

# Business case for operating rule change to the use of the Barmah-Millewa Forest Environmental Water Allocation

A Sustainable Diversion Limit Adjustment Measure



A joint proposal prepared by the Department of Environment, Land, Water and Planning (Victoria) and the Office of Water (NSW)

## **DISCLAIMER**

This is a preliminary business case, used to inform decision-making by the Murray-Darling Basin Ministerial Council and Basin Officials' Committee on sustainable diversion limit adjustment mechanism projects. The documents represent the business case for each of these projects at the date they were submitted for assessment by Basin governments, which for this project was 2015. Detailed costings and personal information have been redacted from the original business cases to protect privacy and future tenders that will be undertaken to deliver these projects.

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## Glossary

AHD	Australian Height Datum
BMFEWA	Barmah-Millewa Forest Environmental Water Allocation
B-MOP	Barmah-Millewa Operations Committee
CMA	Catchment Management Authority
CMS	Constraints Management Strategy
DELWP	Department of Environment, Land, Water and Planning (Victoria)
EC	Electrical Conductivity (measured in microsiemens/cm)
GL	Gigalitre (1,000,000,000 litres)
GST	Goods and Services Tax
ICC	Icon site Coordinating Committee
MDBA	Murray-Darling Basin Authority
ML	Megalitre (1,000,000 litres)
NSW	New South Wales
O&O	Objectives and Outcomes for River Operations in the River Murray System
SDL	Sustainable Diversion Limit
SDLAAC	Sustainable Diversion Limit Adjustment Assessment Committee
SFI	Specific Flow Indicator
TLM	The Living Murray

# Executive summary

## Operating rule change for a Sustainable Diversion Limit adjustment

This business case proposes to revise the operating rules for the Barmah-Millewa Forest Environmental Water Allocation (BMFEWA) to ensure better coordination with other environmental watering initiatives. The outcome will be to deliver equivalent environmental outcomes as proposed in the Murray-Darling Basin Plan (Basin Plan) but with less water, so generating a possible Sustainable Diversion Limit (SDL) offset.

The proposal is an '*Operating Rule Change*' under the terms of the Phase 2 Guidelines published by the Sustainable Diversion Limit Adjustment Assessment Committee (SDLAAC)<sup>1</sup>.

## The Barmah-Millewa Forest

The Barmah-Millewa Forest is the largest River Red Gum forest in Australia covering 66,000 ha and is listed under the Ramsar *International Convention on Wetlands* as a significant breeding site for waterbirds. The Forest is one of The Living Murray (TLM) icon sites and is managed by an *Icon Site Coordinating Committee*, on behalf of TLM, with representatives from across jurisdictions.

The Barmah-Millewa Forest was the first site along the Murray to be allocated an environmental water allocation, in 1997, as the BMFEWA. Recent growth in environmental water entitlements means that there are now other flows down the Murray for environmental watering programs. The current rules for the BMFEWA are not well coordinated with these other environmental water deliveries. The modelling of the 2,750 GL environmental outcomes in the Basin Plan reflected this poorly coordinated approach.

## The proposal

The business case proposes changes to the operating rules for the release of the BMFEWA that will drive greater integration with other environmental watering initiatives along the River Murray. The proposal is to incorporate two new rules into the BMFEWA operating procedures, these are:

- Do not initiate or continue release from BMFEWA if a continuous 4 monthly flood has already occurred
- Do not automatically trigger target flow releases in December

All the other BMFEWA rules remain as they currently are, including the ability to extend watering to maintain waterbird nesting events through to completion in January in specific years when major breeding events are triggered.

These changes will enable the BMFEWA to be used more effectively, and improve the number of successful environmental events that can be delivered, within the same overall volume of allocation.

## Costs

The costs to implement the proposed rule change are relatively modest, particularly in comparison to other proposals that require the construction of physical infrastructure to deliver environmental water to environmental assets.

<sup>1</sup> SDLAAC 2014. *Phase 2 Assessment Guidelines for Supply and Constraint Measure Business Cases*

The only costs that will need to be incurred will be to complete a stakeholder engagement exercise to ensure community understanding and support for the proposals, and to update Murray-Darling Basin Authority (MDBA) water accounting procedures and tools.

It is suggested that this engagement is delivered as part of a wider regional exercise to consult on a suite of possible SDL adjustment initiatives. That would also help spread shared costs over the wider exercise.

### Stakeholder engagement

A major workshop of relevant cross-jurisdictional agencies was held to identify the key issues of concern to regional stakeholders. The workshop identified potential risks of this proposal and interested stakeholder groups.

Direct engagement with those stakeholder groups was not undertaken as part of this stage of the project. It is considered advisable to gain SDLAAC support for the initiative before raising possible concerns with those stakeholders. A targeted and well planned engagement process that includes broader engagement on the topic of SDL adjustment in the Basin is also recommended, rather than consultation on this specific proposal in isolation. This approach is recommended as the likely concerns of other groups relate to not just this one proposal, but the broader SDL adjustment process and the interaction with other proposed measures. The business case provides recommendations for the coverage of the engagement program that will need to be completed as a second stage of the proposal.

### Impact assessment

A structured risk assessment was undertaken in line with the requirements of the Phase 2 Guidelines. This was based on the advice of an expert working group from across agencies, followed by a rigorous assessment process. This process identified a suite of potential risks covering a range of issues.

This business case reports on the assessment and modelling undertaken to analyse the likely extent of those potential impacts. This confirmed that the proposed changes should generate outcomes that are at least neutral and in many cases broadly positive. The priority risks, concerns and outcomes are identified in the table below.

Issue	Concern	Comment
Environment	That the BMFEWA aims will be lost	Modelling confirms that the changes enhance outcomes in line with BMFEWA objectives
Irrigators	That rights to borrow allocation and harvest return flows will be compromised	Modelling confirms that rights are protected or enhanced as more water is held in reserve
Recreation	That access to the forest will be reduced	The quality of the forests will be enhanced boosting recreational values
Third parties downstream	That South Australia's needs will be impacted	Modelling confirms that SA's rights to flow volumes and quality are protected
Project delivery	That community opposition will impede change	A comprehensive stakeholder engagement exercise is recommended to build understanding and support

The business case advises that with adequate stakeholder engagement, all outcomes are either positive or residual risks are negligible or can be adequately mitigated.

Modelling demonstrates that significantly improved environmental outcomes can be achieved compared to the benchmark modelling, utilising the same 2,750 GL of environmental water recovery. This creates the potential for this rule change to make a positive contribution to a package of measures that could be assessed for SDL adjustment opportunities.

Any potential inter-dependencies between this supply measure and other measures cannot be formally ascertained at this time, until a final package of proposed supply measures is identified and modelled by the MDBA.

This business case broadly reviewed how the *Constrain Management Strategy's* proposal to increase the maximum channel capacity downstream of Hume Dam from its current limit of 26,000 ML/day to close to 40,000 ML/day would affect the proposal to change the rules in the BMFEWA operating procedures.

The assessment indicated the outcome of the Constraints Management Strategy should enhance the ability to deliver larger environmental flows down the river earlier in the season, providing a synergistic effect on the proposal to amend the BMFEWA. Therefore this SDL offset proposal can be supported with confidence that its benefits will be well coordinated with any proposals in the Constraints Management Strategy.

### **Governance & delivery**

This business case has been developed as a joint proposal from Victoria and NSW. The detailed business case documentation has been prepared under the oversight of the Victorian Department of Environment, Land, Water and Planning (DELWP).

The operational rule change will require actions to be undertaken by the MDBA and by the NSW and Victorian governments. Given the inter-jurisdictional negotiations and approvals required it is appropriate that the MDBA should assume project management responsibility for implementing the change once it has been approved as a SDL adjustment measure. Once the change is approved at the Ministerial/Basin Officials Committee, appropriate NSW and Victorian agency staff can assume responsibilities for managing amendments to the relevant water sharing instruments in each state.

Implementation of the rule changes in practice will be subject to oversight and direction from the well-established protocols of the cross jurisdictional *Icon Site Coordinating Committee*. This gives confidence that the proposed changes will be implemented readily and with low cost.



# 1. Introduction

## 1.1. Sustainable Diversion Limit adjustments through operating rule changes

The Murray-Darling Basin Plan (Basin Plan) was prepared by the Murray-Darling Basin Authority (MDBA) and signed into law by the Commonwealth Minister for Water on 22 November 2012, under the Commonwealth *Water Act 2007*. The *Intergovernmental Agreement on Implementing Water Reform in the Murray Darling Basin* subsequently outlined the commitments and responsibilities of the participating jurisdictions and the program for putting the Basin Plan into action.

The Basin Plan sets legal limits on the amount of surface water that can be extracted from the Basin for consumptive use from 1 July 2019 onwards. The sustainable diversion limits (SDLs) for surface water are currently set at a reduction of 2,750 GL on current extraction levels. That SDL value has been modelled to create a certain level of environmental outcome. Under the provision in Chapter 7 of the Basin Plan and in the *Intergovernmental Agreement on Implementing Water Reform in the Murray Darling Basin*, it was agreed that the Basin Plan should be able to achieve these environmental outcomes by improved use and management of the water, as well as by reducing current extraction levels. That would allow the SDL reduction to be adjusted, reducing impacts on regional communities.

The Basin Plan allows for up to 650 GL of the 2,750 GL SDL reduction to be accounted for through this improved use and management of environmental water. The jurisdictions in the Basin states and the MDBA have established an inter-jurisdictional committee, the SDL Adjustment Assessment Committee (SDLAAC), to manage this process and to evaluate proposed investments.

The Basin states have developed a program to promote initiatives under these processes. SDLAAC has drawn up guidelines to help steer the drafting of business cases for such proposals.<sup>2</sup>

Five different forms of intervention have been identified in the guidelines:

- **Environmental works and measures at point locations:** Infrastructure-based measures to achieve the Basin Plan's environmental outcomes at specific sites along the river using less environmental water than would otherwise be required.
- **Water efficiency projects:** Infrastructure-based measures that achieve water savings by reducing water losses through, for example, modified wetland or storage management.
- **Operating rules changes:** Changes to policies and operating rules that lead to more efficient use of water and savings and contribute to achieving equal environmental outcomes with less water.
- **Physical constraint measures:** Ease or remove physical constraints on the capacity to deliver environmental water.
- **Operational and management constraint measures:** Changes to river management practices.

This business case covers one such initiative regarding the management of the Barmah-Millewa Forest Environmental Water Allocation (BMFEWA). This is an 'Operating rule change' that achieves equivalent environmental outcomes with less water providing an opportunity to deliver a SDL adjustment. This business case has been prepared in accordance with the Phase 2 Guidelines (refer Appendix 1).

<sup>2</sup> SDLAAC 2014. *Phase 2 Assessment Guidelines for Supply and Constraint Measure Business Cases*

## 1.2. Terms of reference

This business case has been developed as a joint proposal from Victoria and NSW. The detailed business case documentation has been prepared under the oversight of the Victorian Department of Environment, Land, Water and Planning (DELWP). DELWP<sup>3</sup> specified the terms of reference for this initiative as:

*This business case proposes to revise the operating rules for the Barmah-Millewa Forest Environmental Water Allocation (BMFEWA), while fully meeting its original requirements (i.e. providing the magnitude of the floods required in the original rules and maintaining the drought clauses).*

This is an ‘Operating Rule Change’ under the terms of the SDLAAC Guidelines as it involves a proposal to change the operational rules, planning and practice for the management of the BMFEWA rather than the construction of works and measures. The outcome of this change will be to deliver equivalent environmental outcomes as proposed in the Basin Plan but with less water, so generating a SDL offset.

## 1.3. Background to the proposal

### 1.3.1. Barmah-Millewa Forest

The Barmah-Millewa Forest consists of the Barmah Forest in Victoria and the Millewa group of forests in New South Wales. It is the largest River Red Gum forest in Australia and covers approximately 66,000 ha of floodplain between the townships of Tocumwal, Deniliquin and Echuca (Figure 1). The forest floodplain vegetation communities include swamps and marshes, rush beds, lakes and billabongs, open grassland plains, River Red Gum forests, River Red Gum woodlands and Black Box woodlands.

The area is listed under the Ramsar *International Convention on Wetlands* as a significant breeding site for waterbirds (Figure 2). It is also an important native fish habitat.

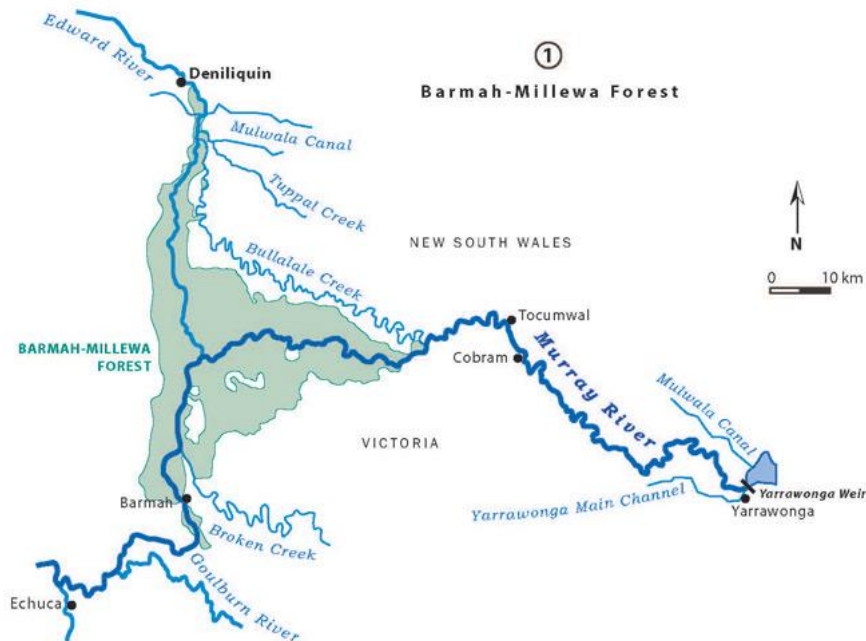


Figure 1. Location of Barmah-Millewa Forest (Source: MDBA)

<sup>3</sup> Note that at the time of commencing development of this business case, DELWP was known as the Department of Environment and Primary Industries.

The MDBA (MDBA, 2014)<sup>4</sup> reports that:

*The ecological health of the forest is under threat from several factors. The main one is river regulation, which has contributed to a decrease in the number of medium-sized spring floods and an increase in the number of small floods in summer, which are undesirable. The reduction in spring flooding is particularly important because the river red gums need frequent flooding in spring to regenerate and grow. It has been calculated that because of river regulation:*

- *the frequency of medium-sized spring floods has more than halved*
- *the duration of inundation of river red gum forest has reduced from an average of five months to two months per year*
- *the maximum length of dry periods has increased six-fold*
- *the variability of river flows has reduced: under natural conditions, average monthly flows vary between 100 GL and 980 GL; under current regulated conditions they vary between 110 GL and 400 GL*
- *the volume of river flows has reduced: downstream of Yarrawonga, diversions reduce annual flow by 25% compared to natural conditions.*

This proposal has the potential to offset some of those threats and to do so with less water than assumed in the Basin Plan.

