited. In addition, as there is no established procedure for licensees to order the water they intend using from their licence, it was only possible to make a general provision for a volume of water to be held in storage for use in the following year rather than specific individual carry-over volumes being held in storage.

The legislation has been amended and will now allow a more flexible system of carry-over to be implemented. In addition, it has been proposed by the Senior Officials Group that South Australia be given the opportunity to store unused allocations in headwater storages for use next water year.

Recommendation:

It is recommended that an announcement be made as soon as possible that permanent facilities for carry-over of unused allocations will be implemented during the 2007-08 water year and will allow licensees to carry-over water for use in 2008-09.

4.3 Water quality measures

4.3.1 USE OF DILUTION FLOWS

The drought recovery strategy project team has identified and assessed options for the use and management of the dilution and river restoration flow allocation made available to South Australia under the water sharing rules agreed by First Ministers. Applying proposed principles, an initial strategy for the use of this water has been developed for the volume of dilution flow available based on the end of July 2007 water resources assessment. The prioritisation of the identified options was undertaken through a qualitative analysis of the relative benefits, opportunity costs and risks.

The full report on the use of the dilution flow available to South Australia is attached as appendix 8 on page 130.

The initial proposed strategy is to commit water to:

- **Increase flushing flows to provide river salinity mitigation**
  21 GL/month starting September for up to 7 months (147 GL)
- **Refill priority regulated wetlands to stop environmental damage**
  4 GL delivered in September
- **Pump water to critical floodplain sites to prevent vegetation death**
  3 GL delivered between September and November
- **Set aside a contingency allowance for salinity or algal flushing**
  70 GL held in storage for possible delivery during summer

In addition it is proposed that the following actions should be undertaken but the volume of water required not be accounted against the dilution and river restoration allocation.

- **Lower lakes salinity flushing trial** - saline water in the vicinity of the barrages should be released if conditions are favourable (up to 50GL).

- Evaporative losses from regulated wetlands – regulated wetlands showing evidence of irreversible environmental damage should be refilled immediately (3 GL).

The total volume required to meet the proposed strategy (224 GL) is greater than the amount allocated to South Australia for dilution and river restoration to 10 August 2007 (154 GL). There is a high probability that the volume allocated to South Australia will increase as the season progresses however if this does not occur, the contingency water set aside for flushing an algal bloom or salinity spike could be used to continue the river salinity mitigation flows through until the end of the main water use period.

Clearly it will be necessary to review this proposed strategy on an adaptive basis over coming months to take account of factors such as the volume of dilution flow allocated to South Australia, the potential for unregulated flows and changing local conditions in the river.

Recommendation:

It is recommended that this proposed strategy for the use of dilution flow be adopted, including a monthly review of the situation to ensure that the greatest possible benefits are derived from the limited flows currently allocated to South Australia.

4.3.2 TRIAL AGAINST SEAWATER INTRUSION INTO THE LOWER LAKES

Leakage and overtopping of the barrages by seawater has led to significantly elevated salinity levels immediately upstream of the barrages, particularly at Goolwa and Mundoo. Movement and mixing of this highly saline water, mainly by wind action, threatens to accelerate the rise in salinity of Lake Alexandrina and, eventually, Lake Albert. This threat has been borne out by the most recent monitoring undertaken by DWLBC.

An approximation of the potential impact this saline water could have on Lake Alexandrina can be obtained by assuming that the contaminated water is fully mixed with the water in the lake. This would result in an approximate increase in salinity for the whole lake from nearly 2000EC currently to over 2250EC, or a 14% increase, or higher.

The opportunities to release water will be very limited and will depend entirely on local weather conditions. These opportunities will become less frequent as the water level in the lakes falls during spring and summer.

Following discussions convened by Hon Dean Brown (community liaison) with local government representatives, impacted landholders, DWLBC and SA Water officers, a proposal to undertake a trial release of water from Goolwa and Mundoo barrages has been developed and has been discussed with the MDBC (River Murray Water).

Under the proposal it was anticipated that a small release (total of the order of 300 ML to 500 ML/day for 4 to 5 days maximum) will be made from the Goolwa and Mundoo barrages at a time when the weather conditions ensured that the lake water level would remain above the downstream estuary level for a few days.

The trial would have to be closely monitored to better quantify the potential benefits to be gained through the avoidance of contamination of the greater Lakes' area from highly saline water in the Goolwa and Mundoo channels.

The perceptions of the different sectors of the community to this proposal are likely to be quite different. Riverland irrigators and metropolitan Adelaide water users could see this discharge as a waste of water, while Lower Murray irrigators are likely to appreciate the proposal as an attempt to improve conditions in the lakes.

It will be important to note that the maximum volume that could be discharged will be small (<5GL) and would lead to a change in lake level of less than 5 millimetres. This will have no significant impact on the availability of water for irrigation or metropolitan Adelaide or on the management of the lakes to enable access to users. On the other hand, any reduction in salinity level near the barrages will reduce the risk of elevated salt concentrations in the main body of the lakes.

Recommendation:

That a one-off trial release of highly saline water through the Goolwa and Mundoo barrages to quantify the potential benefits to be gained through the avoidance of contamination of the greater lakes area.

4.3.3 FILTRATION PLANTS

Work is progressing as expected on the $50 million country water quality improvement program which will deliver filtered water to 17 rural communities.

The delivery of the nine water treatment plants is progressing as expected with bulk earth works commencing on site in August in conjunction with the continuing work to fabricate the treatment plant skids.

Associated with the nine water treatment plants are the pipelines, which total 52km in length, which will supply water to townships remote from the treatment plant sites. Of the six major pipelines to be built, construction has commenced on four with the remaining two pipelines commencing in late August and September.

4.3.4 DETECTING AND MITIGATING ALGAL BLOOMS

The continuing drought conditions in the Murray-Darling basin significantly increase the risk of toxic algal blooms emerging in the river.

Intensive monitoring from the border to Lake Alexandrina has been put in place by SA Water so that changes to river water quality can be detected. This includes:

- Enhanced routing River Murray algal monitoring – 26 locations are sampled weekly and routine taste and odour samples taken to detect benthic algae;
- Regular aerial surveys have been initiated for the early detection and assessment of algal blooms (SA Water with cross-agency collaboration);
- A River Murray water quality monitoring team has been established by SA Water to provide an 'on river' survey capability to cover spring and summer 2007/08. The team is equipped with water quality sondes with blue-green algae sensors which help to indicate the possible onset of a bloom. The team also provides immediate on-the-ground assessment, tracking and early warning of potential water quality challenges allowing implementation of appropriate management actions.

Measures in place and/or underway in SA Water to mitigate the risk of algal blooms include:

- A new rapid field method of testing for toxins found in the cyanobacteria *Microcystis* and *Anabaena* has be develop and validated. This provides a yes/no result for toxins within one hour, compared to the traditional toxin level testing which takes up to five days to obtain a result.
- Construction of filtration plants to provide water to 17 rural communities (discussed in section 4.3.3 above). Water treatment can be effective in removing intact algal cells.
- Facilities for powdered activated carbon (PAC) dosing to treat algal toxins. Certain toxins can be neutralised by oxidation with chlorine and the use of appropriate PAC. This also removes tastes and odours associated with algae. All Riverland water treatment plants have PAC dosing facilities, while temporary facilities at Morgan and Mt Pleasant are being upgraded.
- Algal scum booms have been installed at five high-risk water supply inlets.
- Reserve stocks of treatment materials have been purchased, and arrangements made with a PAC supplier to meet SA Water's needs.
- Plans are being developed for operating water treatment plants in 'emergency mode' in the event of abnormally high levels of toxins, and an emergency management exercise will be conducted by SA Water during spring.

5 MEDIUM TERM CONTINGENCY PLANNING (2008/09 +)

5.1 Demand control measures

5.1.1 INCREASING RESPONSIBLE USE OF WATER

Multi-criteria analysis for Water Proofing Adelaide ranked water demand management, stormwater harvesting, and local water recycling ahead of all other water management options investigated.

It is proposed to now build on Water Proofing Adelaide initiatives by developing options for enhancing responsible water use by South Australian communities, including Adelaide and other River Murray dependent communities. This will include consideration of market incentives, education, regulation and other potential mechanisms.

A range of approaches will be investigated including successful mechanisms from other Australian jurisdictions and overseas, and their applicability to South Australia assessed.

This information will be of use for other Government initiatives, including Water Proofing South Australia, and the full review of Water Proofing Adelaide required as part of the strategy's development process (Water Proofing Adelaide strategy 63).

Potential funding sources for this work will be investigated and may include federal government funding.

Recommendation:

Note that the Water Security Task Force will undertake a new project to develop options for enhancing responsible water use by South Australian communities, including Adelaide and other River Murray dependent communities.

5.2 Supply security measures

5.2.1 EMERGENCY RESERVE

SA critical needs 2008-09 reserve

Contingency planning in late 2006 for the 2007-08 year was based on a volume of 201GL of River Murray water to meet critical urban, stock and domestic needs.

It was estimated that a total volume of 216GL would be required, including a worst case projected Mt Lofty catchment inflow of 15GL, and assumed 50GL reduction in demand due to level 5 restrictions.

An underlying assumption was that salinity was not an issue and any water sourced would be of potable and palatable quality. Hence no additional flows for SA (beyond "conveyance water" – losses) were set aside in the contingency planning.

On 5 February 2007 Cabinet considered a range of measures directed at water security for South Australia for 2007-2008., and approved inter-alia, in principle, the plan to secure an additional 100GL of water for SA in 07/08, including acceptance of the Commonwealth offer to fund half of 20 GL, and the investigation of an options contract on accessible "above target" water held by Snowy Hydro Limited, noting that specific approvals will be sought prior to entering into any commitments to purchase water or options contract.

Conditions over the following months improved sufficiently that this measure was not proceeded with. However much of the preparatory work was done.

The outlook at end August 2007 for the 2008-09 year indicates that at the end of 2007-08 storages will have again been run down to virtually empty with little or no water in reserve. In addition, very low flows and a reduction in river levels throughout 2007-08 will lead to significant increases in salinity and without intervention, a high risk that salinity will render water unpalatable, and potentially non-potable.

Modelling by South Australia and the Murray-Darling Basin Commission indicates that, to mitigate salinity, South Australia needs around 900 GL across the border in 2008/09, including 201 GL for critical human needs and dilution flows.

Whereas in planning for 2007-08, there was agreement between first ministers to share available resources to ensure that specific volumes were set aside such that critical urban, stock and domestic needs could be met as a first priority, no such agreement has yet been reached for 2008-09.

At this stage other jurisdictions have not committed to a reserve, and indications are that their support may be limited to ensuring sufficient reserves to cover transmission losses only, but not water for critical consumption, arguing that each jurisdiction ought to provide for its own critical needs, either by setting aside a component of water available in 2007-08 over and above critical needs, or through purchases in the market.

Recommendation 7 of the September 2007 report on Murray Darling Basin Dry Inflow Contingency Planning, if agreed by First Ministers, has been assessed as providing sufficient volume to SA to meet critical requirements.

Should that recommendation not be accepted South Australia will need to implement measures to secure a reserve for 2008-09 it will need to unilaterally consider alternative measures.

Possible reserve scenarios – for securing a reserve for 2008/09

The options for establishing a reserve for South Australia for 2008-09 are:

1. SA participation in a basin wide reserve, preferably on the same basis as was agreed for 2007-08 by first ministers, but at worst the recommendation 7 measures outlined above and preferably comprising:

    a. All of the resources available within the ambit of the MDBC (on SA's interpretation of the Murray Darling Basin Agreement), including tributary resources in NSW and Victoria which currently account for an additional 1,500GL in storage, **rather than**

    b. Only the "Murray System" resources under the current water sharing arrangements

2. Purchasing 200 GL from limited volumes of allocated water available in the market during 2007/08 for holding in upstream storages for 2008/09. This measure would need to commence as early as October 2007 and is anticipated to cost between $150 million to $220 million.

3. Setting aside sufficient water from SA share in 2007/08 to provide for a reserve. This water could come from the dilution flow (but this would increase salinity levels in 2007/08) or it could come from allocations.

4. Entering into an arrangement with Snowy Hydro for an option contract over water releases, most likely relying on any available "Above Target" water available to Snowy Hydro. Costs are estimated to be $200m to $300m.

5. Accessing "Dead Storage" water available in Snowy Hydro storages (water in storage below minimum operating levels and not accessible without major infrastructure and intervention in SHL operations). Costs are unknown but are likely to be higher then in 4 above.

The best outcome for SA is still the establishment of a basin wide critical reserve for 2008-09.

The relative merits of the alternatives in terms of cost and effectiveness, and the latest time to initiate the measures is depicted below in Figure 22:

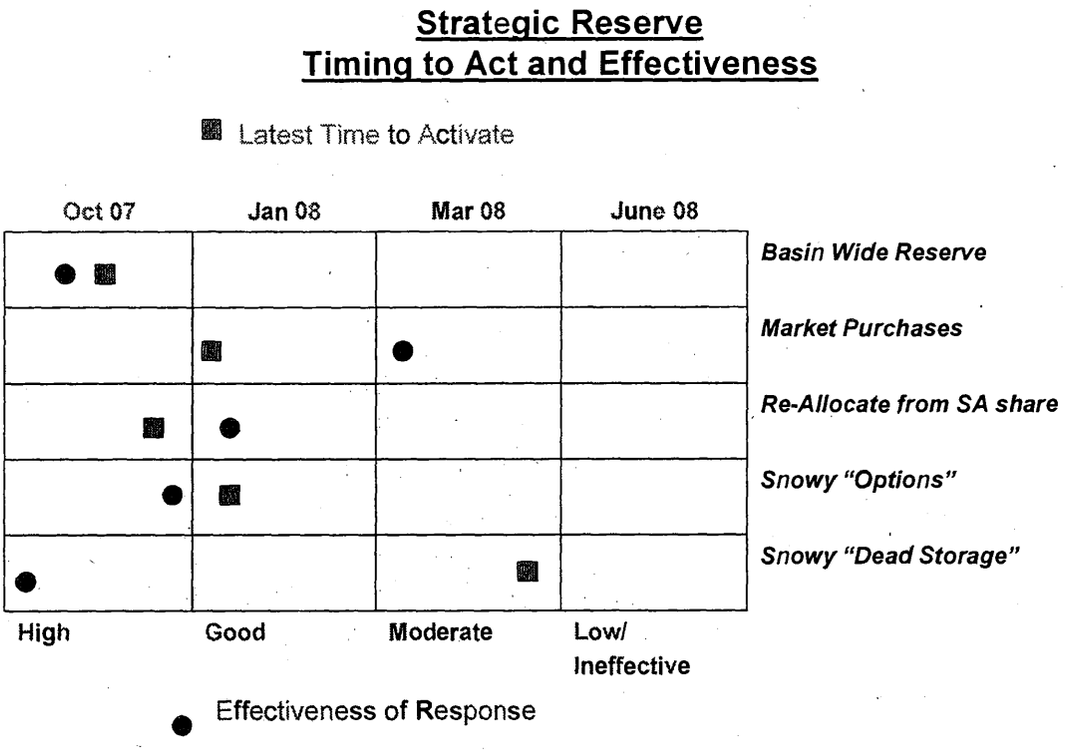


Figure 22 Reserve – timing and effectiveness

It should also be noted that water availability discussed in this paper and subject of discussions and agreements between the States on water sharing arrangements are presently limited to the "Murray System" as defined in the May 2007 *Murray Darling Basin Dry Inflow Contingency Planning Overview Report to First Ministers* [3].

This is significant for South Australia because it precludes approximately 1500GL of water currently in storages on tributaries to the Murray including Blowering and Burrinjuck in NSW on the Murrumbidgee, Eildon on the Goulburn in Victoria, and Snowy Hydro storages which discharge into the Murrumbidgee through the Tumut River. Debate about the requirements of the Murray Darling Agreement for upstream states to include these tributary waters in the water under the purview of the MDB Agreement remain unresolved. This water is therefore currently not considered in the available resource assessments.

[3] The 'Murray System' means the water resources of the southern Murray-Darling Basin which are allocated to States under the terms of the Murray-Darling Basin Agreement, and subject to the management decisions of the Murray-Darling Basin Commission. Broadly these are the Murray River west of Hume Dam and the Darling River south of Menindee Lakes, and the major storages of Dartmouth Dam, Hume Dam and Lake Victoria. The 'southern Basin system' means the Murray System as well as tributary systems such as the Murrumbidgee, the Goulburn, Ovens, Loddon and Campaspe, and their upstream storages.

South Australia's view, which is understood to be consistent with that of the MDBC, is that the MDB Agreement requires tributary water to be taken into account by upstream states in order that they meet guaranteed flows to South Australia. In any event to be planning contingency measures with the prospect of costs likely to run into hundreds of millions of dollars without exhausting all possible avenues to access substantial reserves held in tributary storages would not be in SA's best interests.

South Australia requires a minimum of 201GL to meet critical urban, stock and domestic demand (This does not take into account water required to deliver that volume to SA, or any additional dilution flow to maintain a palatable water supply, and after allowing for intakes to Mt Lofty catchments).

There is a case for additional dilution flows of approximately 180GL to SA beyond that provided under current sharing rules to combat threats to potable water supplies from rising salinity levels. This, along with the SA argument for a basin wide reserve, is discussed in appendix 5 (page 120) a paper to Senior Officials, Dry Inflows Contingency Planning – Reserve in Storage at End May 2008. South Australia is currently planning to set aside water from its consumptive share of flows to SA to provide for both a critical reserve for 2008-09 and additional dilution flows to mitigate rising salinity. Under the current proposal for distribution of water made available to SA under the sharing arrangements4 there is not sufficient for a critical reserve of 201GL under the worst case (100% AEP), and just falls short under the 90% AEP case with 199GL of water set aside at the end June.

Reserve taken from SA's allocation in 2007/08

South Australia is able to set aside a portion of the 2007/08 allocation to form a strategic reserve for 2008/09. The initial agreement with the Commonwealth and the other states was that this reserve would have to come from SA's consumptive share, but the recent SOG recommendation raises the possibility for the reserve to come from the 2007/08 dilution flows.

If the reserve is taken from the consumptive share it is proposed that this be done on the basis of 2 GL out of every 3 GL of improvement going to the reserve, and 1 GL being allocated for consumption. Under this proposal there is not sufficient water for a critical reserve under worst case (100% AEP), and it just falls short under the 90% AEP scenario with 199 GL of water set aside at the end of June, as indicated in Figure 23.

