



# REVIEW OF PERFORMANCE AGAINST OBJECTIVES AND OUTCOMES - 2019/20

*Report of the Independent River Operations Review Group -  
an advisory committee established by, and reporting to, the  
Murray-Darling Basin Authority*

September 2020

This report was written by the independent panel for the Murray–Darling Basin Authority. The views expressed in this document are those of the panel and may not reflect the views of the MDBA. This work is licensed under the *Creative Commons Attribution 4.0 International Licence*. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

Version control			
Version	Revision date	Author/modifier	Distributed to
Draft for comment	11/9/2020	IRORG	Draft to jurisdictional contact officers and MDBA for comment
Final report	30/9/2020	IRORG	Final report to MDBA

# Reviewers' Foreword

Mr Phillip Glyde  
Chief Executive Officer  
Murray-Darling Basin Authority

30 September 2020

Dear Mr Glyde

The Independent River Operations Review Group (IRORG) is pleased to submit to the Murray-Darling Basin Authority its review of the River Murray operations for 2019/20, and in particular the Authority's compliance with the General and Specific Objectives and Outcomes (O&O) set out in the O&O document, Version 9, dated 1 June 2019.

IRORG believes that the Authority has fulfilled its obligations under the Objectives and Outcomes document during 2019/20, with a few minor and justifiable exceptions.

A number of key issues arising from this review is described in Section 7 of the report. Notably, there has been considerable progress made in addressing capacity sharing and shortfall risks, and renewed attention is being directed to the management of the call-out of inter-valley transfer accounts. In this report, IRORG encourages a more quantitative approach to assessing risks to aid in balancing the objectives of efficient water management, meeting both consumptive and environmental demands and maximising harvesting opportunities.

Last year, IRORG recommended that the MDBA and jurisdictions develop agreed communication strategies and procedures, and we are very pleased to see significant advancements in communications and information provision.

IRORG appreciates the assistance provided by your staff, together with key staff in the jurisdictions.

Yours sincerely



Peter Hoey  
Chair



Terry Hillman  
Member



Garry Smith  
Member



Brett Tucker  
Member

# Contents

<b>Reviewers' Foreword</b> .....	<b>iii</b>
<b>Executive Summary</b> .....	<b>vi</b>
Summary of recommendations.....	viii
<b>List of Abbreviations</b> .....	<b>ix</b>
<b>1 Introduction</b> .....	<b>1</b>
<b>2 Review Process</b> .....	<b>2</b>
<b>3 Seasonal context for river operations</b> .....	<b>3</b>
<b>4 Performance against General O&amp;Os (O&amp;O Clause 4)</b> .....	<b>6</b>
<b>5 Performance against Specific O&amp;Os (O&amp;O Clause 5)</b> .....	<b>11</b>
<b>6 Other provisions in the O&amp;O document</b> .....	<b>15</b>
<b>7 Issues relevant to the General and Specific O&amp;Os</b> .....	<b>20</b>
7.1 Operational trade-offs [GO&O 4.2] .....	20
7.2 Capacity sharing and shortfall risks [GO&O 4(2)(b)(iii)] .....	22
7.3 Management of IVT call outs [GO&O 4(2)(b)(iii)].....	23
7.4 Water accounting [GO&O 4(2)(b)(ii), O&O Cl. 14(1)(b)] .....	24
7.5 Loss reporting and management [GO&O 4(2)(b)(i)] .....	24
7.6 Environmental water delivery and accounting [GO&O 4(5)] .....	25
7.7 Bushfire water quality risks [GO&O 4(4)(b)(iii)] .....	26
7.8 Improving operational planning and forecasting [GO&O 4(2), O&O Cl. 10].....	26
7.9 SO&O targets [Multiple SO&Os] .....	27
7.10 Information provision [GO&Os 4(4)(b)(i), 4(6)(b)(i)] .....	28
<b>8 Conclusion</b> .....	<b>29</b>

# Tables

Table 1: Summary of MDBA performance against General O&Os for 2019/20.....	8
Table 2: Assessment of MDBA performance against Specific O&Os for 2019/20 .....	12

# Figures

Figure 1: Rainfall deciles for winter/spring (left) and summer/autumn (right).....	3
Figure 2: River Murray system inflows for 2019/20 water year .....	4
Figure 3: Trade-offs in river operations.....	21

# Executive Summary

IRORG has undertaken a review of the MDBA's performance in river operations for the 2019/20 water year. This review included consideration of the MDBA's performance in managing the river to meet the states' consumptive and environmental water demands and its compliance with the provisions of the Objectives & Outcomes document.