### 1.3.2. Governance

The Barmah-Millewa Forest is managed through a structured suite of entities:

- **The Living Murray:** The forest is one of the icon sites under the Living Murray program. Therefore priorities, programs and funding are delivered in liaison with the TLM program coordinator. As a cross-border site, Barmah–Millewa is jointly managed by Parks Victoria and the NSW National Parks and Wildlife Service in accordance with its environmental water management plan.
- **Icon site manager:** Given the location of the forest straddling the River Murray, responsibility for site management is shared between Victoria and NSW. The role of site manager is exchanged on a yearly cycle between the Goulburn Broken Catchment Management Authority (CMA) in Victoria and NSW Parks and Wildlife Service.
- **Icon site Coordinating Committee (ICC):** Ongoing management of the forest is undertaken by the ICC with support from various subcommittees, as detailed below. The ICC has representatives from state and federal agencies:
  - Commonwealth: Murray-Darling Basin Authority and Department of Environment
  - NSW: Parks and Wildlife Service, Forests NSW, Agriculture & Fisheries, Murray Local Land Services
  - Victoria: Goulburn Broken CMA, Parks Victoria, DELWP
  - Yorta Yorta Nation Aboriginal Corporation
- **Icon site Technical Advisory Committee:** This group of specialist staff develop proposals for the forest based on their technical areas of responsibility.
- **Icon site Consultation Reference Group:** This committee provides a forum for engagement with a wide spread of local and regional stakeholders.

<sup>4</sup> MDBA 2014. The Living Murray story - The Living Murray icon sites. Webpage available at <http://www.mdba.gov.au/media-pubs/publications/living-murray-story/contents/lm-icon-sites>.

- **Icon site Indigenous Partnership project:** This initiative seeks to build engagement with local indigenous partners.
- **Barmah-Millewa Operations Committee (B-MOP):** The B-MOP is a multi-agency committee of managers and practitioners who contribute to timely decision making processes concerning water management requirements in the forest. B-MOP is chaired by MDBA/TLM but draws in practitioners and operations staff as required.

## 1.4. Defining the proposal

### 1.4.1. History and context

The Barmah-Millewa Forest was the first site along the Murray to be allocated an explicit environmental water allocation. The allocation pre-dates the Basin Plan and later developments in environmental watering plans and programs. This early history is important in understanding the challenges that have arisen in integrating the BMFEWA with other watering initiatives.

The important characteristic of the BMFEWA is that the use of the allocation is triggered by a series of rules rather than by a discrete decision to allocate water, as is the case under The Living Murray. The rules specify that the allocation is released if certain flow rates are recorded downstream of Yarrawonga, or if four years have passed without release or flow trigger. The set of triggers are designed to extend the duration of medium-sized floods and break long dry periods.



Figure 2. Ibis breeding in flooded Barmah forest (Source: MDBA)

### 1.4.2. Drivers of change

In 1997, the BMFEWA was the only major environmental water allocation available in the Murray and the rules sought to achieve flow targets by piggy-backing on natural events and regulated releases for irrigation. Recent strong growth in the volume of environmental water entitlements means that there are now larger, more frequent water allocations and flows down the Murray to meet environmental watering needs, and that many of these flows now occur earlier in the season.

The current rules for the BMFEWA do not recognise these changes and so the BMFEWA releases are not well coordinated with other environmental water deliveries. For example, other environmental watering releases

may have created significant flooding events in the forest before the formal triggers apply. This means that watering events in the forest are triggered more often and for a longer period than they would have been under the operating circumstances in 1997. That may result in less than optimal outcomes, e.g. extended watering into December may have limited environmental benefit. The modelling of the 2,750 GL environmental outcomes reflected this poorly coordinated approach.

### **1.4.3. The proposal in context**

The objective of this proposal is to promote more effective coordination between the BMFEWA and other environmental watering initiatives along this reach of the River Murray.

This business case proposes a limited number of simple changes to the operating rules for the release of the BMFEWA that will drive greater integration with other initiatives. These changes will enable the BMFEWA to be used more effectively, and improve the number of successful environmental events that can be delivered, within the same overall volume of allocation.

There are several ways these outcomes are generated:

- When the forest's needs have already been met by other watering initiatives, the carryover rules in BMFEWA mean that the allocation can be used in other seasons when the Basin Plan environmental water cannot meet its demands.
- By curtailing releases in months when low environmental benefits are achieved (e.g. in December) the same allocation can be used at other times to generate improved outcomes.

It was important that the terms of reference for the proposal were well specified in order to provide clarity for the analysis and modelling of costs and benefits in the business case.

The Department reviewed a range of alternative possible approaches to identify the change that generated the best outcomes with lowest transaction costs. These were both at a strategic and an operational level. At a strategic level the assessment included the scenario of converting the BMFEWA into an environmental entitlement to allow it to be held and managed by the Commonwealth Environmental Water Holder. This was deemed unfeasible given the characteristics of the resource and the agreement on harvesting of return flows and borrowing rights in years of low allocations.

The operational options included possible rule changes that were consistent with the original intent underpinning creation of the BMFEWA, including options to better target Specific Flow Indicator events developed for the Barmah-Millewa site under the Basin Plan.

The current proposal uses other environmental initiatives as the baseflow and then manages the BMFEWA around them. One other possible approach would be to use the BMFEWA as the baseflow and manage other initiatives on that basis. However, that would be difficult to implement as the BMFEWA is triggered by rules around external factors related to flows in the Murray. It would be difficult to plan other programs around these external triggers.

The Department undertook modelling of the proposed changes to confirm that the new approach met the original aims and objectives of the BMFEWA, to assess whether equivalent or improved environmental outcomes could be achieved with the modified rules, and to identify any third party impacts.

#### 1.4.4. Interaction with other initiatives

The business case also reviewed how far this proposal would interact with other parallel SDL offset proposals. The assessment covered two classes of initiatives:

- **Other operating rule changes and works and measures initiatives:** Any potential inter-dependencies for this supply measure, in terms of other measures, cannot be formally ascertained at this time. This is because such inter-dependencies will be influenced by other factors that may be operating in connection with this measure, including other supply/efficiency/constraints measures under the SDL adjustment mechanism, and the total volume of water that is recovered for the environment.

It is expected that all likely linkages and inter-dependencies for this measure, including with any constraints measures, will become better understood as the full adjustment package is modelled by the MDBA and a final package is agreed to by Basin governments.

- **Constraints strategy:** The MDBA released a Constraints Management Strategy (CMS) at the end of 2013, with a target of agreeing on proposals to address constraints by 2016. In recognition of this, the business case looked at how far any likely outcome of the constraints strategy would interact with this proposal.

One of the key constraints in the system is the maximum channel capacity downstream of both Hume Dam and Yarrawonga. The CMS includes proposals to increase this capacity to 40,000 ML/day. This business case broadly reviewed how this change would affect the proposal to change the rules for release of the BMFEWA allocation.

The assessment indicated the only effect of this constraint reduction would be to enhance the ability to deliver larger environmental flows down the river earlier in the season. That would have a synergistic effect on the proposal to amend the BMFEWA as it would provide more occasions when other watering programs would be available to deliver outcomes within the forest.

Therefore this SDL offset proposal can be supported with confidence that its benefits will be well coordinated with any proposals in the Constraints Management Strategy.

#### 1.4.5. A new measure

This proposal is a 'new measure' under the Phase 2 Guidelines and so is eligible for full or partial Commonwealth Supply Funding as no funding has been provided or committed to-date by the Commonwealth or has already been approved by another organisation.

## 2. Proposal

### 2.1. Current operating rules

The BMFEWA was established in the 1990s, in two stages or tranches. The first stage occurred in the early 1990s, when Victoria and NSW agreed to provide a total of 100 GL annually (50 GL from each state) to water the Barmah-Millewa Forest. This entitlement was the first real commitment by the jurisdictions to address the environmental decline of the largest red-gum forest in the system. Unfortunately, it was not used extensively in the early years after its establishment, as there were no rules or processes developed to guide how this water could effectively be delivered to the forest<sup>5</sup>.

The second stage in the establishment of the BMFEWA commenced in 1997, with the development of the *Sharing the Murray*<sup>6</sup> report, which set out proposals for dividing up Victoria's share of the River Murray system resources between the competing users and needs that existed. The objectives were to establish clear water sharing arrangements that would be codified into bulk water entitlement orders, replacing the large range of unclear existing rights that had been incrementally established over many decades. In addition to clarifying rights, *Sharing the Murray* also aimed to establish a basis for compliance with the Murray-Darling Basin Cap on Diversions and to identify arrangements that would protect the environment.

The Barmah-Millewa Forest was the key River Murray wetland that could be addressed by releasing water from MDBA storages. As a result of the modelling studies undertaken at that time, a number of issues emerged:

- Releasing 100 GL from Lake Hume each year would not reinstate the important medium sized floods that river regulation had removed
- Floods of around four months duration with flows of around 550 GL/month were required in spring to support fish, vegetation and waterbird health
- Even if releases were piggy-backed onto natural floods, volumes of between 200 – 800 GL were needed to create a four month long flood.

In order to address these issues, and in recognition that the BMFEWA was the only water available to tackle the needs of the forest, innovative approaches were applied to maximise the benefit achievable through this single entitlement. It was proposed that the entitlement be amended to include:

- An extra 50 GL of lower security water (25 GL each from NSW and Victoria)
- Unused allocations could be carried over from one year to the next to accumulate a larger volume
- Next year's allocation could be overdrawn if there was sufficient water in reserve, in order to generate larger volumes for a watering event
- In order to minimise impacts on consumptive entitlements through allocating additional volumes to the forest:
  - The accumulated allocation could be borrowed in drought times to increase allocations against retail water entitlements. Borrowing had to be paid back once water availability increased.
  - Water returning from the forest to the river could be used to supply other consumptive demands.

<sup>5</sup> Murray Water Entitlement Committee 1997. *Sharing the Murray – Proposal for defining people's entitlements to Victoria's water from the Murray*, October 1997

<sup>6</sup> Ibid.

After extensive consultation, these proposals were supported and NSW and Victoria made provisions for the BMFEWA in their Water Sharing Plans and Bulk Entitlements respectively.

Subsequently, detailed water release targets and triggers were developed. An interim set of rules were agreed to in March 2001 and the current rules were approved by the Murray-Darling Basin Ministerial Council in May 2007. Key provisions of the BMFEWA are summarised in Table 1.

Table 1. Key provisions of the BMFEWA

Provision	Description
Allocation:	
• High security allocation	<ul style="list-style-type: none"> <li>Max annual volume = 100 GL</li> <li>Allocation has same reliability as Victorian High Reliability Water Share</li> </ul>
• Low security allocation	<ul style="list-style-type: none"> <li>Maximum annual volume = 50 GL</li> <li>Allocation made in full when cumulative 30-35 month natural inflows to Hume exceed agreed trigger volumes.</li> </ul>
	All allocations provided 50:50 by NSW and Victoria
Maximum allocation	700 GL (350 GL in each of NSW and Victorian shares)
Carryover	Unused water can be carried over from one year to the next
Overdraw	Up to 100 GL (50 GL from each state)
Spills	<p>When Lake Hume physically spills, water spills firstly from</p> <ul style="list-style-type: none"> <li>The carry over component of environmental entitlements other than BMFEWA, and then</li> <li>From the BMFEWA</li> </ul> <p>Spill limit – each state account cannot spill below 100 GL + the volume of previous year borrowings (up to 100 GL)</p>
Borrow rights	Water may be borrowed for other environmental purposes, with pay-back required in the following year. Equally, local irrigators may 'borrow' allocations when announced allocations are low and then 'repay' them in later seasons.



Provision	Description
Release triggers	<p>October release for 5 year drought:</p> <ul style="list-style-type: none"> <li>Releases in October are triggered if four years have passed with no release or without a flow downstream of Yarrawonga of at least 500 GL/month from September to November and 400 GL/month in December</li> </ul> <p>October Release following a September flow</p> <ul style="list-style-type: none"> <li>Releases are triggered in October if the September flow is &gt; 500 GL/month and the usable component of the account is ≥ 400 GL.</li> </ul> <p>November release following an October flow</p> <ul style="list-style-type: none"> <li>Releases are triggered in November if the October flow is &gt; 500 GL/month and the usable component of the account is ≥ 400 GL.</li> </ul> <p>December release</p> <ul style="list-style-type: none"> <li>Releases are triggered in December if the flow is &gt; 500 GL/month for both October and November.</li> </ul>
Flow targets (for flows d/s of Yarrawonga)	<p>October – 500 GL/month</p> <p>November – 500 GL/month</p> <p>December – 400 GL/month</p> <p>Special release targets – after three years with no flow of ≥ 660 GL/month in any August to November month then the target flow is increased to 660 GL/month in October and November if the release starts in that month.</p>
Accounting for releases	Releases are accounted for as the additional release from Lake Hume (on top of releases made to meet all other water requirements) made to achieve the target flow at Yarrawonga.

The rules also allow for water to be borrowed for other environmental purposes if it is not required for the Barmah-Millewa Forest, with pay-back required in the following year. The rules provide for agreed variations to the release targets and target flows in a particular year to improve environmental outcomes. These provisions have been used to extend watering to maintain waterbird nesting events through to completion in January for example. In addition to one-off variations, the current rules also incorporate arrangements for the review and permanent amendment of the rules.

These operational rules have been applied to guide the release and usage of the BMFEWA by the MDBA and jurisdictions since their adoption in 2007. During the Millennium Drought, borrowings were undertaken to support allocation levels for retail entitlements. Following the end of the drought, the use of the BMFEWA for forest watering has also been generally in accordance with these rules<sup>7</sup>. The detailed ‘specific outcomes and objectives’ oblige the MDBA to account for BMFEWA releases in accordance with these agreed rules.

The baseline model and the benchmark model (refer to Figure 3 for definition) both represent the behaviour of the River Murray system by applying the rules summarised in Table 1. These models include an identical version of the extended watering practices noted above.

<sup>7</sup> [REDACTED] MDBA – pers. comm. 26 January 2015.

**Baseline:** The modelling scenario used to represent the operating conditions of the Murray system as at 30 June 2009 (MDBA 2012).

**Benchmark:** A modelling scenario based on the baseline model, but assumes that the 2,750 GL/y SDL reduction has been implemented in full.