If the reserve is taken out of dilution flow, the option exists to retain water currently allocated to SA but not yet delivered, in addition to storing future allocations. This will give greater certainty of the reserve being established, but any reduction in dilution flows will result in increased salinity levels in 2007/08. An optimum balance is still being modelled

[4] Attachment 6 Probability Of Improvement In River Murray Water Allocations

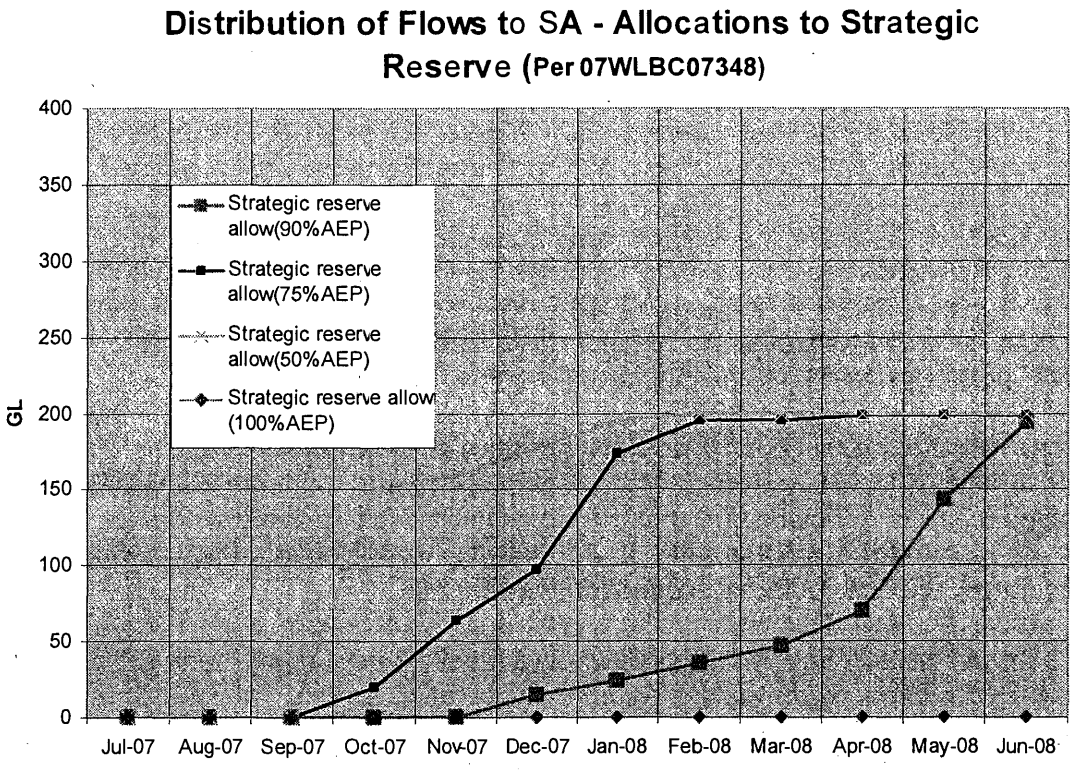


Figure 23 Distribution of flows to SA and allocation to a reserve

There is a high risk of relying solely on markets to secure a reserve because there may not be sufficient water for a properly functioning market, possibly not a market at all, and even if there is prices will be at or above 2006-07 levels.

SA will need to acquire a minimum of ~200GL if it was out on its own for a reserve for 2008-09, at cost likely to be in the region of $150m to $220m (based on estimated purchase cost of $0.75m to $1.1m/GL – at 17 September temporary water prices are around $0.95m/GL, having risen sharply in the preceding 6 weeks) for purchases of temporary allocations via water markets, and a significantly higher, but unquantified cost to access Snowy Hydro water. The consequences and financial and economic impact of unacceptably high salinity warrant consideration of securing a further 180GL for dilution flows at an estimated cost of between $135 million to $200 million. The economic and other impacts of salinity are discussed in sections 3.1.

It is anticipated that market purchases, or negotiating an agreement with Snowy Hydro would take several months to complete. Accessing Snowy Hydro dead storage could take 1 to 2 years to implement.

Discussion

Snowy Hydro Water

Accessing Snowy Hydro water remains an option but one which should be considered a last resort. It nevertheless ought to be "on the table".

During 2006-07 in preparation for low inflows in 2007-08, discussions were held with Snowy Hydro about taking an option on Snowy releases of "Above Target" water (water available from Snowy Hydro for release at its discretion, rather than releases required under its operating licence). Snowy Hydro storages have been run down to their lowest level since the commencement of the Snowy Scheme operations and the scheme is reported to be operating below previous minimum operating levels. There is virtually no prospect of entering into options arrangements for releases of "above target water" in the Murray System unless there are substantial inflows from snow melt in spring. However the NSW government announced on 28 August 2007 that it had increased allocations to Murrumbidgee High security entitlement holders from 30% to 60%, in part because of "Above target " releases from Snowy Hydro, and a relaxation of town water restrictions from level 4 to level 3a.

Prices offered for 2007-08 by Snowy Hydro for exercised options were approximately $1m/GL, including costs of securing water in the market to payback releases. Current estimates are that this cost would rise to around $1.5m/GL for 2008-09, and there is no guarantee that Snowy Hydro will have sufficient reserves of above target water to enter into an options agreement.

The other remaining Snowy Hydro alternative involves accessing "dead storage" in Snowy Hydro dams (water below the normal operating levels). Talbingo Dam has the largest dead storage capacity of all Snowy Dams at ~700GL. However accessing this water would require major intervention in their operations, both in terms of new infrastructure required and disruption to electricity generation capacity. It would therefore be very expensive to implement and would only be feasible with cooperation from SHL shareholders, because of potential to have a major impact on electricity supplies and shareholder dividends.

Water Markets

At this early stage in the season it is difficult to assess water availability and allocations, and therefore market conditions, however it is evident that water markets are substantially more constrained than in 2006-07 when demand and prices reached record levels. Under normal circumstances water markets usually become active in around October which would be the earliest indication of likely prices and availability.

In the current circumstances a move to acquire water in the market ought to commence in October 2007 to ensure the greatest prospect of acquiring the necessary volume.

This is due to a number of factors, primarily;

- Assuming a 90% AEP inflows scenario (current inflows are tracking at near the 90%AEP level), September/October is the time when the majority of irrigation decisions will be made about whether or not to grow crops (either planting annual crops, or irrigating perennial crops with sufficient water for a crop, or at a reduced level sufficient only to maintain in survival mode).
- Irrigators who choose not to irrigate or to irrigate at minimum levels will have water available to put on the market in October.

- Those irrigators who decide to proceed with growing a crop will want to secure water as early in the season as possible to ensure they have sufficient water supplies.
- An indication to the market of South Australia's intention to acquire water in the market at around the time irrigators are making their decisions will provide irrigators a firm alternative should they decide not to proceed with a crop for 2007-08.
- Analysis of allocation announcements foreshadowed by water authorities throughout the Southern Murray Darling Basin indicates that (to the extent that allocation increases are possible) the largest increases will be made in October.
- The 201GL of water required will be significant relative to the total volume allocated, which is estimated to increase by around 280GL in October under 90%AEP inflows, taking the total allocated for irrigation to around 900GL.

It is estimated that at the beginning of September 2007 there is about 600GL allocated to irrigation in water markets in the Southern Murray Darling Basin.

Water use in the southern MDB in 2004-05, considered a relatively normal year, was around 6,000GL. In 2006-07, the worst year on record for inflows, around 3,500 GL was available for allocation, made possible only by virtually exhausting reserves in storage. At this level of water availability market prices reached record levels, with prices for temporary water between $0.3m/GL and $0.5m/GL (up to $0.9m/GL in one constrained market), and permanent water between $2m/GL and $2.5m/GL.

Under the current agreed water sharing arrangements for the MDB, available water (approximately equal to inflows given storages are at close to empty) will need to reach ~2,750GL before special sharing arrangements fall way and are replaced by the "normal" sharing arrangements of the MDB Agreement.

For the 2007-08 year the current the MDBC projections are for inflows similar to 2002-03, the third lowest on record, with about a 40% chance of inflows exceeding 3,500 GL (approximately the volume of water allocated in the Southern MDB in 2006-07), a 10% chance of exceeding 5,000GL and 0% probability of inflows exceeding 7,500 GL[5].

There is therefore a considerable risk of whether or not there will be sufficient water available on the market, however it is not possible to assess this until some time after winter inflows are known in around October.

[5] Dreverman presentation Echuca 10 Aug 2007-dry tercile basis

RECOMMENDATIONS

Continue to press to secure a basin wide reserve for critical human needs taking into account flows required to manage salinity at acceptable levels.

Pressure all other jurisdictions to include tributary water (including an additional 1500 GL currently in storage) within the gambit of the basin wide contingency measures.

Maintain a watching brief on water inflows and allocations to assess the viability of purchasing temporary water as the season progresses, and re-assess the position in late October.

Maintain a watching brief on Snowy storages as inflows of winter snows begin in spring to assess whether there is a likelihood of re-opening discussions on options over above target water releases.

Open discussions within SOG on the prospect of accessing Snowy Hydro dead storages under worst case scenarios for 2008-09.

As a matter of urgency, consider holding back some of the dilution flow allocated to SA in 2007/08.

5.2.2 CONTINGENCY PLANNING FOR THE PROTECTION OF CRITICAL ENVIRONMENTAL ASSETS

During 2006-07, the River Murray Environmental Annual Watering Plan was suspended due to ongoing drought conditions. The only environmental watering that was undertaken was at the Chowilla and lower lakes/Coorong/Murray mouth icon site, using water that had been made available for the Living Murray. As a result of that water, Red Gum, Black Box and a range of other vegetation communities on the Chowilla floodplain that would otherwise be dead or extremely stressed showed significant signs of recovery. The small volume of water used on Chowilla not only revived a few core areas of floodplain but provided a rare breeding opportunity for many species of aquatic plants, invertebrates, frogs and water birds. The maintenance of these habitats and species is critical to the long-term maintenance of the broader floodplain and the river system as a whole. During drought conditions watered areas provide critical resources & refuges for many riverine plants and animals that can recover at the icon sites once water resource availability improves. In addition, barrage fishway releases promoted native fish spawning and recruitment and localised freshening of the estuary downstream of the barrages. While this small volume of water achieved significant localised environmental improvements, it watered less that 1 per cent of the floodplain in South Australia.

The Murray Annual Environmental Watering Plan prioritises River Murray environmental assets on the basis of their uniqueness, value as a refuge, and feasibly of watering. It includes barrage fishway releases, Chowilla sites that have benefited from previous watering and which will invariably decline in ecological health

if not rewatered, River Red Gum sites where an investment in watering has previously been made and maintenance of managed wetlands. Monitoring results from previous years indicates that action at the re-watering sites will ensure the continued recovery of those River Red Gum communities. The response of vegetation will be further consolidated with follow-up (consecutive) watering. The application of water this year will allow iconic trees (some estimated to be around 400 years old), which are currently on the brink of death to survive for perhaps another 2-3 years, by which time a natural flood event (or rewatering) may occur. If these sites aren't watered on an ongoing basis, until such time as there are sufficient flows in the system to provide a natural inundation, many of these iconic, high priority River Red Gum and Black Box trees will be lost forever.

Denying water to the these sites in 2007/8 will seriously erode the benefits achieved though the watering program to date, remove critical refuge areas for many floodplain species, hasten long-term ecological change of the floodplain ecosystem and reduce the capacity of the ecosystem to recover. The continuation of the watering program is the only way to ensure the previous investment in the health of floodplain is not wasted and that important areas of floodplain are maintained until long-term solutions are place.

It should be noted that the Lower Murray (i.e. below Wentworth) has suffered years of human-induced drought and has subsequently lost the resilience that would enable maintenance of ecological function throughout drought periods. Unless water is specifically allocated to critical environmental assets, we will lose them forever.

Recommendations:

That small allocations of water be made available for the protection of critical environmental assets, for example by using 7 GL of dilution flow.

Prior to making an environmental allocation, consideration be given to all the circumstances, including the availability of unregulated flows or other water.

5.2.3 REVIEW OF WATER PROOFING ADELAIDE

The following preliminary review of the Water Proofing Adelaide strategy (WPA) has been undertaken recently. As the challenges and duration of the drought are more fully understood, WPA could be fully reviewed in light of new information regarding water security. This review would be consistent with initiative 63 of WPA and should encompass water security, some scenario planning and identification of specific proposals. It would need to consider any additional strategies and specific infrastructure proposals that have arisen as a result of the severe drought conditions and also considering environmental, water quality and cost issues in a holistic way.

Introduction

Water Proofing Adelaide (WPA) is a strategy released by the South Australian Government in 2005 identifying a number of important initiatives and approaches

within the greater Adelaide region which would allow for a series of outcomes, particularly, the protection, enhancement and development of existing water supplies and to assist in meeting new demand created by growth. Responsible water use and demand management is also an important element of the Strategy. The outcomes identified do not just relate to water for human use but also include environmental use as well.

WPA reflects a range of initiatives that had been identified over time as having the potential to contribute to these outcomes over a twenty year period to 2025.

The WPA strategy identifies 63 initiatives that could be undertaken to achieve the outcomes identified. Some of these initiatives are legislative, regulatory and administrative in nature but are important to create the governance framework within which the identified outcomes could be achieved.

The set of potential WPA outcomes include matters that are beyond just the question of creating new sources or savings of potable water. There is an important element of WPA relating to improvements in environmental flows, the protection of catchments in the Mount Lofty Ranges and water quality issues.

In particular, it is important to understand that WPA was developed at a time when flows of less that 1500 GL across the SA border were inconceivable. It was therefore assumed that inflow variability in the Mt Lofty Ranges would be balanced by extractions from the River Murray. Water Proofing Adelaide has a contribution to make to the current situation but it is not in itself a solution to managing variability of inflows in the Mt Lofty Ranges.

As the challenges and duration of the drought are more fully understood, WPA could be fully reviewed in light of new information regarding water security. This review would be consistent with initiative 63 of WPA and should encompass water security, some scenario planning and identification of specific proposals. It would need to consider any additional strategies and specific infrastructure proposals that have arisen as a result of the severe drought conditions and also considering environmental, water quality and cost issues in a holistic way.

Overview

WPA is a twenty year strategy (2005 – 2025). The impact of its various elements will in many cases take time to be reflected in measurable outcomes. It is possible to outline the progress on the 63 individual initiatives and to measure the aggregate level of achievement that has occurred to date.

The implementation of WPA Strategy is reviewed on a six monthly basis by the two agencies that have responsibility for the bulk of the initiatives – Department of Water, Land and Biodiversity Conservation and SA Water Corporation.

Implementation

To date a total of 9 of the 63 initiatives (14%) have be completed. While this might seem low, it must be recalled that WPA is a twenty year strategy. Of the outstanding 54 initiatives, 22 (35% of all initiatives), are because of their nature described as

ongoing. A further 23 (35% of all initiatives), are planned for completion in a 2006 to 2008 time frame.

If completions proceed as planned it is likely that WPA, will be approaching 50% complete by the end of 2008. There is however a small concern that some projects with planned completion dates in 2006 and 2007 may not achieve their planned completion date.

It should be clear that the implementation of an initiative does not mean that the full benefits attributed to the initiative will come to fruition immediately or even in the near future. It cannot be stated too often that WPA is a long term strategy with connected activities intended to achieve an overall benefit to the community and that expectations need to match this reality.

It is not surprising that of the initiatives that have been completed the bulk are those which cover legislative, policy and governance type activities. Further these initiatives are more aimed at setting the framework for the strategy than they are aimed at direct water saving outcomes.

It is noted that several initiatives relating to the Water Efficiency Labelling Scheme (WELS) attribute the Australian Government as the lead agency. However, in the most recent update report the relevant South Australian Government agency has been identified, as the lead agency is lieu of the Australian Government.

Achievements

Despite the fact that WPA is not a drought response there is still a valid question to be asked as to the contribution that WPA has made to the task of saving water.

One measure of this is shown in Figure 24.

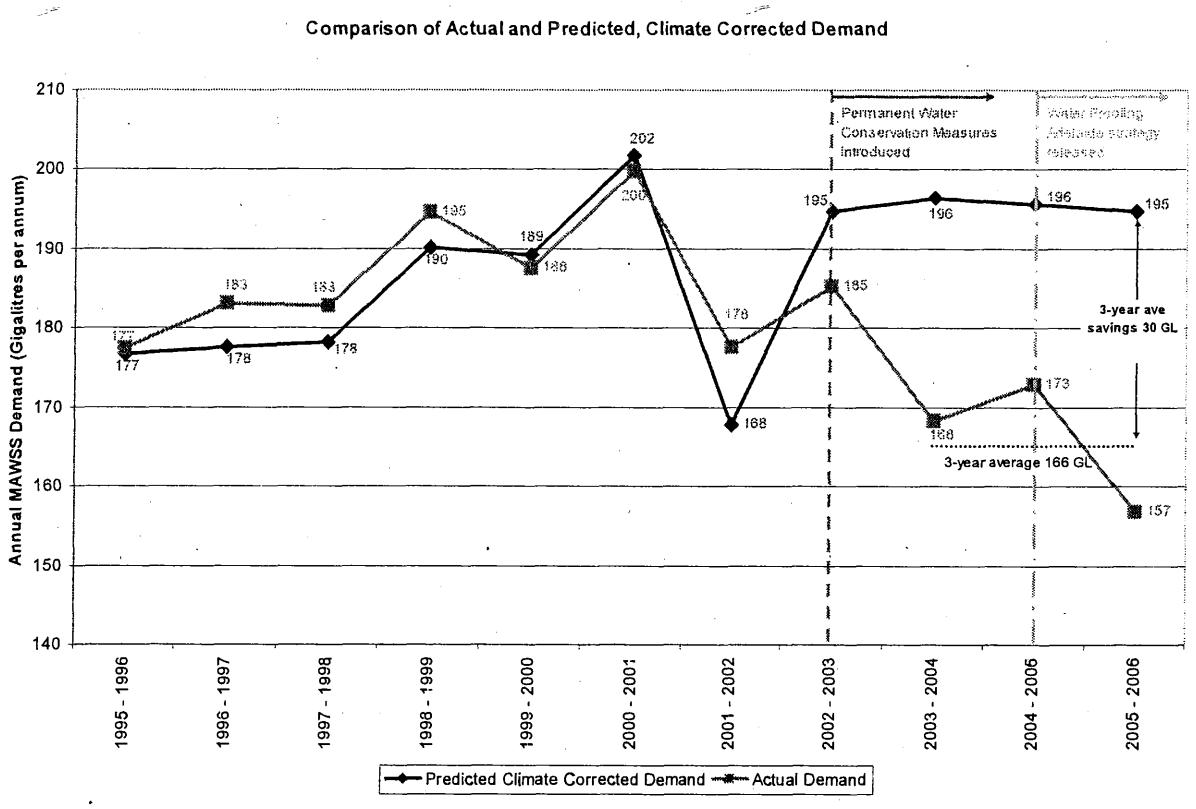


Figure 24 Potable savings to date

Figure 24 shows the difference between actual demand and the predicted level of demand as adjusted for annual growth, the number of days when the temperature exceeded 30 degrees and annual evaporation. This shows a very significant reduction in the demand for water of 30 GL per year.

The disappointing aspect of this analysis is that there appears to be very little ability to allocate actual water savings to individual initiatives. In some of the WPA initiatives this is completely understandable. As has been indicated, a number of initiatives are of a legislative or policy nature and will not have savings directly attributable to them. However, in the case of other initiatives, the measurement of the contribution from of individual initiatives appears to rely on the prior estimation of possible savings.

Unfinished agen**da**

The revenue direction for SA Water approved by Cabinet in 2006 for the period 2007-2008 to 2011-2012 established a pricing path of CPI plus 3.0%. Of the 3.0%, an amount consistent with 2.5% was identified as being funding available for WPA projects.

The funding of individual WPA projects was and is still subject to the normal approval processes.

This appears to be a sensible approach to a diverse and potentially costly strategy which has an implementation period of several years at a minimum and a pay-back period of 20 years. As indicated in the introduction some of the capital intensive initiatives of WPA will need to be considered in the seriatim of capital projects that are being identified and considered to deal with the drought situation.

Most of the capital intensive projects that are part of the WPA Strategy will produce water at levels that are equivalent to the cost of water on a per unit basis from large scale projects such as desalination or increased storage. However, it is important to ensure that the full range of significant options is considered and assessed.

Of course there may be very good reasons relating to other desired policy outcomes that would justify the investment in some of the capital intensive WPA initiatives. Examples of this might be the recommendations of the Coastal Waters Study and objectives arising from it for the reduction of ocean outfall from waste water treatment plants. In addition, holistic stormwater management may also have multiple benefits, including reduction of nutrient out-flows to the ocean, flood management and amenity.

The significant WPA initiatives for reducing demand and replacing the sources of water are set out in Table 8

Table 8

STRATEGY	Total savings	Potable savings	Ground water savings	Economic development
Responsible water use	37 GL	34.5 GL	2.5 GL	
Re-use (treated effluent and stormwater)	33 GL	12.5 GL	9.5 GL	11 GL
TOTAL	70 GL	47 GL	12 GL	11 GL

Conclusions.

