GOULBURN-MURRAY WATER

Review of allocation and trading rules for the Broken system

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Executive Summary

The Northern Region Sustainable Water Strategy (NRSWS), published in 2009, sets out actions to ensure that water entitlements are secure and aims to provide more choice and flexibility for entitlement-holders to manage the risks imposed by drought and climate change. The actions aim to improve certainty that water can be delivered when needed, with flexibility to match supplies with users water needs. Chapter 5 of the strategy contains specific actions to review carryover rules (including the use of spillable water accounts), reserve rules and trading rules for the Broken system.

This paper outlines the current allocation policies, carryover rules and reserve rules for the Broken system and looks at the issues associated with changing them. This includes discussion of the legalities surrounding advance allocation, as well as the pros and cons of introducing advance allocation as an option in the Broken. The paper presents a number of options to liberalise trading, including allowing trade out of the system. The implications of each of these options are considered, both hydrologically and environmentally, but also in terms of the complexities for allocation policies, administration and accounting.

Recommendations in the paper have been developed by a sub-committee of the Goulburn-Broken Regional Water Services Committee (the WSC) and Broken River water users. The sub-committee has worked with G-MW to seek agreement on proposed changes to allocation and trading rules with the aim to improve options for Broken System customers. Recommendations have been made as a result of the lengthy investigations and, if approved, the target date for implementing the changes is 1 July 2013.

The review of current allocation rules against possible new options for the Broken river system has led to the recommendation of no change to the majority of rules. The Broken has a relatively small storage capacity, 40 GL, and operates as an annual system. As a result having a reserve policy, or spillable water accounts, would not provide additional flexibility for users or improve early season allocations. One of the main aims of the sub-committee was improving early season allocation and access to water. As such the review has recommended to remove the ability to carryover against Low Reliability Water Shares (LRWS). This has the potential increase early season allocations by as much as 9%.

Another recommendation is to seek advance allocation for the Broken System. Advance allocation will provide users access to early season unregulated flows and would be benefit in years where there is little or no carryover available. However, it can not be relied upon as an option in all years, as the necessary minimum period of unregulated flow conditions may not materialise. Change to legislation is required before advance allocation can occur. Legislative change is a lengthy process and it is expected that advance allocation could not be offered for several years.

The review of trade rules has recommended allowing trade of allocation and water shares (by tagging) out of the Broken to Goulburn and downstream One of the main issues for trade out of the Broken concerns the introduction of inter-valley trade (IVT) to the system. The Broken system has a relatively low ratio of storage volume to entitlement when compared to other systems and, as a result, the ability of the Broken

system to achieve a high allocation is dependent on the utilisation of unregulated flows as well as stored resource.

To maintain system reliability, a mechanism will be required to allow delivery of IVT to be met through a mix of stored water and unregulated flows, in a pattern to be determined by the Resource Manager. The relative proportions should ideally reflect how the water would have been supplied if it had been used in the Broken system instead of being traded out.

A cut-off date for trade would be required each season because management of the IVT account requires time to call out the IVT balance before the end of the season. If there is substantial late season trade, there might not be enough time for the receiving valley to call out the IVT balance, leading to third-party effects in the destination system due to loss of resource and the retention of a large quarantined volume in Lake Nillahcootie.

There are several environmental concerns with regards to trade out of the system, slackwater habitats are important and have been shown to be sensitive to changes in minimum flows. Such habitats could be adversely affected by a significant increase in summer and autumn flows required to meet delivery of downstream trade obligations. This may therefore require upper limits on flows at these times.

One of the recommendations of this paper is that trade out of the Broken is feasible hydrologically and should be allowed. However, there is a lack of available information to immediately determine an environmentally acceptable level of trade out. An environmental study is required to determine the magnitude of flows that could cause environmental damage and therefore the limits to apply to any traded volume of water to prevent the damage occurring. The aim is to develop an operational regime that mimics natural conditions as much as possible and provides environmental benefits. Until the possible environmental impacts are known, an initiall conservative cap on the level of trade out may be required. The cap could be adjusted accordingly as more information and advice becomes available.

The recommendations of both the allocation and trading rules reviews are summarised below.

Recommendations – allocation rules review

1. Retain the 100% rule for maximum volume of water to be held on the Broken system, as introduction of spillable water accounts would not provide significant additional flexibility for Broken irrigators;
2. Remove the right to carry over against LRWS on the Broken system as it can constrain high-reliability allocations at the start of the season;
3. Retain the 50% limit on the volume of water that can be carried over for HRWS on the Broken system;
4. A reserve policy should not be introduced for the Broken system. Modelling results show that the additional resource created through the introduction of a reserve is still not enough to deliver a 1% opening allocation in all years and at the same time has a significant negative impact on February allocations;

5. Seek advance allocation in the Broken system to give users access to unregulated flows in advance of seasonal allocation, recognising that this will require legislative amendments and may take several years.
6. Do not convert Low Reliability Water Shares into a SRWS product. Seek to use advanced to give water users access to early season unregulated flows allocation instead.
7. G-MW to work with the WSC on options to maximise allocations and give water users greater certainty on seasonal water availability

Recommendations – trading rules review

1. Merge existing trading zones 2A and 2B into a single zone. Following the decommissioning of Lake Mokoan, the need for two zones to separate the demand dependent on Lake Mokoan is no longer relevant. Unlimited trade is now permitted within the Broken, effectively creating a single zone, and should be formalised;
2. Investigate the environmental impacts of trade to determine the environmentally acceptable level of trade out and develop guidance on the optimum pattern of delivery of water to avoid environmental damage;
3. Implement changes to trading rules to allow the trade of allocation out of the Broken to Goulburn and downstream. Trade out is considered feasible hydrologically and can be managed using existing Water Register and inter-valley trade (IVT) accounting arrangements;
4. Implement changes to trading rules to allow the trade of water shares (by tagging) out of the Broken to Goulburn and downstream. Trade out is considered feasible hydrologically and can be managed using existing Water Register and inter-valley trade (IVT) accounting arrangements. Trade of water shares creates a few more issues for management and accounting than trade of allocation;
5. Set a trade close-off date (date to be determined but no later than 31 March) for the trade of allocation and for usage against tagged water shares to enable IVT water to be managed and delivered within the season. Delivery of IVT should be met through a mix of stored water and unregulated flows, in a pattern to be determined by the Resource Manager;
6. Trade of advance allocation or SRWS, if they become available in the Broken in future, would not be permitted. Advance allocation and the SRWS are a special local opportunity for users in the Broken system and are dependent on the availability of unregulated flows in the Broken. It is not a separate right and so cannot be traded.

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1 Introduction

1.1 Background to the review

The Northern Region Sustainable Water Strategy (NRSWS), published in 2009, identifies and analyses threats to water availability and quality in northern Victoria over the next 50 years. It was developed in light of the stresses experienced in the recent drought and the future uncertainty associated with climate change.

The strategy sets out actions to ensure that water entitlements are secure and aims to provide more choice and flexibility for entitlement-holders to manage the risks imposed by drought and climate change. The actions aim to improve certainty that water can be delivered when needed, with flexibility to match supplies with users water needs. Chapter 5 of the strategy contains specific actions to review carryover rules (including the use of spillable water accounts), reserve rules and trading rules for the Broken system.

Initially the aim was to have any recommended changes ready for implementation at the start of the 2012/13 financial year, 1 July 2012. However, at the request of the Goulburn-Broken Regional Water Services Committee (the WSC), this date has been pushed back to the 1 July 2013.

Section 2 of this paper outlines the current allocation policies, carryover rules and reserve rules for the Broken system and looks at the issues associated with changing them. This includes discussion of the pros and cons of introducing advance allocation as a separate product in the Broken or converting low-reliability water shares to Spill Reliability Water Shares to improve access to water early in the season. Recommendations are presented in section 2.2. Section 3 presents a number of options to liberalise trading, including allowing trade out of the system. The implications of each of these options are considered, both hydrologically and environmentally, but also in terms of the complexities for allocation policies, administration and accounting. Recommendations are presented in section 3.3.

Proposed timelines for the full review are outlined in section 4. The recommendations presented in this issues paper have been consulted with the WSC. The recommendations have been developed by a sub-committee of the WSC consisting of Broken System customers. Details of the review process are outlined in section 1.3. This issues paper will be consulted with entitlement holders, prior to proposing final recommendations to the Minister.

1.2 Broken River basin

The Broken River is one of the tributaries of the Goulburn River in north-eastern Victoria. The Broken River basin also includes the catchment of Broken Creek which diverges from the Broken River at Casey's Weir and flows in a north-westerly direction to the Murray River. The basin covers an area of approximately 7,724 km^2.

In the far south of the basin, the Broken River flows westward from its source in the ranges near Tolmie, and then swings to the north near Mt Samaria before entering Lake Nillahcootie. The Broken River continues first north and then west to join the Goulburn River at Shepparton.

The average annual flow of the river is about 287,000 ML above the Broken Creek anabranch at Casey's Weir and about 78,000 ML at the Nillahcootie dam site. Streamflow within the Broken River basin is extremely variable over the seasons of the year, and between years. The three months July to September account for over half of average annual flow.

Lake Nillahcootie is the only major storage in the Broken catchment and has a capacity of 40 GL at full supply level, with a catchment area of approximately 422 km^2. Lake Nillahcootie is designed to fill and spill annually, and is used to regulate the flow of the Broken River to meet downstream requirements of entitlement holders and the environment. Releases are made once unregulated flows in the downstream tributaries recede, usually commencing in late spring through to late autumn.

As at June 2011, entitlements within the Broken comprise 17,815 ML of high-reliability water shares (HRWS) and 3,345 ML of low-reliability water shares (LRWS). North East Water also has a Bulk entitlement for 135 ML.