**Proposal:** A modelling scenario based on the benchmark model, but assumes that the initiative outlined in this Business Case has been implemented in full.

**Figure 3. Important terminology of modelling scenarios**

## 2.2. Drivers for change

In 1997, the BMFEWA was the only major environmental water allocation available in the Murray and the rules sought to achieve flow targets by piggy-backing on natural events and regulated releases for irrigation. The last ten years have seen the creation of significant volumes of environmental water entitlements. These are now used to generate larger and more frequent flows down the Murray to meet various environmental watering objectives. Many of those flows also occur earlier in the season as they seek to mimic natural spring freshes.

The development of the Basin Plan has applied more recent environmental science to better define water requirements for the forest, and has also provided significantly larger environmental water allocations to meet these needs. The current rules for the BMFEWA don't recognise these changes, with the result that continuing to follow these rules under Basin Plan conditions means that the BMFEWA releases are not well coordinated with other environmental water deliveries. This in turn means that events are often continued into December when they may have already extended for four or more months, and there may be limited environmental benefits from these December releases.

There is now a need to consider how best to integrate the BMFEWA with these other environmental watering initiatives to achieve the best overall outcome. Enhanced coordination of these various different packets of water will result in more efficient system operation. As a planned environmental water entitlement, the BMFEWA can only be used in the manner allowed by the rules adopted for its use. This means that the key opportunity for improving the coordination of environmental water deliveries to the Barmah-Millewa Forest will be through developing modified rules for the use of the BMFEWA.

Analysis suggests that changes to the rules for the release of the BMFEWA should enable it to be used more effectively. Given the very attractive carryover characteristics of this entitlement, constraining releases in years when other releases meet the forest water needs means that water can then be carried over to times when Basin Plan environmental water could not meet demands, and should improve the number of successful environmental events that can be delivered.

The results of modelling studies support this proposal.

Comparison of the usage of the BMFEWA in the baseline and the benchmark models highlighted significant differences in the timing of the use of this allocation. Figure 4 shows the changed access to the BMFEWA.

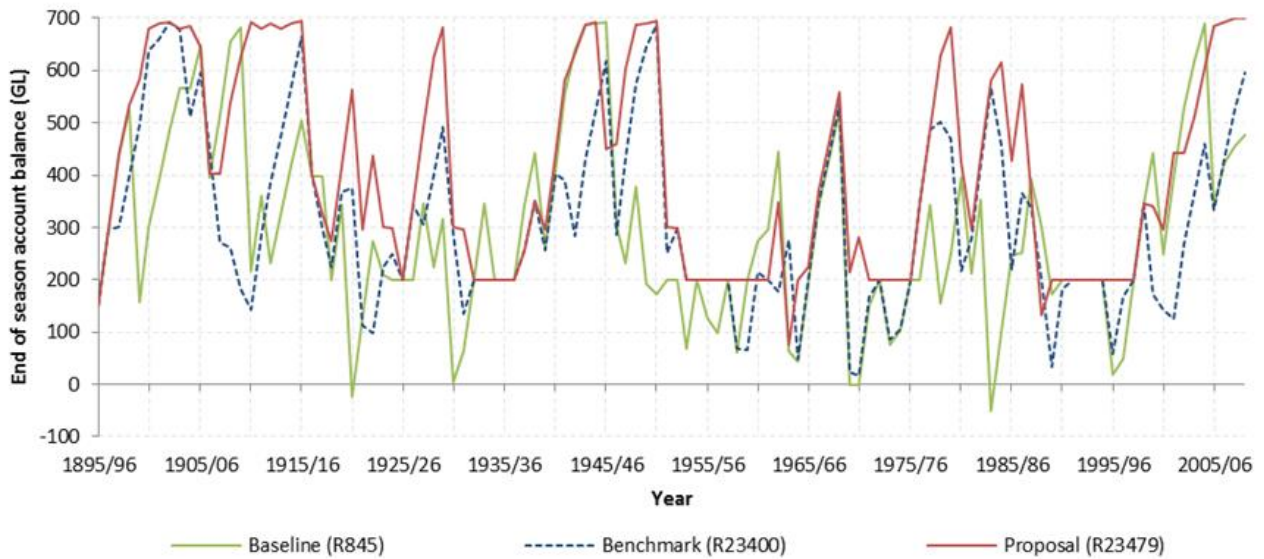


Figure 4. Account balance of the BMFEWA over time

The BMFEWA account is called on more frequently in the benchmark run, suggesting that the flow trigger conditions are activated more frequently under benchmark conditions than in the baseline. Additionally, the account is not overdrawn as frequently under the benchmark conditions, which tends to indicate there was a reduced requirement to overdraw to meet the volumes required to complete successful watering events under the benchmark. This is not surprising given the availability of significantly larger volumes of environmental entitlements that could be applied to meet the Barmah-Millewa Forest water requirements under benchmark conditions, in comparison to the pre-Basin Plan situation represented in the baseline model.

This modelling took account of the losses attributed to the BMFEWA, the volumes diverted and the return flows credited to the account.

It was also noted that under benchmark conditions, there was a shift in BMFEWA releases away from October and November and into December (Figure 5).

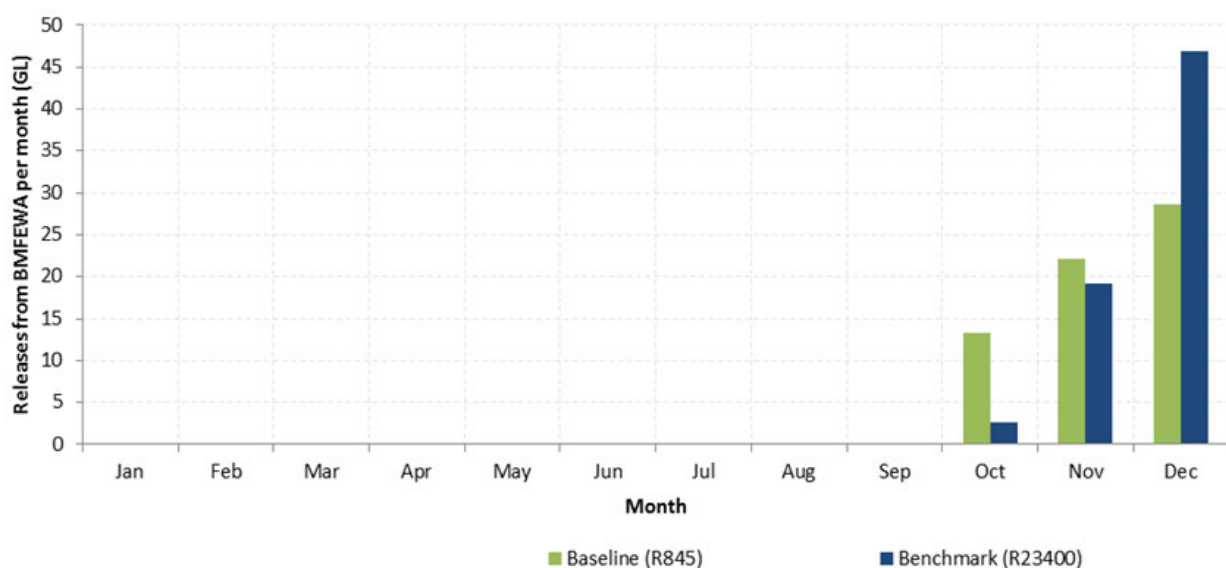


Figure 5. Average volume of BMFEWA released from Lake Hume each month

Closer analysis of the benchmark model showed that a key factor in determining the assumed use of the BMFEWA was the watering requirements developed for the Barmah-Millewa Forest as part of the Basin Plan. The MDBA used the best available science to identify the environmental water requirements at indicator sites<sup>8</sup>. The seven Specific Flow Indicators (SFIs) for the Barmah-Millewa Forest are shown in Table 2. The most notable aspect of the SFIs is that all watering events are designed to commence in June to better replicate natural conditions, whereas flows under the BMFEWA are triggered later, in October and November.

The SFIs drive the demands for environmental water deliveries in the benchmark (and proposal) model. For the Barmah-Millewa Forest, the B5 and B6 indicators were not used in the benchmark (or proposal) model to generate release demands, as it was acknowledged that the required flow rates were significantly in excess of what could be achieved with managed releases from Lake Hume. It was noted that B4 would also be very difficult to achieve under current release constraints.

The vast majority of SFIs used for modelling are targeted to end in November. Therefore, while the Basin Plan watering assumptions in the benchmark model are activating the BMFEWA flow triggers more often and extending the BMFEWA activation into December more often, the SFIs indicate that extension of events in December typically achieves lower environmental benefits.

<sup>8</sup> MDBA (2012), *Hydrologic modelling to inform the Basin Plan: Methods and results*, Feb 2012

Table 2. The seven Specific Flow Indicators for the Barmah-Millewa Forest<sup>9</sup>

Flow indicator	Flow magnitude	Duration (days)	Start month	End month	Low-uncertainty frequency (% yrs)	High-uncertainty frequency (% yrs)
B1	12,500 ML/d	70 (min 7)	Jun	Nov	80	70
B2	16,000 ML/d	98 (min 7)	Jun	Nov	50	40
B3	25,000 ML/d	42 (min 7)	Jun	Nov	50	40
B4	35,000 ML/d	30 (min 7)	Jun	May	40	33
B5	50,000 ML/d	21 (min 7)	Jun	May	30	25
B6	60,000 ML/d	14 (min 7)	Jun	May	25	20
B7	15,000 ML/d	150 (min 7)	Jun	Dec	30	30

Note: The low-uncertainty and high-uncertainty frequencies recognise the uncertainty associated with the definition of the environmental water requirements of plant and animal populations. For the low uncertainty frequency, there is a high likelihood that the environmental objectives and targets will be achieved. The high uncertainty frequency is considered to represent a boundary beyond which there is a high likelihood that the objectives and targets will not be achieved.

In summary, analysis of the benchmark modelling showed that:

- The science underpinning the Basin Plan seeks environmental water deliveries for Barmah-Millewa to commence in June, before the BMFEWA is available to be used under the current rules.
- Other environmental water is called out to meet these demands (and other downstream demands), frequently creating the flow conditions in September and subsequent months that trigger releases from the BMFEWA. Given the reduction in the average volumes used from the BMFEWA across October and November in the benchmark compared to the baseline, it can also be assumed that larger components of the BMFEWA target flows are being provided by these other environmental releases.
- More frequent November flows above trigger levels are leading to increased releases of BMFEWA in December compared to the baseline situation.
- Most of the Barmah-Millewa flow indicator events are designed to finish before December.

### 2.3. Proposed operating rules

The overarching objective of the proposal is to achieve enhanced watering outcomes for the Barmah-Millewa Forest by promoting better coordination between the BMFEWA and other environmental watering initiatives that also seek to generate ecosystem outcomes along this reach of the Murray.

The business case has identified a limited but effective change in the BMFEWA that would achieve much of this objective.

<sup>9</sup> MDBA (2012), *Hydrologic modelling to inform the Basin Plan: Methods and results*, Feb 2012

In order to analyse the impacts of improved coordination between the BMFEWA and other environmental watering initiatives, the model was changed to incorporate two new rules:

- Do not initiate or continue release from BMFEWA if a continuous 4 monthly flood has already occurred.
- Do not automatically trigger target flow releases in December.

All other BMFEWA rules remain as they currently are, including the flexibility to maintain watering events through until January when needed to maintain waterbird nesting events or to support inundation of high value vegetation classes.

This rule change is able to be readily implemented and put into practice.

The modelling shows that with the proposed rule change in place, significantly improved environmental outcomes can be achieved compared to the benchmark modelling, utilising the same 2,750 GL of environmental water recovery (Section 3 explores this finding). This creates the potential for this rule change to make a positive contribution to a package of measures that could be assessed for SDL adjustment opportunities, and modelling studies have confirmed the potential for this rule change to contribute significantly to SDL adjustment volumes.

## 2.4. Costs

The costs to implement this proposed rule change are relatively modest, particularly in comparison to other proposals that require the construction of physical infrastructure to deliver environmental water to environmental assets.

Many of the costs will involve the commitment of staff resources from the MDBA and state agencies which will already be covered within existing budgets, but nevertheless there will need to be a re-allocation of priority to implementation of this measure in preference to other potential implementation activities.

There are two major areas of activity associated with implementation of this proposed rule change. The first area of activity is to update the documentation of the rules and accounting system, involving the following specific tasks:

- Update and approve new BMFEWA rules. It is assumed that preparation of any submissions to the Basin Officials Committee and Ministerial Council to approve the rule changes would be covered by existing support resources and no additional costs will be incurred.
- Amend water accounting systems and procedures to account for the new rules accurately. It is estimated that up to [REDACTED] of MDBA staff resources may be required to develop updates to accounting procedures documentation and make changes to accounting models and tools.
- Update modelling tools (largely done as part of these investigations).

It has been assumed that any updates to water sharing plans and Bulk Entitlement orders needed to authorise these rule changes will be undertaken as part of the development of water resource plans required under the Basin Plan, and that no additional costs will be incurred to make these rule changes at that time.

The second area is consultation with stakeholder groups who have an interest in the outcomes of any changes in the BMFEWA rules, and may be concerned about the potential for third party impacts.

Section 4 of this report details the stakeholders likely to be interested in this issue and the engagement processes that may need to be employed. For the purposes of cost estimation, it has been assumed that all consultation and engagement activities are directly managed and delivered by the MDBA and state agency staff. The key activities required for a comprehensive consultation program include:

- Design and production of consultation materials.

- Conducting a series of well planned community engagement meetings. The number of meetings required will depend on the final form of the proposed rule change and how wider consultation processes on other SDL adjustments and Basin plan implementation issues are managed. For the purposes of this estimate, it is assumed that up to 15 meetings may be required to engage concerned stakeholders.
- Managing enquiries and liaison with media etc.

Overall, it is estimated that a comprehensive consultation program delivered by MDBA and agency staff could cost in the order of [REDACTED]. These costs are summarised in Table 3.

Table 3. Projected implementation costs

Category	Activity	Cost (\$'000s)
Update documentation and accounting system	Staff salaries	[REDACTED]
Consultation	Staff salaries	[REDACTED]
	Goods and services	[REDACTED]
<b>Total</b>		[REDACTED]

Note: All costs are exclusive of Goods and Services Tax (GST)

These costs have been developed on the basis of a stand-alone consultation process for this proposal; however as noted in Section 4, it is recommended that consultation should occur as part of a broader engagement program addressing SDL adjustment processes and the interaction with other proposed measures. Under such a scenario, the consultation costs for this measure would be incorporated as part of the overall cost for the broader engagement program covering a number of proposals.