The Water Proofing Adelaide strategy has contributed to a significant reduction in water use as measured against the "climate corrected" projections of demand. This saving is estimated to be 30GL using the three year average (2003-2004 to 2005-2006).

Unfortunately there appears to be a gap between this global performance and the identification of the specific causes of this reduction. This does not invalidate the savings that have been achieved but it does not allow the identification of successful strategies and therefore limits the ability to reinforce or extend these successful strategies.

While a considerable number of the initiatives identified under the WPA banner have been achieved it has been difficult to identify any mechanism or structure that has been established to drive the completion of the all the identified initiatives. This role

falls to the lead agency for each initiative but there does not appear to be any co-ordinated approach to driving initiatives or setting deadlines.

In part this is understandable because of the demands that have been placed on agencies and individuals as part of the response to the drought.

Recommendations:

That a formal process to monitor and drive the implementation of Water Proofing Adelaide be established and report regularly to Cabinet through the Minister for Environment and Conservation and the Minister for Water Security.

Note that it is difficult to attribute specific savings to specific actions.

That Water Proofing Adelaide be fully reviewed in light of new information regarding water security. This review would be consistent with initiative 63 of WPA and should encompass water security, some scenario planning and identification of specific proposals. It would need to consider any additional strategies and specific infrastructure proposals that have arisen as a result of the severe drought conditions and also considering environmental, water quality and cost issues in a holistic way. This review should commence in 2008.

5.2.4 NEIGHBOURHOOD SCALE RECYCLING, STORMWATER AND DESALINATION

Multi-criteria analysis for Water Proofing Adelaide ranked water demand management, stormwater harvesting, and local water recycling ahead of all other water management options investigated. Public consultation for Water Proofing Adelaide also indicated very strong community support for local water harvesting and recycling, including water sensitive urban development projects. The relevance of stormwater and wastewater reuse reflects in the Water Proofing Adelaide strategy, which aims to increase stormwater and recycled water use by 33 GL per year by 2025, including through water sensitive development in new land divisions.

While several major stormwater and water recycling projects are already planned, key challenges remain for promoting additional use of these resources, particularly in well-established metropolitan areas where most of Adelaide's stormwater and effluent is generated, and in non-metropolitan areas. Options for desalination and additional storage are also being developed for metropolitan Adelaide and some regional areas.

WPA also addresses environmental water management issues, indicating the Adelaide Coastal Waters Study would provide information on the extent to which the stormwater and effluent discharges to Adelaide's coastal environment may be affecting the marine environment, and that there may be a need for additional interventions depending on the outcome. The Adelaide Coastal Waters Study has now demonstrated stormwater and effluent discharges as the major cause for the loss of Adelaide's seagrasses, and a need for very large reductions in some pollutants entering Gulf St Vincent from these sources. In order for this to occur, it will

be necessary to better manage stormwater and wastewater within catchments, including by increasing stormwater use and water recycling to reduce discharges to the marine environment.

The State Government supports the concept of local water reuse and water sensitive urban development, including through:

- the NWI Agreement, which requires action for innovation and capacity building to create water sensitive urban cities (NWI Agreement, section 92)
- the State and Local Government Agreement on Stormwater Management, which includes actions to promote water sensitive urban development to manage stormwater
- involvement in specific developments encompassing reuse, including Mawson Lakes and the Lochiel Park development.

Planning SA is also currently undertaking a project, with federal funding, to institutionalise water sensitive urban development in the greater Adelaide area, to ensure water-sensitive objectives in the Planning Strategy are taken up by local councils and developers.

Further work is needed to identify additional projects and ensure the thoughtful application of existing techniques is required to adapt to local circumstances.

Potential projects would include:

- neighbourhood scale initiatives supported by local councils
- water sensitive urban development at a development level, which would also require support of developers and local councils

5.3 Water quality measures

5.3.1 CONTINGENCY PLANNING FOR HIGH SALINITY AND ALGAL BLOOMS

Contingency planning is underway to deal with a situation where source water from River Murray reaches salinity levels of 2,000 mg/L TDS, rendering it not suitable for drinking. As salinity levels progressively increase, the water will become increasing unpalatable and could reach the 2000 mg/L level by May 2008. Higher levels could be ongoing for some 12 months depending on the level of dilution flows in the river.

The same contingency plans would apply in the event of a toxic algal bloom that was beyond the capability of water filtration plants.

Emergency drinking water would need to be provided to communities at 4 litres per person per day. SA Water could manage providing up to approximately 50,000 people (eg. five townships of 10,000 people) with emergency drinking water. Beyond this State Emergency Management assistance would be required.

Country townships receiving water directly from the river would be the first to be affected by rising salinity levels. However, in the absolute worst case, the whole of

metropolitan Adelaide's population (approximately 1.1 million people) may require emergency drinking water.

The majority of West Coast and Lower South East townships are not affected as their waters are sourced from ground waters.

Alternative source water of emergency drinking water

At a rate of 4 litres per person per day, ample quantities of alternative source water have been identified. This includes bottled water, a potentially quarantined reservoir in the Adelaide Hills, spare capacity from Lower South East groundwater, Adelaide natural spring water, existing community rainwater tank supplies and commercial producers of a high volume of reverse osmosis water.

In addition, mobile and high capacity reverse osmosis desalination units are available for hire or manufacture within short timeframe and to suit specific specifications. Note these are capable of providing the 4 litres per person per day of drinking water, not fulfilling all water needs.

Logistics

The most critical issue in the supply of emergency drinking water from an identified source is the logistics of actually delivering the quantity of potable water to communities on a continuous basis for the duration a high salinity problem.

SA Water has identified sources of bottled water manufacturers and bulk water tanker providers (each of which requires prime movers, drivers and fuel in which to effectively deliver sufficient quantities of potable water). While there may be sufficient bulk water tankers in SA, the economic impacts on the state of commandeering these from the transport companies (in particular wine industry) would be significant.

Cost

Continuity planning undertaken by SA Water has enabled estimates of required quantities of alternative drinking water, methods of distribution and indicative costs. Obviously, these elements are affected by the number of people needing to be supplied, the volume of water required, the distances to transport it, and the degree of community support to assist with public distribution.

The direct and indirect costs involved will be significantly large and increase over time.

Mobile desalination units, whilst high cost for initial outlay, become more cost effective over time.

Other Considerations

As a consequence of saline water entering into SA Water distribution network, the following major issues will occur:

- Reuse from wastewater plants may not be practical depending on the target use tolerance to high salinities. As mains water salinity approaches 2000mg/L treated

wastewater, salinity is likely to exceed 3000mg/L which would exceed the tolerance of many crops/plants.

- Re-use water normally supplied to major users at Virginia (vegetable growers) and Willunga (viticulture) will become saline and not acceptable for these activities.
- Re-use water / effluent used for parks and gardens etc (particularly along river townships) will become saline and not acceptable for these activities.
- Major industries reliant on lower salinity mains water would need to make alternative water supply arrangements or alternatively closed down.
- Increased rates of corrosion would occur on SA Water sewers, pumps, pumping mains and plants.
- Increased rates of corrosion would occur in household water heaters in particular.
- Extreme economic cost of recovery.

6 LONG TERM PLANNING

6.1 Desalination

The Desalination Working Group is currently progressing as quickly as possible with desalination investigations and is due to report in October 2007. Two different sizes of plant are being assessed – 50 GL and 100 GL. All advice received so far highlights that, if a plant is constructed, it should allow for ease of upgrade at a later date.

There is a minimum time required to perform environmental work, develop a procurement arrangement and construct a plant. Even the Australian states that are fast tracking plant construction are still expected to have taken a total of around 4 to 5 years for the entire project to be completed.

Detailed environmental studies are required before any approvals to construct and operate will be given. The Government announced in the recent budget that SA Water will be investing $3 million on environmental base line studies along the metropolitan coast. This is in addition to the work being undertaken by the Desalination Working Group. There are three specific environmental studies that are required and expected to take 12 months to complete. This is the minimum time because will 12 months of data will be needed to assess the annual variation in water quality in the gulf. The critical studies are:

- environmental baseline study;
- brine dispersion study;
- water quality characteristic study.

All major water infrastructure investments will result in an increase in water charges. The effect of major projects on current water prices is currently being investigated.

6.2 Increase storage in Mount Lofty Ranges

The Government announced in June 2007 that SA Water had conducted an initial scoping study into increasing the capacity of Mt Bold reservoir in the Adelaide hills. Preliminary investigations of six potential sites have shown that a new dam built immediately downstream of the existing Mt Bold dam has the potential to increase the storage at Mt Bold from 46 GL to 240 GL. The new reservoir would be almost entirely contained within the current Mount Bold site. Two new dam walls would be required (a main dam and a saddle dam), the main dam would be approximately 30 metres higher than the current dam, which would be drowned if the new reservoir is built. At a height of 85 metres, the new dam would be the highest in South Australia. It is not feasible to raise the existing dam to this extent. The saddle dam would be built nearby to the main dam on the reservoir rim to a height of about 35 metres.

An increase in storage in the Mt Lofty Ranges could be a key piece of infrastructure in dealing with climate variability in the Mt Lofty Ranges and the Murray-Darling Basin. SA Water has only around 160 GL of usable storage (of around 200 GL of full supply storage). The usable storage volume is less than one year's demand. This is

much less than other Australian capital cities which tend to have at least three years of storage capacity.

Adelaide's current problem with water supply is the existing climatic variability in the Mt Lofty Ranges. This is currently dealt with by pumping water from Murray. On average around 60% of Adelaide's water comes from the river. However, in dry local conditions up to 90% of Adelaide's supply is sourced from the River Murray.

Additional storage capacity would be equally useful for managing the variability of inflows to the reservoirs in the Mt Lofty Ranges, irrespective of whether this is linked to a future desalination plant or the River Murray. An expanded Mt Bold reservoir makes a future desalination plant more effective – when there is plenty of water available from the Mt Lofty watershed, the desalination plant could fill the reservoir for use when water in the Mt Lofty Ranges is more limited in supply

If an increase in Mt Lofty Ranges storage is not pursued, a desalination plant significantly larger than 45 GL would be required to deal with climate variability. To completely bullet-proof Adelaide's water supply system without the Mt Lofty Ranges storage option, a very large plant would be required (ie much greater than 45 GL).

All major water infrastructure investments will result in an increase in water charges. The effect of major projects on current water prices is currently being investigated.

6.3 Upper Spencer Gulf desalination

On 17 February 2006, the South Australian Government entering into a memorandum of understanding (MOU) in relation to in investigating the Government's participation in the proposed desalination plant in the upper Spencer Gulf (USG).

The USG desalination plant is just one component of the proposed Olympic Dam expansion. The plant has the potential to service the current and future water needs of the region and meet the long term, sustainable water supply requirements for BHPB for an expanded Olympic Dam mine. It is estimated that up to 22 GL/year of water pumped from the River Murray could be replaced with desalinated water from the proposed plant.

The SA Government's objectives will be to:

- meet the water needs of the Upper Spencer Gulf and the Eyre Peninsula;
- ensure the long-term sustainable management of the Great Artesian Basin; and
- provide opportunity for sustained economic growth.

BHPB is still undertaking the pre-feasibility assessments of the USG desalination plant. As with any project at the pre-feasibility phase, forecasts of costs may vary significantly as engineering solutions are developed and refined. Construction of the USG desalination plant is scheduled to commence in mid 2010, with the plant becoming operational in late 2012.

The Government's participation in the proposed USG desalination plant will be subject to:

- a decision by BHP Billiton to proceed with the expansion of the Olympic Dam mine and that desalination is the preferred option to supply water to the mine;
- approval of the respective environmental impact statements for the expansion of the Olympic Dam Mine and the USG desalination plant;
- satisfying the funding terms of the Australian Government's Water Smart Australia Program; and
- a formal decision by the South Australian Government to proceed.

In June 2006, the SA Government applied to the Australian Government for funding from the Water Smart Australia program. Senior officers from both the SA Government and the Australian Government are working co-operatively and constructively in order to ensure a timely and proper assessment of State and Commonwealth funding for the project. No subsidies or State or Commonwealth funding is being requested for the BHPB component of the USG desalination plant.

The Department of Trade and Economic Development (DTED) is working with relevant parties to reach agreement on the State's position in relation to funding model and operating structure of the plant.

6.4 National Plan for Water Security

In January 2007, the Prime Minister announced "A National Plan for Water Security". The $10 billion plan aims to address water issues in rural Australia through improvements in water efficiency and addressing the over-allocation of water. The plan is based around 10 points:

1. A nationwide investment in Australia's irrigation infrastructure to line and pipe major delivery channels (Commonwealth $3 billion: irrigation companies $750 million).

2. A nationwide programme to improve on-farm irrigation technology and metering (Commonwealth $1.725 billion, with significant contributions from irrigators).

3. The sharing of water savings on a 50/50 basis between irrigators and the Commonwealth, leading to greater water security and increased environmental flows.

4. Addressing water over-allocation in the Murray-Darling Basin.
   (The Commonwealth Government will allocate up to $3 billion "to adjust entitlements" in the Murray-Darling Basin, with the extent of over-allocation to be ascertained by the CSIRO, catchment-by-catchment. The Commonwealth Government is prepared to provide structural assistance and, if necessary, to purchase water allocations in the market.)

5. A new set of governance arrangements for the Basin, including the establishment of a new expert based, Murray-Darling Basin Authority (MDBA).

6. A sustainable cap on surface and groundwater use in the Basin;

7. Major engineering works at key sites in the Murray-Darling Basin, such as the Barmah Choke and Menindee Lakes;

8. Expanding the role of the Bureau of Meteorology to provide the water data necessary for good decision-making by governments and industry ($480 million);

9. A taskforce to explore future land and water development in Northern Australia; and

10. Completion of the restoration of the Great Artesian Basin.

Water Act 2007

The Commonwealth Parliament passed the *Water Act 2007* in August 2007 to partially implement the National Plan based on its own constitutional powers.

The Water Act 2007 incorporates South Australia's model for an independent, expert-based Murray-Darling Basin Authority.

The first task for the new authority will be to prepare a basin plan that sets enforceable, sustainable diversion limits (caps) for the basin and catchments, and includes a water quality and salinity plan and an environmental watering plan.

However, the MDB Authority cannot undertake management functions such as setting seasonal allocations, salinity management and bulk water management (river operations). The MDBC will therefore continue to operate side by side with the new MDB Authority and the existing MDB agreement will be retained.

The Act establishes a new role for the Australian Competition and Consumer Commission to monitor and enforce water charging and market rules. It also establishes a new role for the Bureau of Meteorology to collect comprehensive water information across Australia.

However several matters important to South Australia, such as requirements that the basin plan include mandatory provisions for meeting critical human water needs, are not dealt with under the Act due to the limitations of the Commonwealth's constitutional powers.

South Australia's preference remains to pass complementary legislation with the Commonwealth and other States to achieve the best outcomes for the River Murray and South Australia's water security. The Prime Minister has indicated that the Commonwealth's objective also remains a comprehensive Commonwealth water law.

Discussions between Commonwealth and State government officials regarding the future referral of powers have re-commenced. Should this occur it is possible that the MDBC and MDB agreement could be superseded by the comprehensive water law.

In the long term, new and more equitable arrangements for the management of the waters of the Murray-Darling Basin hinge upon the success of the National Plan for Water Security, and in particular the Basin plan. The new arrangements provide an opportunity to address over-allocation, improve water use efficiency and facilitate more effective water markets which will contribute to long term water security.

6.5 Arrangements for access to upstream storages as part of a long term strategic reserve

There is potential for South Australia's long term water security to be enhanced by a range of measures around securing a strategic reserve by combining:

1. the use of water markets,
2. renegotiating parts of the Murray Darling Basin Agreement (MDBA) to provide a SA specific storage access regime, and/or
3. incorporating into the MDBA, revised water allocation and sharing arrangements which better meet SA's needs, and/or
4. entering into commercial arrangements with Snowy Hydro P/L to utilise its storages.

Work is progressing to assess the viability of a concept which involves SA securing more favourable access and/or management arrangements of upstream storage capacity either in the Murray Darling Basin Commission or Snowy Hydro. Such arrangements could allow SA to manage its own strategic reserve holding for release at SA's discretion.

The objective is to utilise these arrangements to provide a basis for SA to have greater or sole control to manage dedicated resources accessible by it in upstream storages in a way that will allow it to secure water supplies for SA under severe drought conditions, and at other times to manage according to its own priorities which may include environmental uses.

The concept has the potential to be flexible and scaleable so that it could be utilised to complement other long term water security measures offsetting some capital costs, most likely at a lower cost, could be adapted to a permanent measure, or used to limit water restrictions during a transition period between the end of the current drought and the implementation of measures such as desalination or the Mount Bold extension, including its filling.

The critical characteristics of a viable option would need to include;

1. a clear definition of the "right" (property or access) that South Australia has established in any arrangements to secure its water supply by using upstream storage;

2. absolute certainty as to its security, reliability and release arrangements; and

3. certainty concerning the public policy agenda in water management so that there is no "sovereign risk" to South Australia from the Commonwealth, NSW and Victorian governments changing the "rules of racing" and hence changing the reliability and certainty of the product that has been created.

The potential incentives to key participants include;

South Australia
South Australia can "insure" its critical urban needs at potentially lower cost than other options, ie desalination, raising reservoirs or constructing new reservoirs etc.

Commonwealth
Consistent with the National Water Initiative and would demonstrate a least cost approach to solving a complex water supply problem.

NSW and Victoria
Removes the need for special treatment for South Australia in critical drought sequences and hence lowers transaction costs to all MDBA participants.

Snowy Hydro
The water would be stored "above target" water as a new product (the South Australian Long Term Reserve) in the Snowy System. Since SA would call on this water very infrequently, and with considerable notice, for most years this water would be available to Snowy Hydro for electricity generation or market "hedging."

Such measures could not provide a short term solution to water security for SA, but could be implemented in the medium to long term, as alternative, complementary, or transition arrangements while the other long term measures currently under consideration such as desalination and Mt Bold are assessed and developed, and as part of a recovery strategy for managing the transition out of the current drought.

Short term measures for securing a reserve for South Australia for 2008-09 and for the remainder of the current drought which rely on water markets and accessing water held in storage by Snowy Hydro are discussed in section 5.2.1.

7 OTHER ISSUES FOR CONSIDERATION

7.1 Waiver of top up application fees

In 2006-07, as a drought response measure, the prescribed application fee on an application to transfer or convert a water allocation to 'top up' the water available to a River Murray water licence holder was waived. This determination relieved the financial burden on licence holders for acquiring water and incurring additional costs arising from water restrictions.

A 'top up' is deemed to be the annual temporary transfer of a water allocation, or the annual conversion from a water (holding) allocation to a water (taking) allocation to enable a licence holder to access a volume of water during 2007-08 that is less than or equal to 100% of the water (taking) allocation endorsed on their water licence when restrictions on water use commenced on 1 July 2007. Water for 'top up' can be acquired from within South Australia or from a licence holder in New South Wales or Victoria.

Under the *Natural Resources Management Act 2004* an application to transfer or convert a water allocation must be accompanied by the fee prescribed in the regulations, which is currently $324.00, where there is no technical assessment. Under Regulation 42 (2) of the *Natural Resources Management Act 2004*, the Minister for Environment and Conservation may, on application or on the Minister's own initiative, in the Minister's discretion, waive payment of the whole or part of a fee.

The ongoing dry conditions and low inflows to the Murray-Darling Basin have necessitated the continuation of measures to manage the scarce water resources, resulting in substantial water restrictions for River Murray water users in 2007-08. The dry conditions and water restrictions continue to cause extreme hardship to many water users.

The current level of restriction is the highest level of restriction ever imposed on River Murray water users in South Australia and although easing to 16% of allocation from 1 October 2007, the level of restriction is likely to remain high for some time.

A total of 993 applications for temporary water allocation transfer or annual conversion from holding to taking were received during 2006-07 for 'top up' purposes, which equates to $311 802 in application fees waived.