IRORG's review process is based around identification of key issues via three main lines of evidence:

- issues documented in the MDBA's River Murray System - Summary of River Operations report – 2019-20 Water Year,
- issues raised in interviews and in submissions by jurisdictions; and
- any issues arising from IROrg's own review of available information.

The dry conditions of the previous two years continued through spring and summer, and severe bushfires affected large parts of upper Murray catchments during the 2019/20 summer. Conditions changed significantly from January onwards, with significant rainfall in the northern basin and above average rainfall occurring across the southern basin in March and April. Bushfires affected large parts of the upper Murray catchments during the 2019/20 summer. Approximately 56% of the upper Murray catchment was impacted by bushfire, bringing with them the risk of water quality issues in the post bushfire period.

The water year opened with storages holding 36% of their active capacity. Overall, inflows were well below average, with actual inflows at levels that would be expected to be equalled or exceeded in 88% of years, based on historical records. Despite significant rainfall in the northern basin in early 2020, inflows into the Menindee Lakes were not enough to take the storage level above 640 GL, which is the threshold for a return to MDBA control as part of the shared resource, so Menindee Lakes remained under NSW control for all of the 2019/20 water year.

IRORG's assessment is that the MDBA performed well throughout 2019/20 and monitored system performance closely and responded appropriately with adjustments to operations in the face of these challenging conditions. All jurisdictions endorsed this overall assessment of the MDBA's performance.

IRORG considers that all the general objectives for river operations were achieved overall in 2019/20, despite one specific outcome area receiving a "qualified achievement rating". The area in question was the management of hydrometric stations. The MDBA contracts states to undertake hydrometric monitoring, and advised IROrg that it is moving to ensure all states can provide formal assurance of data quality and methods. Whilst the states use competent staff and experienced contractors, in the absence of formal assurance around methods and data quality, IROrg opted to assign a qualified achievement rating.

The Authority also performed well in complying with the specific objectives and outcomes. In total, 98% of the SO&Os were fully achieved, whilst the one area of qualified achievement related to minor breaches of flow targets which had no material impact on river operations, the environment, or communities.

IRORG believes that the Authority has generally complied with range of provisions in the O&O document that set out procedural arrangements to support and enable delivery of outcomes in the general and specific O&Os.

The MDBA has also delivered a number of important initiatives during 2019/20. There has been a substantial focus on improving communication activities to ensure stakeholders are better informed around the river operations and water management issues. The MDBA also undertook a Level of Service Review which reviewed and documented the services and service standards currently provided for environmental watering activities and identified potential future improvements. This work was overseen by the newly formed Environmental Water Improvement Group (EWIG). Jurisdictions warmly endorsed the formation of EWIG as a positive initiative.

The MDBA performed well its river operations activities; however, the season presented some challenges and issues that had to be worked through in conjunction with the jurisdictions. IROrg has identified and commented on a range of these issues in this review and made a number of recommendations to support continuous improvement in performance. These issues include the following matters:

- Balance a range of objectives for meeting state orders for water, avoiding shortfalls, maximising harvesting opportunities, and managing the system efficiently to conserve resources.
- Jurisdictions again unanimously identified the resolution of capacity sharing and shortfall risks as one of the most critical issues facing the joint venture in relation to river operations. All jurisdictions provided positive feedback on the progress made by the MDBA on the Capacity Sharing and Shortfall Risks project in 2019/20.
- Water accounting is an essential task for effective water resource management. IROrg is of the view that states need to ensure they are meeting their obligations to provide final metred use data in a timely manner so that the MDBA has access to the best available data to support river operations and planning.
- Losses are an inevitable part of river management and are heavily influenced by a range of factors, many of which are outside the control of the system operators. IROrg believes that the MDBA should continue to focus on enhancing the monitoring, analysis and reporting of losses in the River Murray system.
- As noted, bushfires affected large parts of the River Murray catchments in 2019/20. MDBA staff undertook significant work to map burnt areas, assess water quality risks and develop potential mitigation actions. In order to build on this good work, the MDBA should develop a business continuity plan for responding to bushfire and consider the use of formal incident management processes for these types of events.
- The MDBA has been working on the implementation of new tools to enhance their ability to develop operational plans. The key tool is the Source water system modelling platform which can be run in operational planning mode to rapidly develop forecasts, plans and scenarios for system operations. IROrg strongly supports this initiative and encourages the MDBA and jurisdictions to allocate a priority to its implementation.

# Summary of recommendations

As part its 2020 review, IRORG has identified a number of opportunities for improvement in river operations and water sharing activities. The five recommendations from the 2020 review are summarised below, together with a reference to the relevant section of the report where further detail and background can be found.

## ***Operational trade-offs (Section 7.1, page 20)***

2020.01 IRORG **recommends** that the MDBA consider adopting a more quantitative risk assessment approach to provide improved clarity and assist in making complex river operations trade-off decisions.

## ***Water accounting (Section 7.4, page 24)***

2020.02 IRORG **recommends** that the MDBA and jurisdictions develop principles to guide the application of retroactive updates to accounts in circumstances where there may be a material impact on water available to a state.

## ***Loss reporting and management (Section 7.5, page 24)***

2020.03 IRORG **recommends** that the MDBA continue to focus on enhancing the monitoring, analysis and reporting of losses in the River Murray system.

## ***Bushfire water quality risks (Section 7.7, page 24)***

2020.04 IRORG **recommends** that the MDBA develop a business continuity plan for responding to bushfire, and that it also considers the use of formal incident management processes for these types of events.

## ***SO&O targets (Section 7.9, page 27)***

2020.05 IRORG **recommends** that the MDBA establish a program to progressively review relevant SO&O targets to establish meaningful indicators with realistic tolerances appropriate for operation of a large, complex water system.

# List of Abbreviations

Act	Commonwealth <i>Water Act 2007</i>
Agreement	Murray-Darling Basin Agreement
AOO	Annual Operating Outlook
Authority	Murray-Darling Basin Authority
BOC	Basin Officials Committee
BMF	Barmah Millewa Forest
Committee	Basin Officials Committee
EWC	Environmental Water Committee
EWIG	Environmental Water Improvement Group
GO&O	General Objectives and Outcomes, Clause 4 of the O&O document
IRORG	The Independent River Operations Review Group
IVT	Inter-Valley Transfer (account)
MDBA	Murray-Darling Basin Authority
MDB Agreement	Murray-Darling Basin Agreement
O&O document	Objectives and Outcomes document
PPM	Pre-requisite Policy Measure (refer Chapter 7 of the Basin Plan)
RMIF	River Murray Increased Flows
RMO	River Murray Operations group
RMOC	River Murray Operations Committee
SCBEWC	Southern Connected Basin Environmental Watering Committee
SO&O	Specific Outcomes and Objectives, Appendix A to the O&O document.
WLWG	Water Liaison Working Group

# 1 Introduction

The Murray-Darling Basin Authority is responsible for water sharing and operational management of the River Murray system.

The Murray-Darling Basin Agreement (the Agreement) sets out detailed provisions for the management and sharing of the basin water resources. The Agreement also establishes the functions for the Basin Officials Committee (BOC), which includes making high-level decisions in relation to river operations within the River Murray System. Clause 31 of the Agreement requires BOC to approve an Objectives and Outcomes (O&O) document, which specifies the objectives and outcomes that the Authority should achieve in relation to river operations.