## 3. Outcomes

### 3.1. Risk assessment overview

The SDL Phase 2 Guidelines cover three risk categories:

- **Adverse ecological effects** (clause 4.4.2: If relevant, business cases need to include an assessment of potential adverse ecological impacts resulting from the operation of the proposed measure)
- **Impacts from the operation of the measure** (clause 4.7: All business cases need to include a risk assessment and risk management strategy for the proposed operating regimes or proposed operating rules changes)
- **Project development and delivery risks** (clause 4.11.4: The business case needs to include a risk assessment and risk management strategy for risks to project development and delivery)

The guidelines confirm that the business case will be assessed on the basis that:

- All significant project development and delivery risks and impacts have been identified, adequately described and analysed and robust treatments and mitigations proposed;
- The risk management strategy complies with the AS/NZS ISO 31000:2009 Risk management— Principles and Guidelines; and
- All residual risks are negligible or can be adequately mitigated.

The business case fully implements these requirements. This section of the business case sets out a generic risk management framework that has been applied across all impacts. The section covers the issues related to potential ‘adverse ecological effects’ and ‘impacts from the operation of the measure’. The risks associated with ‘project development and delivery’ are dealt with below in Section 5.

### 3.2. Risk management framework

A risk assessment of the impacts of the proposed change was completed in line with AS/NZS ISO 31000:2009 (as required under the guideline requirements). This assessed both the likelihood of an event occurring and the severity of the outcome if that event occurred. This methodology generates a risk matrix in line with the AS/NZS ISO 31000:2009 standard. Table 4 shows the risk matrix and definitions used in this risk assessment.

Table 4. AS/NZS ISO 31000:2009 Risk prioritisation matrix

Likelihood	Consequence	Consequence			
		Negligible	Minor	Moderate	Major
Rare	Low	Low	Low	Moderate	High
Unlikely	Low	Low	Moderate	High	High
Possible	Low	Moderate	Moderate	High	Very High
Likely	Low	Moderate	High	Very High	Very High
Almost Certain	Moderate	Moderate	High	Very High	Very High



The risk assessment process comprised two main elements:

- **Expert panel:** A workshop was held with senior agency staff across jurisdictions representing the key constituencies with an interest in the proposal. That group identified the key risks from implementing the proposal and allocated priorities to those risks. Appendix 3 reports the outcomes of that workshop.
- **Professional judgement:** Members of the project team then made judgments on the range of risks and their likely characteristics in-line with AS/NZS ISO 31000:2009, informed by experience of working on very similar projects related to environmental watering proposals.

The outcome was a listing of possible risks with a ranking based on the AS/NZS ISO 31000:2009 methodology.

In each case the mitigation strategy comprised two main elements:

- Analysis and modelling to confirm that the evidence showed either neutral or positive outcomes
- Adequate community engagement to ensure understanding and contributions from affected stakeholders

The listing of the risks and the assessment of their significance is provided in Table 5 below. The risk level refers to the severity of the risk prior to the application of any mitigation actions. With these controls in place, the analysis that follows in this business case covering environmental outcomes (Section 3.3) and third party impacts (Section 3.4) demonstrates that any residual risk is acceptably low.

### 3.2.1. Impact assessment criteria

In the following risk assessment we make a distinction between variability in system operation and adverse third party impacts.

All natural systems have considerable inherent variability. Rainfall, inflows and flow levels vary considerably within and between seasons. That leads to uncertainty in outcomes for affected third parties. In addition, we are in the early stages of a major shift in river system operation with the growth of environmental watering programs as the holdings of the environmental water holders are increased to match the sustainable diversion limits identified in the Basin Plan.

The development and implementation of more extensive environmental watering programs will lead to changes in flow patterns and the extent, frequency and duration of inundation regimes. These changes are an inevitable and understood consequence of wider strategic decisions on the long term health of the River Murray.

These changes are considered part of the base case of natural variability and prior water resource management decisions. Any impacts are therefore deemed not to represent adverse outcomes for risk management.

By contrast, adverse third party impacts are taken to involve changes and outcomes beyond those considered in existing resource management programs, particularly where they involve inundation of private land, or where they involve extension of impacts beyond the projected bounds of the current natural variability.

Table 5. Risk assessment listing and ranking

Risk	Rating <sup>10</sup>	Potential issue	Risk assessment (prior to mitigation)			Comment
			Likelihood	Consequence	Risk rating	
1 The water needs of the forest	16	The change reduces the focus on the health of the forest	Unlikely	Moderate	Moderate	Section 3.3
2 Over-watering	6	The change retains watering beyond optimal outcomes	Rare	Minor	Low	Section 3.3
3 Is it a real saving?	11	The change is just an accounting issue with no real impact on environmental outcomes	Rare	Minor	Low	Section 2
4 Operating practice	7	The change reduces current flexible working practice	Unlikely	Moderate	Moderate	Section 2
5 Forest regulators	10	The scope of the proposal is unclear	Rare	Minor	Low	Section 2
6 Constraints Management Strategy (CMS)	11	Implementation of the CMS reduces the benefits of this proposal	Rare	Minor	Low	Section 1.4.4
7 Hume airspace proposal	9	There is double counting of benefits with the proposal for the Hume airspace management	Unlikely	Minor	Low	Section 1.4.4
8 Knowledge of forest needs	11	The proposed change does not reflect the improved knowledge of forest needs since 2009	Possible	Moderate	Moderate	Section 3.3
9 Impact on third parties	9	The change impacts on harvesting of return flows, borrow rights or use of the forest for recreation	Unlikely	Moderate	Moderate	Sections 3.4.1 & 3.4.4

<sup>10</sup> The rating column reports the relative score allocated to each issue by the expert working group to reflect the anticipated level of stakeholder concern. The higher the rating, the greater the anticipated extent of concerns

Risk	Rating <sup>10</sup>	Potential issue	Risk assessment (prior to mitigation)			Comment
			Likelihood	Consequence	Risk rating	
10 South Australia	7	The change results in adverse outcomes for South Australia	Rare	Minor	Low	Section 3.4.3
11 Guidelines		The business case does not reflect the requirements of the Phase 2 Guidelines	Rare	Minor	Low	Section 1 & Appendix 1

The risk assessment determined the following priority risk issues for the review:

- Environmental outcomes: how changes will impact on environmental outcomes
- Third party impacts: whether third parties will be affected by the proposed changes.

The analysis and consideration of these priority issues is outlined below. It should also be noted that the modelling that supports the analysis of the proposal's outcomes was conducted by Jacobs on behalf of DELWP<sup>11</sup>.

### 3.3. Environmental outcomes

#### 3.3.1. Context for the assessment

Appendix 8 of the Phase 2 SDL Guidelines confirms that this section is concerned to minimise:

*The risks associated with accurately understanding, predicting and delivering ecological objectives at the site, within the reach and to downstream locations.*

The primary intention of the SDL Guidelines is to ensure that the business case predicts and controls the impact of new structural works and measures on ecological systems. In contrast, this proposal involves an operating rule change (i.e. rather than structural works and measures) to retain the original aims and objectives of the BMFEWA but to allow some additional flexibility in their operation so that they can be better integrated with other environmental watering initiatives.

There should, therefore, be enhanced delivery of ecological objectives within the reach and downstream. As the proposed changes involve only changes in operating rules there will be no risks regarding the construction of major works and measures.

At present, the rules based approach in the BMFEWA may result in sub-optimal outcomes, for example, when BMFEWA releases are triggered even though the forest has already been watered from other environmental initiatives. This additional watering from the BMFEWA may generate few environmental benefits and uses the water when it could have been held in reserve and used to greater benefit on other occasions.

The intention of the proposed rule change is to ensure better integration of the BMFEWA with other parallel environmental watering initiatives to ensure optimal watering programs for the Barmah-Millewa Forest. This should at a minimum retain the same level, extent and focus of benefits as were assumed in the benchmark modelling for the Basin Plan. The aim is that the change should provide opportunities to direct the existing BMFEWA to different or additional Barmah-Millewa Forest targets that enhance and extend the current quantum of benefits.

Adjusting the trigger rules as proposed to reduce occasions when there is a double up of watering between BMFEWA and other environmental initiatives should leave more water in reserve. This is confirmed in Figure 6 below, which shows the median account balance in the BMFEWA by month. It is also shown in Figure 7 below, which shows the projected average volume of BMFEWA released from Lake Hume each month under the baseline, benchmark and proposed rule change. The outcome is that on average the BMFEWA has a larger volume in reserve as a result of the proposed rule change. This then provides the opportunity to extend watering programs within the forest in years when allocations are reduced.

<sup>11</sup> Jacobs 2014. Modelling Investigation of Barmah-Millewa BMFEWA rules and Forest Regulator use to achieve environmental outcomes, Report for Department Of Environment And Primary Industries

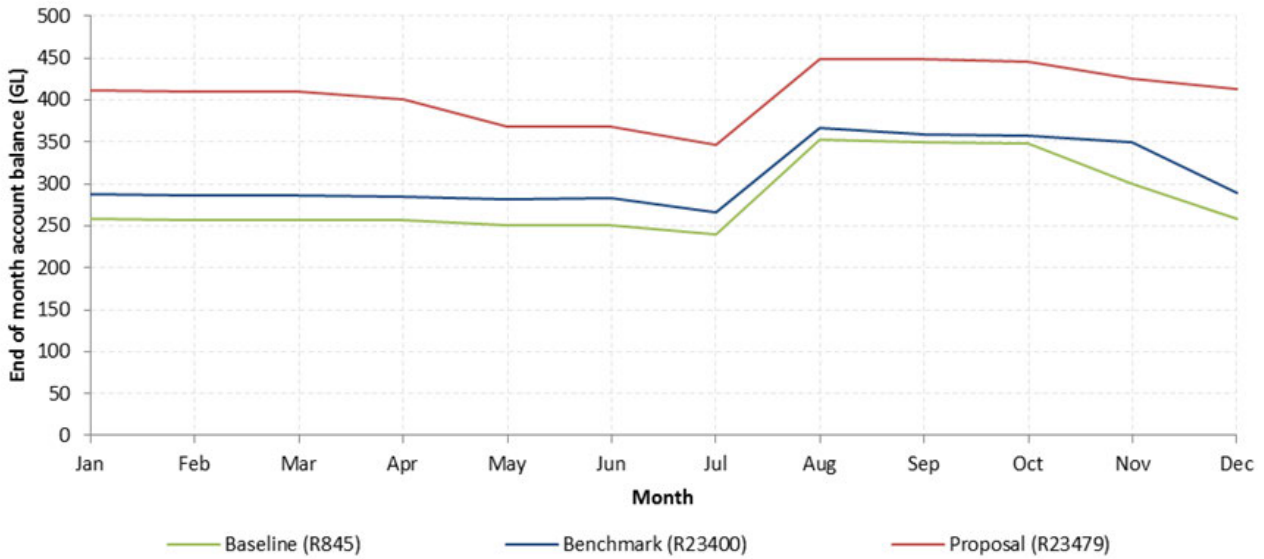


Figure 6. Median account balance of the BMFEWA in each month

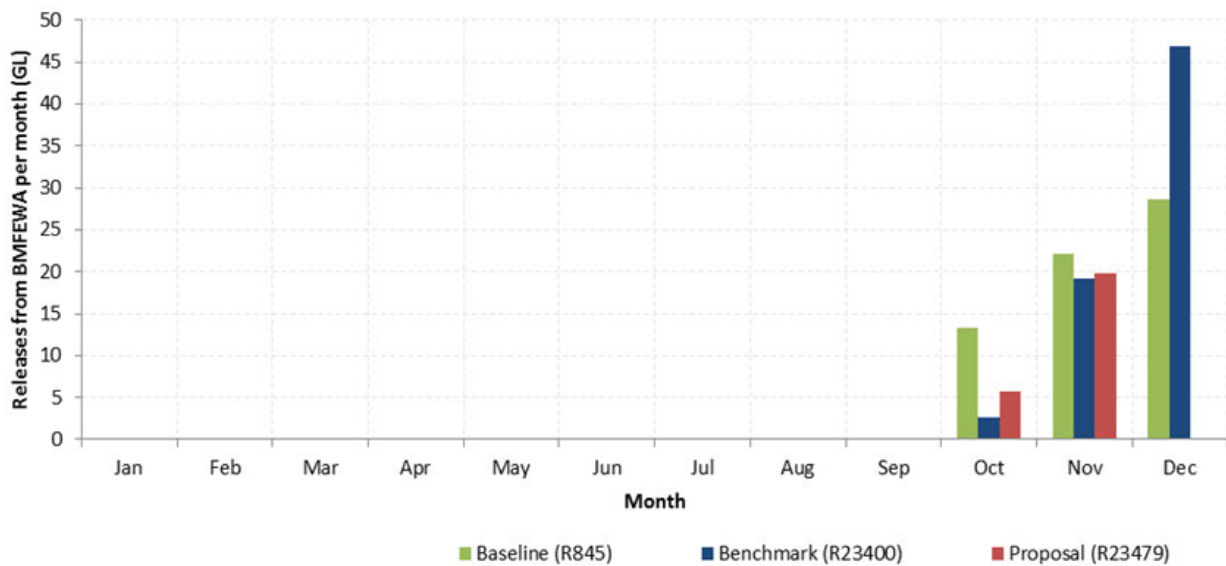


Figure 7. Average volume of BMFEWA released from Lake Hume each month

Modelling has been undertaken to test the environmental outcomes that could be achieved from this rule change. The modelling has examined the environmental outcomes of the proposal in two principal ways:

- How the proposal affects the achievement of Specific Flow Indicators (SFIs – refer Table 8) over the long-term.
- Whether the proposal compromises any of the limits of acceptable change outlined in Schedule 6 (Section S6.07) of the Basin Plan.

The next section provides an overview of the environmental assets of the Murray system (Section 3.3.2), which is followed by discussion of the results of modelling environmental outcomes at these assets (Section 3.3.3). These sections pick up on risks 1, 2, 3, 4 & 8 in Table 5 above.

### 3.3.2. Environmental assets

There are six key environmental assets between Lake Hume and the Murray Mouth. An overview of these assets is provided below (Table 6).