There are approximately 3800 irrigators (including those within irrigation trusts) that could apply for a 'top up' and, while not all will apply for 'top up', many are likely to apply more than once during 2007-08, given that the volume of water available within South Australia and interstate is severely limited.

Paying the prescribed fee for a water allocation transfer or conversion to 'top up' is an additional financial burden to the water user that they would not have normally incurred if water restrictions had not been implemented.

Waiving of the application fee will only apply to an annual transfer or annual conversion application that meets the 'top up' criteria and will not apply to any other

application. Therefore, the budgeted revenue from other applications will not be affected.

Recommendations:

Continue, as a River Murray drought response measure, to waive the prescribed fee on an application to transfer or convert a River Murray water allocation to 'top up' the water available to a water licence holder until 1 July 2008, or when the water restrictions have been removed, which ever comes first.

Approve additional appropriation of $816,000 in 2007-08 to the Department of Water, Land and Biodiversity Conservation to offset a reduction in revenue and the additional resources required to manage drought related licensing administration, including this scheme.

Approve additional expenditure authority of $426000 in 2007-08, including the employment of 4.0 FTE employees for 2007-08 to undertake the drought related licensing administration.

7.2 Legal and legislative issues

7.2.1 ISSUES ASSOCIATED WITH INCREASED SALINITY

It is clear that the public health benefits of continuing to reticulate water for washing and toilet flushing are such that SA Water should continue to supply water, even if that water was no longer potable due to high salinity or algal problems. 10 Legal professional privilege

While section 33 of the Act allows water supplies to be reduced or discontinued (either generally or for particular purposes), it only covers situations where the quantity of water is insufficient, not where the quality of the water is of concern. Similarly, section 33A of the Act allows SA Water to issue water restrictions regulating the purposes for which water can be use, but only where the quantity of water is considered insufficient.

Consequently, as it currently stands, the Waterworks Act is inadequate for dealing with a situation where SA Water may need to supply non-potable water across it's major reticulation system. Sections 33 and 33A would need to be amended in order to allow those powers to be exercised on water quality grounds – for example, to issue water restrictions.

10 Legal professional privilege

10 Legal professional privilege

7.2.2 SPECIAL LEGISLATION

If a weir needs to be constructed, it could be helpful to put in place enabling legislation. Legislation may be essential in order to fast track initial works in the circumstances where the decision to construct is delayed such that it is not possible to comply with normal approval processes.

Special legislation (or amendments to existing Acts) may also be appropriate to provide expanded or more sophisticated enforcement options, works such as wetland closure (protection from liabilities etc) and possibly other necessary works/measures.

Recommendation:

It is recommended that further consideration be given to the legal issues raised by the full suite of short and medium term projects recommended in this report and, if necessary, further recommendations be made regarding the need for special or amending legislation.

7.3 Recovery

Recovery from the most serious drought on record will take several years of average or above average inflows to the system. It will be important to plan for recovery in an adaptive manner both in terms of responding to water resource conditions and responding to the local impacts of ongoing drought, especially in relation to environmental impacts. A drought recovery strategy project has been established to provide advice and direction for an ongoing adaptive recovery process.

7.4 Communications

A whole of government communications strategy has been prepared for the Water Security Task Force and is reviewed regularly. This is an overarching strategy, under which more detailed and focused strategies are being implemented by relevant agencies.

A schedule of likely key announcements (eg future water restrictions, decision on the temporary weir, desalination) and other communication needs for the August to December 2007 period has been compiled and will be updated as necessary. Appropriate communications tools from the strategy will be applied to each of these needs to ensure the required information is communicated in an appropriate and timely manner to the target audience(s).

To date, communications on water security matters have tended to focus on communities along the River Murray and lower lakes, who are being directly affected by the drought. Domestic water restrictions have also been a key focus.

Communications to affected communities have been through a number of mechanisms including:

- briefing and seeking advice from community/ industry based forums such as the River Murray Advisory Committee, Riverland Horticultural Reference Forum and the Lower Murray Drought Reference Group. The importance of this face-to-face communication and interaction involving relevant senior officers and on many occasions the Minister for Water Security can not be underestimated;
- wide distribution of fortnightly River Murray water resources reports and regular *SA Drought E-News*;
- preparation and distribution of answers to frequently asked questions (FAQs);
- presentations to a wide range of small forums and larger public meetings; and
- a wide range of workshops at the local level.

Moving forward, communications to date will be complemented by a whole of government electronic and print media campaign, all of which will be tied together in a similar look and feel under the theme of 'Securing tomorrow's water today'. Communications experts from SA Water, PIRSA and DWLBC are working closely with the Strategic Communications Unit of the Department of the Premier and Cabinet (DPC) to progress this campaign.

A key part the printed media element of the campaign will be a regular section in a widely distributed paper, such as *The Advertiser* or *Sunday Mail*, which provides a headline and a few paragraphs on a current key issue, with a link to a whole of government portal site maintained by DPC. The portal site will contain a fact sheet on the particular issue and also provide a link to the relevant agency's website, where more detailed information on that issue can be found. This is an important element of the current Water Security Communications Strategy.

Such a campaign will allow the Government to communicate more widely on the current water resources situation and likely outlook for the remainder of 2007-08 and beyond. It will provide another opportunity to convey how serious the situation is and what is being done as part of the Government's emergency response and a longer-term program to ensure this State's water security in the medium to long-term.

7.5 Costs and budget pressures for 2007/08

A detailed summary of water security related costs and expenditures is set out in appendix 9 on page 146. Costs incurred (or revenues lost) are summarised for DWLBC, SA Water and DEH.

The total cost of water security measures was $32 million in the last financial year, taking into account $5.9 million in lost water sales by SA Water.

In 2007/08 costs are expected to total $83.8 million, including $20 million in lost revenues to SA Water.

It is also noteworthy that:

- Capital expenditure on the filtration plants for river townships – the largest capital project apart from a possible temporary weir – will amount to $45 million over the two financial years from 2006/07 to 2007/08.
- $1.6 million will be spent over 2006/07 and 2007/08 on preparations for the construction of a temporary weir near Wellington. As noted earlier in this report, the temporary weir remains an essential contingency measure in the event of continuing below-average conditions. Even average rainfalls are unlikely to prevent the need to construct the weir.
- $1.18 million will be spent on investigations into the expansion of Mt Bold reservoir.
- $1.2 million will be spent on desalination investigations.

A number of matters are creating budget pressures for agencies. These are estimated to total $11.8 million and will be dealt with via the mid-year budget review process and/or by seeking explicit appropriation.

Recommendation:

Responding to water security related issues as they arise is creating budget pressures for agencies, which will be pursued through the mid-year budget review process and/or by seeking explicit appropriation.

8 CONCLUSIONS AND RECOMMENDATIONS

To date, the 2007-08 year is tracking as a severe drought, similar to that experienced in 2002/03. Coming after the record drought of last year, the real risk in 2007/08 has already been realised for irrigated agriculture along the River Murray in South Australia.

The most significant emerging issue is salinity. As the weather heats up over summer, the risk of algal blooms will also be present. Using the 'dilution flow' available to SA, it will be possible to keep river salinity below 1400 EC, and hence palatable, for most of the 2007/08 year. Below Wellington, salinity, water levels and accessibility to water are already a serious problem that undoubtedly will worsen. The situation for the lower lakes is unlikely to recover in the next three years, and possibly in the next decade.

South Australia's critical urban water needs will be met in 2007/08 with a reduced likelihood of a need for level 5 water restrictions, although 2008/09 remains a risk.

Current indications are that a decision to commence the construction of a temporary weir near Wellington will not need to be taken before June 2008. SA Water has continued to seek ways of avoiding having to construct a weir at all or, if that's not possible, to minimise the size and cost of the structure.

Given the risk of very low storages at the end of this year, the report highlights that securing an end-of-year (31 May 2008) reserve of water in storage to cope with demands during 2008/09 is a critical contingency measure. It should also be noted that the South Australian River Murray floodplain environment, including its wetlands, is in a perilous state of health.

Planning is underway to deal with the medium and longer term – that is, from 2008/09 onward. The following recommendations arise from that planning:

1. Support for modelling and monitoring river and lake levels are imperative, particularly once realistic scenarios for 2008/09 are available (section 2.3).

2. Support for ongoing monitoring and modelling of salinities is imperative, particularly with respect to salt discharges and the movement of salt downstream of Lock 1 and the salinity of flow at the South Australian border (section 3.1.1).

3. Support for the development of strategies for river management to match demand, evaporation and local climatic conditions should continue (section 3.1.1).

4. Note the current activity on acid sulphate soil investigations, and the emerging risks associated with the presence of acid sulphate soils in wetlands and potentially the river channel (section 3.3).

5. Note there are options available for managing acid sulphate soils below Lock 1, and that the Water Security Task Force will provide further recommendations on this matter (section 3.3).

6. That the matter of irrigation restructuring, exacerbated in part by the current drought, should be addressed jointly with the Commonwealth Government as a matter of some urgency (section 3.4 and section 4.1.1.1).

7. Information on water availability, lake levels and salinity that is timely and robust should continue to be made available and utilised by irrigators for business planning purposes (section 4.1.1.1).

8. The program for skilling irrigators through fact sheets and decision support tools for drought management, water budgeting, salinity management and water trade decisions should also be continued (section 4.1.1.1).

9. A carry-over policy for irrigators should be determined as soon as possible (section 4.1.1.1).

10. As a matter or urgency, the consideration of adjustment by lower lakes irrigators should be facilitated, and the investigation of groundwater recharge and access by Langhorne Creek irrigators should be resolved (section 4.1.1.1).

11. Close monitoring of water availability and water use should continue, and water restriction levels reviewed monthly. Should inflows continue below drought (90% AEP) levels, it will be necessary to re-visit the recommended level of urban water restriction (section 4.1.2).

12. The buffer in Mt Lofty Ranges storages should target a minimum of 20 GL and, if conditions improve, the buffer should be allowed to increase rather than necessarily being used to reduce water restrictions (section 4.1.2).

13. It is recommended that irrigators using River Murray water via SA Water's reticulation system be restricted to the same percentage allocation as other River Murray irrigators plus an appropriate allowance for stock and domestic requirements (section 4.1.4).

14. That an enhanced rebate scheme be developed as an incentive for more efficient water use by households, taking into account the work already completed by DWLBC (section 4.1.6).

15. Approve the following principles for considering government support for accessing water supplies, isolating wetlands and wetland management:

    1) Government will maintain supplies on government owned and operated systems.
    2) Assistance may be provided for council water supply schemes equivalent to the community service obligation that would be paid if SA Water was operating the scheme.

3) In general, individual households not on government owned and operated systems will need to make their own arrangements for water carting with private operators.
4) Government will prepare contingency plans for emergency situations that are beyond the capacity of councils and individual householders – for example, if there was a widespread blue-green algae outbreak.
5) Assistance for economic purposes will be made on a case by case basis, having regard to the economic value of services being protected and the costs involved.
6) Impacter pays when the objective is to secure water savings or water quality objectives.
7) Beneficiary pays where the goal is to ensure an environmental objective (section 4.2.7).

16. It is recommended that an announcement be made as soon as possible that permanent facilities for carry-over of unused allocations will be implemented during the 2007/08 water year and will allow licensees to carry-over water for use in 2008/09 (section 4.2.10).

17. It is recommended that this proposed strategy for the use of dilution flow be adopted, including a monthly review of the situation to ensure that the greatest possible benefits are derived from the limited flows currently allocated to South Australia (section 4.3.1).

18. That a one-off trial release of highly saline water through the Goolwa and Mundoo barrages to quantify the potential benefits to be gained through the avoidance of contamination of the greater lakes area (section 4.3.2).

19. Note that the Water Security Task Force will undertake a new project to develop options for enhancing responsible water use by South Australian communities, including Adelaide and other River Murray dependent communities (section 5.1).

20. Continue to press to secure a basin wide reserve for critical human needs taking into account flows required to manage salinity at acceptable levels (section 5.2.1).

21. Pressure all other jurisdictions to include tributary water (including an additional 1500 GL currently in storage) within the gambit of the basin wide contingency measures (section 5.2.1).

22. Maintain a watching brief on water inflows and allocations to assess the viability of purchasing temporary water as the season progresses, and re-assess the position in late October (section 5.2.1).

23. Maintain a watching brief on Snowy storages as inflows of winter snows begin in spring to assess whether there is a likelihood of re-opening discussions on options over above target water releases (section 5.2.1).

24. Open discussions within SOG on the prospect of accessing Snowy Hydro dead storages under worst case scenarios for 2008/09 (section 5.2.1).

25. As a matter of urgency, consider holding back some of the dilution flow allocated to SA in 2007/08 (section 5.2.1).

26. That small allocations of water be made available for the protection of critical environmental assets, for example by using 7 GL of dilution flow (section 5.2.2).

27. Prior to making an environmental allocation, consideration be given to all the circumstances, including the availability of unregulated flows or other water (section 5.2.2).

28. That a formal process to monitor and drive the implementation of Water Proofing Adelaide be established and report regularly to Cabinet through the Minister for Environment and Conservation and the Minister for Water Security (section 5.2.3).

29. Note that it is difficult to attribute specific savings to specific actions in the Water Proofing Adelaide strategy (section 5.2.3).

30. That Water Proofing Adelaide be fully reviewed in light of new information regarding water security. This review would be consistent with initiative 63 of WPA and should encompass water security, some scenario planning and identification of specific proposals. It would need to consider any additional strategies and specific infrastructure proposals that have arisen as a result of the severe drought conditions and also considering environmental, water quality and cost issues in a holistic way. This review should commence in 2008 (section 5.2.3).

31. It is recommended that further consideration be given to the legal issues raised by the full suite of short and medium term projects recommended in this report and, if necessary, further recommendations be made regarding the need for special or amending legislation (section 7.2.2).

32. Responding to water security related issues as they arise is creating budget pressures for agencies, which will be pursued through the mid-year budget review process and/or by seeking explicit appropriation (section 7.5).

9 APPENDICES:

APPENDIX 1

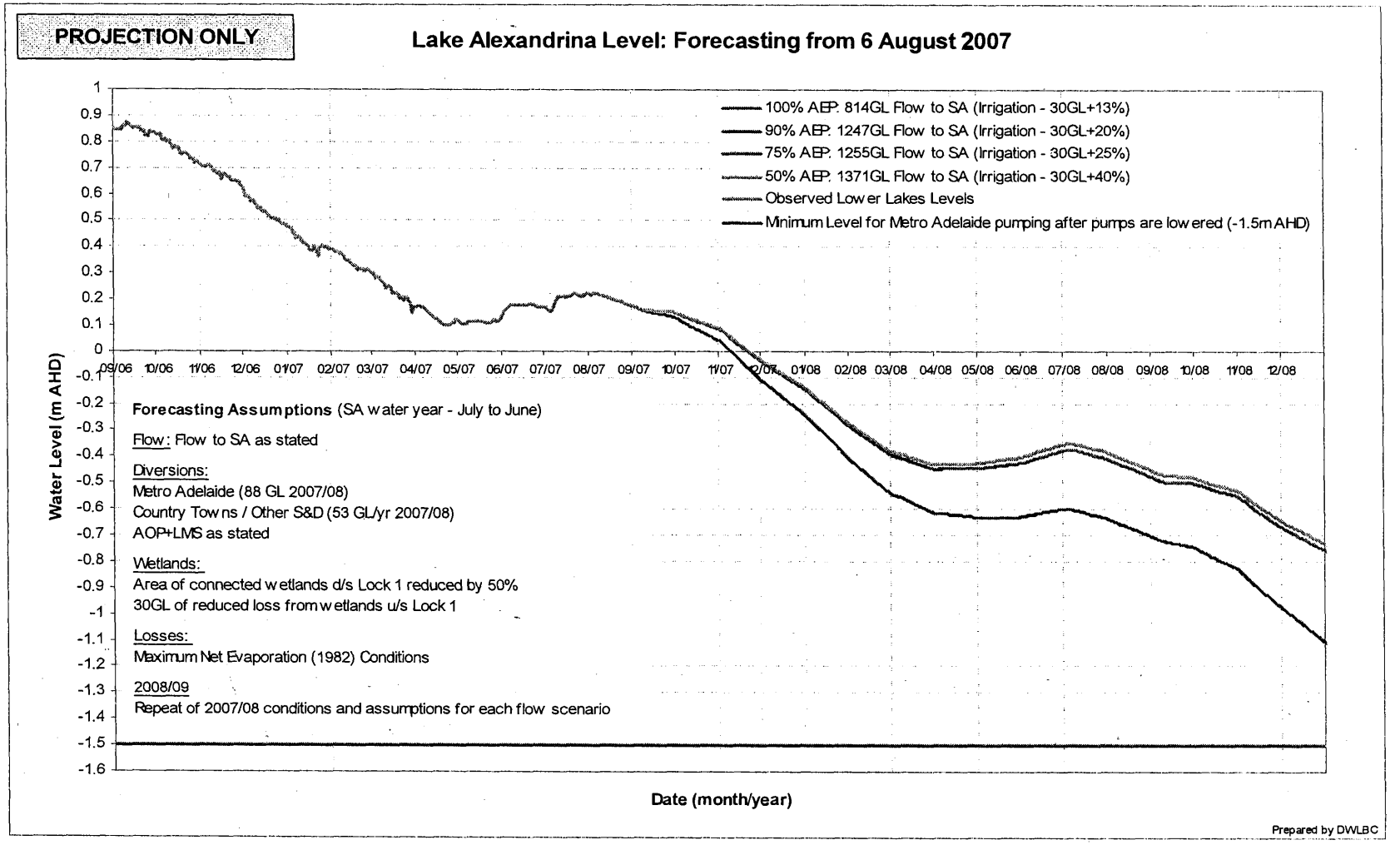
Water Supplied from the River Murray

via SA Water's reticulated systems

Pipeline	Areas served	Population served	Amount (GL)
Morgan Whyalla	Sole source for Whyalla, Port Augusta, Port Pirie, Clare Valley, Crystal Brook, Jamestown and Morgan. Customers include OneSteel, Zinafex and NRG. Also provides some supply to Yorke Peninsula.	75,000	28
Mannum Adelaide	Supplies Hope Valley and Anstey Hill water treatment plants. Also supplies Mount Pleasant, Springton, Houghton, Paracombe, Inglewood, Birdwood and Eden Valley.	300,000	25.5
Murray Bridge Onkaparinga	Supplies Happy Valley water treatment plant	400,000	38
Barossa system	Areas supplied include Barossa Valley, Gawler, Williamstown and country lands	200,000	16
Tailem Bend Keith	Sole source for Tailem Bend, Keith, Meningie, Coonalpyn and country lands	15,000	3
Swan Reach Stockwell	Supplies Yorke Peninsula, northern Barossa, Auburn	60,000	14
River towns	Water treatment plants at Berri, Barmera, Loxton, Mannum, Murray Bridge, Waikerie and Renmark. Plus off-takes to other townships.		6
	TOTALS	1,050,000	130.5