The Agreement and the O&O document provide a framework for the Authority to undertake its river operation functions. The O&O document includes provisions for the Authority to appoint an Independent River Operations Review Group (IRORG) to review river operations. IRORG consists of four members and is an advisory committee established under the provisions of Section 203 of the Water Act 2007 (the Act). IRORG's members<sup>1</sup> are:

- Peter Hoey (Chair)
- Terry Hillman
- Garry Smith
- Brett Tucker

IRORG's terms of reference require it to assess whether the MDBA, in operating the River Murray System, has complied with the General and Specific Objectives and Outcomes set out in the O&O document. IRORG's role also includes identifying any improvements to either the MDBA's processes or the O&O document.

This report sets out IRORG's findings, observations and recommendations on these issues.

---

<sup>1</sup> IRORG members have wide ranging expertise in water management issues. As part of their consulting roles or involvements with state water resource management agencies, IRORG members may have knowledge of or prior exposure to some water management matters that may be addressed in the review. Members disclose these matters, and where appropriate the Chair of IRORG, in consultation with the MDBA's Executive Director River Management, ensures that members with a potential conflict of interest in relation to an issue do not participate in development of IRORG findings on that issue.

## 2 Review Process

The Authority provided IRORG with a range of material to assist it in reviewing river operations during 2019/20. This material included:

- River Murray System - Summary of River Operations report – 2019-20 Water Year.
- River Murray System Annual Operating Outlook 2019-20 Water Year<sup>2</sup>.
- River Murray system Annual Operating Outlook end of October 2019 update<sup>3</sup>.
- The River Murray System Water accounts – as at end of May 2020.
- Objectives and outcomes for river operations in the River Murray System Version 9 – 1 June 2019<sup>4</sup>.

In the course of its review, IRORG also sought and received additional information from the MDBA to address specific questions and information gaps.

IRORG's review process is based around identification of key issues via three main lines of evidence:

- issues documented in the MDBA's River Murray System - Summary of River Operations report – 2019-20 Water Year<sup>5</sup>
- issues raised in interviews and in submissions by the jurisdictions<sup>6</sup>; and
- any issues arising from IRORG's own review of available information

This review addresses the MDBA's performance for the 2019-20 water year, which covers the period 1 June 2019 – 30 May 2020. Following investigation and analysis of all identified issues, IRORG developed its findings, observations and recommendations.

IRORG has relied on the information provided to it by the MDBA and in the verbal and written submissions from jurisdictions in helping it to formulate its findings; however, the conclusions and recommendations included in this report are entirely those of IRORG.

---

<sup>2</sup> This report is available on the MDBA website

<sup>3</sup> *ibid*

<sup>4</sup> *ibid*

<sup>5</sup> This report is subsequently referred to as the Summary of River Operations report.

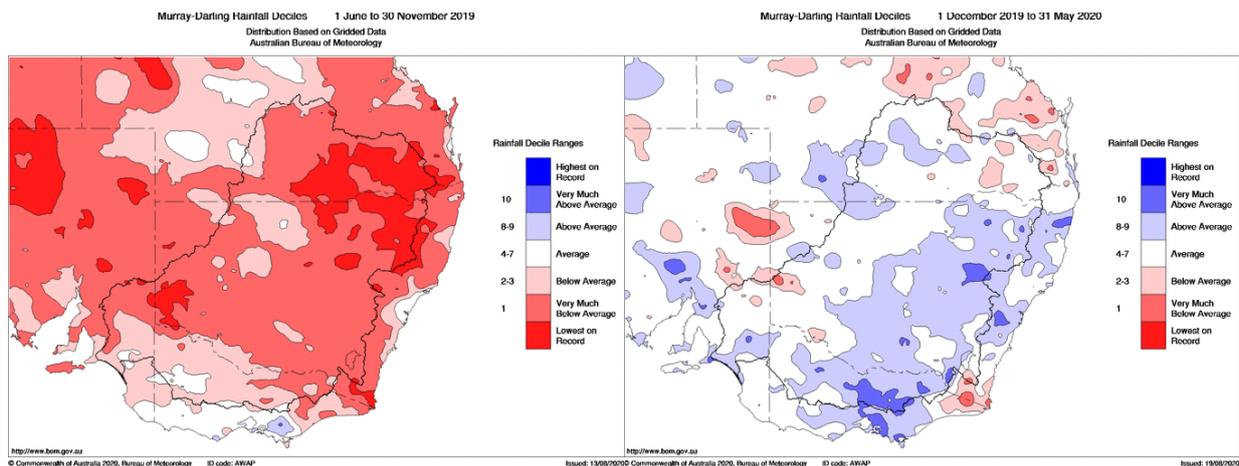
<sup>6</sup> In relation to the operation of the River Murray System, the relevant jurisdictions are the Commonwealth, New South Wales, South Australia and Victoria. These jurisdictions are all represented on the Water Liaison Working Group (WLWG) which advises the MDBA on river operations issues.