Table 6. Key environmental assets between Lake Hume and the Murray Mouth

Asset	Description
Barmah–Millewa Forest	The Barmah–Millewa Forest icon site is the largest river red gum forest in Australia. Located in New South Wales and Victoria, the forest covers 66,000 ha of wetlands, and is home to many threatened native plants and animals. It is also a significant breeding site for waterbirds and an important native fish habitat.
Gunbower–Koondrook–Perricoota Forest	Gunbower–Koondrook–Perricoota Forest icon site consists of two forests — Gunbower Forest and Koondrook–Perricoota Forest — that together comprise Australia's second largest river red gum forest. Located in New South Wales and Victoria, the combined Gunbower–Koondrook–Perricoota Forest covers around 50,000 ha. It is home to many threatened native plants and animals, and its wetlands are important breeding places for waterbirds and native fish.
Hattah Lakes	The Hattah Lakes icon site forms part of the 48,000 ha Hattah–Kulkyne National Park. Located in Victoria, this icon site includes over 20 semi-permanent freshwater lakes that support river red gum communities and a variety of native plants and animals. They are also important breeding places for waterbirds.
Chowilla Floodplain and Lindsay–Wallpolla Islands	The Chowilla Floodplain component of this icon site covers over 17,000 ha across New South Wales, Victoria and South Australia. Because of its remote location, Chowilla is relatively unaffected by irrigation and other development and much of its natural character has been preserved.  Included in this icon site are the Lindsay–Wallpolla Islands, including Mulcra Island, and their floodplains. Together this part of the icon site covers almost 20,000 ha and supports many threatened native plants, animals and fish species.
Lower Lakes, the Coorong and Murray Mouth	The Lower Lakes, Coorong and Murray Mouth icon site — where the River Murray meets the Southern Ocean — is in South Australia. Covering over 140,000 ha, it includes 23 different wetland types that range from very fresh water to saltier than the sea.  As a complex estuarine environment, this site is one of 10 major Australian havens for large concentrations of wading birds and is recognised internationally as a breeding ground for many species of waterbirds and native fish.
River Murray Channel	The River Murray Channel is the main artery of the river. Extending over 2,000 km from the Hume Dam in Victoria to Wellington in South Australia, the channel links the forests, floodplains, wetlands and estuaries along the River Murray. It provides habitat for many native plants, fish and animals, while its banks support river red gum forests of high natural and cultural value.

### 3.3.3. Limits of acceptable change and Specific Flow Indicators

Schedule 6 (Section S6.07) of the Basin Plan identifies the limits of acceptable change in score or outcome from the benchmark environmental outcomes (i.e. those achieved by the unadjusted SDL) that ensure environmental outcomes are maintained within identified limits. The limits of acceptable change are defined at the region and reach-scale.

**For each region:** no reduction in the benchmark scores, although some reductions in individual elements may be permitted if they are offset by increases in other elements.

**For each reach,** limits of acceptable change are based on the Specific Flow Indicators (SFIs) developed for each hydrologic indicator sites:

- Where the benchmark model run achieves or exceeds the target frequency range for a flow indicator, achievement of the target frequency range must be retained and the frequency result must not vary by more than 10% of the benchmark result
- Where the benchmark model run does not achieve the target frequency range for a flow indicator, the frequency result must not vary by more than 10% of the benchmark result, and not fall below the baseline model result
- Where the benchmark model run provides little improvement in frequency for a flow indicator (less than 50% progress toward the target range from the baseline model result), the frequency result must not vary by more than 15% of the benchmark result, and not fall below the baseline model result
- Where a supply measure or combination of measures can achieve the ecological outcomes sought by the plan as represented by an ecological target or targets, and a flow indicator or indicators and associated benchmark model results, then the three dot points above do not apply to that flow indicator or indicators.

**For the Coorong, Lower Lakes and Murray Mouth—maintenance or improvement of the following:**

- Lake Alexandrina salinity: less than 1500 Electrical Conductivity (EC) for 100% of the time and less than 1000 EC for 95% of days;
- Barrage flows: greater than 2000 GL per year on a three year rolling average basis with a minimum of 650 GL in any year, to be achieved for 95% of years
- Barrage flows: greater than 600 GL over any two year period, to be achieved for 100% of the time
- Coorong salinity: South Lagoon average daily salinity less than 100 grams per litre for 96% of days
- Mouth openness: Mouth open to an average annual depth of 1 metres (-1.0 m Australian Height Datum (AHD)) or more for at least 90% of years and 0.7 metres (-0.7 m AHD) for 95% of years
- For all base flows and fresh requirements within each reach—no reduction in outcomes achieved in the benchmark run.

Modelling of the River Murray system with the proposed changes in place found that the proposal does not result in any breach of the limits of acceptable change for the region (Table 7), the individual reaches (Table 8) and/or the Coorong, Lower Lakes, Murray Mouth (Table 9).<sup>12</sup>

<sup>12</sup> Jacobs (2014), *Modelling Investigation of Barmah-Millewa BMFEWA rules and Forest Regulator use to achieve environmental outcomes*, Report for Department of Environment and Primary Industries.

In comparison to the benchmark, the proposal results in a net increase in the number of successful events<sup>13</sup> across the Barmah-Millewa Forest, Gunbower-Koondrook-Perricoota, Chowilla floodplain, Edward Wakool and Lower Darling floodplain sites over the modelled record (Table 10). All SFIs experience the same or greater number of net successful events, with the exception of B5, C4 and E3 which have just one fewer event (Table 10). Importantly, there is no increase in the maximum dry spells experienced at these sites compared to the benchmark outcomes and furthermore the maximum dry spell of the H1 SFI decreases from 13 to 9 years (Table 10). The proposal also has positive implications on Coorong South Lagoon salinities (Table 9).

These results confirm that the proposed change to the operating rules improve the environmental outcomes that are generated overall. By implication, the proposed change will allow equivalent environmental outcomes to those available under the benchmark conditions to be achieved with lower total water requirements.

One of the important attractions of the proposed rule change is that it remains consistent with the original intent of creating a four month long medium flood event that piggy-backs on other releases, which was the basis that underpinned the extensive negotiations with stakeholders that led to the creation of this entitlement in the 1990s.

Once more experience is gained in the delivery of environmental water under the Basin Plan, further opportunities may be identified for improving and optimising the integration of this planned environmental allocation with other held entitlements. In the meantime, this rule change offers a positive contribution to a package of measures that could be assessed for SDL adjustment opportunities.

Table 7. Testing of limits of acceptable change for the region (from DELWP, 2015)

Limit of acceptable change	Benchmark (R23400)	Proposal (R23479)
Regional Ecological Elements Score	0.4935	0.4944

<sup>13</sup> Note, the term 'successful event' is used throughout this document to describe events that achieve the intended hydrologic conditions of each SFI (e.g. B1 requires 12.5 GL/d for 70 days, between June and November, with a minimum of 7 consecutive days). A variety of other non-flow related factors influence whether an event achieves the intended ecological response. Therefore a hydrological 'successful event' should not be interpreted as necessarily being an ecologically successful event.



**Table 8. Testing of Specific Flow Indicators and limits of acceptable change for each reach (from Jacobs, 2014)**

Indicator Description	Minimum consecutive days	Start month	End month	Target	FREQUENCY			LIMITS OF CHANGE	
					Baseline (R845)	Benchmark (R23400)	Proposal (R23479)	Test result	
<b>MURRAY - BARMAH-MILLEWA FOREST</b>								passed	
B1	12.5 GL/d for 70 days	7	Jun	Nov	70 - 80 %	50%	83%	83%	passed
B2	16 GL/d for 98 days	7	Jun	Nov	40 - 50 %	30%	58%	58%	passed
B3	25 GL/d for 42 days	7	Jun	Nov	40 - 50 %	30%	43%	44%	passed
B4	35 GL/d for 30 days	7	Jul	Jun	33 - 40 %	24%	30%	31%	passed
B5	50 GL/d for 21 days	7	Jul	Jun	25 - 30 %	18%	16%	15%	passed
B6	60 GL/d for 14 days	7	Jul	Jun	20 - 25 %	14%	11%	11%	passed
B7	15 GL/d for 150 days	7	Jun	Dec	30%	11%	39%	40%	passed
<b>MURRAY - GUNBOWER-KOONDROOK-PERRICOOTA</b>								passed	
G1	16 GL/d for 90 days	7	Jun	Nov	70 - 80 %	31%	68%	69%	passed
G2	20 GL/d for 60 days	7	Jun	Nov	60 - 70 %	34%	60%	60%	passed
G3	30 GL/d for 60 days	7	Jul	Jun	33 - 50 %	25%	37%	37%	passed
G4	40 GL/d for 60 days	7	Jul	Jun	25 - 33 %	11%	18%	18%	passed
G5	20 GL/d for 150 days	7	Jun	Dec	30%	7%	25%	25%	passed
<b>MURRAY - HATTAH-KULKYNE LAKES</b>								passed	
H1	40 GL/d for 60 days	7	Jun	Dec	40 - 50 %	30%	46%	46%	passed
H2	50 GL/d for 60 days	7	Jun	Dec	30 - 40 %	19%	32%	32%	passed
H3	70 GL/d for 42 days	7	Jun	Dec	20 - 33 %	11%	17%	17%	passed
H4	85 GL/d for 30 days	7	Jul	Jun	20 - 30 %	10%	13%	13%	passed
H5	120 GL/d for 14 days	7	Jul	Jun	14 - 20 %	8%	8%	8%	passed
H6	150 GL/d for 7 days	7	Jul	Jun	10 - 13 %	5%	5%	5%	passed
<b>MURRAY - RIVERLAND CHOWILLA FLOODPLAIN</b>								passed	
C1	20 GL/d for 60 days	60	Aug	Dec	71 - 80 %	43%	71%	74%	passed
C2	40 GL/d for 30 days	7	Jun	Dec	50 - 70 %	37%	61%	61%	passed
C3	40 GL/d for 90 days	7	Jun	Dec	33 - 50 %	22%	35%	36%	passed
C4	60 GL/d for 60 days	7	Jun	Dec	25 - 33 %	12%	26%	25%	passed
C5	80 GL/d for 30 days	7	Jul	Jun	17 - 25 %	10%	14%	14%	passed
C6	100 GL/d for 21 days	1	Jul	Jun	13 - 17 %	6%	5%	5%	passed
C7	125 GL/d for 7 days	1	Jul	Jun	10 - 13 %	4%	4%	4%	passed
<b>MURRAY - EDWARD WAKOOL RIVER SYSTEM</b>								passed	
E1	1,500 ML/d for 180 days	1	Jun	Mar	99 - 100 %	96%	92%	96%	passed
E2	5 GL/d for 60 days	7	Jun	Dec	60 - 70 %	39%	63%	66%	passed
E3	5 GL/d for 120 days	7	Jun	Dec	35 - 40 %	22%	36%	35%	passed
E4	18 GL/d for 28 days	5	Jun	Dec	25 - 30 %	15%	16%	16%	passed
E5	30 GL/d for 21 days	6	Jun	Dec	17 - 20 %	12%	11%	11%	passed
<b>LOWER DARLING - LOWER DARLING FLOODPLAIN</b>								passed	
1	7 GL/d for 10 days	10	Jan	Dec	70 - 90 %	51%	59%	60%	passed
2	17 GL/d for 18 days	18	Jan	Dec	20 - 40 %	18%	25%	25%	passed
3	20 GL/d for 30 days	30	Jan	Dec	14 - 20 %	10%	11%	11%	passed
4	25 GL/d for 45 days	45	Jan	Dec	8 - 10 %	8%	8%	8%	passed
5	45 GL/d for 2 days	2	Jan	Dec	8 - 10 %	8%	8%	8%	passed

Note: The frequency columns have been colour coded to show more frequent events in darker shades of green, with less frequent events in lighter shades of green.

Table 9. Testing of limits of acceptable change for the Coorong, Lower Lakes and Murray Mouth (from Jacobs, 2014)

Indicator Description	Start month	End month	Target	FREQUENCY			LIMITS OF CHANGE
				Baseline (R845)	Benchmark (R23400)	Proposal (R23479)	Test result
COORONG, LOWER LAKES, MURRAY MOUTH INDICATORS							passed
1 Lake Alexandrina salinity: Percentage of days that Lake Alexandrina salinity is less than 1,500 EC	Jul	Jun	100%	96%	100%	100%	passed
1 Lake Alexandrina salinity: Percentage of days that Lake Alexandrina salinity is less than 1,000 EC	Jul	Jun	95%	89%	97%	98%	passed
2 Barrage flows: Percentage of years that barrage flows are greater than 2,000 GL/yr (measured on a three year rolling average) with a minimum of 650 GL/yr	Jul	Jun	95%	75%	97%	97%	passed
3 Barrage flows: Percentage of years that barrage flows are greater than 600 GL for any two year period	Jul	Jun	100%	98%	100%	100%	passed
4 Coorong Salinity: South Lagoon average daily salinity 96th percentile (grams per litre)	Jul	Jun	100	112	82	79	passed
5 Mouth Openness: Percentage of years mouth open to an average annual depth of 1.0 meters (-1.0 m AHD) or more	Jul	Jun	90%	76%	94%	95%	passed
5 Mouth Openness: Percentage of years mouth open to an average annual depth of 0.7 metres (-0.7 m AHD) or more	Jul	Jun	95%	84%	97%	98%	passed

Note: The frequency columns have been colour coded to show events that exceed the target in green, and events that do not meet the target in orange.