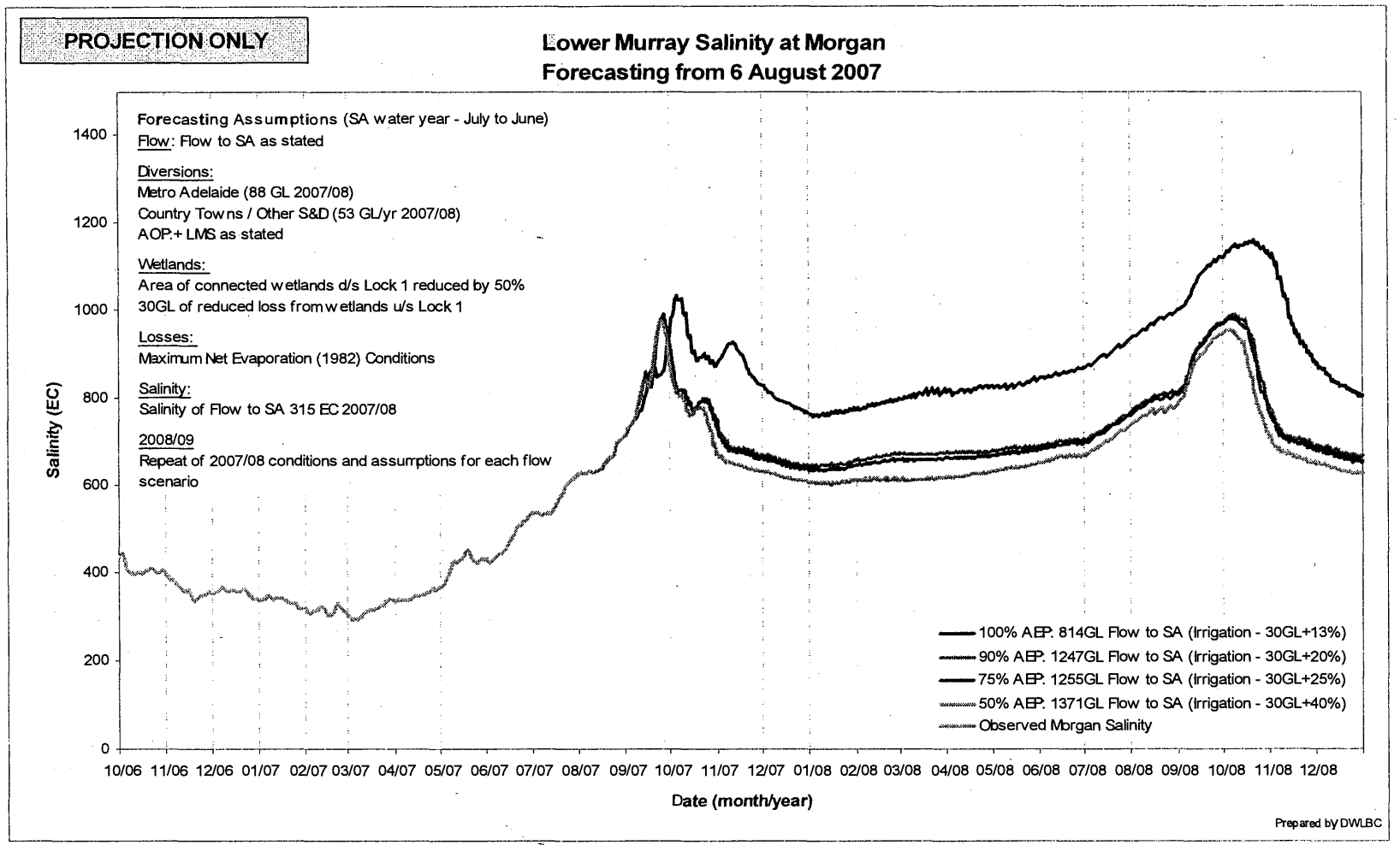
APPENDIX 2

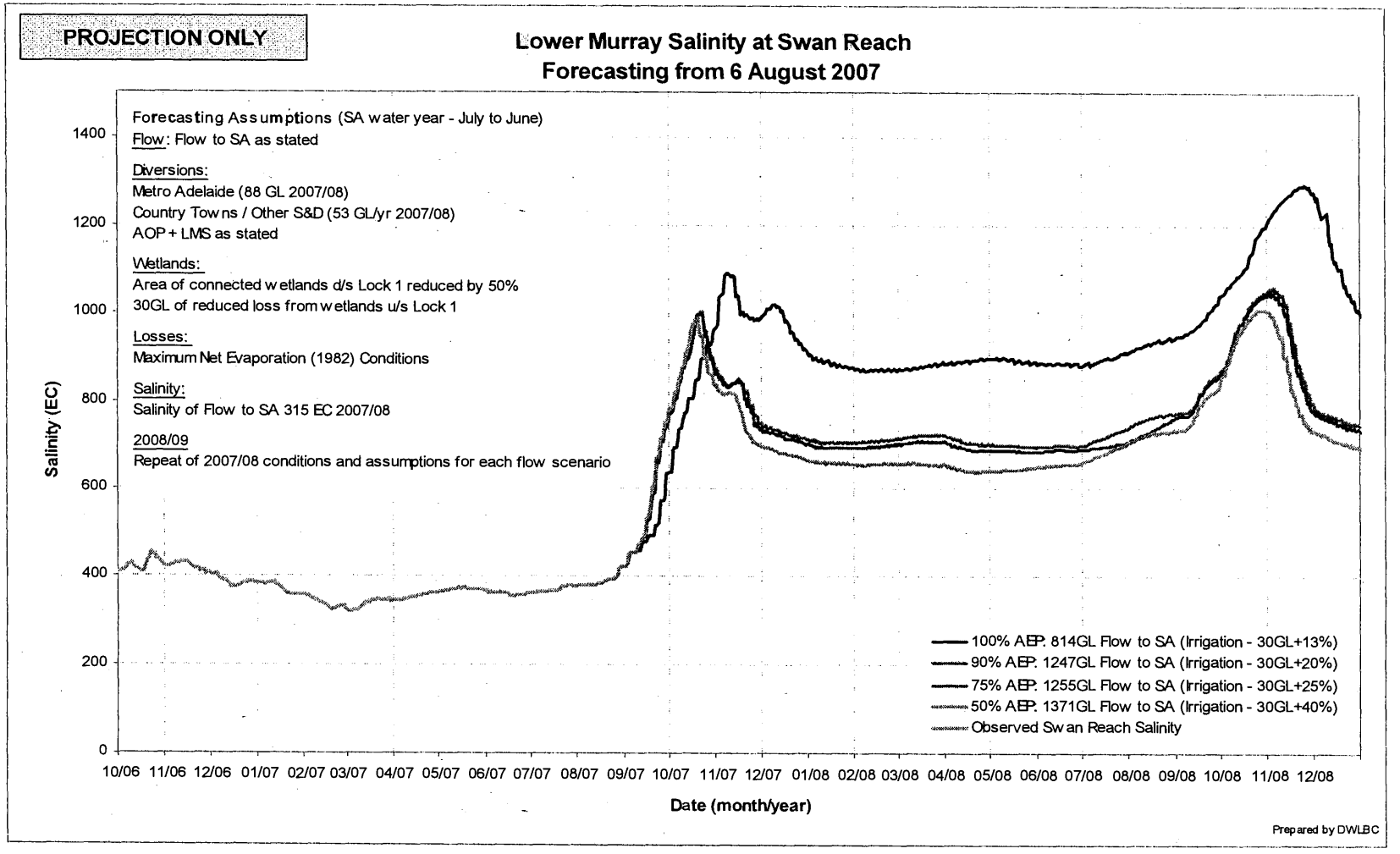
Draw down of Lake Alexandrina

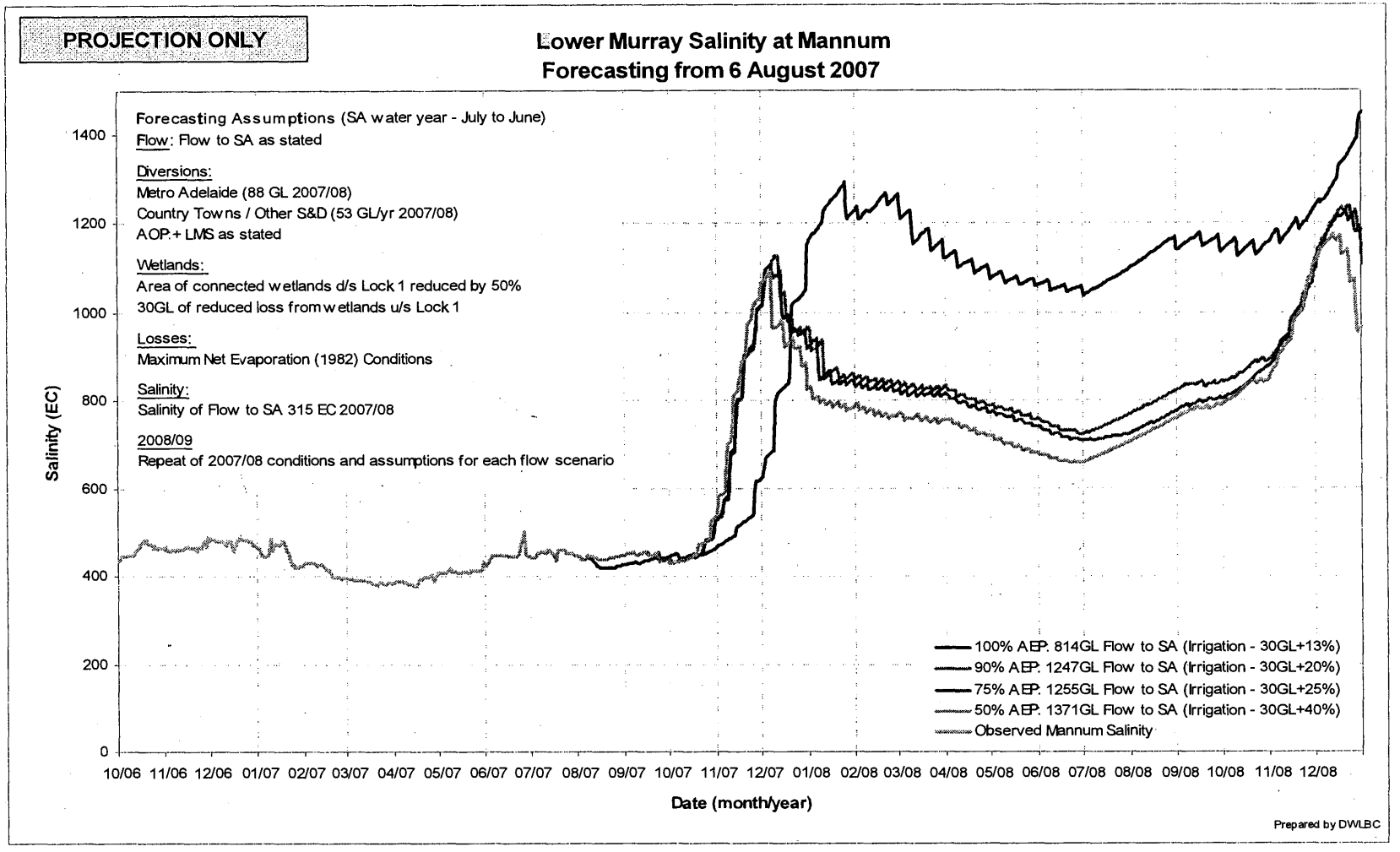


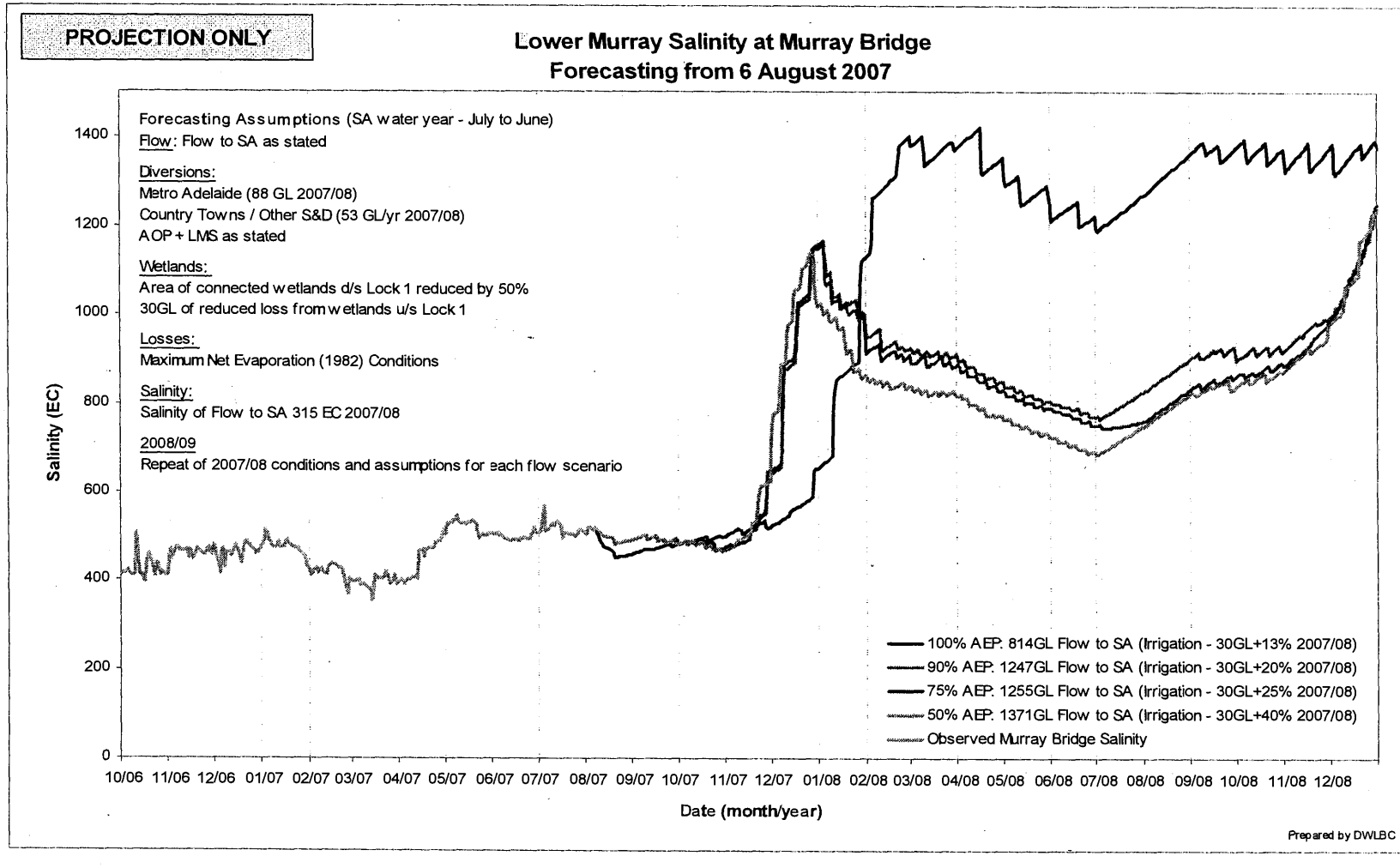
APPENDIX 3

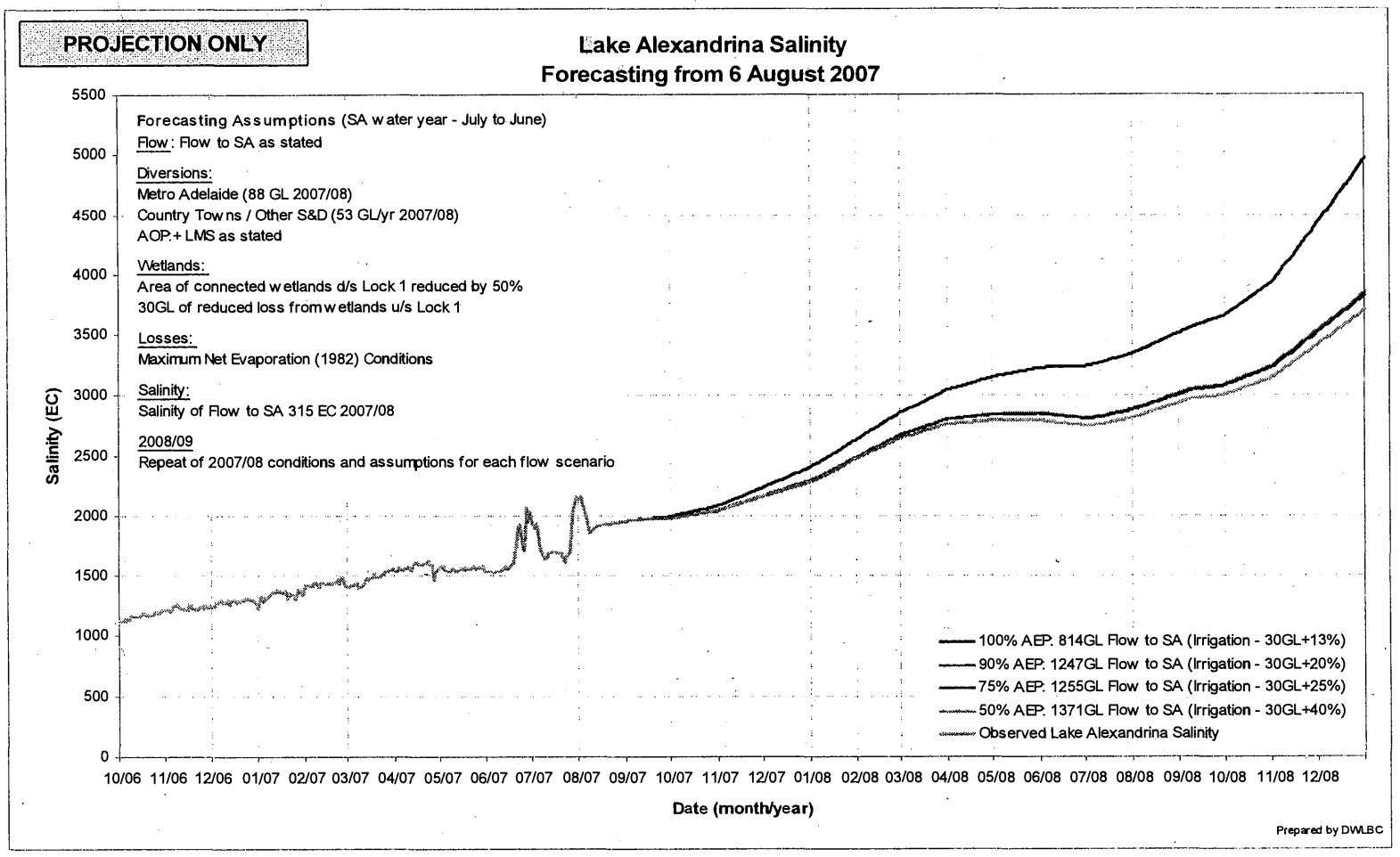
Salinity predictions at designated river locations




PROJECTION ONLY
Lower Murray Salinity at Swan Reach
Forecasting from 6 August 2007
Forecasting Assumptions (SA water year - July to June)
Flow: Flow to SA as stated
Diversions:
Metro Adelaide (88 GL 2007/08)
Country Towns / Other S&D (53 GL/yr 2007/08)
AOP + LMS as stated
Wetlands:
Area of connected wetlands d/s Lock 1 reduced by 50%
30GL of reduced loss from wetlands u/s Lock 1
Losses:
Maximum Net Evaporation (1982) Conditions
Salinity:
Salinity of Flow to SA 315 EC 2007/08
2008/09
Repeat of 2007/08 conditions and assumptions for each flow scenario
Salinity (EC)
1400
1200
1000
800
600
400
200
0
10/06 11/06 12/06 01/07 02/07 03/07 04/07 05/07 06/07 07/07 08/07 09/07 10/07 11/07 12/07 01/08 02/08 03/08 04/08 05/08 06/08 07/08 08/08 09/08 10/08 11/08 12/08
Date (month/year)
100% AEP: 814GL Flow to SA (Irrigation - 30GL+13%)
90% AEP: 1247GL Flow to SA (Irrigation - 30GL+20%)
75% AEP: 1255GL Flow to SA (Irrigation - 30GL+25%)
50% AEP: 1371GL Flow to SA (Irrigation - 30GL+40%)
Observed Swan Reach Salinity
Prepared by DWLBC