1.3 Review process and development of recommendations

Goulburn-Murray Water, in conjunction with the Department of Sustainability and Environment (DSE) and the Goulburn-Broken Catchment Management Authorities (CMA), undertook a review of the allocation rules and investigated a number of options to liberalise trading, including allowing trade out of the system. A discussion paper was written to summarise the options, issues and resulting recommendations. This paper was presented to the Goulburn-Broken Regional Water Services Committee (WSC) in late 2011.

At the request of the Goulburn-Broken RWSC, a sub-committee made up of customers from the Broken River system was formed to review and provide advice on recommendations of the paper. The aim of the sub-committee is to review the issues paper and consider options to improve reliability of access to water for water users.

The sub-committee was made up of the following members;
Morris Brown (Chair)
David Rush
Mark Foletta
Maureen Cottam
Michael Reid
Wayne Spinks

Using the issues paper as a basis, the sub-committee has worked with G-MW to seek agreement on proposed changes to allocation and trading rules with the aim to improve options for Broken System customers. Following the review, on advice from the committee the initial issues paper was updated and revised to reflect the recommendations of the sub committee.

The updated issues paper was presented to the Goulburn-Broken WSC on the 3 September 2012.

2 Allocation rules

2.1 Current allocation policy

Entitlements within the Broken consist of high-reliability water shares (HRWS) and low-reliability water shares (LRWS). Allocations in the Broken system follow the same general principles used in all declared water systems, with the exception of the Ovens. Allocations are made in advance according to the volume of water in storage (or guaranteed to be received into the storage) and customers cannot take water until an allocation or delivery of carryover is available.

Assessments are updated twice a month, on the 1st and 15th of the month, until allocations of 100% of HRWS are reached. Thereafter assessments are updated on a monthly basis. The volume of water available for allocation is assessed as the volume in storage, plus the volume forecast into storage based on assumed inflows for the next 6 weeks ahead, minus the environmental flows, urban supplies, carryover and losses for the rest of the season. Losses occur as a result of storage and delivery of water, due to seepage and evaporation.

The Broken has a relatively small storage capacity, 40 GL, and operates as an annual system. This means that the storage would be expected to fill annually under average conditions and the planning period is one year. Water is allocated to all HRWS first, then to LRWS if there is sufficient storage volume remaining. After this, any additional water remains in storage for the following year. There is currently no reserve policy for the Broken system.

2.2 Recommendations of the review

The recommendations of the allocation rules review are summarised below. Detailed discussion of the issues and options associated with them are presented in the remaining sections of this chapter.

1. Retain the 100% rule for maximum volume of water to be held on the Broken system, as introduction of spillable water accounts would not provide significant additional flexibility for Broken irrigators;
2. Remove the right to carry over against LRWS on the Broken system as it can constrain high-reliability allocations at the start of the season;
3. Retain the 50% limit on the volume of water that can be carried over for HRWS on the Broken system;
4. A reserve policy should not be introduced for the Broken system. Modelling results show that the additional resource created through the introduction of a reserve is still not enough to deliver a 1% opening allocation in all years and at the same time has a significant negative impact on February allocations;
5. Seek advance allocation in the Broken system to give users access to unregulated flows in advance of seasonal allocation, recognising that this will require legislative changes and may take several years.
6. Do not convert Low Reliability Water Shares into a SRWS product. Seek to use advanced to give water users access to early season unregulated flows allocation instead.
7. G-MW to work with the WSC on options to maximise allocations and give water users greater certainty on seasonal water availability

2.3 Carryover rules

2.3.1 Current rules

Carryover was introduced in the Broken system in 2008, and is currently governed by two key rules:

1. The volume of unused allocation that can be carried over is limited to 50% of entitlement volume, with entitlement holders able to carry over against both high- and low-reliability water shares.
    - 5% of the volume carried over is deducted to cover evaporation in the new season.
2. In the subsequent season, the carryover plus allocation against a water share cannot exceed 100% of the water share volume; hence, forgo some allocation increases as a result of carryover recorded against a water share.

2.3.2 Benefits of carryover

Carryover provides Broken irrigators with greater flexibility to manage their own water availability. Particularly in dry years, carryover can be used to address the risk of low early season allocations, as well as to provide more certainty about accessing the full entitlement volume over the course of the season.

As an example, approximately 7 GL of water was carried over into the 2008/09 season, which meant some water was available for irrigation in the Broken even though seasonal allocations remained at 0% for the entire season. Similarly around 4 GL was carried over into the 2010-11 season. Even though they climbed rapidly in spring, allocations were still 0% up until mid-August, but carryover was able to be delivered if water was required.

It is important that Broken irrigators are aware that there are risks that carryover may not always be able to be delivered at the start of the season. The high losses associated with Broken River operations mean that in some extremely dry years it may not be possible to deliver any water at certain times in the season. Modelling (see Reserve rules, section 2.4) suggests that under historic conditions, there may be 10 years out of 100 with 0% August allocations. In some of these years access to carryover at the start of the season could be restricted.

2.3.3 Consideration of options

Carryover rules were reviewed through the Northern Region Sustainable Water Strategy (NRSWS), resulting in significant changes to carryover rules in the Murray, Goulburn and Campaspe systems. DSE and G-MW have now extended this analysis to options for the Broken system.

2.3.3.1 Spillable water accounts

Spillable accounts provide additional flexibility on top of the 100% rule in water systems with large storages compared to entitlement volume. They have been introduced to manage carryover in the Murray, Goulburn and Campaspe water systems, where water is held in reserve for future seasons. In such systems, spillable accounts are particularly beneficial as allocations to HRWS can reach 100% in many years when the storages do not fill.

This is not the case in the Broken, where entitlement volume is a relatively large proportion of storage capacity, and Lake Nillahcootie is operated as an annual storage to maximise allocations in the current season. There is little to no spare storage capacity when allocations approach 100%, and Lake Nillahcootie will spill in almost all years when 100% high-reliability allocations are achieved.

Recent years provide concrete evidence of this. In 2011/12, Nillahcootie spilled throughout September while the effective allocation (allocated water including carryover) had reached

95%. In 2010/11, high-reliability allocations hit 100% HRWS on 1 September after Nillahcootie filled in late August 2010.

Due to the particular hydrology of the system, spillable water accounts are not recommended for the Broken system, as they would not provide significant additional flexibility for Broken irrigators.

Recommendation 1: That the 100% rule be retained on the Broken system.

2.3.3.2 Carryover for low-reliability water shares

Since LRWS in the Broken system are not supported by storage capacity for the duration of the season, it may not be appropriate to allow water to be carried over and stored against these entitlements.

In the 2011/12 season, Lake Nillahcootie was full early in the season without being able to make allocations to low-reliability water shares.

Allocations to LRWS in the Broken will generally become available later in the season – once deliveries have reduced the initial high-reliability and loss commitments, freeing up room in the storage to make low-reliability allocations.

This occurred in the 2010-11 season, when 100% LRWS allocations were possible by 15 November, after Nillahcootie had first filled in September.

Allowing carryover against LRWS does constrain HRWS allocations at the start of the season. While the extent of this impact is small (with only around 3.3 GL of low-reliability entitlements in the Broken, the maximum possible carryover commitment is 1.6 GL), carryover against low-reliability shares can constrain early season high-reliability allocations by up to a maximum of 9%.

Alternatively, the right to carry over against Broken low-reliability water shares could be left in place. The ability to carry over against low-reliability water shares does provide Broken irrigators with an additional option to manage their risks.

However, the existing right to carry over against HRWS may provide the necessary flexibility for Broken irrigators. It is a sound recommendation in principle if low-reliability shares are not supported by storage capacity for the full season, and in some seasons could result in slightly higher opening high-reliability allocations.

Table 2-1: Pros and cons of 50% carryover against LRWS

Pros of 50% carryover against LRWS	Cons of 50%carryover against LRWS
Further flexibility for water users to carryover volume to meet next season's needs.	LRWS not supported by storage capacity for the duration of the season, may not be appropriate to carryover.
	Can constrain early season allocations by a maximum of 9%.

Recommendation 2: That the right to carry over against low-reliability water shares be removed on the Broken system.

Who would be impacted by this change?

This would not change the total availability of water in the system, but rather the distribution of water between individuals. Irrigators with low-reliability shares would have a lower maximum volume for carryover, but **all** users would have more water available as high-reliability allocations.

Analysis of water shares associated with land in the Broken system indicates that:

- Around half of all properties have only high-reliability water shares associated with domestic and stock supplies
- Of the other half that also have low-reliability water shares, almost all properties still hold the same proportion of high- and low-reliability shares that they were issued with upon unbundling in 2007.

There is no evidence of individuals having collected low-reliability water shares specifically for carry over against, so there is a low likelihood of disadvantage by removing the right to carryover against low-reliability shares in the Broken.

2.3.3.3 How much should individuals be able to carry over?

Currently individuals can carry over unused allocation up to 50% of their entitlement volume. Through the NRSWS, this limit was increased in 2009 (from 30%) to give individuals more freedom to choose how much to carry over, and more flexibility to manage their own risk.

The current 50% limit is thought to be about right in terms of providing the flexibility for Broken customers to secure enough water for their early season needs, as well as providing additional certainty over access to their full entitlement volume by the end of the season.

Alternatively, in line with the philosophy of giving individuals the discretion to manage their own risk, this limit could be increased to allow individuals to carry over up to their full entitlement volume.

However, with a 100% limit on the volume carried over plus allocation in the new season, it would be unusual for irrigators to be allowed to carry over their full entitlement volume just to receive no allocations in the following year.

The question has been asked if the amount that can be carried over should be restricted (say back to 30%) as a way of returning more water to the communal pool to boost allocations or to help run the river. In practice, any unused water above 30% of entitlement volume will predominantly be because individuals have chosen to not use that water and carry it over. It would not be returned to the pool in any case. If the carryover limit was lower, individuals would either use that water, or trade it out of the basin if possible.