# 3 Seasonal context for river operations

The 2019/20 water year was a year of two distinct halves. Overall rainfall for the year was average to below average across most of the southern Murray-Darling Basin (MDB), with above average temperatures. The winter/spring extended and continued the dry conditions of 2017/18 and 2018/19, with below average or very much below average rainfall (see Figure 1) and above average temperatures. Parts of the northern basin experienced the lowest rainfall on record during the winter/spring.

Conditions changed rapidly from January 2020 onwards, with significant rainfall events providing some much-needed relief to drought affected southern Queensland and northern NSW. March and April produced well above average rainfall across the southern MDB (see Figure 1).

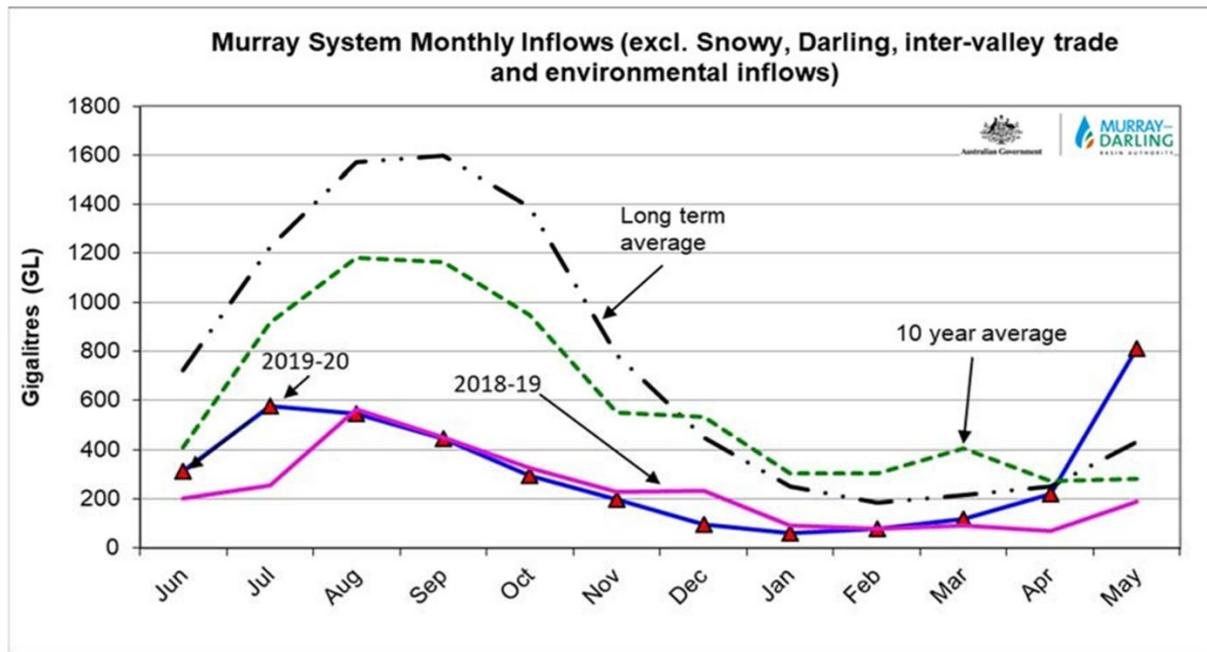
Figure 1: Rainfall deciles for winter/spring (left) and summer/autumn (right)