PROJECTION ONLY
Lower Murray Salinity at Mannum
Forecasting from 6 August 2007
Forecasting Assumptions (SA water year - July to June)
Flow: Flow to SA as stated
Diversions:
Metro Adelaide (88 GL 2007/08)
Country Towns / Other S&D (53 GL/yr 2007/08)
AOP + LMS as stated
Wetlands:
Area of connected wetlands d/s Lock 1 reduced by 50%
30GL of reduced loss from wetlands u/s Lock 1
Losses:
Maximum Net Evaporation (1982) Conditions
Salinity:
Salinity of Flow to SA 315 EC 2007/08
2008/09
Repeat of 2007/08 conditions and assumptions for each flow scenario
Salinity (EC)
0
200
400
600
800
1000
1200
1400
10/06 11/06 12/06 01/07 02/07 03/07 04/07 05/07 06/07 07/07 08/07 09/07 10/07 11/07 12/07 01/08 02/08 03/08 04/08 05/08 06/08 07/08 08/08 09/08 10/08 11/08 12/08
Date (month/year)
100% AEP: 814GL Flow to SA (Irrigation - 30GL+13%)
90% AEP: 1247GL Flow to SA (Irrigation - 30GL+20%)
75% AEP: 1255GL Flow to SA (Irrigation - 30GL+25%)
50% AEP: 1371GL Flow to SA (Irrigation - 30GL+40%)
Observed Mannum Salinity
Prepared by DWLBC


PROJECTION ONLY
Lower Murray Salinity at Murray Bridge
Forecasting from 6 August 2007
Forecasting Assumptions (SA water year - July to June)
Flow: Flow to SA as stated
Diversions:
Metro Adelaide (88 GL 2007/08)
Country Towns / Other S&D (53 GL/yr 2007/08)
AOP + LMS as stated
Wetlands:
Area of connected wetlands d/s Lock 1 reduced by 50%
30GL of reduced loss from wetlands u/s Lock 1
Losses:
Maximum Net Evaporation (1982) Conditions
Salinity:
Salinity of Flow to SA 315 EC 2007/08
2008/09
Repeat of 2007/08 conditions and assumptions for each flow scenario
Salinity (EC)
1400
1200
1000
800
600
400
200
0
10/06 11/06 12/06 01/07 02/07 03/07 04/07 05/07 06/07 07/07 08/07 09/07 10/07 11/07 12/07 01/08 02/08 03/08 04/08 05/08 06/08 07/08 08/08 09/08 10/08 11/08 12/08
Date (month/year)
100% AEP: 814GL Flow to SA (Irrigation - 30GL+13% 2007/08)
90% AEP: 1247GL Flow to SA (Irrigation - 30GL+20% 2007/08)
75% AEP: 1255GL Flow to SA (Irrigation - 30GL+25% 2007/08)
50% AEP: 1371GL Flow to SA (Irrigation - 30GL+40% 2007/08)
Observed Murray Bridge Salinity
Prepared by DWLBC


PROJECTION ONLY
Lake Alexandrina Salinity
Forecasting from 6 August 2007
Forecasting Assumptions (SA water year - July to June)
Flow: Flow to SA as stated
Diversions:
Metro Adelaide (88 GL 2007/08)
Country Towns / Other S&D (53 GL/yr 2007/08)
AOP.+ LMS as stated
Wetlands:
Area of connected wetlands d/s Lock 1 reduced by 50%
30GL of reduced loss from wetlands u/s Lock 1
Losses:
Maximum Net Evaporation (1982) Conditions
Salinity:
Salinity of Flow to SA 315 EC 2007/08
2008/09
Repeat of 2007/08 conditions and assumptions for each flow scenario
Salinity (EC)
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
10/06 11/06 12/06 01/07 02/07 03/07 04/07 05/07 06/07 07/07 08/07 09/07 10/07 11/07 12/07 01/08 02/08 03/08 04/08 05/08 06/08 07/08 08/08 09/08 10/08 11/08 12/08
Date (month/year)
100% AEP: 814GL Flow to SA (Irrigation - 30GL+13%)
90% AEP: 1247GL Flow to SA (Irrigation - 30GL+20%)
75% AEP: 1255GL Flow to SA (Irrigation - 30GL+25%)
50% AEP: 1371GL Flow to SA (Irrigation - 30GL+40%)
Observed Lake Alexandrina Salinity
Prepared by DWLBC

APPENDIX 4

Native title and Aboriginal heritage – Summary of progress and next steps

Drought Response Measure	Area of River Affected	Aboriginal group(s)	Instructing Officer/Agency	Agreement Progress	Next Steps/Outstanding Issues
Temporary Weir (construction)	Pomanda Point	Ngarrindjeri	SA Water (TBA)	Community Consultation Agreement between Ngarrindjeri and Minister Maywald signed. The Agreement provides funding for a series of local, regional and community meetings. The government is obliged to provide relevant environmental and other information, including the information that forms the basis of the referral to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) Costs of consultation agreed at $87,000 plus GST	Notice (S24KA) required to be given pursuant to NTA (two month notice period) or negotiation of waiver/truncation if and when construction commences. Negotiation of agreements (survey and monitoring) for preliminary and access works construction as needed. EPBC Act Guidelines published. Public comment period completed. Ngarrindjeri have made a submission to the Commonwealth. Ngarrindjeri wrote to the Minister seeking further information, and assurances about the State's compliance with EPBC processes. Minister responded by letter on Monday 20 August.
Dredging	Lakes and River	Ngarrindjeri First Peoples; MACAI	Steve Ward (PIRSA)	Monitoring Agreements with Ngarrindjeri and MACAI have now been extended to 31 October. Agreement with First Peoples for dredging expires at the end of September. (note that the First Peoples agreement also includes wetland closure – see below).. Extension of the dredging component currently being negotiated	Reduced demand because of seasonal conditions, but reduced allocations have also reduced demand. In the longer term, water quality issues below Lock One may have an impact of the demand for dredging. Many irrigators may be reviewing their position in light of that.

Drought Response Measure	Area of River Affected	Aboriginal group(s)	Instructing Officer/Agency	Agreement Progress	Next Steps/Outstanding Issues
Wetlands Closure	Likely to be confined to northern stretch of River above Murbko	First Peoples, MACAI	Judy Goode, Chris Rover (DWLBC); Steve Ward (PIRSA)	Agreement with first peoples, for wetland closure operates until the end of January 2008. But note that the dredging component of the Agreement expires at the end of September (extension currently being negotiated) CSO currently negotiating with MACAI about involvement in wetland closure. As there is only one wetland in the MACAI area, an exchange of letters or similar may suffice, rather than a formal agreement.	Closure of a wetland at Murbko South will commence soon. Unlikely that any wetlands south of Murbko will be closed, due to ecological factors.
Water Quality Monitoring Units in Lakes and Coorong	Lakes and Coorong	Ngarrindjeri	Richard Brown (DWLBC)	New project. Existing units need to be moved into deeper water around the lakes' edge, to continue to providing water quality data for use by water users. New monitoring stations are proposed to be installed in the Goolwa channel area and in the north lagoon of the Coorong. Agreement signed between DWLBC and Ngarrindjeri	Installation is notifiable under s24KA of the NTA. Heritage implications also exist.

APPENDIX 5

TO: SENIOR OFFICIALS, DRY INFLOW CONTINGENCY PLANNING

Reserve in storage at the end of May 2008

PURPOSE

This paper puts forward a case to the Senior Officials' Group for the Murray-Darling Basin Commission to provide for a minimum reserve in storage at the end of May 2008 in order to supply the fully restricted water needs for urban areas and towns dependent on the River Murray for 2008-09.

BACKGROUND

The Prime Minister convened a summit on the Murray Darling Basin with the Premiers of New South Wales, Victoria and South Australia and Acting Premier of Queensland on 7 November 2006. It was agreed by First Ministers "to establish a group of high level officials drawn from First Ministers' Departments and the Murray-Darling Basin Commission to examine contingency planning to secure urban water supplies during 2007-08".

In April 2007 First Ministers agreed that available water be first allocated for critical human water consumption needs, and that the volume to achieve this objective was 269 GL to be pumped direct from the River Murray in 2007-08. This took account of a 60 GL transfer from the River Murray to the Mount Lofty Ranges in 2006-07, for use in 2007-08. South Australia's share of this volume was 141 GL, requiring 487 GL as a cross border flow, "subject to salinity issues which may emerge".

In May 2007 First Ministers agreed on new water sharing arrangements for 2007-08 to meet both the fully restricted urban demands and to share any additional water that may become available in subsequent months. These arrangements were formalised by the Murray-Darling Basin Ministerial Council, and given effect by the Murray-Darling Basin Commission.

IN-STORAGE RESERVE AT THE END OF MAY 2008 – CONCEPT

While it is now evident that fully restricted critical urban demands for 2007-08 can be met, and that there is in fact additional water available, there is an obvious need to plan ahead for 2008-09. We need to avoid a repeat of the situation we found ourselves in December 2006, where it was projected that the MDBC storages would end the water year empty and that, while restricted irrigation proceeded, there was insufficient water to meet fully restricted urban demands.

In their June 2007 Report, Senior Officials advised First Ministers that they would be examining "a case for setting aside some of the improved flows in

the Murray System in 2007-08 for the delivery of critical water supplies in 2008-09".

Clause 99 of the Murray-Darling Basin Agreement requires the Commission, from time to time, to determine the water available for:

a) Distribution to the States before the end of the following May, and
b) Holding in reserve at the end of the following May.

IN-STORAGE RESERVE AT THE END OF MAY 2008 – VOLUME

To decide on the volume of an end-of-May 2008 reserve in storage, the following basic commitments during 2008-09 just to provide the fully restricted water needs for urban areas and towns dependent on the River Murray need to be considered:

1. One year's supply to satisfy the fully restricted water needs for urban areas and towns dependent on the River Murray (329 GL);
2. River system losses in the upper Murray (695 GL with special measures in place);
3. River system losses in South Australia (333 GL down to Wellington only and with special measures in place);
4. An additional dilution flow in South Australia to ensure the quality of the fully restricted critical potable and drinkable urban needs (180 GL[6]), noting that clause 86(c) of the Murray-Darling Basin Agreement specifically provides for 'additional quantities for dilution' for South Australia.

It is increasingly apparent that water quality, rather than quantity, will be the limiting factor in meeting the demands from fully restricted urban areas and towns dependent on water supplies from the Lower Murray. Modelling has shown that if the provision of additional flows to mitigate salinity is delayed until the start of 2008-09 it will not be possible to keep salinities below critical levels.

Where an immediate start to additional dilution flows was applied, modelling indicated that it would be possible to maintain salinities below about 2000EC for the whole of the Swan Reach – Murray Bridge river reach right through both 2007-08 and 2008-09 if an additional 500ML/day were delivered from now on. This represents a total of 180GL additional flow per year.

Increases in salinity levels without adequate dilution will impact on the quality and acceptability of water for drinking and other purposes, and may potentially lead to salinities beyond drinkable levels. Evidence suggests that salinities in the range 1000 to 2000 mg/L (1600 to 3300 EC) increasingly renders water unpalatable, and should be subject to public notification.

Thus, the total basic commitment during 2008-09, necessary to provide for fully restricted water needs for urban areas and towns dependent on the River

[6] Volume determined by agreed salinity models for very low flows during 2008-09 in the Lower Murray.

Murray, is in the order of 1500 to 1600 GL, assuming all special measures (eg wetlands closures) are in place and are providing the assumed savings.

However, for the same period (ie during 2008-09), minimum inflows to the Murray system (including Snowy inflows) are estimated to be around 1100 GL.

Accordingly, there is a shortfall between predicted demands in 2008-09 (to meet fully restricted urban areas and towns dependent on water supplies from the Lower Murray) and the 'worst case' supply for the same period from the River Murray system of around 400 to 500 GL. This is the volume of water which needs to be acquired in some manner from improved flows in the River Murray System in 2007-08, and held in storage by the end of May 2008, in order to meet fully restricted water needs for urban areas and towns dependent on the River Murray in 2008-09.

IN-STORAGE RESERVE AT THE END OF MAY 2008 – STRATEGIES AND RISKS

There are various strategies for acquiring an end-of-May 2008 in-storage reserve.

a) By regulatory agreement between jurisdictions.
b) By a collective market-based approach.
c) By an individual State(s) market-based approach.
d) By an individual consumer market-based approach.

In broadly comparing the regulatory and the various market based approaches to acquiring an end-of-May 2008 in-storage reserve to meet fully restricted water needs for urban areas and towns dependent on the River Murray in 2008-09, it can be noted that the former approach (regulatory), which was applied in 2006-07, has been successful. While the 'cost' of this approach was borne by other consumptive users (mainly irrigators), the ring-fenced volumes were relatively small.

Market based approaches are accompanied by a security risk borne by fully restricted urban users. This risk arises from the reliance on market purchases to acquire the reserve. (In short, irrigators may not be willing to sell). In addition, there may be significant administrative and financial costs (to government) in arranging for many purchases (possibly thousands) of small quantities of water supplies. And finally, the current water market is relatively immature, and has probably yet not factored in the dominant demand issue of water quality.

RECOMMENDATIONS

1. First Ministers should note that, assuming worst case inflows to the River Murray system, an end-of-year (31 May 08) volume in storage of between 400 and 500 GL will be required to meet fully restricted water needs for urban areas and towns dependent on the River Murray in 2008-09.

2. First Ministers should agree that all steps should be put in place to immediately acquire an end-of-year (31 May 08) volume in storage of between **400** and **500 GL** to meet fully restricted water needs for urban areas and towns dependent on the River Murray in 2008-09.

South Australia
30 July 2007

APPENDIX 6

MINUTES forming ENCLOSURE to 07WLB07348

To MINISTER FOR THE RIVER MURRAY
Re Probability of improvement in River Murray water allocations

BACKGROUND

With licence allocations at record low levels it is important for licensees to understand the degree to which allocations are likely to improve over the coming irrigation season and when improvements could be expected. All jurisdictions attempt to provide information on the probability of improvement in licence allocations but this process has been complicated this year by the revised sharing rules agreed by First Ministers and the issue of securing a strategic reserve for critical human needs for 2008-09. In South Australia it is also necessary to take into account the existing and predicted conditions in the river and the lower lakes in terms of both water level and salinity.

DISCUSSION

Predicted flows to South Australia

The Murray-Darling Basin Commission has provided updated predictions at different inflow probabilities of the total flow that could be expected within South Australia and the monthly improvement in flows leading to the annual total. These predictions are based on a dry-tercile multi-history analysis of the available inflow data. It is considered appropriate to use the dry-tercile analysis as the 2007 autumn period was extremely dry and there is a very strong correlation between a dry autumn and low total inflows for the full year.

This multi-history analysis also only includes regulated or entitlement flows to SA. For the wetter inflow probabilities (eg 75% or 50% probabilities) it is highly likely that we will receive some quantity of unregulated or above entitlement flows in addition to these predicted volumes. However it is not appropriate to include unregulated flows in an assessment of possible allocations as it is generally not possible to manage these flows to deliver water for consumptive uses.

Application of 3i Sharing Rules

The raw multi-history data have been used to predict the monthly flows to South Australia at different inflow probabilities on the basis of the sharing rules agreed by First Ministers. These rules provide for improvements in both water for consumptive use and for dilution and river restoration in different proportions and it is necessary to analyse these improvements to identify the progressive volumes available for each component as resource conditions improve through the year. Table 1 (below) details the progressive improvement in each component as the total River Murray inflows improve.

Table 1 – Component flows to SA with improving resource availability

Total Distributable System Resources (GL)	SA Dilution Component (GL)	SA Divertible Component (GL)	Total Available Flow to SA (GL)
0	333	0	333
269	333	141	474
766	453	261	714
1282	582	261	843
1500	637	261	898
2200	696	554	1250
2410	696	554	1250
2669	696	554	1250
4670	696	1154	1850

Note: The total distributable system resources at the 7 August were 897 GL giving SA 261 GL divertible component (including 141 GL for critical human needs) and 154 GL dilution component.

Factors Influencing Water Availability for Consumptive Allocations

Water for consumptive licence allocations can only be sourced from the volume made available for consumption and cannot be derived from the volume allocated to dilution and river restoration (the use and management of this dilution component is addressed in a separate minute). In order to provide an estimate of the predicted probability of improvement in allocations it is necessary to make assumptions regarding how any strategic reserve would be accumulated and whether all water available for consumptive uses should be committed to licence allocations or to provide some improvement in salinity and water levels in the Lower Murray.

Securing a Strategic Reserve

The Senior Officials Group has not yet made a firm decision regarding the accumulation of a strategic reserve during 2007-08 to ensure that critical human needs can be met in 2008-09. It is likely that if South Australia wishes to have a reserve for 2008-09 it will have to be accumulated out of flows to this state during 2007-08. Clearly this decision will impact on the water available to allocate to consumptive uses within South Australia in 2007-08 because until the dilution and river restoration flow allocated to South Australia has reached a total of 696 GL, water for a strategic reserve cannot be sourced from this dilution component.

In order to estimate the potential improvements in consumptive allocations with improving resource conditions, it has assumed that no reserve will be allocated until the volume available for consumptive purposes exceeds the 120GL already allocated. Beyond this volume it has been assumed that 2/3 of any increase in the amount available for consumptive uses will be set aside for a strategic reserve with 1/3 being allocated to improvements in irrigation allocations.

An alternative approach would be to allocate all water available for consumptive use to licensees up to a specific level before accumulating a strategic reserve. Clearly this approach has a greater risk of a strategic

reserve not being secured if conditions deteriorate as the year progresses. For this reason this approach has not been used in these calculations.

Sharing of Resource Improvements

Total flows allocated to South Australia are required to manage the health of the river within the state, to provide flushing flows to manage salinity and to provide for consumptive allocations for all uses. Under normal circumstances the first 696 GL of Entitlement Flow to South Australia is committed to providing for dilution and flushing flows and system losses. Flows in excess of this amount are then effectively shared between consumptive uses and further environmental and flushing requirements. Under the current very constrained conditions, it has been agreed that portion of the first flows to the state which would normally be committed only to dilution, will be committed to meeting the consumptive requirements for critical human needs and initial priority irrigation needs.

In order to identify predicted improvements in irrigation allocations it has been assumed that once a strategic reserve has been secured, all further increases in the divertible component of flow to South Australia will be made available for allocation to licensees. It is considered that this provides a reasonably balanced approach as once resources have improved to this extent (ie a total distributable resource of about 2200GL) there is a very high likelihood of also receiving unregulated flows which will be in addition to the regulated flows used in this assessment. These unregulated flows will provide water for improved dilution and flushing of the system.

The detailed month by month analysis of the volumes available for consumption and dilution, the volumes assumed for accumulation of a strategic reserve and therefore the volumes available for consumptive use and the percentage licence allocations is provided in Attachment 2.

Predicted Improvements in Allocations

Applying the assumptions identified above and the predicted flows to South Australia under the various inflow probabilities, allocations have been calculated based on the end of month resource prediction. Table 2 below summarises these results.

Table 2 - **Predicted maximum allocations with different inflow probabilities**

Inflow Probability	Predicted maximum end of month allocation				
	October	December	February	April	June
100%	16%	16%	16%	16%	16%
90%	16%	18%	20%	23%	34%
75%	18%	25%	34%	34%	34%
50%	30%	32%	41%	55%	55%

Interpretation of Results

These results assume that water is not allocated for consumptive use until it is available to South Australia. On this basis the predicted end of month allocations show that under a minimum inflow scenario (100% inflow probability) there will be no additional water available for allocations beyond the 120GL currently identified. If this volume were fully allocated this would equate to 16% licence allocations although only 13% (equivalent to 102GL) has been allocated to date.

Under 90% inflow probability (9 years in 10) licence allocations could not be increased beyond about 20% before the end of February 2008. Wetter scenarios effectively bring forward the time at which allocations could be increased to at least accommodate the level of irrigation required to keep permanent plantings alive (estimated at 25% - 30%).