Recommendation 3: That the 50% limit on the volume that can be carried over be retained.

Table 2-2: Pros and cons of carryover using the 50% carryover limit

Pros of the 50% carryover limit	Cons of the 50% carryover limit
Gives greater opportunity for water users to manage needs	Potentially reduces early season allocation by a maximum of 50% (if water would not have been used)
Gives good balance between giving flexibility of carryover and maximizing early season allocation	
Works well with the 100% allocation rule as it reduces the amount of allocation water users will give up if they carryover the full allowance	
Gives a mechanism to access water early in the season when allocations are generally low.	

Table 2-3: Pros and cons of increasing/decreasing levels of carryover from the 50% limit

Carryover scenario	Pros	Cons
100 %	Increases flexibility for water users to manage risk	Potentially increases effects on early season allocation (if water would not have been used) 100% rule means that if full carryover is utilised water users will forego all allocation in the following season.
30%	Potentially reduces effects on early season allocations by maximum of 20% Further reduces the amount of next year's allocation that water users who carry over will forgo.	Reduces flexibility for water users as it reduces volume of carryover Users may not be able to carryover sufficient volume to meet needs in next year
No Carryover	Minimises effects on early season allocations	No potential for water users to mitigate risks of no water availability

2.4 Reserve rules

2.4.1 Background

The recent drought showed that new climate extremes were possible and reduced future water availability is a real risk for Northern Victorian systems. This could result in more years where there is not enough water to operate the distribution system at the start of the irrigation season, leading to zero allocations and unavailability of access to carryover.

The NRSWS proposed to change or introduce reserve policies on the major regulated northern systems with the objective of running the distribution system and giving access to carryover in all years (i.e. operating water, critical human needs and securing at least a 1% opening allocation in August), under a range of possible climate scenarios. The proposed changes involved reserving some of the water in storage to meet next year's commitments earlier than had previously been done.

Changes to reserve policies have already been assessed on the Murray, Goulburn, Campaspe and Loddon systems. The policy for the Goulburn has already been changed to set aside some of the existing reserve a bit earlier, and there is a commitment to also change the Murray policy. On the Campaspe and Loddon systems no changes were made, as the specific circumstances (storage size, entitlement volume, system losses and interactions with the Goulburn in the form of supplements) meant that too much of the current season's allocation had to be put aside to achieve a 1% opening allocation under the most extreme climate change scenario.

Action 5.3 of the NRSWS committed to investigating reserve policy options for the Broken system, through hydrological modelling, to assess the effectiveness of introducing a reserve policy in the Broken to address the risk of zero allocation years. The preliminary results of this assessment are presented in section 2.4.2 below.

2.4.2 Hydrological modelling results

Modelling work has been carried out using two climate scenarios to assess the effects of introducing a reserve policy on the Broken system. The two scenarios are:

- Base Case scenario – long-term average climate
- Climate Change (Scenario D) – continuation of the low inflows experienced since 1997

The model was run with inflows for the period 1891-June 2010 for both of the above scenarios. The model setup was as per the operating rules post-decommissioning of Lake Mokoan.

Three sets of allocation and reserve rules were tested:

- Current allocation rules (see section 2.1) – 0 GL set aside in reserve before 100% HRWS allocations are reached;
- Option 1 – set aside 1 ML for each 2 ML from 30% to 50% allocation – this option sets aside approximately 4.4 GL of water in reserve before 100% HRWS allocations are reached;
- Option 2 – set aside 1 ML for each 2 ML from 0% to 100% allocation – this option sets aside approximately 18 GL of water in reserve before 100% HRWS allocations are reached.

The results of the modelling work are shown in Table 2.1 below.

Table 2-1: Results of reserve rules hydrological modelling work

		Base case		Climate change (Scenario D)	
		Aug	Feb	Aug	Feb
Number of years in 100 with 0% allocation	Current policy	10	2	44	7
	Option 1	9	2	42	5
	Option 2	8	1	29	4
Number of years in 100 with 100% allocation	Current policy	51	89	15	67
	Option 1	0	86	0	62
	Option 2	0	23	0	1

Under the current policy and the Base Case, there are 10 years in 100 with 0% allocation in August and 89 years in 100 with 100% allocations in February. Under climate change (Scenario D) the figures rise to 44 years in 100 with 0% allocations in August and years with 100% allocations in February drop to 67 years in 100.

Options 1 and 2 both involve introducing a reserve and setting aside some water for next year rather than allocating it all as it becomes available.

Under Option 1 rules, compared to the current policy, the number of years with a 0% August allocation decreases from 10 in 100 to 9 in 100 (Base Case) and from 44 in 100 to 42 in 100 (Scenario D). This comes at a cost of decreased years with 100% February allocation – from 89 in 100 to 86 in 100 (Base Case) and from 67 in 100 to 62 in 100 (Scenario D).

Under Option 2 rules, compared to the current policy, the number of years with a 0% August allocation decreases from 10 in 100 to 8 in 100 (Base Case) and from 44 in 100 to 29 in 100 (Scenario D). However, the cost is very high in terms of the reduction in the number of years

with 100% February allocation – from 89 in 100 to 23 in 100 (Base Case) and from 67 in 100 to 1 in 100 (Scenario D).

Neither option achieves the objective of securing at least a 1% opening allocation in all years. This is similar to the Campaspe results where the reserve of water set aside is high compared to the total entitlement but still is not sufficient to cover the losses incurred in delivering water when a series of dry years occurs.

Recommendation 4: That no reserve policy be introduced on the Broken system.

2.5 Advance allocation

2.5.1 Background

Advance allocation rules were in place in northern Victoria during the 2003/04 and 2004/05 seasons to allow entitlement holders to access a portion of their entitlement during an unregulated flow period (if it occurred) in advance of receiving seasonal allocation. However, due to the lack of unregulated flows in both seasons, G-MW did not announce the availability of advance allocations in any system. Despite never being tested in practice, advance allocation arrangements were generally accepted at the time by irrigators and environmental interests as a reasonable drought response in northern Victoria.

The NRSWS, released in 2009, has since introduced new policies for improved water sharing under dry conditions including reserves, carryover and spillable water accounts. Together with the existing water market, the implementation of the initiatives in the NRSWS removes the impetus for introducing advance allocation in northern Victoria.

The exception to this may be in the Broken system where there is an annual storage designed to fill and empty each year, rather than store water for multiple seasons, and limited capacity for reserves or large volumes of carryover, and uncertainty over the ability to secure opening access to carryover in all years.

Broken irrigators have requested access to advance allocation following the decommissioning of Lake Mokoan. Lake Mokoan was historically used to harvest unregulated flows in the Broken River and Holland's Creek, mostly during winter and spring. These flows then contributed to the resource available for allocation in the Broken, allowing access to an allocation earlier in the season. Irrigators would now like access to some of these unregulated flows, which would otherwise flow into the lower Broken River and then into the Goulburn and Murray, to meet early season requirements through an advance allocation policy.

2.5.2 Legal issues

Investigations into the legalities of advance allocation by DSE have highlighted that the current legal basis for advance allocation is tenuous and that a change to the Water Act would be required to adequately provide for advance allocation.

The fundamental legal problem is that an individual's authorisation to take water comes under their water allocation and therefore an individual cannot take water in advance of receiving allocation against their water share. G-MW could potentially allocate water (as advance allocation) to users based on orders during an unregulated flow period, up to 30% of HRWS, which would ensure that allocation is made before the taking. However, this assumes that water ordered during the defined period will actually be used at that time – once allocated there is no way to ensure that the use actually occurs during the required unregulated period, rather than being parked for use later in the season. The Act needs to be changed to reflect that for advance allocation there are terms and conditions on when the water can be taken, requiring a separate time-limited determination aside from the original seasonal determination.

Historically, before unbundling, advance allocation was made available via a declaration of water shortage and temporary qualification of rights.

Options considered for advance allocation going forward are as follows:

- Option 1 – do not allow advance allocation given the lack of provision to do so under the Water Act, unless during a future water shortage the Minister for Water permits advance allocation via a qualification of rights.
- Option 2 (preferred) – do not allow advance allocation at this stage but seek legislative amendment to include provision for advance allocation under the Water Act. Recognising that this may take a few years to do.
- Option 3 – allow advance allocation under the current tenuous legal provision under the Water Act which may be challenged. This would require amendments to G-MW's Broken BE to reference unregulated flows and potentially the instrument of appointment for making seasonal determinations as well as the carryover declaration, all of which would need the Minister for Water's approval. G-MW would also need to somehow ensure that use of any advance allocation made occurs during the declared unregulated flow period, which could be very difficult to administer.

Due to the significant legal constraints, advance allocation cannot be implemented at the current time. It may be possible following legislative change, but this will take time to investigate and implement. Under current legislation the administrative complexity and financial costs of implementing advance allocation could be high.

2.5.3 Discussion of pros and cons

If the legal issues previously discussed could be overcome, then the introduction of advance allocation in the Broken would be a possibility. The pros and cons of introducing advance allocation as an option in the Broken system are summarised in the following table and discussed in more detail in the paragraphs below:

Table 2-2: Pros and cons of advance allocation

Pros of advance allocation	Cons of advance allocation
In years of consecutive low allocations, carryover and early season allocations may not always be available. It provides another mechanism to access early season tributary flows in these years.	It cannot be relied upon as an option in all years, as sufficient unregulated flow conditions may not materialise.
In 'average' years, advance allocation may be available for limited periods and may prove useful.	Potentially sets a precedent for other systems to request an advance allocation product.
Use of advance allocation through unregulated flows early in the season may mean that allocations will be higher later in the season.	Depending on the seasonal conditions, payback of advance allocation may not always be possible, leading to potential third party impacts.
It is another mechanism for water users to access early season flows when allocations may be low.	Increased administrative and water resources management workload, and potential cost implications for customers.
	Availability will be high in wet years (when demand is low) and low or non-existent in dry years (when demand is high).
	Extra compliance monitoring and policing required to ensure water being used has been ordered.
	The volume of use is likely to be small and hence the magnitude of third party impacts (environmental, downstream users) is also likely to be small.
	Requires legislative change to occur
	In most cases, advance allocation will not give users access to any more water, it will balance out with carryover and subsequent allocation later in the season.
	Advance allocation would potentially allow more diversion during an important period for environmental flows (late winter/early spring).