**Table 10. Net increase in number of successful events and maximum duration of dry spells for each SFI (from Jacobs, 2014)**

Indicator Description	Minimum consecutive days	Start month	End month	NUMBER OF SUCCESSFUL EVENTS			MAXIMUM DRY SPELL (YEARS)			
				Benchmark (R23400)	Proposal (R23479)	Net increase	Benchmark (R23400)	Proposal (R23479)	Net increase	
<b>MURRAY - BARMAH-MILLEWA FOREST</b>										
B1	12.5 GL/d for 70 days	7	Jun	Nov	95	95	0	4	4	0
B2	16 GL/d for 98 days	7	Jun	Nov	66	66	0	7	7	0
B3	25 GL/d for 42 days	7	Jun	Nov	49	50	1	10	10	0
B4	35 GL/d for 30 days	7	Jul	Jun	34	35	1	16	16	0
B5	50 GL/d for 21 days	7	Jul	Jun	18	17	-1	22	22	0
B6	60 GL/d for 14 days	7	Jul	Jun	13	13	0	24	24	0
B7	15 GL/d for 150 days	7	Jun	Dec	44	46	2	6	6	0
<b>MURRAY - GUNBOWER-KOONDRÖÖK-PERRICÖÖTA</b>										
G1	16 GL/d for 90 days	7	Jun	Nov	77	79	2	9	9	0
G2	20 GL/d for 60 days	7	Jun	Nov	68	68	0	9	9	0
G3	30 GL/d for 60 days	7	Jul	Jun	42	42	0	13	13	0
G4	40 GL/d for 60 days	7	Jul	Jun	21	21	0	21	21	0
G5	20 GL/d for 150 days	7	Jun	Dec	29	29	0	21	21	0
<b>MURRAY - HATTAH-KULKYNE LAKES</b>										
H1	40 GL/d for 60 days	7	Jun	Dec	53	53	0	13	9	-4
H2	50 GL/d for 60 days	7	Jun	Dec	36	36	0	13	13	0
H3	70 GL/d for 42 days	7	Jun	Dec	19	19	0	21	21	0
H4	85 GL/d for 30 days	7	Jul	Jun	15	15	0	22	22	0
H5	120 GL/d for 14 days	7	Jul	Jun	9	9	0	24	24	0
H6	150 GL/d for 7 days	7	Jul	Jun	6	6	0	38	38	0
<b>MURRAY - RIVERLAND CHOWILLA FLOODPLAIN</b>										
C1	20 GL/d for 60 days	60	Aug	Dec	81	84	3	4	4	0
C2	40 GL/d for 30 days	7	Jun	Dec	70	70	0	9	9	0
C3	40 GL/d for 90 days	7	Jun	Dec	40	41	1	13	13	0
C4	60 GL/d for 60 days	7	Jun	Dec	30	29	-1	22	22	0
C5	80 GL/d for 30 days	7	Jul	Jun	16	16	0	22	22	0
C6	100 GL/d for 21 days	1	Jul	Jun	6	6	0	38	38	0
C7	125 GL/d for 7 days	1	Jul	Jun	5	5	0	38	38	0
<b>MURRAY - EDWARD WAKÖÖL RIVER SYSTEM</b>										
E1	1,500 ML/d for 180 days	1	Jun	Mar	105	109	4	4	3	-1
E2	5 GL/d for 60 days	7	Jun	Dec	72	75	3	4	4	0
E3	5 GL/d for 120 days	7	Jun	Dec	41	40	-1	11	10	-1
E4	18 GL/d for 28 days	5	Jun	Dec	18	18	0	22	22	0
E5	30 GL/d for 21 days	6	Jun	Dec	13	13	0	24	24	0
<b>LOWER DARLING - LOWER DARLING FLOODPLAIN</b>										
1	7 GL/d for 10 days	10	Jan	Dec	67	68	1	7	7	0
2	17 GL/d for 18 days	18	Jan	Dec	28	28	0	28	28	0
3	20 GL/d for 30 days	30	Jan	Dec	13	13	0	29	29	0
4	25 GL/d for 45 days	45	Jan	Dec	9	9	0	29	29	0
5	45 GL/d for 2 days	2	Jan	Dec	9	9	0	29	29	0

Note: ‘Successful events’ are those that achieve the intended hydrologic conditions of each SFI. Given that a variety of other non-flow related factors influence whether an event achieves the intended ecological response, a hydrological ‘successful event’ should not be interpreted as necessarily being an ecologically successful event.

### 3.4. Third party impacts

Third party impacts arise when individuals, who were not involved in a decision by others to undertake an action, incur costs (or benefits) as a result of that action. Third party impacts, which are also sometimes called externalities, are often a point of concern in water resource management when transactions between two willing parties such as a water trade, may give rise to an impact on a “third party” not involved in the transaction.

This section of the guidelines is concerned to predict and control the third party impacts from the operation of the measure. The following potential third party impacts were raised through the review process and are assessed further below:

- Impacts on local irrigators’ rights to ‘borrow’ allocation
- Impacts on irrigators’ access to return flows
- Impacts on access to the forest for recreation
- Impacts on other parties’ rights

The intention of the proposal is that the rule change should be at least neutral if not positive in terms of its impact on third parties. The business case has modelled and analysed the evidence to confirm this outcome.

#### 3.4.1. Borrowing and harvesting

The Barmah-Millewa Forest water agreement was the outcome of a lengthy process of negotiation and involved effectively gifting water for future environmental benefits (refer Sections 1 and 2). The agreement therefore involved a series of arrangements in terms of agreed rights for third parties. The two most significant are:

- The right of local irrigators to ‘borrow’ allocations when announced allocations for entitlements are low and then ‘repay’ them in later seasons. This predates and is in addition to any later carry-over rights.
- The right of irrigators to access and harvest return-flows from the Barmah-Millewa Forest downstream of the site. This differs from most other environmental watering agreements where the return-flows are normally quarantined and shepherded downstream for use at other high-value environmental watering sites.

The proposed rule changes do not change any of these provisions, so it would be difficult to argue that they are likely to cause third party impacts in this regard. The analysis and modelling results were used to confirm the extent to which these rules could be exercised under the benchmark conditions and the proposed rule change. This confirmed that the proposed changes will benefit local borrowing opportunities as more water will be retained in reserve (Figure 6) instead of being used to double-up on other watering initiatives. This has the impact of increasing the amount of BMFEWA borrowed for consumptive use across the year in comparison with the benchmark model (Figure 8).

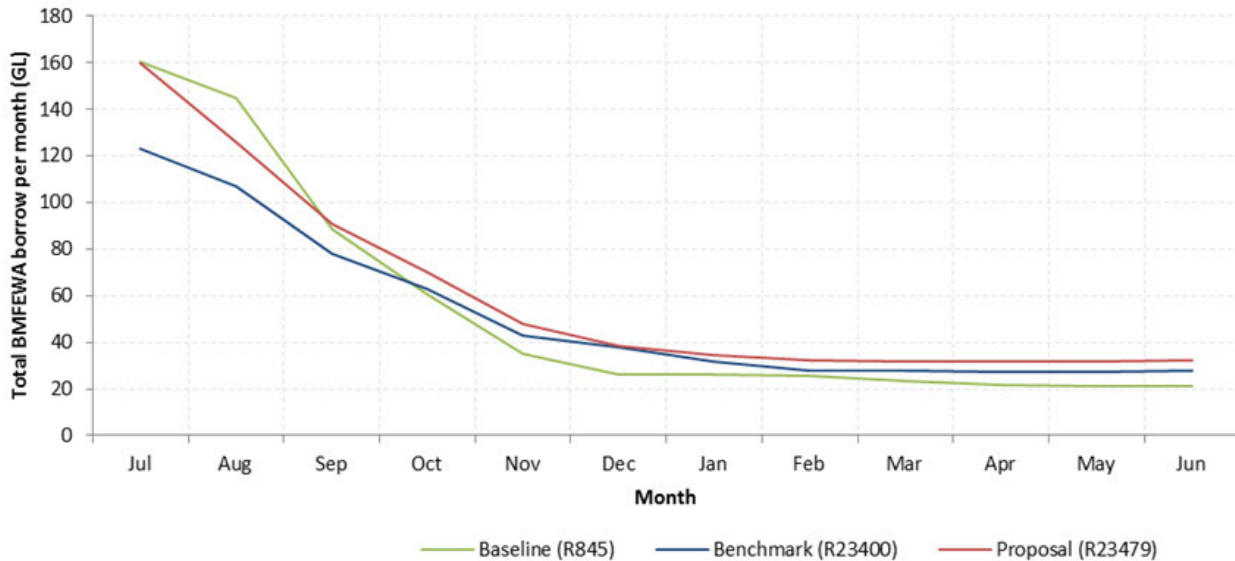


Figure 8. Average total volume of BMFEWA borrowed for consumptive use each month

In terms of the harvesting rights, the total volume of water in the BMFEWA does not change and therefore the total volume available for harvesting does not change. However, there may be some adjustment in the timing of that release within and between seasons.

As expected, modelling has shown some minor variations in a number of statistics associated with water availability compared to the baseline/benchmark conditions, but overall confirmed that there are no significant impacts on reliability<sup>14</sup>.

This section has addressed a component of risk issue 9 in Table 5.

### 3.4.2. Spillable water accounts

There are a number of water accounts held in MDBA reservoirs that are debited when water spills from the storage. These spillable accounts exist at the wholesale and retail water accounting levels. Examples of spillable water accounts at the wholesale level include:

- South Australia’s Storage right
- Barmah-Millewa Forest Environmental Water Allocation
- River Murray Increased Flows in Hume account.

At the retail level, allocations against several types of entitlement can be debited in response to the amount of spill that occurs. These accounts include:

- NSW Adaptive Environmental Water Accounts
- Victorian Spillable Water Accounts.

Debits to these accounts occur as a result of a physical spill from the storage, and may also follow from internal spills from the Victorian or NSW half share of the reservoir volume, depending on the rules governing the specific entitlement type.

<sup>14</sup> Note, DELWP are providing the detailed results and data from the modelling to relevant jurisdictions to inform the assessment of this business case

As noted earlier, the proposed rule change results in BMFEWA releases being made earlier in the season when compared to the benchmark, with the total volume of BMFEWA releases less than the baseline (Figure 7). This change in timing and volume of BMFEWA releases has the potential to influence spill behaviour.

Modelling demonstrates that under both the benchmark and the proposed rule change, physical spills are expected to be lower than experienced under baseline conditions (Figure 9). The difference in spill volumes between the proposal and benchmark is marginal, with the proposal generating total spill volumes only 2% higher than the benchmark (Figure 9). This addresses a component of issue 10 in Table 5.

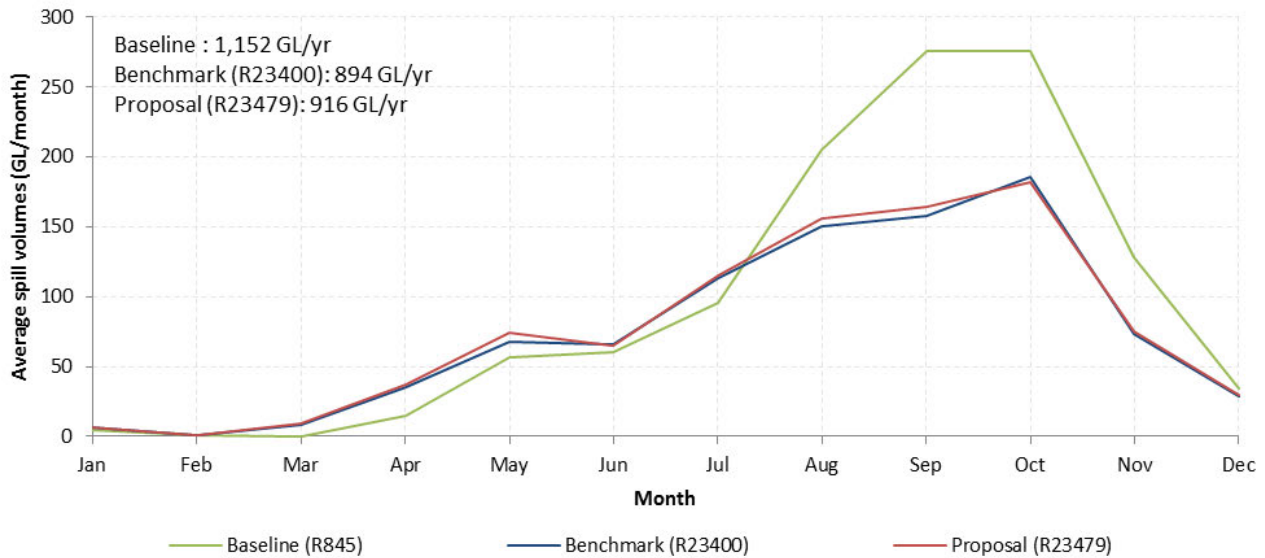


Figure 9. Monthly averaged spills from Lake Hume

### 3.4.3. Flows to South Australia

South Australia has well defined rights regarding flows and water quality at the border. South Australia is concerned to ensure that any change does not materially affect these rights by reducing total flows in the system. This covers risk 10 in Table 5.

The modelling and analysis confirms that the proposed change has virtually no impact on projected flows and average salinities to South Australia each month compared to the benchmark condition (Figure 10 and Figure 11). Both the benchmark and proposal outcomes for flow and salinity are positive when compared to the historic baseline conditions.

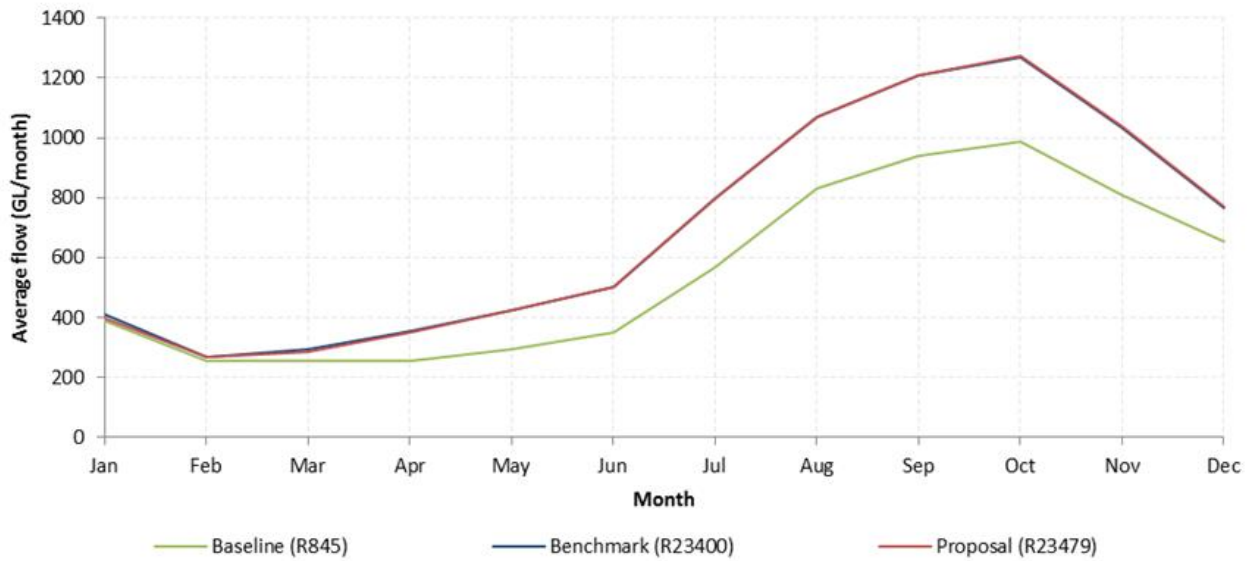


Figure 10. Average flow to South Australia each month

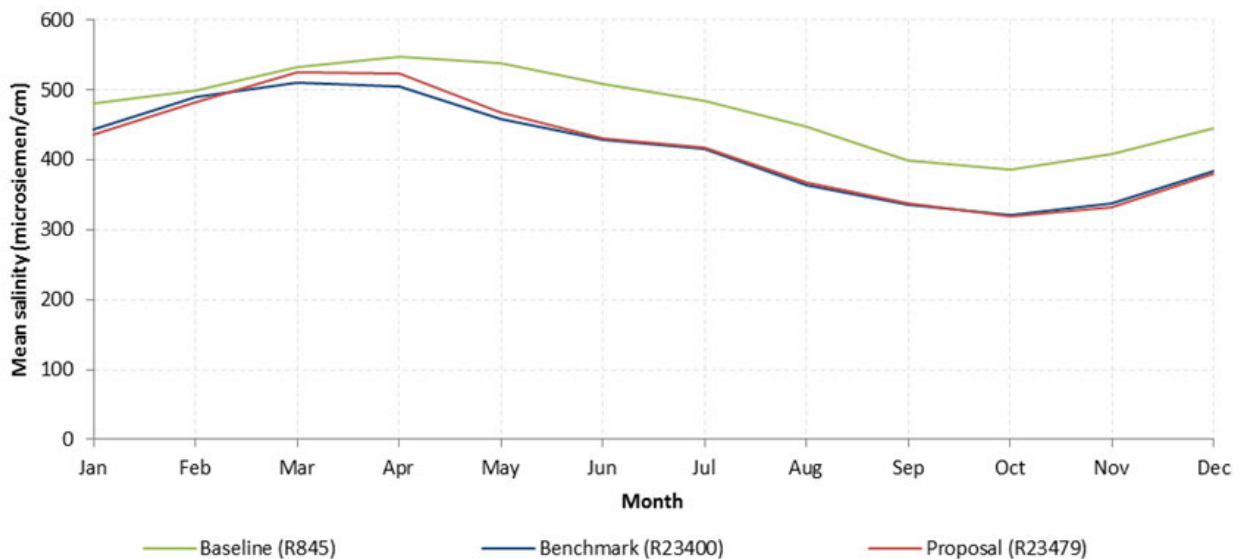


Figure 11. Mean salinity levels at Morgan each month

The annual 95<sup>th</sup> percentile salinity levels at Morgan are also very similar under the benchmark conditions and the proposed rule change. Both these options also exhibit substantial reductions in 95<sup>th</sup> percentile salinity levels in many years in comparison to the baseline conditions (Figure 12).