Late Season Resource Improvements

While these results assume that all water will be allocated to licensees as it becomes available, it may be appropriate to consider how late season resource improvements are dealt with. There are several options that could be considered including:

- Allocate all consumptive water to individual licensees as it becomes available throughout the year;
- Allocate resource improvements up to a specific date (eg end of February) and leave any further resource improvement in storage as a reserve for use in 2008-09; and
- Allocate resource improvements up to a specific date (eg end of February) but use any further resource improvement in 2007-08 to improve water quality and lower lakes water level.

An additional factor needs to be taken into account in assessing which of these options to implement. If individual carry-over is again implemented, allocating throughout the year may result in a substantial volume of the late season improvements being carried-over to 2008-09. If carry-over is not introduced, it is likely that at least part of the late season improvement in allocation will not be used by irrigators and would remain in storage as a South Australian carry-over rather than as a private irrigator carry-over.

This South Australian carry-over could be set against the need for a strategic reserve thereby bringing forward the time at which irrigation allocations could be announced in 2008-09. If the carry-over is held by the individual irrigators, this would allow those irrigators early access to consumptive water in 2008-09 but would not enable general irrigation allocation announcements to be brought forward.

Summary

The calculation of probabilities of improvement in licence allocations during 2007-08 requires the application of significant assumptions regarding the sharing of resources between licensees, a strategic reserve for 2008-09 critical human needs and the condition of the river (especially the lower lakes) at the start of next water year. Based on the assumptions outlined above,

predicted end of month allocations have been calculated for different inflow probabilities. These indicate that under continuing dry conditions it will not be possible to allocate significant improvements before the end of summer and that even under median inflow conditions, allocations by the end of December would only be 32%.

As allocations beyond February 2008 will be strongly influenced by decisions on the management of late season resource improvements, it is proposed that any announcement on probabilities of improvement in licence allocations only be made up to and including February.

This report has also been provided for consideration by the Water Security Taskforce and they may provide additional comment direct to you on this analysis and the recommendations.

RECOMMENDATIONS

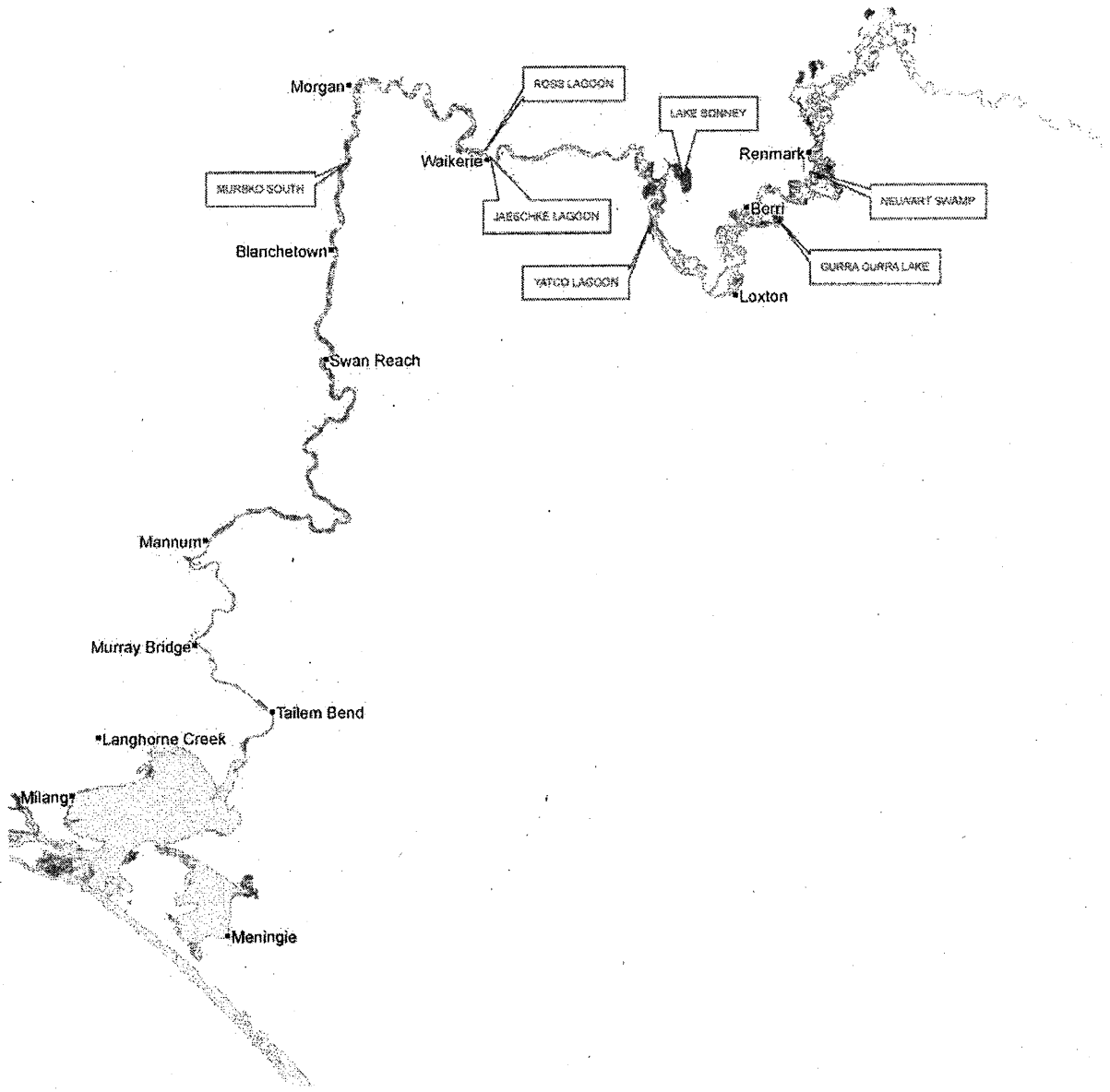
It is recommended that irrigators be advised of the current estimate of predicted allocations under different inflow probabilities for the end of October, December and February only as outlined in attachment 1.

Further, it is recommended that a more detailed analysis be completed of the implications of policies such as the provision of individual carry-over on the allocation of late season resource improvements before any information is released on possible allocations beyond February 2008.

Rob Freeman
CHIEF EXECUTIVE
Date: / /2007

APPENDIX 7

Location of wetlands to be closed



APPENDIX 8

Options for the use and management of dilution and river restoration flows

A report on the assessment of options for the use and management of the River Murray water allocated to South Australia for dilution and river restoration under the 3i sharing rules agreed by First Ministers to achieve the best economic, social and environmental outcomes for the whole of the River Murray in South Australia.

Initial report of the **D**rought Recovery Strategy **P**roject Team

August 2007

OPTIONS FOR THE USE AND MANAGEMENT OF DILUTION AND RIVER RESTORATION FLOWS

EXECUTIVE SUMMARY

The Drought Recovery Strategy Project Team has identified and assessed options for the use and management of the Dilution and River Restoration Flow allocation made available to South Australia under the 3i sharing rules agreed by First Ministers. Applying proposed principles, an initial strategy for the use of this water has been developed for the volume of dilution flow available based on the end of July 2007 water resources assessment. The prioritisation of the identified options was undertaken through a qualitative analysis of the relative benefits, opportunity costs and risks.

The initial proposed strategy is to commit water to:

- Increase flushing flows to provide river salinity mitigation
  21 GL/month starting September for up to 7 months (147 GL)
- Refill priority regulated wetlands to stop environmental damage
  4 GL delivered in September
- Pump water to critical floodplain sites to prevent vegetation death
  3 GL delivered between September and November
- Set aside a contingency allowance for salinity or algal flushing
  70 GL held in storage for possible delivery during summer

In addition it is proposed that the following actions should be undertaken but the volume of water required not be accounted against the dilution and river restoration allocation.

- Lower lakes salinity flushing - saline water in the vicinity of the barrages should be released if conditions are favourable (up to 50GL).
- Evaporative losses from regulated wetlands – regulated wetlands showing evidence of irreversible environmental damage should be refilled immediately (3 GL).

The total volume required to meet the proposed strategy (224 GL) is greater than the amount allocated to South Australia for dilution and river restoration to 10 August 2007 (154 GL). There is a high probability that the volume allocated to South Australia will increase as the season progresses however if this does not occur, the contingency water set aside for flushing an algal bloom or salinity spike could be used to continue the river salinity mitigation flows through until the end of the main water use period.

Clearly it will be necessary to review this proposed strategy on an adaptive basis over coming months to take account of factors such as the volume of dilution flow allocated to South Australia, the potential for unregulated flows and changing local conditions in the river.

It is recommended that this proposed strategy be adopted including a proposed monthly review of the situation to ensure that the greatest possible benefits are derived from the limited flows currently allocated to South Australia.

Background

In June 2007 First Ministers agreed to revised rules for the sharing of water resources available in excess of the requirements to meet critical human needs. As resource conditions have improved, water has been allocated to the three southern Murray-Darling Basin states in accordance with these rules. A critical element of these allocations negotiated by South Australian officials was a specific allocation for dilution and river restoration within the state. As at 10 August 2007 a total of 154 GL had been allocated to this component.

To a large extent, South Australia has responsibility for deciding on the delivery, use and management of this water to generate the best, integrated outcomes of economic, social and environmental benefits within the state.

Responsibility for developing and assessing options for the use of this water was allocated to the Drought Recovery Strategy Project Team reporting to the Water Security Technical Group. This report is the initial report from the Project Team recommending an interim strategy for the delivery, use and management of the water allocated to this component to date.

Methodology

The Project Team undertook a three-step process to develop initial recommendations on the use and management of this water allocation.

The team initially identified a set of principles to guide identification and prioritisation of options for the use and management of this water taking account of the fact that some uses will not be mutually exclusive and the timing of required flow for the different options will influence decisions on priority uses.

Options for the use and management of this water to deliver economic, social and environmental benefits were identified and the volume of water and the timing of delivery required to generate the desired outcomes for each option was estimated. The options considered were constrained by the requirement to use this water for dilution and river restoration rather than for commercial consumptive demands.

The options were then prioritised in accordance with the identified principles, taking account of the potential for multiple outcomes from specific allocations and the critical timing of some options. A risk-based approach was adopted in an effort to optimise the use of this allocation. Factors considered in this assessment of each option included:

- The volume required

- The timing of the requirement
- The benefit derived on a volume basis
- The opportunity cost of an allocation to this option
- Alternative approaches or sources of water to achieve the outcome
- Opportunities for multiple use of allocations

Principles

Several key principles to guide the development and prioritisation of options were identified.

Maximising the net benefit - it was recognised that a careful assessment would be required to identify and assess the net benefit of applying water in each of the options. This assessment would need to recognise both temporal and spatial aspects. However it was recognised that the assessment would have to be qualitative rather than quantitative because quantitative data are not available on all potential benefits (especially some of the environmental benefits) to allow an effective comparison of options.

Pursuing opportunities for multiple benefits and uses – it was recognised that many options will enable the water to be 'used' for more than one outcome and that this would need to be taken into account when prioritising options.

Taking account of cumulative effects of the application of water – several environmental watering and management programs have delivered significant benefits over the past few years but the investments at these sites will be under threat if they are not rewatered in the near future. Building on previous investments by both governments and the community will be a significant factor in the assessment of any use of this water.

Taking account of thresholds for the volumes and timing of water delivery – it will be important to recognise thresholds below which the delivery of water for some of the potential options will be ineffective (eg at the fishways). In addition the timing of water delivery for some options will be critical to the extent that delivery outside the optimal period may even be counterproductive or at least ineffective.

Treating all water uses equally – First Ministers agreed on a hierarchy of use with critical human needs being met before critical environmental needs. The options for use of the dilution and river restoration flows must be assessed within the constraints of this hierarchy of use but beyond this all uses should be treated equally. The basic critical human needs have already been met through the sharing arrangements agreed by First Ministers. As a consequence the dilution and river restoration flows need to be assessed against priorities for critical environmental needs as well as the need to provide ongoing protection for critical human needs.

Options

The options identified by the Project Team for the use and management of the water allocated for dilution and river restoration were (not in priority order):

- Allowance for flushing blue-green algal blooms or salinity spikes
- River salinity dilution
- Lower lakes salinity flushing
- Pumping to priority River Red Gum Rescue sites
- Pumping to priority Chowilla floodplain sites
- Provision of attractant flows at barrage fishways
- Refilling priority regulated wetlands closed since November 2006
- Refilling unregulated wetlands
- Restoration of the water level in the lower lakes
- Restoration of estuarine conditions in the Coorong

Details of the volumes required and optimal timing of these requirements are provided in Attachment 1. Table 1 below provides a summary of the volumes and delivery requirements for each of these options.

Table 1 – Volume and timing of flows required for identified options

(All volumes in GL/month)

Option	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
River Salinity Mitigation	21	21	21	21	21	21	21			
Lakes Salinity Flushing	20	20	10							
Red gum Rescue	1	1	1							
Chowilla priority sites 1 *	1	1	1							
Chowilla priority sites 2 **	1	1								
Barrage Fishways 1 *			1.5	1.5	1.5	1.5				
Barrage Fishways 2 ***			9	9	9	9				
Wetlands Refill (unreg)								5	5	5
Wetlands Refill (reg)	4									
Wetlands Evap (reg)			0.5	0.5	0.5	0.5	0.5	0.5		
B/G Algae Flush Reserve				35		35				
Restoration of LL level	52	52	52	52	52	52	52	52	52	52
Restoration of estuary	50	100	200	100	50					

* Chowilla priority sites 1 (red gum watering) & lower lakes Fishways 1 (fishway flow) – water provided through The Living Murray environmental flows program allocation.

** Chowilla priority sites 2 (red gum watering) –critical sites that require watering in addition to those that can be watered with through The Living Murray environmental flows program allocation.

*** Lower lakes Fishways 2 – water required as an attractant flow to improve the efficacy of the fishway flow provided through The Living Murray environmental flows program allocation.

Synergies

Clearly there is a strong potential for multiple use of water from the dilution and river restoration allocation. In particular, water delivered for river salinity dilution could also contribute to lower lakes salinity flushing, provision of attractant flows, restoration of lower lakes water level or restoration of estuarine conditions. In identifying priorities and developing a proposed delivery strategy for the allocated dilution and river restoration water, it will be appropriate to take account of these synergies.

Similarly, water set aside for a contingency allowance to manage algal blooms or salinity spikes, if not required by the end of March 2007, could be earmarked as part of a strategic reserve to meet critical human needs for 2008-09. However specific agreement of the other jurisdictions may be required to allow water that has been identified for dilution to be used for consumptive purposes. If this were agreed it could allow more water to be allocated for consumptive purposes in South Australia in 2007-08. This constraint only exists until the total dilution and river restoration flow to South Australia reaches 363 GL. Beyond this point South Australia can decide how to allocate any further improvements in flow.

Triggers for Use

Some of the identified options for use of the dilution and river restoration flows will depend on other factors and triggers. In particular this applies to the refilling of wetlands, the lower lakes salinity flushing and the barrage fishway releases and attractant flows.

Ecological triggers have been adopted for decisions on refilling the unregulated wetlands that are being closed as part of the First Minister's decision on meeting critical human needs. As a result it is not possible to definitively identify when refill volumes will be required.

Similar ecological triggers are proposed for the refilling of regulated wetlands closed in late 2006 as part of a South Australian decision to conserve water. This decision was separate to the First Ministers' decisions relating to the whole of the River Murray. Already 4 of the 27 regulated wetlands that were closed are exhibiting serious ecological damage and the ecological trigger for refill has been exceeded. Additional wetlands are likely to deteriorate to the extent that these ecological triggers are activated as the year progresses.

Releases from the barrages to flush saline water from the vicinity of the Goolwa and Mundoo barrages and releases from the fishways and for attractant flows will be dependent on local conditions. At current lake levels there is limited time when releases can be made due to reverse head at the barrages. Local weather conditions (eg wind or heavy rainfall) may make releases possible for short periods. As a consequence it is not possible to accurately identify the volumes or timing of these releases. The volumes used in this report are likely to be the maximum volumes that could be released.

Potential for increased volumes available

The current volume of water allocated to dilution and river restoration under the 3i sharing rules is 154GL. Under these rules South Australia will be allocated 25% of ongoing improvements in resource availability up the point where we have been allocated the total of 696GL of our formal dilution flow. This equates to a total allocation of 363 GL for dilution and river restoration. There is approximately a 90% chance that we will at least receive a further 200GL for dilution and river restoration by the end of December 2007.

Benefits

The benefits and opportunity costs of each of the options have been assessed on a qualitative basis. Table 2 below provides a summary of this analysis in the form of an indicative scale of the relative economic, social and environmental benefits and the foregone opportunity cost of using the water for a particular purpose. This analysis has attempted to include the broad range of benefits of each option to agricultural and industrial users, rural and urban communities and the environment as well as trying to assess the costs (or lost benefits) if water is put to that option rather than one of the other possible uses.

Table 2 – Quantitative Assessment of Benefits

Option	Volume required (GL/year)	Economic benefit	Social benefit	Env. benefit	Opportunity cost
River Salinity Mitigation	147	√√√√		√	XXXX
Lakes Salinity Flushing	50	√	√	√	XX
Redgum Rescue	3		√	√√√	X
Chowilla priority sites 1	3		√	√√√	X
Chowilla priority sites 2	2		√	√√√	X
Barrage Fishways 1	6	√	√	√√√	X
Barrage Fishways 2	36	√	√	√√	X
Wetlands Refill (unreg)	15	√	√	√√	X
Wetlands Refill (reg)	4		√	√√√	X
Wetlands Evap (reg)	3			√√	X
B/G Algae Flush Reserve	70	√√√	√√	√	XX
Restoration of LL level	520	√√	√√	√√	XXXX
Restoration of estuary	500	√	√√	√√√	XX

Some modelling has been undertaken to assist in the assessment of the benefits of the proposed river salinity mitigation flows and the relative impacts on river salinity mitigation of allocating small volumes of water to consumptive environmental actions rather than to salinity mitigation (see Attachment 2).

It is evident from the modelling that the additional salinity benefit achieved if all available water was put to river salinity mitigation rather than a small amount of this water being used for environmental purposes will be minimal compared to the overall benefit of the salinity mitigation flows.

Priority Uses

The critical priority uses identified by applying the principles and methodology outlined above were:

- River salinity mitigation
- Refilling priority regulated wetlands
- River Red Gum Rescue
- Contingency allowance for flushing algal blooms or salinity

It was considered that lower lakes salinity flushing is a high priority and is required early in the year, but it was recognised that the water required for this

(approximately 50 GL) could be obtained from the existing volume within the lakes without the need for a specific allocation from the dilution and river restoration component. Any water delivered for river salinity flushing through the year could effectively replace the water used for lower lakes salinity flushing. Any flushing of the lower lakes would, where possible, be undertaken in harmony with the operation of the fishways.

In addition it was recognised that the provision of water for river salinity mitigation would also provide water for restoration of lower lakes water level and potentially for the restoration of estuarine conditions and fishway attractant flows.

A further priority identified was to provide for ongoing evaporative losses from regulated wetlands that have been refilled. It was considered that water for this purpose is already included in the loss component of the decision on providing for critical human needs.

River Salinity Mitigation

River salinity mitigation will require a significant volume of water and the delivery of water for all other options except refilling wetlands (both regulated and unregulated), River Red Gum Rescue or pumping to Chowilla floodplain will contribute to this outcome. Further modelling is required to define the optimal delivery of water maximise the in-river salinity benefits but an initial assessment indicates that a continuous flow of between 500ML/day and 1000ML/day is required throughout the year from September. A flow of 700ML/day has been assumed amounting to 21GL per month or 147GL for the year.

Refilling Priority Regulated Wetlands

Initially this priority requires only a small volume (4GL) to achieve significant benefits in restoring the health of critical ecological refugia and protecting the extensive investment by the community in these sites. To gain the greatest benefit for this allocation it must be delivered as soon as possible to prevent irreversible degradation at these sites. Currently the ecological triggers applied for refilling these sites have only been exceeded at 4 sites. It is anticipated that further sites will have to be refilled as the season progresses and the ecological trigger is reached.