If introduced, it is suggested that the original rules for advance allocation would apply. This means the expectation of a minimum two week unregulated flow period before the availability of advance allocation is announced, and a maximum of 30% of HRWS volume available for use as advance allocation.

Unregulated flows are defined as flows in excess of those required to meet all commitments and expected demand over the specified period. The specified period will need to be determined for the Broken system. Historically a 2 week period has been used. However this was based on the Goulburn System with longer travel times. . Declaration periods would be announced based on threshold flows at relevant gauging stations in the catchment (these flows would need to be defined), and conservative assumptions about the magnitude and pattern of demand. Customers wishing to make use of unregulated flows during a declared advance allocation period would still be required to order water in the usual manner.

In defining the threshold flows, there would need to be careful consideration of what the environmental requirements for the system are prior to defining the resource available as advance allocation. As an example, allowing the only winter flush of the year to be taken as advance allocation would not be good for the environment. To ensure adequate flows remain in the river there would be a need to define the flow rate available to divert in an event and also a need to limit diversions at the time to the available resource (in terms of maximum pumping rate and volume).

Advance allocation could be a useful option in the Broken as carryover may not always be available as a product for customers there. However it cannot be relied upon as an option in all years, as the necessary minimum period of unregulated flow conditions (2 weeks) may not materialise dependent on the season:

- Advance allocation could be of most use in a sequence of consecutive dry years, when any carryover has been used in the first dry year and opening allocations are very low. However, due to the requirement for a period of at least 2 weeks of unregulated flows, advance allocation is likely to be a rare event in dry years. Furthermore after an extended dry period the environmental requirements are likely to be high and would need to be taken into consideration prior to making advance allocation available;
- The longest periods of unregulated flows (and hence advance allocation) are most likely to occur in wet years. In these situations, demand from customers is likely to be low due to the generally wet catchment conditions, and advance allocation is therefore likely to be of limited use;
- In ‘average’ years, advance allocation may be available for limited periods, particularly in the late winter moving into spring. In these situations, when catchments are starting to dry out, the weather is warming up and there is emerging irrigation demand, advance allocation may prove useful. This is particularly the case for large users of water who have early season requirements and no carryover available;
- Advance allocation may not be available to all customers at the same time, creating a potential equity issue. For example, lower reaches may be in unregulated flow conditions while at the same time other reaches, particularly upper reaches, may not be.

The use of advance allocation through unregulated flows early in the season has the advantage that seasonal allocations will reach higher percentages more quickly later in the season. This is due to some HRWS commitments being met by the unregulated flows. However, the introduction of advance allocation will result in increased administrative and water resources management workload, and will have cost implications for customers. Issues include:

- increased management time, including monitoring and making decisions on periods and locations of unregulated flows;
- the complexity of adding and administering another product in the Water Register;
- costs associated with additional meter reads following periods of advance allocation (offset by the automatic read meters in the area);
- additional compliance workload to ensure any water taken has been ordered in the usual manner.

If advance allocation is made available and the trade of HRWS out of the Broken is allowed, it needs to be made clear that water traded out of the Broken system will not have the advance allocation feature. It is already a locational feature anyway (for example there may be differences in declared periods either upstream or downstream of Holland's Creek) and dependent on the availability of unregulated flows in the Broken catchment. These may stop and start intermittently and cannot be taken in a distant location where unregulated flows may not be occurring.

Payback of any advance allocation will help ensure no net increase in annual diversions and minimise the third party impacts. Payback rules should specify that payback, via foregone seasonal allocation later in the season, is only necessary in the current season if allocations reach 100%. However there is a need to ensure that there are no significant third party impacts as a result. This includes implications for the Goulburn-Broken-Loddon cap associated with take that may not otherwise have occurred and the change in volume or timing of Mokoan derived environmental flows.

Modelling work carried out by DSE using the current rules for the Broken indicates that there will be 100% allocation to HRWS in February in 89 out of 100 years. This means that payback of advance allocation could be achieved in at least 89% of cases. In reality the number of payback years could be greater, as the 100% rule limits allocation plus carryover plus advance allocation to 100% HRWS in any given season, meaning that payback for some irrigators would begin at lower than 100% allocation (see example below):

> ***Example of 100% rule***
>
> *In any given season the 100% rule limits allocation + carryover + advance allocation to 100% HRWS For example, if an individual has 20% HRWS volume carried over and uses 20% HRWS as advance allocation then they will forego any seasonal allocation above 60% HRWS and payback of the advance allocation will be achieved once seasonal allocation reaches 80% of HRWS. However, if seasonal allocations only reached 50% in this example, then the advance allocation is not paid back.*

There is also a need to consider how and if any 'debt' from advance allocation is carried forward into the next season, and options for payback. This includes consideration of how it will be managed and potential issues surrounding overuse.

In the small number of years where payback is not achievable, it is possible that advance allocation may not have been available anyway due to the seasonal conditions.

Climate change may have a significant impact on the ability to payback and this needs to be borne in mind. Under the dry scenario (Scenario D) of the NRSWS modelling, a continuation of the low inflows experienced since 1997, the number of years with 100% February allocations falls to 67 in 100. As a result there is a greater risk in allowing advance allocation and hence increased third party impacts under climate change conditions.

Advance allocation should only be allowed if it can be demonstrated that there is a demand for it that cannot be met by carryover and allocation trade and there are no material impacts on third parties or the environment. Based on the off-quota history in other systems, the volume of use under advance allocation is likely to be small and hence the magnitude of third party effects is also likely to be small.

There is a concern over the precedent this may set for other systems to request an advance allocation product. This would therefore need to be introduced as a Broken-specific product (in the same way that the spill product is specific to the Ovens).

Recommendation 5: Seek advance allocation in the Broken system to give users access to unregulated flows in advance of seasonal allocation, recognising that this will require legislative amendments and may take several years.

2.7 Converting LRWS into Spill-reliability water shares (SRWS).

To enable early season access to unregulated flows before seasonal allocations, an alternative to advanced allocation could be the Spill Reliability Water Share (SRWS) product. The SRWS is used in the Ovens system and allows access to unregulated flows occurring early in the season. New entitlement cannot be created under the Basin Cap so this proposal would require the conversion of existing LRWS into the SRWS product.

Access to the SRWS product would be dependant upon a G-MW declaration that the Broken system is spilling. It is proposed that spill periods would be when Lake Nillahcootie is physically spilling or when there are unregulated flows downstream of Lake Nillahcootie of a magnitude sufficient to meed demand (water users and the environment).

In general, conditions required for declaration of a spill period will occur between July and November. Depending on the season this could be a couple of weeks, months or not at all.

2.5.4 Overview of the SRWS product

Spill allocation gives customers access to unregulated flows during a specified time period, when storages in the system are physically spilling or declared to be spilling by G-MW (this could be extended to the periods where there are unregulated flows downstream of Lake Nillahcootie but it is not actually physically spilling). Spill allocations are currently not posted to the Water Register in advance; instead usage is determined after the end of the temporary access period and credited to the Water Register retrospectively. Key components of the Spill reliability product are:

- It can be used when the system is unregulated i.e. in the period when the storage is physically spilling, or G-MW declares it to be spilling early in the season;
- No formal allocation is made; instead access to SRWS is allowed during the declared spill period and is restricted to the total volume of SRWS (and HRWS). However, orders are still required for planning process
- At the end of the specified spill period, customer meters are read and the volume of water used is recorded against the customer's SRWS. If the volume used is greater than 100% of the customer's SRWS, the remainder is recorded against their HRWS;
- If a spill period is declared, use in this period will be first recorded against SRWS. Use above the entitlement volume of the SRWS is then recorded against the HRWS as shown below;

• **Entitlements:**	• **100 ML of HRWS**	• **30 ML of SRWS**
If Allocation = 50%		
If Spill allocation = yes		
Then available water	=50 ML	Up to 30 ML
If use = 60 ML	-30 ML	-30 ML
Balance	20 ML (up to 50% future allocation possible)	0

- The spill period can only be declared once. If the storages start spilling again following the end of the declared spill period, no further usage of SRWS is allowed. Any use has to be from HRWS allocation (as is also the case if water is taken before a spill period is declared).

- No carryover of SRWS is available as it is seasonally dependant on flows. However, as this paper has already recommended removing carryover against LRWS (see section 2.3.3.2) this will have minimal implications above the previous recommendation.

2.5.5 Discussion of pro's and cons

The pro's and cons and issues raised through of use of the SRWS product are very similar to the use of advanced allocation. SRWS will act very similarly to advanced allocation in terms of giving access to the unregulated flows that occur from tributary inflows downstream of Lake Nhillacootie that were previously captured and regulated by Mokoan.

Benefits of converting LRWS into SRWS are that it increases the access to early season water in the same way as advanced allocation; however, the setup is easier as a new product does not need to be created in the water register. SRWS offers the advantage of consistency between Ovens and Broken and avoids the precedent of advance allocation

Additionally, water users could potentially access greater volumes earlier in the season and retain their HRWS allocation and carryover to guarantee access to water later in the season. This will aid in planning and confidence early in the season.