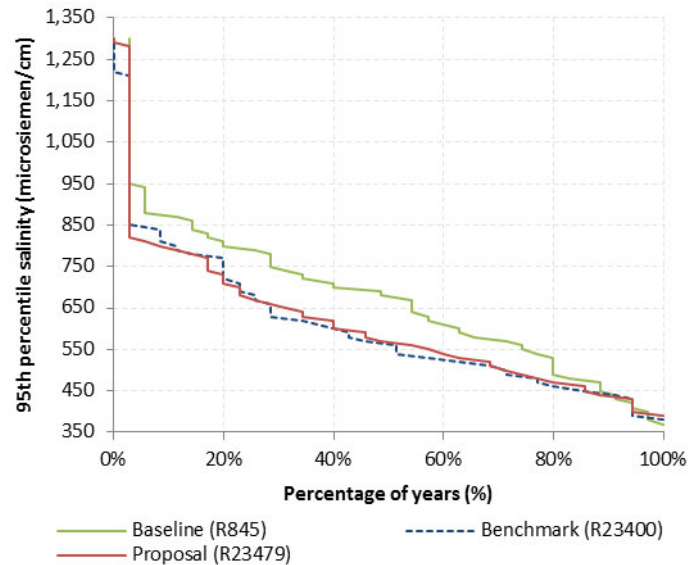


Figure 12. Percentage of years that the annual 95<sup>th</sup> percentile salinity level at Morgan exceeds a given level

In summary the analysis above confirms that the proposed changes to the BMFEWA will maintain average flows and water quality parameters in-line with the benchmark outcomes.

In addition to the above analysis of flow rates and salinity levels, South Australian representatives suggested a broader and more detailed suite of modelling output metrics for consideration in this business case. Appendix 2 provides the detailed results of the assessment against each matter raised by the South Australian representatives. Appendix 2 demonstrates that on every measure of flow and salinity the proposal provides conditions that are better than, or equivalent to, the benchmark conditions. When compared to the baseline, the improvements under the proposal are even more prominent.

### 3.4.4. Recreational users

The Barmah-Millewa Forest provides a wide range of recreational and amenity benefits. That includes camping, walking and horse-riding. The BMFEWA has been used to create a certain pattern of inundation of the forest and wetlands. Local people and tourists have become used to that pattern, although the pattern has varied by extent and duration between seasons.

Implementation of the Basin Plan in its current form will result in more frequent inundation of the Barmah-Millewa Forest, so there will be changes compared to the baseline situation, which may in turn restrict some recreational activities. However, implementation of the proposal should offset these changes to some degree, as the limits on December releases included in the rule change are likely to have a positive impact on access for recreation access over the important Christmas/New Year holiday period.

More broadly, the improved watering of Barmah-Millewa Forest will lead to improved ecosystem health which will enhance future recreational values. This review suggests that the proposal does not represent an adverse risk to recreational users.

The discussion above addresses a component of risk 9 in Table 5.



### 3.5. Other issues

The expert workshop identified a number of additional concerns, which the business case has reviewed:

- *The scope of the proposal is unclear:* The terms of the project brief clearly exclude from the scope any consideration of the forest regulators.
- *Implementation of the CMS reduces the benefits of this proposal.* This issue is dealt with in Section 1.4.4. This suggests that the only interaction would be to increase the value of this proposal as it would allow larger flows upstream of Yarrawonga.
- There is double counting of benefits with the proposal for the Hume airspace management. This issue is dealt with in Section 1.4.4.
- The business case does not reflect the requirements of the Phase 2 Guidelines. This is dealt with in Section 1 which confirms the applicability of the guidelines to operating rule changes.

### 3.6. Outcomes conclusions

The assessment of the outcomes of the project suggests that the proposed change will generate greater environmental benefits than were estimated for the benchmark model while having negligible impact on the total volume available for harvesting, entitlement reliability, physical spill volumes and water quality and quantity to South Australia. Compared to benchmark conditions the proposal will have a minimal or slightly positive impact on recreation, as implementation of the proposal reduces the likelihood of environmental watering impacting recreational access over the summer holiday period.

## 4. Stakeholders

### 4.1. Engagement process

All agencies materially affected by the proposal have been consulted in the development of this business case. These agencies include:

- Murray-Darling Basin Authority
- Water NSW
- Office of Environment and Heritage (NSW)
- NSW National Parks and Wildlife Service
- Parks Victoria
- Department of Environment (Commonwealth)
- Department of Environment, Water and Natural Resources (South Australia)
- Victorian Environmental Water Holder
- Goulburn Broken Catchment Management Authority (CMA)
- Goulburn-Murray Water.

A workshop was held on 15 January 2015 (at DELWP Attwood) and representatives of the state and Commonwealth agencies listed above were informed of the proposal for changes to the BMFEWA operating rules and invited to attend. All agencies were represented at the workshop, except for apologies from the NSW National Parks and Wildlife Service and Goulburn Broken CMA. Goulburn Broken CMA and NSW National Parks and Wildlife Service were subsequently consulted on the detailed proposals. The workshop attendees identified the potential risks of this proposal and interested stakeholder groups. The risks identified in the workshop have been addressed in this business case (Section 3).

Due to the scope and scale of the proposal (operational rule changes), the Department has not embarked on a detailed consultation process with local landholders and interest groups. Engagement undertaken to date has involved consultation with key agencies and providing information to other interested parties of the proposal.

It is prudent, given the larger scale of this SDL adjustment measure (as opposed to a works measure for example), to undertake further consultation with other interested groups following approval of this business case. This approach is recommended as the likely concerns of other groups relate to not just this one proposal, but the broader SDL adjustment process and the interaction with other proposed measures. A targeted and well planned engagement process that includes broader engagement on the topic of SDL adjustment in the Basin is recommended if this measure is to proceed beyond this business case.

The Department proposes to engage further with key stakeholders, in collaboration with partners in SDLAAC including MDBA and Commonwealth, and has costed engagement into this business case (Section 2.4). Costing includes:

- Development of a detailed engagement plan
- Meetings with interested groups
- Meetings with agencies

## 4.2. Stakeholder map

Table 11 lists the stakeholders with an interest in this proposal. Engagement with all stakeholders listed is proposed following approval of this business case.

Table 11. Map of agencies, groups and individual stakeholders with an interest in the SDL adjustment proposal, including their interface with proposal and potential areas of concern

Stakeholder	Role / responsibility	Interface with the proposal	Likely areas of concern	Awareness of proposal
Murray-Darling Basin Authority	Operations planning Constraints management Hydrological modelling Water policy	River operator TLM coordinator / icon site management	Impacts to state water shares Operational planning and management of Lake Hume Achievement of ecological outcomes	Consulted in development of business case
NSW Office of Water	Water policy/planning and water resource allocation.	Water resource manager	Impacts on NSW water users and riparian communities	Consulted in development of business case. Co-sponsor of proposal.
Water NSW	Local storage operations	Water manager	Impacts to other water users	Consulted in development of business case
Goulburn Broken CMA	Waterway manager – Goulburn Broken catchment (Victoria)	Environmental water planning Site management	Achievement of ecological outcomes	Consulted in development of business case
Goulburn-Murray Water	Storage operator, Victorian water entitlements and allocation	Allocations, water planning, accounting	Impacts on Victorian water allocations / entitlements, Accounting	Consulted in development of business case
Office of Environment and Heritage (NSW)	NSW Environmental policy/planning	Environmental water planning	Achievement of ecological outcomes Interface with other environmental water use	Consulted in development of business case

Stakeholder	Role / responsibility	Interface with the proposal	Likely areas of concern	Awareness of proposal
NSW National Parks and Wildlife Service	Barmah-Millewa Forest land manager (NSW)	Land manager	Site management implications Achievement of ecological outcomes	Consulted in development of business case
Parks Victoria and Yorta Yorta Nations Aboriginal Corporation (joint managers)	Barmah- Millewa Forest land manager (Vic)	Land manager	Site management implications Achievement of ecological outcomes	Aware of proposal To be engaged following approval of business case
Department of Environment (Commonwealth)	Support management of Commonwealth environmental water portfolio	Environmental water planning	Achievement of ecological outcomes Interface with other environmental water use	Consulted in development of business case
Department of Environment, Water and Natural Resources (South Australia)	Management of water and environment (South Australia)	Water planning Downstream water user	Implications of proposal on downstream assets and water supply (quantity and quality)	Consulted in development of business case
Commonwealth Environmental Water Holder	Management of Commonwealth environmental water portfolio	Environmental water planning	Achievement of ecological outcomes Interface with other environmental water use	Aware of proposal
Victorian Environmental Water Holder	Management of environmental water entitlements (Vic)	Environmental water planning	Achievement of ecological outcomes Interface with other environmental water use	Consulted in development of business case
Murray Local Land Services	Catchment manager - NSW	Catchment management	Interface with land assets	Aware of proposal

Stakeholder	Role / responsibility	Interface with the proposal	Likely areas of concern	Awareness of proposal
				To be engaged following approval of business case
NSW Fisheries	Fishery stock manager	Stock management- River Murray	Impacts of proposal on fisheries	Aware of proposal To be engaged following approval of business case
Local councils • Moira • Murray Shire (NSW)	Local government authorities	Local asset manager (levees, roads etc.)	Flooding of local assets	Aware of proposal To be engaged following approval of business case
Environment groups: • Wentworth Group • Australian Conservation Foundation • Victorian National Parks Association • Environment Victoria • Goulburn Valley Environment Group • Inland Rivers Network • NSW National Parks Association 'Friends of' groups	Environmental advocates	Ecological outcomes at a local, reach and basin-scale	Achievement of ecological outcomes	Aware of proposal To be engaged following approval of business case
Local action groups: • River Murray Action Group (Bullatale and Wakool) • Hume/Yarrawonga Advisory Committee • Coorong Lower Lakes Murray Mouth Community Advisory Panel	Local community advocates	Represent local community	Third party impacts of proposal	Aware of proposal To be engaged following approval of business case

Stakeholder	Role / responsibility	Interface with the proposal	Likely areas of concern	Awareness of proposal
Irrigation groups: <ul style="list-style-type: none"> <li>• Murray Irrigation</li> <li>• Southern Riverina Irrigators</li> <li>• NSW Irrigators Council</li> <li>• South Australia Water Recovery Advisory Group</li> <li>• Goulburn-Murray Water Water Services Committees</li> </ul>	Irrigator advocates	Impacts on irrigator water rights at a local, reach and basin-scale	Interface with irrigation water demand Share of storages Flooding impacts	Aware of proposal To be engaged following approval of business case
Local State & Federal members	Local community advocates	Represent local community	Third party impacts of proposal	To be engaged following approval of business case
Indigenous Groups	Advocate for indigenous water and cultural interest	Changes to watering on sites of indigenous significance	Impacts on indigenous land and water use	To be engaged following approval of business case

## 5. Project delivery

### 5.1. Project delivery risks

The overarching approach and methodology for the risk assessment requirements of the Phase 2 Guidelines are set out in Sections 3.1 and 3.2 above. That also reports on the review of risks related to adverse ecological impacts and risks from operation of the measure. This section reports on the risks related to the development and delivery of the project.

Appendix 8 of the Guidelines confirms that the primary risks anticipated for 'Project development and delivery' are:

- design risks
- risks to project completion on time
- the risk of project failure
- the inability to deliver the project within budget.

These risks are applicable where major infrastructure is required to implement works and measures. However, these risks are largely immaterial for this proposal as the business case involves an operating rule change.

The main sources of risks for this project are associated with the effective engagement with stakeholders and the provision of appropriate information to resolve any concerns associated with potential third party impacts. Section 4 above outlines a proposed stakeholder engagement strategy. The implementation of that strategy is outside the terms of this business case.

The minor project development and delivery risks are described in more detail, together with the proposed mitigation actions in Table 12. The proposed mitigation actions are expected to reduce all identified risks to acceptably low levels.