River Red Gum Rescue

Similarly this priority also requires only a small volume (3GL) to achieve significant benefits in restoring the health of critical ecological refugia and protecting the extensive investment by governments in these sites. The optimal time for delivery of this water will be over the September to November period.

Contingency Allowance for Flushing Algal Blooms or Salinity

Low river flows increases the risk of significant potentially toxic algal blooms or unexpected increases in salinity. Either of these events could seriously

impact on the availability of water for human use. The release of water at a relatively high rate to break-up an algal bloom or to flush a saline spike through the system is probably the most effective way of managing these events. Initial estimates suggest that approximately 70GL should be set aside as a contingency allowance.

Development of a staged plan

In view of the potential for increased volumes of water for dilution and river restoration becoming available over the next few months, it is proposed that an initial plan for the delivery and use of this component be developed for the next three months. This strategy should be reviewed regularly in line with the water resources assessments provided by the Murray-Darling Basin Commission each month and as updated modelling information becomes available.

This approach should optimise the application of this water to those priority needs where the water is required early in the season without unduly jeopardising those priorities requiring water later in the year.

Adoption of the proposed strategy

Once a strategy for the use and management of the dilution and river restoration flows allocated to South Australia has been adopted, the flow to the state will be adjusted to ensure that diversions can be met and the required flows can be passed through the system without jeopardising the overall management and operation of the river in this state. Delivery of the suggested volumes of water will ensure that it is possible to maintain weir pool levels upstream of Lock 1 and should maintain salinity levels below 1100EC at Swan Reach for the rest of this financial year. Without the proposed dilution flows the salinity at Swan Reach could exceed 1500EC.

Risks

A wide variety of risks associated with this strategy were assessed, at least in a qualitative manner and this assessment has been taken into account in developing the proposed strategy. These included factors such as the risks to agricultural, industrial and urban users of increasing salinity and falling water levels and environmental risks of failing to take remedial action.

One social risk associated with all activities that could be identified as addressing environmental rather than economic issues will be opposition from some sections of the community to these uses. This risk can be countered by recognition that the water allocated for dilution and river restoration cannot be used for commercial consumptive purposes and by providing evidence that the use of water for environmental benefits has minimal impact on the ability to deliver other benefits.

Key messages

It will be important both when assessing this proposed strategy and when promoting the strategy to the community, to establish that the water allocated

to South Australia for dilution and river restoration cannot be used for any other purpose and that it is essential the greatest overall benefits for the community and the long term sustainable use of the river are delivered through the application and management of these allocations.

The proposed strategy adopts a conservative approach while not causing excessive hardship early in the year by unduly restricting flows when there is a high probability of improved flows during the year. In this regard the proposed strategy attempts to allocate and use the water in a way that does not over-commit resources at the start of the year but addresses critical issues in a timely manner. The proposed strategy should effectively deal with the worst case scenario of allocations not increasing any further during the year but also facilitate optimal use of the existing allocations under a more likely scenario of increasing (albeit modest increases) allocations for dilution and river restoration.

Recommended strategy

The Drought Recovery Strategy Project Team propose the following initial strategy for the use and management of the dilution and river restoration flows:

Delivery and Application of the water:

River Salinity Mitigation – provide an ongoing increased flow to the state of approximately 700ML/day starting 1 September 2007.

Refilling priority regulated wetlands – the four identified regulated wetlands already exhibiting serious environmental damage should be refilled during September (the flow to the state for September should be increased by 4GL to accommodate this action).

River Red Gum Rescue – the previously watered River Red Gum Rescue sites should be re-watered during the September to November period (the flow to the state during this period should be increased by 1GL per month to accommodate this action).

Contingency allowance for flushing algal blooms or salinity – at least 70GL of the volume of water allocated to dilution and river restoration should be quarantined for use as a flushing flow in the event of either of these issues arising.

Complementary Actions

Lower lakes Salinity Flushing – proposals to release water through the barrages to reduce salinity in proximity of the barrages should proceed when this can be undertaken without significant risk. It is likely that the opportunities to make these releases will be very limited and it would be inappropriate to deliver water from the dilution and river restoration allocation to the lower lakes specifically for this action. The volume of water released (up to 50GL) should be accounted against the water released for river salinity mitigation. If

possible some of this water should be directed in such a way that it provides potential for improving conditions in the estuary.

Replacing evaporative losses from refilled regulated wetlands - once priority regulated wetlands are refilled, ongoing evaporative losses (3 GL) should be accepted as part of the losses within South Australia included in the calculations under the 3i sharing rules. No evaporative savings from the 27 regulated wetlands closed in 2006 have been included in the flow calculations for 2007-08.

Modelling

Ongoing assessment of the options through modelling should be continued to improve our understanding of the volumes and timing of flows needed to deliver the desired outcomes, particularly in relation to river salinity mitigation, lower lakes salinity flushing and flushing of algal blooms or salinity spikes.

Adaptive approach

It is proposed that the strategy for the use and management of the dilution and river restoration flows be reviewed on a monthly basis by the Drought Recovery Strategy project team to ensure that the application of this water is optimised in relation to the economic, social and environmental benefits that can be achieved.

Monitoring

It is proposed that monitoring of the impacts of the options implemented be undertaken to ensure that the use and delivery of this water is optimised and to identify changes in conditions in the river, wetlands, the lower lakes and the Coorong which could change an assessment of priorities for the use of this water.

Volume required for proposed strategy

The volume of water from the dilution and river restoration allocation required to implement this proposed strategy is outlined in Table 3.

Table 3 – **Volume required to implement proposed strategy**

Option	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April
River Salinity Mitigation	21	21	21	21	21	21	21	147
Wetlands Refill (reg)	4							4
Redgum Rescue	1	1	1					3
B/G Algae Flush Reserve				35		35		70
Lakes Salinity Flushing	Up to 50 GL accounted against River Salinity Mitigation volume							
Chowilla priority sites	TLM water							
Barrage Fishways	TLM water							
Wetlands Evap (reg)	Up 3 GL accounted against South Australian losses under 3i sharing rules							
TOTAL	**26**	**22**	**22**	**56**	**21**	**56**	**21**	**224***

* The total volume is 70GL more than currently allocated to SA for dilution and river restoration. In the worst case scenario of no further allocations for this use for the year, the contingency for flushing algae or salinity spikes could be used for other purposes.

Drought Recovery Strategy Project Team

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Attachment 1

Options for the use and management of dilution and river restoration flows

Options

The options identified by the Project Team were:

- *Allowance for flushing blue-green algal blooms or salinity spikes*
- *River salinity dilution*
- *Lower lakes salinity flushing*
- *Pumping to priority River Red Gum Rescue sites*
- *Pumping to priority Chowilla floodplain sites*
- *Provision of attractant flows at barrage fishways*
- *Refilling priority regulated wetlands closed since November 2006*
- *Refilling unregulated wetlands*
- *Restoration of the water level in the lower lakes*
- *Restoration of estuarine conditions in the Coorong*

Details of the volumes required and optimal timing of these requirements are provided below.

Contingency allowance for flushing blue-green algal blooms or salinity spikes

In the event of a major toxic cyanobacterial bloom or an unexpected 'spike' in salinity occurring within South Australia, a volume of water will be required to flush this event past critical off-takes. An initial estimate of the volume required is 70 GL (based on a total flow of 7000 ML/day for 2 weeks requiring an average of 5000 ML/day additional flow combined with the planned minimum flow for October to February). The critical timing for this contingency will be between October 2007 and February 2008 inclusive.

River salinity dilution

Current predictions indicate that under minimum inflow conditions salinity will exceed 1200EC at Murray Bridge for a significant part of 2007-08. A key option for the use of the dilution and river restoration flow will be to mitigate salinity in the river between Lock 3 and Wellington. While the optimal volume and delivery pattern for this water is yet to be finalised, it is evident that an early start to this dilution flow will minimise the peak salinity experienced. In addition early modelling indicates that a continuous flow of between 500ML/day and 1 000ML/day is likely to maintain salinity levels at acceptable levels throughout the summer period. As an initial estimate it has been assumed that a dilution flow of 700ML/day (21GL/month) will be required for the period September to March inclusive.

Lower lakes salinity flushing

Seawater overtopping the barrages during storm events and leakage of seawater through the barrages has resulted in a significant increase in salinity in the vicinity of the barrages. This is particularly evident in the Goolwa and Mundoo channels where the mixing of water into the main body of Lake Alexandrina is restricted. Although the static water level in the lakes is below the level of water in the estuary for much of the time, there may be opportunities to release some of the contaminated water during brief periods when there is a positive head difference due to wind action.

Operational rules are being developed to facilitate this action. While it is not known how much water could be released in this manner it is proposed that a maximum target volume of 50GL be used. This should provide for a significant flushing of both the Goolwa and Mundoo channels.

If this action is to be implemented it is most likely that it will be limited to the September to November period before lake levels fall to a level where it is no longer possible to discharge water.

Pumping to priority River Red Gum Rescue sites

In the past three years water has been pumped to specific priority areas to protect and rehabilitate small areas of floodplain river red gum habitat outside the Chowilla icon site with considerable success. In order to protect the significant investment that has already been made through this project and to maximise the survival of river red gums that have been rehabilitated through the previous flooding, it us necessary to re-flood these areas.

This operation would require approximately 3GL over the September to November period.

Pumping to priority Chowilla floodplain sites (in addition to TLM water)

Similar to the River Red Gum Rescue sites outside the Chowilla Icon site, several sites within Chowilla have been watered in the past two years. South Australia has secured 2GL of water through the Living Murray Environmental Water Allocation for re-watering these sites but this allocation will be insufficient to provide water for all critical sites. A further 2GL during the September to November period is required to rewater critical sites.

Provision of attractant flows at barrage fishways (TLM allocation to provide water to operate fishways)

Operation of the barrage fishways requires a specific allocation of water when the level in the lower lakes is below 0.75m AHD. Under all but the wettest circumstances it is predicted that the level will remain below this level throughout the year. South Australia has secured 5.7GL of water through the Living Murray Environmental Water Allocation for the operation of the barrage fishways but there is no allowance for attractant flows. Optimal operation of the fishways requires the discharge of an attractant flow from a barrage gate

adjacent to each fishway. It is estimated that a total of 36 GL would be required to provide attractant flows at two of the three fishways for approximately 50% of the time over a four month period from November to February inclusive.

Refilling priority regulated wetlands closed since November 2006

A total of 27 regulated wetlands in South Australia were closed during October – November 2006 to generate evaporative savings. Several of these wetlands are now exhibiting signs of stress (especially salinisation) and at least four sites are considered to have deteriorated to a critical level and the damage is becoming irreversible. A total of 4GL is required to refill these critical priority sites as soon as possible.

A further 3GL is required to replace the evaporative savings from these wetlands during the summer period (November to April inclusive).

Refilling unregulated wetlands closed under the First Minister's decision on meeting critical human needs

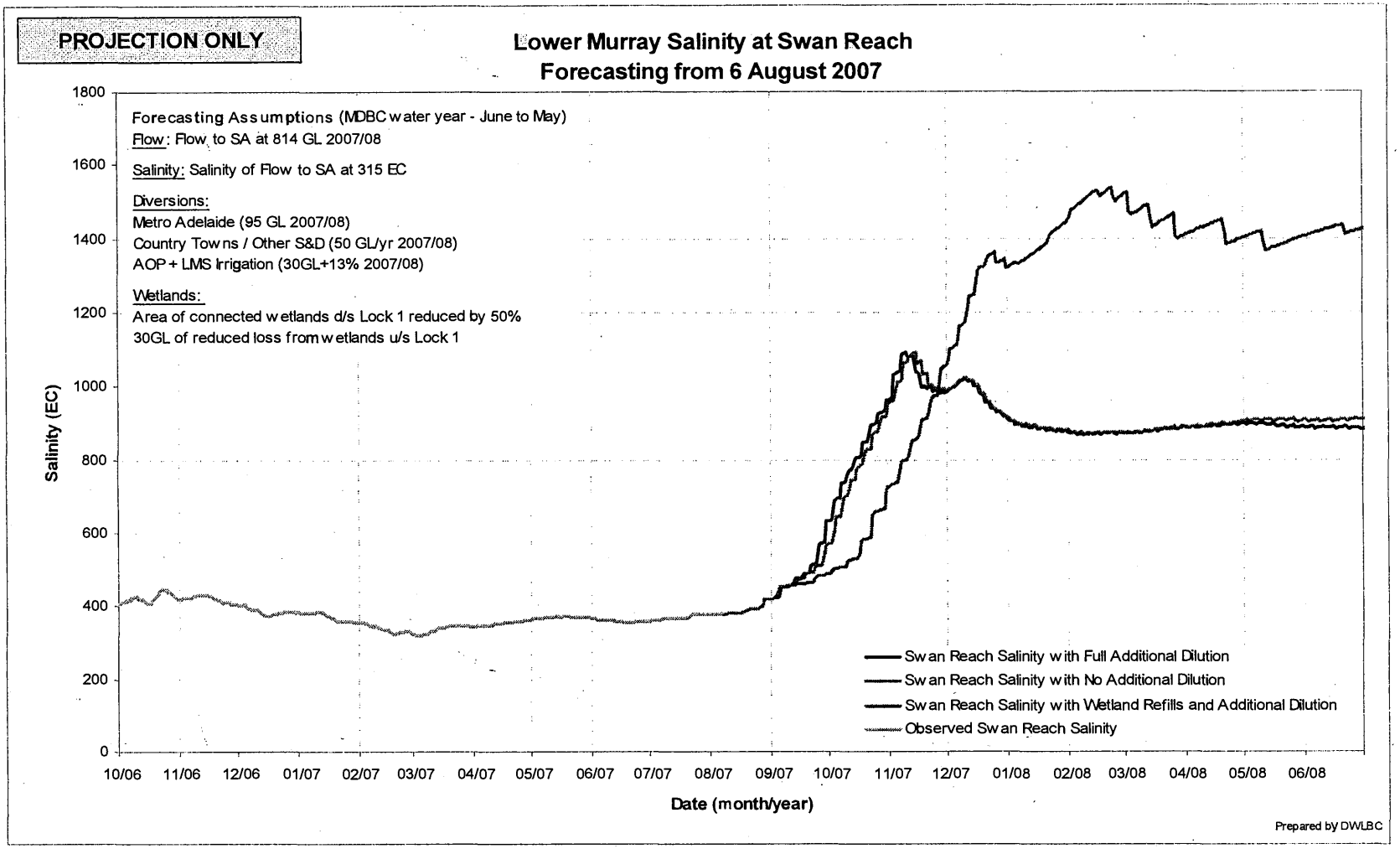
It is proposed that a total of up to 9 wetlands and lakes will be disconnected from the river to generate evaporative savings during 2007-08. In order to ensure that these wetlands do not suffer permanent damage a total of approximately 30GL is required to refill these sites towards the end of the year.

Restoration of the water level in the lower lakes
Under 90% inflow conditions a total volume of approximately 520GL would be required to raise the end of season water level in the lower lakes is raised to 0.30m AHD. It is assumed that the most effective delivery of this water would be at a constant rate throughout the year from September.

Restoration of estuarine conditions in the Coorong

The promotion of estuarine conditions in the Coorong would be achieved through the release of river water through the Tauwitchere, Ewe Island and Goolwa barrages during the period when natural spring – summer flows would be experienced. It has been assumed that the appropriate pattern of flows would consist of a spring – summer flush of 500GL extending over 5 months centred on November.

Attachment 2



APPENDIX 9

Budget impact of drought in SA

ATTACHMENT 2

RIVER MURRAY DROUGHT IN SOUTH AUSTRALIA

2007 - 08 ESTIMATES

WATER SECURITY/DROUGHT MEASURE	2006-07 Estimate/ Actual $'000s	2007-08 Approved $'000s	2007-08 Estimated Outcome $'000s	2007-08 Budget Impact $'000s
Advisory Groups				
Water Security Advisory Group & High Level Officers Group	145	295	295	0
Water Security Taskforce & Technical Group	15	30	30	0
Community Liaison Managers	140	0	100	100
Ngarrindjeri Monitoring Agreement	100	0	70	70
Mannum to Border Monitoring Agreement	100	0	30	30
First Peoples - Emergency Dredging and Wetland Closures	0	0	20	20
Wellington Weir Local Knowledge Advisory Group	0	0	10	10
Sub-total	500	325	555	230
Communications Strategy and Drought Response				
Public Meetings	15	20	20	0
Media Campaign - Advertising, Mail Outs, Printing	315	325	446	121
DWLBC Drought Response Team	204	327	446	119
DWLBC Drought Response Team - Absorbed Costs	803	1 137	1 137	0
Sub-total	1 337	1 809	2 049	240
Licensing and Compliance				
Accelerating and Managing additional applications for 'Top-Up' water allocations	100	0	426	426
Lost revenue as a result of waiving fees to "Top up"	300	0	390	390
Managing Compliance & enforcement of Water Access for Irrigators	180	400	1 178	778
Education Program	100	105	176	71
Water Carryover	100	150	150	0
Meter Reading	135	0	50	50
Sub-total	915	655	2 370	1 715
Monitoring and Scientific Investigations				
Drought Flows Study, Salinity Scenarios	105	110	297	187
Groundwater Availability Angas Bremer	30	30	30	0
Monitoring and Information	20	0	838	838
Sub-total	155	140	1 165	1 025
Wetland Closures	0	0	128	128
Other				
Ral Ral Creek Drought relief	0	0	40	40

Regulations requiring water efficiency plans by Industrial Users of RMW and Regs applying domestic water restrictions	0	0	130	130
Acid sulfate soil mitigation and monitoring	0	0	300	300
Maintain ex-suitu populations of nationally endangered river Murray fish	0	0	50	50
Environmental impact study on proposed Wellington Weir			700	700
Investigate drought refuge options for the Finniss and Currency Creeks	0	0	25	25
Sub-total	0	0	1 245	1 245
Water Sales Lost	5 900	20 240	20 240	0
Drought Response				
Communication Education Program	1 587	700	700	0
Water Restrictions Officers	635	1 976	1 976	0
RAA Hotline	496	440	440	0
Additional Burst/Choke Maintenance/PAC	1 586	0	0	0
Pumping/Treatment Costs - Additional/(Reduced)	5 100	0	1 820	1 820
Other	95	25	25	0
Sub-total	9 499	3 141	4 961	1 820
Water Security				
Water Quality Investigations	180	225	225	0
Bring Forward River Murray Pumping 60 GL	5 000	0	0	0
Water filtration plants	0	700	700	0
Wellington Weir Investigations	889	667	1 600	933
Pumping Stations Investigations	256	0	0	0
Low Lift Pump Stations (Operating Costs)	0	0	167	167
Water carting - Streaky Bay	0	0	110	110
Increasing No of audits for Water Efficiency	0	0	54	54
Water Licences	457	0	0	0
Backup Tankering & Raukkan Temporary Deep Water Intake	107	150	150	0
Sub-total	6 889	1 742	3 006	1 264
Impact of the Drought on Capital Plan				
Kangaroo Island Pipeline	467	0	0	0
CWQIP Stage 3^	11 941	48 100	45 956	(2 144)
CWQIP Stage 4	0	0	4 700	4 700
Hand Held Devices for the Water Conservation Officers	101	0	0	0
Clayton Pipeline	80	4 920	5 079	159
Lower Pumping Levels in the River Murray	0	2 000	500	(1 500)
Procure and install algal scum booms at high risk intake locations in River Murray	28	0	0	0
Install permanent PAC dosing facility at Morgan WTP	123	600	828	228
Mt Pleasant WTP PAC Dosing	0	0	871	871
Minor Plant	39	138	90	(48)
Mt Bold Investigations	0	0	1 182	1 182
Desalination Investigations	0	0	1 210	1 210
Sub-total	12 779	55 758	60 416	4 658
TOTAL	**32 074**	**83 810**	**96 135**	**12 325**

( ) denotes savings against approved budget