The setup of SRWS in Ovens has some minor issues which require legislative change. If SRWS are recommended for the Broken, it would be best if they are implemented after legislative changes to SRWS.

Allocation against LRWS generally occurs later in the season (around November depending on seasonal conditions) and thus does not give water users certainty on seasonal water availability when planning in August. The later allocation also means that for a lot of users the allocation is not utilised. Converting LRWS to SRWS will give users the greater certainty as they will know early in the season whether the spill product is available.

The negative of this proposal for water users is for those that utilise LRWS late in the season. This would no longer be available and water would need to be met using HRWS allocation or carryover.

As Recommendation 2 proposes to remove the ability to carry over against LRWS there are minimal implications for not allowing carryover against SRWS. However, for water users that utilise their HRWS and not their LRWS, unused LRWS is allocated against HRWS carryover if there is space in the HRWS carryover volume at the end of the season. As a result for a small number of high water users, carryover may be slightly less than historic in some cases. It is anticipated that the ability to trade could overcome this issue.

As stated in section 2.3.3.2, there is no evidence of individuals having collected low-reliability water shares specifically to carry over against, so there is a low likelihood of disadvantage by removing the ability of this carryover in the Broken. This is further evidenced by the low ratio of LRWS compared to HRWS.

In defining the threshold flows for declaration of spill, there would need to be careful consideration of what the environmental requirements for the system. To ensure adequate flows remain in the river there would be a need to define the flow rate available to divert in an event and also a need to limit diversions at the time to the available resource (in terms of maximum pumping rate and volume).

In the Ovens system allocations are 100% HRWS every year and thus any use over the SRWS volume that is recorded against HRWS is paid back from this allocation. Depending on the scope of legislative changes to the SRWS rules, in the Broken system a payback mechanism may be required as allocations don't reach 100% in all years. It is proposed that the same methodology as discussed in the advanced allocation section could be used for the use of spill product above a holders SRWS volume (that gets counted against HRWS allocation).

Conversion of LRWS to SRWS would require changes to Bulk Entitlements and the water register. The Minister would most likely require the majority of LRWS holders to agree to the proposal before signing off on any BE changes. The Water Service Committee will be responsible for determining the best method to determine the level of community agreement.

The introduction of SRWS will result in increased administrative and water resources management workload, and will have cost implications for customers. Issues are the same as those raised in the advanced allocation section. However it is anticipated that management of the SRWS by G-MW would require less effort than the management of advanced allocation and hence increases in costs would be less than those for advance allocation.

If SRWS is introduced there would not be the ability to also have advanced allocation as they would be serving the same aim and effectively accessing the same water. The ability for usage over the SRWS volume (old LRWS) in the spill period to be accounted against the HRSWS allocation (even though it may not yet be allocated) is in effect the same as advanced allocation of HRWS.

SRWS would be required to be linked to a HRWS account so that use above the SRWS volume can be issued against the HRWS. Water users could not hold a SRWS without a HRWS account.

On balance the SRWS achieves the same aims as advanced allocation, however, it is not preferred due to:

- LRWS have value, particularly for late season water users, the loss of this product does not outweigh the benefit of the SRWS.
- The advanced allocation product is a better fit for what is requested by the irrigators which is advance access to unregulated flows using HRWS allocation.

Recommendation 6: Do not convert Low Reliability Water Shares into a SRWS product. Seek to use advanced to give water users access to early season unregulated flows allocation instead.

Table 2:3: Pros and cons of converting LRWS into SRWS

Pros of converting LRWS into SRWS	Cons of converting LRWS into SRWS
Allows early access to the water whereas LRWS was generally only available late in the season.	Will negatively impact on water users who rely on LRWS late in the season.
If a user uses greater than their SRWS volume the volume Water used is counted against their HRWS for the season.	Availability will be high in wet years (when demand is low) and low or non-existent in dry years (when demand is high).
The magnitude of third party impacts (environmental, downstream users) is likely to be small due to the small amount of use.	The volume of use is likely to be small
SRWS works as advance allocation without the need to create a new product and precedent. Especially as use over the SRWS volume is counted against HRWS seasonal allocation.	SRWS would potentially allow more diversion during an important period for environmental flows (late winter/early spring).
Water users can access early season flows when allocations may be low.	Not eligible for carryover
Potentially increase early season HRWS allocation by a maximum of 9%.	It cannot be relied upon as an option in all years.
Access to early season unregulated flows in addition to carryover, thus increasing user flexibility.	Likely that the Minister will require agreement by the majority of LRWS holders before agreement to the conversion.
Aligns rules with the Ovens system.	
Allocation is based on water actually used	
Management effort less than advanced allocation and thus implications for cost increases are less.	

2.7 Other mechanisms to increase access to water.

Aside from reviewing the recommendations of G-MW, DSE and the CMA, one of the key aims of the sub-committee was to increase access to water early in the season. While reviewing the allocation and trade rules, several ideas were raised that could help to achieve this aim. Although no specific recommendations are made, these are things that G-MW can further consider and develop with water users.

A summary of potential options and brief description are

1. IVT delivery pattern
   - Utilisation of unregulated flows for the delivery of IVT could potentially increase early season allocations.

2. Educational tools
   - Encourage trade to utilise unused allocation and have individual water users managing water in their accounts to minimise risk
   - Information on potential forecasts for the season by improving information held in seasonal outlooks to aid in risk management and planning decisions

3. Change risk profile for allocations
   - G-MW could alter assumptions used for allocation calculations, i.e. evaporation, recession flows to increase available allocation. This would increase the risk of not having sufficient water to meet allocations and may not be accepted by the Minister.

4. Infrastructure/storages
   - Investigate the use of in-stream storages (e.g. Casey's weir) to re-regulate flows or as improved operational supplies
   - Investigate using small wetlands as additional storage

Recommendation 7: G-MW to work with the WSC on options to maximise allocations and give water users greater certainty on seasonal water availability.

3 Trading rules

3.1 Existing trading rules

There is currently no trade allowed out of the Broken system.

There are two trading zones within the Broken:

2A – Broken – Lake Nillahcootie to Casey's Weir
2B – Broken – Casey's Weir to Goulburn River

The original reason for having two zones was to keep the demand dependent on Lake Mokoan downstream of Lake Mokoan. Since the decommissioning of Lake Mokoan, the need to keep the two zones separate is no longer relevant and unlimited trade is permitted within the Broken, effectively creating a single zone.

Refer to Appendix A for an overview of existing trading zones and their locations.

3.2 Trade principles

The NRSWS includes a number of principles to guide the development of trading rules, and these are as follows:

- Trade from one trading zone to another is generally permitted if the traded water can readily flow to the destination trading zone (that is, if the water can be physically delivered).
- Trade upstream, for example from the Murray into a tributary (that is, 'back-trade') cannot occur unless there has been previous trade the other way.
- Trade should not damage the environment or heritage assets – for example, there are limits on trade through the Barmah Choke to avoid summer flooding in the Barmah-Millewa Forest.
- Trade should not create impacts on third parties by eroding other people's entitlements or level of service – for example, trade from an unregulated system (where there is no guarantee that allocations can be taken) to a regulated system (where allocations once made are guaranteed) is only allowed as back-trade. However, trade should not be prevented where impacts on others are caused solely by increased utilisation of pre-existing 'sleeper' entitlements.

The Australian Competition and Consumer Commission (ACCC) has also made recommendations to the Murray-Darling Basin Authority (MDBA) on trading rules for inclusion in the Basin Plan. These include:

- Trade restrictions should exist only for hydrological reasons;
- Any trade restrictions should be specifically explained and justified.

In line with the above principles the starting point is that trading opportunities should be increased unless there are significant issues arising from hydrology, environmental impacts or third party effects. Trade is expected to lead to increased utilisation of water and therefore may have some impact on reliability for other entitlement holders. This in itself cannot be used as a reason for limiting trade, but it may be necessary to do some further investigation to understand the scale of the impact.

3.3 Recommendations of the review

The initial recommendations of the trading rules review are summarised below. Detailed discussion of the issues and options associated with them are presented in the remaining sections of this chapter.

1. Merge existing trading zones 2A and 2B into a single zone. Following the decommissioning of Lake Mokoan, the need for two zones to separate the demand dependent on Lake Mokoan is no longer relevant. Unlimited trade is now permitted within the Broken, effectively creating a single zone, and should be formalised;
2. Investigate the environmental impacts of trade to determine the environmentally acceptable level of trade out and develop guidance on the optimum pattern of delivery of water to avoid environmental damage;
3. Implement changes to trading rules to allow the trade of allocation out of the Broken to Goulburn and downstream. Trade out is considered feasible hydrologically and can be managed using existing Water Register and inter-valley trade (IVT) accounting arrangements;
4. Implement changes to trading rules to allow the trade of water shares (by tagging) out of the Broken to Goulburn and downstream. Trade out is considered feasible hydrologically and can be managed using existing Water Register and inter-valley trade (IVT) accounting arrangements. Trade of water shares creates a few more issues for management and accounting than trade of allocation;
5. Set a trade close-off date (date to be determined but no later than 31 March) for the trade of allocation and for usage against tagged water shares to enable IVT water to be managed and delivered within the season. Delivery of IVT should be met through a mix of stored water and unregulated flows, in a pattern to be determined by the Resource Manager;
6. Trade of advance allocation or SRWS, if they become available in the Broken in future, would not be permitted. Advance allocation and the SRWS are a special local opportunity for users in the Broken system and are dependent on the availability of unregulated flows in the Broken. It is not a separate right and so cannot be traded..