Table 12. Risk assessment and mitigation actions

Risk	Potential issue	Risk assessment (prior to mitigation)			Mitigation actions
		Likelihood	Consequence	Risk rating	
1 Failure to engage effectively	Key stakeholders are not engaged in information/consultation processes, resulting in opposition to proposed changes such that project doesn't proceed.	Likely	Moderate	Medium	<p>Well-designed stakeholder engagement program, including the following features:</p> <ul style="list-style-type: none"> <li>• Key stakeholders with an interest in use of BMFEWA (i.e. environmental managers) directly invited to participate in engagement process.</li> <li>• Timing designed to facilitate attendance by interested parties.</li> <li>• Alternative opportunities to provide feedback offered to any key stakeholders that can't attend interactions. <ul style="list-style-type: none"> <li>• Accessible, clear information made widely available for interested groups/individuals to ensure they are aware of the proposed change and understand the limited nature of the change and the fact that it is not expanding the access to water under this entitlement, but rather re-phasing it to better integrate with other environmental water.</li> </ul> </li> </ul>
2 Community opposition to measures	Community members are not convinced that proposals are sound/without unacceptable impacts and project is opposed	Possible	Moderate	Medium	<p>Communication and consultation information/interactions carefully designed to clearly communicate issues:</p> <ul style="list-style-type: none"> <li>• Advice/input gained from experienced agency staff on likely key issues and material designed to clearly address possible questions/concerns.</li> <li>• Leaders of key farmer organisations and community environmental groups briefed on proposals to identify issues and ensure a "no-surprises" approach.</li> <li>• Issues raised in interactions are logged and feedback provided on how they have been addressed/resolved.</li> </ul>



Risk	Potential issue	Risk assessment (prior to mitigation)			Mitigation actions
		Likelihood	Consequence	Risk rating	
3 Project delivery	Detailed development of design of operational changes cannot be undertaken in a timely fashion, so project fails to proceed with other measures.	Possible	Moderate	Medium	<ul style="list-style-type: none"> <li>• Roles and responsibilities for project development and implementation clearly assigned within MDBA and jurisdictions.</li> <li>• Project manager assigned to manage delivery program.</li> <li>• Integration of consultation with wider programs for SDL adjustment and constraints program will minimise calls on staff time for stakeholder engagement and ensure project advances in parallel with other elements of a “package”</li> </ul>

## 5.2. Legal and regulatory requirements

Once a package of SDL measures is approved under the provisions set out in the Basin Plan and the Intergovernmental agreement on Implementing Water Reform in the Murray Darling Basin (2013), this rule change can be implemented.

As detailed in Section 2, the proposed rule change is consistent with the provisions of the Murray-Darling Basin Agreement and does not affect any other river operational practices apart from the use and accounting for the BMFEWA.

The key changes that would be required to implement the rule change are:

- Detailed procedures and rules for the use of and accounting for the BMFEWA will need to be updated to reflect the approved rule change.
- Given that the current rules were approved by the Murray-Darling Ministerial Council (in 2007), and the approval of the Ministerial Council is also required for the final package of SDL adjustment measures, it is likely that changes to these multi-state rules for the use of the BMFEWA will also require Ministerial Council approval, on the recommendation of the Basin Officials Committee.
- Once there is inter-jurisdictional agreement to the proposed rule changes, they will need to be implemented in both the NSW and Victorian water entitlement frameworks. These rules are currently given legal force through their inclusion in NSW Water Sharing Plans for the Murray and in the Victorian Bulk Entitlements for the Murray (see Section 2). These instruments will need amendment, or the new rules may be incorporated into the appropriate Water Resource Plans developed by each state under the provisions of Chapter 10 of the Basin Plan.
- The specific objectives and outcomes in the *Objectives and Outcomes for River Operations in the River Murray System (O&O)* document require the MDBA to account for releases from the BMFEWA using a consistent, reliable method that is agreed by NSW and Victoria. Some minor updating of wording in the interpretation notes supporting this objective may be required.

It is not anticipated that there will be any significant legal or regulatory approval barriers to implementation of this rule change, once the change has been adopted as a SDL adjustment measure.

## 5.3. Governance and project management

This operational rule change will require actions to be undertaken by the MDBA and by NSW and Victoria. Given the inter-jurisdictional negotiations and approvals/recommendations required from the Ministerial Council and the Basin Officials Committee it is appropriate that the MDBA should assume project management responsibilities for implementing the change once it has been approved as a SDL adjustment measure. Once the change is approved at the Ministerial/Basin Officials Committee, appropriate NSW and Victorian agency staff can assume responsibilities for managing amendments to the relevant water sharing instruments in each state.

This rule change has similarities to other rule change processes that are frequently undertaken by the Operations Group. The usual model for managing these changes is for the Water Liaison Working Group to monitor project progress and provide advice to the MDBA on issues that may arise, under the overarching oversight of the Basin Official Committee which will monitor the progress in developing the necessary rule changes and will make the necessary recommendations to the Ministerial Council (if required).

Section 1.3 confirms the structured governance arrangements in place for the management of the BMFEWA at an operational level. Implementation of the rule changes in practice will be subject to oversight and direction from the well-established protocols of the cross-jurisdictional *Icon Site Coordinating Committee*. This gives confidence that the proposed changes will be implemented readily and with low cost.

## 5.4. Monitoring and evaluation

The key monitoring and evaluation requirements are to ensure that the approved rule change is being implemented in accordance with the approved provision in the O&Os and the operating procedures, and that it is working as intended in relation to improving the management of the BMFEWA.

The O&O document already incorporates provisions for an annual independent review of the MDBA's performance in river operations activities and that their compliance with the general and specific outcomes and objectives for river operations practices has regard to any matters that are relevant.

This annual review should confirm that the management and accounting for use of the BMFEWA is being undertaken in accordance with the agreed rules. The review process also supports continuous improvement of operational practices, which occur as the MDBA reviews and reports on its own performance and then addresses any recommendations arising from the independent review.

Additionally, the monitoring and evaluation processes incorporated in the Barmah–Millewa Forest Icon Site management processes, which are overseen through the governance arrangements described in Section 1.3, can be used to ensure that the ecological objectives and targets for the forest are being effectively achieved under the changed operating rules.

More broadly, the final monitoring and evaluation plan (MEP) for this operating rule change will be informed by broader intergovernmental arrangements for Basin-wide monitoring and evaluation under the Basin Plan. This measure is expected to contribute to the achievement of outcomes under two key Chapters of the Plan, namely: (i) the delivery of ecological outcomes under Chapter 8; and (ii) under Chapter 10, meeting the relevant sustainable diversion limit/s (SDLs), which must be complied with under the states' relevant water resource plan/s (WRPs) from 1 July 2019.

While the MDBA has specific responsibilities regarding evaluation of outcomes at the Basin scale, the states are responsible for reporting on relevant matters once implementation of specific Basin Plan Chapters commence within a state. With regard to this supply measure, this will include five yearly reporting on environmental outcomes at an asset scale (Chapter 8), and annual reporting on WRP compliance (Chapter 10). Victoria's participation in the MDBA's monitoring and evaluation framework will effectively allow for outcomes under both Chapters to be effectively assessed and reported.

This approach closely aligns with agreed arrangements under the *Basin Plan Implementation Agreement*, where implementation tasks are to be as streamlined and cost-efficient as possible.

## 6. Conclusion

This business case proposes a limited number of simple changes to the operating rules for the release of the BMFEWA that will drive greater integration with other initiatives. These changes will enable the BMFEWA to be used more effectively, and improve the number of successful environmental events that can be delivered, within the same overall volume of allocation.

There are several ways these outcomes are generated:

- When the forest's needs have already been met by other watering initiatives, the carryover rules in BMFEWA mean that the allocation can be used in other seasons when the Basin Plan environmental water cannot meet its demands
- By curtailing releases in months when low environmental benefits are achieved (e.g. in December) the same allocation can be used at other times to generate improved outcomes.

The modelling shows that with the proposed rule change in place, significantly improved environmental outcomes can be achieved compared to the benchmark modelling, utilising the same 2,750 GL of environmental water recovery. This creates the potential for this rule change to make a positive contribution to a package of measures that could be assessed for SDL adjustment opportunities, and modelling studies have confirmed the potential for this rule change to contribute significantly to SDL adjustment volumes.

Modelling has identified that third party impacts will be broadly positive in outcome, with local irrigators gaining increased opportunity to 'borrow' allocation in years of low announced allocations. Equally, flows across the border to South Australia meet current and projected values in terms of flow and water quality.

The project will be low cost to implement as a rule change and is subject to robust governance and project management controls.

The business case recommends that a comprehensive stakeholder engagement exercise is rolled-out to ensure community understanding and support for the proposal and to minimise risks of local opposition.

## 7. References

Jacobs 2014. Modelling Investigation of Barmah-Millewa BMFEWA rules and Forest Regulator use to achieve environmental outcomes, Report for Department Of Environment and Primary Industries.

MDBA 2012. Hydrologic modelling to inform the Basin Plan: Methods and results, Feb 2012.

MDBA 2014. The Living Murray story - The Living Murray icon sites. Webpage available at <http://www.mdba.gov.au/media-pubs/publications/living-murray-story/contents/tlm-icon-sites>.

Murray Water Entitlement Committee 1997. Sharing the Murray – Proposal for defining people’s entitlements to Victoria’s water from the Murray, October 1997

SDLAAC 2014. Phase 2 Assessment Guidelines for Supply and Constraint Measure Business Cases

# Appendices

## Appendix 1. Summary of response to the Phase 2 Assessment Guidelines

This section confirms how this business case delivers against each of the relevant requirements of the SDLAAC Phase 2 Guidelines. The following table lists the requirements and then records where the issue is dealt with in this business case.

Table 13. Concordance - Phase 2 Guidelines and Business case

Guidelines Section	Heading	Requirement	Business Case Section
3.1.1	Supply measure definition	Defines the requirements for supply measures to: <ul style="list-style-type: none"> <li>• operate to increase the quantity of water</li> <li>• achieve equivalent environmental outcomes with a lower volume of water</li> <li>• have no detrimental impacts</li> </ul>	2, 3.3 & 3.4
3.1.2	Measures not included in the benchmark conditions of development	Confirm that the measure was not in the benchmark conditions of development	1.4
3.2	Constraint measure requirements	Defines application of guidelines to constraint measure initiatives	Not applicable to this business case
3.3	Operational by June 2024	The measure must be capable of entering into operation by 30 June 2024	0
3.4.1	The measure is a 'new measure'	Confirm the measure has not received funding or have funding approved	1.4.5
3.4.2	Compliance with the purposes of the Water for the Environment Special Account	Defines funding eligibility for constraint measure initiatives	Not applicable to this business case
4.1	Project details	Key project details and overview	1 & 2
4.2	Ecological values of the site	Description of the ecological values of the site	2.2 & 3.3
4.3	Ecological objectives and targets	Confirm objectives and targets	2.2 & 3.3
4.4.1	Anticipated ecological benefits	proposed outcomes from the investment	3.3

Guidelines Section	Heading	Requirement	Business Case Section
4.4.2	Potential adverse ecological impacts	Assessment of potential adverse impacts	3.3
4.5.1	Current hydrology and proposed changes	Clear articulation of current and proposed hydrology	0 & 3.3
4.5.2	Environmental water requirements	Water requirements of new inundated areas	3.3
4.6	Operating regime	Explanation of the role of each operating scenario	0
4.7	Assessment of risks and impacts of the operation of the measure	Assessment of risks and mitigation options	3
4.8	Technical feasibility and fitness for purpose	Evidence that the project infrastructure is technically feasible	Not applicable to this rule change business case
4.9	Complementary actions and interdependencies	Confirm interaction with other initiatives	1.4
4.10	Costs, Benefits and Funding Arrangements	Detailed costing and listing of benefits	2.4 & 3
4.11.1	Stakeholder management strategy	Confirm stakeholder list and stakeholder management strategy	4
4.11.2	Legal and regulatory requirements	Legal and regulatory requirements	5.2
4.11.3	Governance and project management	Governance and project management	5.3
4.11.4	Risk assessment of Project Development and Delivery	Risks from project development and delivery	5.1
Appendix 6	Summary of key evaluation criteria	Listing of evaluation criteria and Guideline reference	All
Appendix 8	Categories of risk and impact that should be considered in business case development	Categories of risk and impact that should be considered in business case development	3 & 5.1

## Appendix 2. Detailed assessment of matters raised by South Australia

Environmentally Sustainable Level of Take (ESLT) flow and salinity indicators for Coorong, Lower Lakes and Murray Mouth	Baseline	Benchmark (R23400)	Proposal (R23479)
Average salinity (g/L) in Coorong southern lagoon over model period	62	46	45
Maximum salinity (g/L) in Coorong southern lagoon over model period	291	159	131
Max period (days) salinity in Coorong southern lagoon is greater than 130 g/L	323	129	6
Proportion of years salinity in Coorong southern lagoon < 100 g/L	82%	96%	96%
Average salinity (g/L) in Coorong northern lagoon over model period	29	22	22
Maximum salinity (g/L) in Coorong northern lagoon over model period	148	91	76
Max period (days) salinity in Coorong northern lagoon is greater than 50 g/L	604	197	168
Proportion of years 3 year rolling average barrage flow greater than 1,000 GL/y	91%	99%	99%
Proportion of years 3 year rolling average barrage flow greater than 2,000 GL/y greater than 95%	79%	96%	99%

Lakes metrics	Baseline	Benchmark (R23400)	Proposal (R23479)
% days Lake Albert salinity exceeds 2000 EC	6%	1%	1%
% days Lake Alexandrina salinity exceeds 1000 EC	11%	3%	2%
% days Lake Alexandrina level below 0.4 m	18%	5%	5%



### **Appendix 3. Outcomes of key issues workshop - 15 January 2015**

This section records the key issues raised by the cross-jurisdictional workshop at Attwood held to engage key agency stakeholders in the proposed SDL adjustment business cases for the operating rule change supply measure for the Barmah-Millewa environmental watering program. These issues are recorded in a tabular form in Table 5 above. The numbers after each sub-heading report the number of votes allocated to that issue by the workshop participants.

The issues raised are addressed in Section 3 above.

#### **Are the water needs of the forest being met? (16)**

- e.g. Colonial water birds
- Do the rules themselves need to be changed, eg. not constraining water to rules

#### **Are we providing more water than needed (6)**

- At some times / all times?

#### **Is it a real 'saving' (11)**

- Is it an actual change?
- Will it maintain the same level of model uncertainty?
- Will it just substitute other water for the BMFEWA? (5)

#### **Will the proposal change the rules? (7)**

- Will it prevent current uses?
- Will it adopt current working practice?

#### **Scope – are forest regulators included? (0)**

- Answer: No.

#### **Constraints interaction? (11)**

- What are the likely interactions between this proposal and the Constraints Strategy?
- Would implementation of reduced constraints in flow below Hume increase or decrease the SDL offset benefits?

#### **Interaction with Hume proposal?**

- Is there double counting with the savings from the Hume airspace SDL business case?

**Interaction with improved knowledge of forest water need – post 2009 (11)**

- The benchmark model is based on operating protocols in 2009. Operation of the BMFEWA since 2009 has led to changes and improvements, e.g. Moira grass needs and black water management
- How will these changes be incorporated in the proposal?

**Will this proposal affect the BMFEWA rules (9)**

- Will it impact on rules for harvesting of return flows down-stream?
- Will it impact on the borrow / repay rules for local irrigators?

**Downstream South Australia impacts (7)**

- How will the changes impact on South Australia rights?

**Business Case Guidelines**

- Be clear on the application of the SDLAAC Phase 2 Guidelines on Operating Rule changes.

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