3.4 Trading options and potential issues

3.4.1 Overview of key issues

One of the main issues for trade out of the Broken concerns the introduction of inter-valley trade (IVT) to the system. The Broken system has a relatively low ratio of storage volume to entitlement when compared to other systems and, as a result, the ability of the Broken system to achieve a high allocation is dependent on the delivery of unregulated flows as well as stored resource. When the reliability of the Broken system is modelled over the long-term, delivery of unregulated flows is factored into the calculation of the average allocation for the period.

Introduction of IVT to the Broken would see demand commitments that can currently be met through unregulated flows being transformed into trade commitments that would need to be met from stored resource in Lake Nillahcootie. If large volumes of water are traded out and the volume needs to be supplied from stored resource rather than a combination of stored water and unregulated flows, this will have a negative impact on system reliability as more water will be needed from Lake Nillahcootie.

In an extreme case, if all allocations to HRWS were traded out of the Broken this would mean that all 17 GL would need to be delivered from Lake Nillahcootie when needed by the

downstream system. Historically, some of this would have been delivered to farm from unregulated flows.

To minimise the impact, there needs to be a mechanism to allow delivery of IVT to be met through a mix of stored water and unregulated flows, in a pattern to be determined by the Resource Manager. The relative proportions should ideally reflect how the water would have been supplied if it had been used in the Broken system instead of being traded out – in practice, very difficult to do. There is the potential to use the model developed for South Australia which splits delivery of commitment between stored resource and unregulated flows. Depending on the volume of trade, future consideration of a change to the BE may be needed to set out rules as to how this mix can be determined across varying seasons and behaviours.

The use of unregulated flows to meet IVT needs to be at a time when they will be useful to the receiving systems; for example not at a time when the Goulburn and Murray are also in unregulated flow conditions and there is no capacity for storage in any of the downstream Murray storages.

A cut-off date for trade and for usage against tagged water shares would be required each season because management of the IVT account requires time to call out the IVT balance before the end of the season to avoid carrying water over in the IVT account. If there was substantial trade out towards the end of the season, there might not be enough time for the receiving valley to call out the IVT balance, leading to third-party effects in the destination system due to loss of resource.

The transformation of a Broken irrigation commitment to a trade commitment out of the system would require a corresponding increase in loss allowance as the volume of water would need to be transmitted further down the river. This would increase the river operating requirements, offsetting the loss savings made through the buyback initiative.

There are several environmental concerns with regards to trade out of the system and a lack of available information to immediately determine an environmentally acceptable level of trade out.

There is reasonable evidence (via recent work by the Murray-Darling Freshwater Research Centre) that slackwater habitats are important, are supported by minimum flows and are sensitive to changes in minimum flows. Such habitats could be adversely affected by a significant increase in summer and autumn flows required to meet delivery of downstream trade obligations. This may therefore require upper limits on flows at these times.

One option would be to set a conservative level of trade out initially which could be adjusted accordingly as more information and advice becomes available. Goulburn-Broken Catchment Management Authority (GBCMA) and Goulburn-Murray Water (G-MW) would work together to develop management options to allow trade without damage to the environment. This would include consultation with an expert panel to determine the magnitude of flows that would cause environmental damage and therefore the limits to apply to any traded volume of water to prevent the damage occurring. Limits may need to be time-based as well as volumetric to ensure that delivery of IVT water does not adversely impact on the environment. The aim is to develop an operational regime that mimics natural conditions as much as possible and provides environmental benefits. This is a piece of work which would need to be completed before trade out could occur.

3.4.2 Summary of trading options

Opening up of trade from the Broken to the Goulburn and downstream increases the options available to customers for accessing water. Back-trade opportunities would also be created as a result. However, increased trading options would also lead to increased management and accounting requirements.

There is an expectation that utilisation of water will rise with increased trade, resulting in a reduction in reliability for entitlement holders. However, this increased utilisation is not a valid reason to prevent trade – this is one of the principles of trade rules in the NRSWS and is also set out in the proposed Basin Plan trading rules.

The options for allowing trade out of the Broken are presented in Table 3.1, together with a brief summary statement as to whether each option is considered feasible or not. A more detailed discussion of the options and the potential issues associated with each one is provided in Section 3.4.3.

Table 3-1: Trading options for the Broken

Ref	Trading option	Comment
1	Do nothing – i.e. no trade out	**Option discounted** – does not fulfil the need to review and relax trading rules.
2	Merge trading zones 2A and 2B into a single zone	**Option recommended** – following the decommissioning of Lake Mokoan, there is no longer a need for two zones. Use of a single zone is effectively happening already and should be formalised.
3	Trade of allocation to Goulburn and downstream	**Option recommended** – this is considered feasible hydrologically and can be managed using existing Water Register and IVT accounting arrangements. Trade close-off date required. Environmental impacts need to be investigated, with recommendations developed around trade limits and pattern of IVT delivery.
4	As for Option 3, but also allow trade of water shares (by tagging) to Goulburn and downstream	**Option recommended** – this is also feasible hydrologically but creates a few more issues for management and accounting. Trade close-off date required. Environmental impacts need to be investigated, with recommendations developed around trade limits and pattern of IVT delivery.
5	Trade of advance allocation within Broken and to Goulburn	**Option not available** – advance allocation is not a separate right (it is a special local opportunity for Broken users) and so cannot be traded.
6	Trade of SRWS	**Option available –** Use LTT as the mechanism to effectively allow this to occur. Would be within the system only.

3.4.3 Discussion of individual options

Option 1 (discounted) – Do nothing i.e. no trade out

The NRSWS lists the need to investigate trade out of the Broken system by 2011. This option does not fulfill the need to review and relax trading rules and has therefore been discounted.

Option 2 (recommended) – Merge trading zones 2A and 2B into a single zone

The original reason for having two trading zones in the Broken was to keep the demand dependent on Lake Mokoan downstream of Lake Mokoan. Since the decommissioning of Lake Mokoan, the need for two zones to separate the demand is no longer relevant and unlimited trade is permitted within the Broken system, effectively creating a single trading zone. It is recommended that the two zones are merged officially into a single zone to simplify management of trading.

Implementation of this change is relatively simple, requiring a minor change to the trading rules to recognise the merged zones, and also changes to the water register data to convert the two existing trading zones into one.

Recommendation 1: Merge existing trading zones 2A and 2B into a single zone.

Option 3 (recommended) – Trade of allocation to the Goulburn and downstream

This option appears feasible. The systems are sufficiently connected to allow delivery of traded water, although careful management is needed. Trade mechanisms, restrictions and accounting can be accommodated.

The environmental impacts of extra downstream delivery of water to meet trade obligations are uncertain and would need to be investigated prior to any trade occurring. It is important to ensure that the environmental values of the lower Broken River are not adversely impacted. Recommendations to determine the environmentally acceptable level of trade out and guidance on the optimum pattern of delivery to avoid environmental damage need to be developed as part of this work. See section 3.4.4 for further details on the environmental issues.

One major management task is to ensure that traded water can be delivered downstream at a time when it is useful to the downstream systems. This would be managed through the setting up of a new Inter-Valley Trade (IVT) account[1] in the water register. Water in the IVT account would need to be delivered within the current season due to the limited storage capacity in the Broken system. If the full IVT balance was not used it would not be carried over and would be reset to zero. This would impact on the downstream Goulburn system which took on the obligation to supply the traded water, but lost the water that was to support the trade.

At the same time it is important to ensure that there is no detrimental effect on allocations and system reliability in the Broken The Broken system has a relatively low ratio of storage volume to entitlement when compared to other systems and, as a result, the ability of the Broken system to achieve a high allocation is dependent on the delivery of unregulated flows as well as stored resource. Section 3.4.1 discusses the reliability issues in more detail.

There may be a potential loss of connectivity between the Broken and Goulburn systems at certain times, resulting in difficulty in delivering water in the IVT account. However, there is usually enough flexibility in the use of the IVT account to allow releases to be timed appropriately to overcome this issue. Any delivery of IVT would also need to be done at a time that offsets releases from Goulburn Weir.

[1] Trades between trading zones are tracked by inter-valley trade (IVT) accounts. The functions of an IVT account are –

- To record water owed from one trading zone to another;
- To record any trade or use that adds to the debt;
- To record any delivery of water that reduces the debt, or any spill of water that prevents the debt being met; and
- To show the availability of trade in the opposite direction (‘back-trade’).

Clarity would be needed, potentially in the BE, as to any limitation on which flows can be counted as debiting the IVT account. For example, specifying whether late spring unregulated flows can reduce any IVT volume that has built up at that stage, or whether such water is owned by the environment. The environmental research work to be carried out will help to provide guidance on thresholds to apply.

Trade late in the season could remove the opportunity to deliver water to support the trade at a time when downstream storages or users could make use of it. For example, a trade in May or June would allow no opportunity for the Broken to deliver useful water to the Goulburn. If there was substantial trade out approaching the end of the season, there might not be enough time for the receiving valley to call out the IVT balance, leading to third-party effects in the destination system due to loss of resource. There will therefore need to be a cut-off date after which trade would not be permitted.

The trade cut-off date will be set to prevent potential third party effects in the downstream Murray and Goulburn systems. IVT delivery can occur for the full season (until 30 June). Potential negative impacts to Broken system allocation and reliability through delivery of IVT will be managed through delivery rules to be determined by the resource manager.

Two potential approaches that could be taken to setting this cut-off date are raised below.

1. *Early season cut-off – e.g. allow trade from 1 July until 31 October only:*

   This would ensure that all trade was done early in the season, and would have some benefits for entitlement holders. The total volume of trade would be known at the cut-off date and there is the potential that it could be supplied downstream relatively early in the season. This could free up storage space to catch any late spring or summer inflows, thus providing the possibility of further allocations.

   However, an early cut-off would reduce options for entitlement holders to trade out. Seasonal conditions may not have become clear, allocations would be generally low and the market may not have settled. It seems unnecessary to prevent trade out so early in the season.

2. *Late season cut-off – e.g. allow trade from 1 July until 31 March:*

   This would allow trade decisions to be made later in the year when seasonal and market conditions are clearer. Like with any cut-off date, it can be expected that a number of trades will be left to the last minute – therefore, there could be a significant trade volume in the final few days. This water must then be delivered in the following few weeks while it can still be used in the lower Goulburn or Murray receiving system.

   Preventing trade out in the April-June period can be justified due to the third party impact on the downstream systems if later trade was unable to be delivered.

It is therefore recommended that late season trade of allocation (eg. after 31 March) is not permitted. The Minister has the power to make a trading rule that includes a trade cut-off date.

There may be some years in which later trade can be managed, and perhaps some years in which an earlier trade cut-off date would be advisable. However, this would not necessarily be known much in advance of the announcement, and it gives more market certainty to set a fixed date.

Trade mechanisms and accounting can be accommodated for trade to all downstream systems (Lower Goulburn, Murray and interstate). Trade to Goulburn upstream of Goulburn Weir, Campaspe and Loddon might also be possible through back-trade into those systems.

Back trade to the Broken (from the Goulburn or further downstream) can occur but, as for any other tributary, only to the extent of previous trade out as shown by the IVT balance. Back-trade will be more limited here as the lack of carryover of IVT means that the IVT balance will be zero at the start of each season.

In summary, this option is considered feasible hydrologically and can be managed using the existing Water Register and IVT accounting arrangements.

Implementation will require that –

- trading rules are changed to enable trade up to a certain date (no later than 31 March) in any year, from the Broken to any downstream system, in accordance with the normal trading rules;
- a cutoff date for trade is determined that allows the IVT to be delivered in the season and stops potential third party impacts to downstream systems
- IVT delivery patterns and rules are determined by the resource manager to ensure the delivery of IVT does not negatively impact Broken System entitlement holders
- potential changes to the BE are considered to set out rules for delivery of traded water;
- environmental issues are researched and appropriate management options developed;
- MDBA protocols are changed to allow interstate trade;
- the water register is changed to allow and account for this trade.

Recommendation 2: Investigate the environmental impacts of trade to determine the environmentally acceptable level of trade out and develop guidance on the optimum pattern of delivery of water to avoid environmental damage.

Recommendation 3: Implement changes to trading rules to allow the trade of allocation out of the Broken to Goulburn and downstream.

Recommendation 5: Set a trade close-off date (date to be determined but no later than 31 March) for the trade of allocation to enable IVT water to be managed and delivered within the season. Delivery of IVT should be met through a mix of stored water and unregulated flows, in a pattern to be determined by the Resource Manager.

Option 4 (recommended) – as for Option 3, but also allow trade of water shares (by tagging) to Goulburn and downstream

This adds to Option 3. Water share trade would be by tagging to identify the source of the water as the Broken. The water share stays a Broken system water share and earns Broken system allocations, but can be used at the destination location. When water is used in the new location, this amount is added to the IVT account.

This option is considered feasible hydrologically; the same issues and opportunities as identified under Option 3 also apply to this option, with a few additional considerations, as detailed below.

There would need to be separate allocation bank accounts (ABAs) for water from different sources so, for example, a customer holding water shares in the Goulburn who purchased water shares from the Broken would require 2 ABAs, one for their Goulburn water and one for their Broken water. This is the normal method where tagging is involved, and is already common for Murray users who also hold a Goulburn water share.

Late season usage of a tagged water share (e.g. after 31 March) creates the same issues as late season trade of allocation, and should therefore not be allowed. Administratively, this

can be done by G-MW refusing orders on the tagged ABAs after the cut-off date. Section 33AI of the Water Act (taking of water outside the associated water system) provides the legal basis for preventing use after a certain date.

As for option 3, the environmental impacts of trade will be investigated to determine the environmentally acceptable level of trade out and to develop guidance on the optimum pattern of delivery of water to avoid environmental damage.

Implementation will require similar changes to those for Option 3, plus changes to:

- trade application forms (to include a reference to Section 33AI of the Water Act)
- trading rules (to impose the cut-off date)
- letters (to inform applicants of the condition).

G-MW will need to take special care to inform people of this condition, and include it in letters, as it would not warrant a change to the register to automate it.

Recommendation 4: Implement changes to trading rules to allow the trade of water shares (by tagging) out of the Broken to Goulburn and downstream.

Recommendation 5: Set a trade close-off date (date to be determined but no later than 31 March) for usage against Broken-Goulburn tagged water shares to enable IVT water to be managed and delivered within the season. Delivery of IVT should be met through a mix of stored water and unregulated flows, in a pattern to be determined by the Resource Manager.

Option 5 (not available) - Trade of advance allocation within Broken and to Goulburn

This option considers trade of advance allocation if it is made available on the Broken.

Advance allocation is not a separate right but rather an opportunity for users on the Broken to access localised intermittent unregulated flows. It is a locational feature dependent on the availability of unregulated flows in the Broken catchment (for example there may be differences in declared periods either upstream or downstream of Holland's Creek). These may stop and start intermittently and cannot be taken in a distant location where unregulated flows may not be occurring. As the flow is localised, use of advance allocation would only apply to those water shares which could access the flow; as such this is a special local opportunity that could not be made available to a downstream user of a tagged water share.

As discussed in section 2.5, advance allocation is considered to be a mechanism specifically for the Broken to allow users to access water earlier in the season. This is due to the constraints of the small storage volume and high losses in the system, causing early allocations to be unavailable in many years. Users outside of the Broken have access to alternative sources of water and thus may be able to access water through trade from other sources.

Delivery of advance allocation through the IVT is also an issue because water may be used that can't be delivered. This could occur when a short unregulated flow event occurs to enable advance allocation and water is used downstream in excess of flows from the Broken system. In this case, once the unregulated flow event stops and advance allocation is stopped, if the IVT calls the water it will require supply from storage which reduces available resources. In severe cases this could cause a supply shortage, where use and allocation exceed available water.

For the reasons specified above, advance allocation is not available as an option for trade.

Option 6 (not available) - Trade of SRWS within Broken

This option would create increased flexibility for customers by allowing trade of spill allocation within the Broken zones (currently not possible). Trade of the spill-reliability water shares (SRWS) themselves is already possible.

Description

Spill allocation allows customers access to unregulated flows during a specified time period, when storages in the system are physically spilling or declared to be spilling by G-MW . Spill allocations are currently not posted to the Water Register in advance; instead usage is determined after the end of the temporary access period and credited to the Water Register retrospectively.

If trade is to be allowed, the spill allocation will have to be credited in the Water Register before take and use. G-MW would need to change its allocation policy and allocate 100% of SRWS at the start of the declared spill period.

Management mechanism

There are no hydrological problems with allowing this trade. However, as the flows are unregulated, trade would only be permitted within zones or downstream in line with state wide trade rules.

Legal barriers

If allocation is made up front, a mechanism is needed to recognise that the allocation is temporary and can only be used within the declared temporary access period. The temporary access period will vary each season dependent on the season's conditions.

Under the Act, it is not possible to remove allocation that has been made until the end of the season. Consequently there needs to be a mechanism to prevent 'take' of the water outside the access period. Analysis of the powers of the Act has not revealed a clear mechanism to allow this to occur.

Without such an existing mechanism under the Act, this option cannot proceed without legislative change. Seeking legislative change is a lengthy and costly process and is not recommended at this stage.

An alternative approach – limited term transfers

An alternative approach is to encourage the use of a limited term transfer (LTT) to achieve trade of spill allocation. The customer who wants to sell their right to spill allocation would lease (using an LTT) some or all of their SRWS to the buyer for the season. This alternative is already available, and enables the demand for the trade of spill allocation to be met. Its use would affect only the buyer and seller and would remove the need for all irrigators to have duplicate ABAs. However, it is a more complicated process for the seller and buyer than a trade of allocation, with higher fees involved.

Use of LTT means that the users who wish to undertake transfer of spill allocation will pay for each use of LTT but those not undertaking the LTT will not be subject to any costs. This offsets the need for basin wide costs that would be need to be met by all users for the large changes required to enable conventional trade of spill allocation. Effectively it is more of a 'user pays' mechanism.

In future, if demand for trade of spill allocation is high enough, and the cost of seeking legislative change can be justified, a long-term solution may be to implement the required changes to enable this trade.

Summary

If SRWS are created in the Broken System, trade of spill allocation is not recommended because the current legal constraints mean that spill allocation use cannot be confined to the spill period. Limiting use to the spill period would require legislative change.

Under the current legislation, use of LTT is recommended as an alternative mechanism to in effect allow trade of spill allocation through the lease of some or all SRWS from seller to buyer for the season. LTT would enable access to water via the leased SRWS until the end of the spill period in any year.

Recommendation 6: Trade of advance allocation or SRWS, if it becomes available in the Broken, is not permitted. Advance allocation and the SRWS are a special local opportunity for users in the Broken system and are dependent on the availability of unregulated flows in the Broken. It is not a separate right and so cannot be traded.

4 Environmental considerations

The majority of environmental considerations associated with trade are tied to within-year water availability and delivery. Avoiding high flows at the wrong time of year, maintaining low flows, and mimicking the natural hydrological characteristics of the river system are all important to its ecological function.

Slackwater habitats could be adversely affected by a significant increase in summer and autumn flows required to meet delivery of downstream trade obligations. This may therefore require upper limits on flows at these times.

Late season shifting of water to empty the IVT account could also cause an issue, for example delivery of a large volume of water in a short period of time. In these cases it may be necessary to set limits on the acceptable rates of rise and fall in flows to prevent adverse impacts.

It may be possible to move some traded water through the lower Broken River if it is in the form of a fresh. However, there is currently no evidence available to say that if a summer or autumn fresh is desirable, what size, shape and timing of fresh would be beneficial to the environment and conversely what size, shape and timing would be damaging. Spring freshes are more likely to be desirable, but actual recommendations would need to be researched and developed.

Trade out may actually improve delivery efficiency in the difficult summer months and reduce the possibility of very low flows in the lower Broken River during summer.

One of the recommendations of this paper is that trade out of the Broken is feasible hydrologically and should be allowed. However, there are clearly several environmental concerns with regards to trade out of the system and a lack of available information to immediately determine an environmentally acceptable level of trade out. One option would be to set a conservative level of trade out initially which could be adjusted accordingly as more information and advice becomes available. GBCMA and G-MW would work together to develop management options to allow trade without damage to the environment. This could include consultation with an expert panel to determine the magnitude of flows that would cause environmental damage and therefore the limits to apply to any traded volume of water to prevent the damage occurring. Limits may need to be time-based as well as volumetric to ensure that delivery of IVT water does not adversely impact on the environment. The aim is to develop an operational regime that mimics natural conditions as much as possible and provides environmental benefits.

This is a piece of work which may need to be completed before trade out could occur. Although it is considered feasible at this stage for the work to be completed within the timelines outlined in Section 4, the possibility of it becoming an impediment to implementation of the new rules on 1 July 2013 needs to be highlighted.

5 Proposed timescales for the review

The recommendations presented in sections 2.2 and 3.3 above will be consulted and agreed with the Water Services Committee, and also all entitlement holders prior to proposing final recommendations to the Minister.

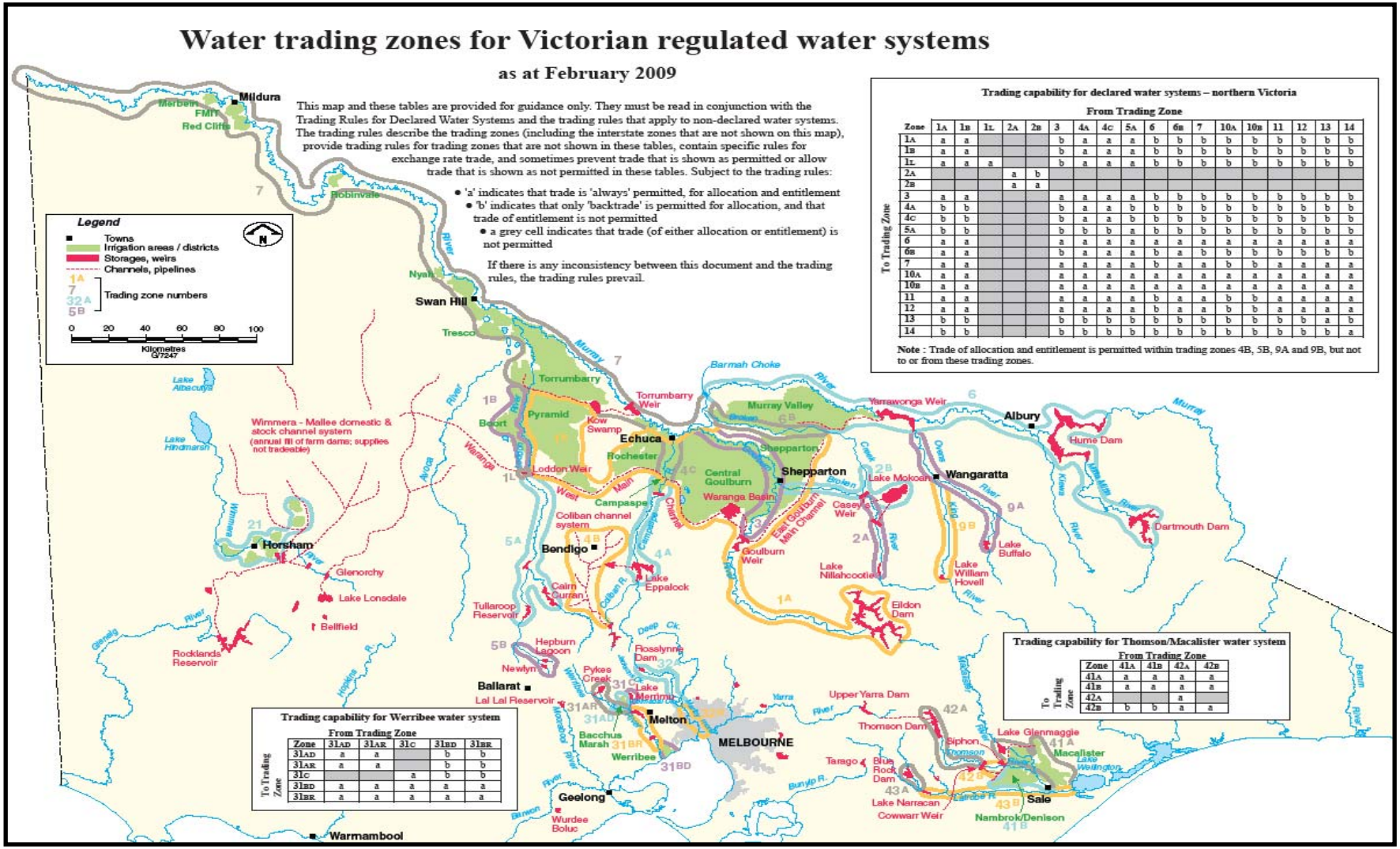
The public consultation requirements and process is to be confirmed by Goulburn-Broken Water Service committee.

Following the submission of recommendations to the Minister, and subject to Ministerial approval, the final steps will be to announce the change and to prepare for implementation. This will include making the necessary changes to the trading rules engine and water register, as well as setting up the required IVT accounts and delivery arrangements.

The target date for implementation of the recommended changes is 1 July 2013.

6 Appendices

6.1 Appendix A – Trading zones for Victorian regulated water systems



Trading Zone	Trading Zone description
1A	**Greater Goulburn** Lake Eildon; Goulburn River from Lake Eildon to Goulburn Weir; Lake Nagambie; Shepparton, Central Goulburn, Rochester and Pyramid-Boort irrigation areas except the Boort irrigation area.
1B	**Boort** Boort irrigation area
1L	**Loddon Weir Pool**
2A	**Broken: Nillahcootie to Casey's Weir** Lake Nillahcootie; Broken River from Lake Nillahcootie to top of Casey's Weir pool.
2B	**Broken: Casey's Weir to Goulburn River** Casey's Weir pool; Broken River from Casey's Weir pool to the Goulburn River; Upper Broken Creek from Broken River to Waggarandall Weir, including Major Creek; Lake Mokoan.
3	**Lower Goulburn** Goulburn River downstream of Goulburn Weir.
4A	**Campaspe** Lake Eppalock; Campaspe River from Lake Eppalock to Waranga Western Channel; Campaspe irrigation district.
4B	**Coliban channel system** Coliban channel system.
4C	**Lower Campaspe** Lower Campaspe River, from downstream of the Waranga Western Channel to the River Murray
5A	**Loddon** Tullaroop Reservoir; Tullaroop Creek from Tullaroop Reservoir down to Loddon River; Cairn Curran Reservoir; Loddon River from Cairn Curran Reservoir down to top of Loddon Weir Pool; Serpentine Creek system upstream of Bear's Lagoon.
5B	**Bullarook** Hepburns Lagoon, and downstream to Bullarook Creek; Newlyn Reservoir; Bullarook Creek from Newlyn Reservoir to Creswick Creek.
6	**Vic Murray Dartmouth to Barmah** Lake Hume; River Murray from Lake Hume to Barmah Choke; Lake Dartmouth; Mitta Mitta River below Lake Dartmouth; Murray Valley irrigation area, excluding Lower Broken Creek.

6B	**Lower Broken Creek** Lower Broken Creek downstream of Katamatite.
7	**Vic Murray Barmah to SA** River Murray from Barmah Choke to the South Australian border; Torrumbarry irrigation area; Tresco irrigation district Nyah irrigation district; Robinvale irrigation district; Red Cliffs irrigation district; Merbein irrigation district; First Mildura irrigation district (Note – this now includes the previous trading zone 8)
9A	**Ovens** Lake Buffalo; Buffalo River downstream of Lake Buffalo; Ovens River downstream of the confluence with the Buffalo River.
9B	**King** Lake William Hovell; King River downstream of Lake William Hovell.
10A	**NSW Murray above Barmah Choke** River Murray from Lake Hume to Barmah Choke
10B	**Murray Irrigation Ltd areas** Murray Irrigation Ltd areas, including Wakool Irrigation District
11	**NSW Murray below Barmah Choke** River Murray from Barmah Choke to SA border (including the Edwards/ Wakool system and the Western Murray Irrigation District).
12	**South Australian Murray** River Murray in SA and Trust districts
13	**Murrumbidgee** Murrumbidgee Irrigation and Colleambally Irrigation areas; Murrumbidgee and Tumut below Burrinjuck and Blowering reservoirs (including Yanko, Colombo and Billabong Creek systems)
14	**Lower Darling** Menindee Lakes and the Darling River downstream of the Menindee Lakes

7 Glossary of Terms

This section defines the terms used throughout the document.

Term/Acronym	Description
ABA	Allocation bank account
ACCC	Australian Competition and Consumer Commission
BE	Bulk Entitlement
DSE	Department of Sustainability and Environment
GBCMA	Goulburn-Broken Catchment Management Authority
GL	One gigalitre (one thousand megalitres)
G-MW	Goulburn-Murray Water
HRWS	High-reliability water share
IVT account	Inter-Valley Trading account
LRWS	Low-reliability water share
MDBA	Murray-Darling Basin Authority
NRSWS	Northern Region Sustainable Water Strategy
OOW	Office of Water
SRWS	Spill-reliability water share
SWA	Spillable water account