Inflows reflected these conditions (see Figure 2), with well below average inflows across the important winter/spring storage filling season, and across the summer. Whilst autumn rain events provided a welcome boost to inflows, overall, the water year was again dry with total inflows to the River Murray system<sup>7</sup> of 3,762 GL. Inflows would be expected to equal or exceed this volume in 88% of years, based on historical records.

<sup>7</sup>River Murray System inflows include unregulated inflows to Dartmouth, Hume and from the Kiewa, plus inflows from the NSW and Victorian tributaries excluding environmental water deliveries and IVT, as well as Menindee when not part of the shared resource.

Figure 2: River Murray system inflows for 2019/20 water year



Source: MDBA

The rainfall across the northern basin resulted in total inflows of 460 GL to the Menindee Lakes storages, which enabled a restart of flows in the lower Darling River. These inflows were not enough to take the storage level above 640 GL, which is the threshold for a return to MDBA control as part of the shared resource, so Menindee Lakes remained under NSW control for all of the 2019/20 water year. Total active storage for the River Murray System at the start of the water year was 3,019 GL (36% of maximum), increasing to a maximum volume of 3,955 GL in store during late August. At the end of the water year total active storage was 2,939 GL (35%), just slightly below the volume in store at the start of the water year.

Some of the other important features that affected system operations in 2019/20 included:

- Dry conditions and low inflows saw differing water availability between the predominant entitlement classes in the southern connected Basin, with Victorian high-reliability water shares receiving an allocation of 66% of entitlement volume and SA water entitlements receiving full allocations. The major NSW Murray product in terms of volumes on issue, general security water access licences, received a 3% allocation late in the water year.
- As in 2018/19, the Victorian tributaries downstream of Albury contributed significantly larger volumes than the NSW tributaries, which benefited Victoria's share of the resource.
- In periods of low inflows, where upper states experience limited volumes of water reserves, the MDB agreement includes provisions for special accounting. Under special accounting, inflows are shared equally between South Australia and those states in a period of special accounting with South Australia. In this situation states will receive a reduction in their water availability. In 2019/20, NSW remained in a period of special accounting with SA for the whole water year and Victoria was in special accounting from August 2019, which extended through until the end of April 2020. The SA entitlement for 2019/20 was 1,584 GL, compared to its normal entitlement of 1,850 GL.

- Following concerns raised from 2017 onwards in relation to the adverse impacts of high Inter-Valley Transfer (IVT) releases in the lower Goulburn River, the Victorian Minister for Water wrote to the MDBA in July 2019 to formally request a reduction in high summer releases from the Goulburn. Low water availability and high allocation trade prices saw some trade from the Murrumbidgee system as well as the Goulburn in 2019/20, and IVT deliveries from the Goulburn were able to be limited to 208 GL, significantly lower than the record 444 GL delivered in the previous year. Murrumbidgee IVT deliveries for 2019/20 were 159 GL (0 in the previous year).
- Bushfires affected large parts of eastern Australia during the 2019/20 summer. River Murray catchments were not spared, and approximately 56% of the upper Murray catchment was impacted by bushfire. This created significant potential water quality risks associated with flushing of ash and debris into waterway and MDBA storages in rainfall events after the fire. MDBA staff undertook significant work to map burnt areas, assess water quality risks and develop potential mitigation actions. Fortunately, no major water quality problems occurred, aided by post-bushfire rainfall of low intensity.

# 4 Performance against General O&Os (O&O Clause 4)

Clause 4 of the O&O document sets out a series of general objectives that the Authority should achieve. The O&O also describes a series of target outcomes that are to be delivered in support of these objectives. The General Objectives and Outcomes (GO&Os) are grouped under five main themes:

- Water storage and delivery accounting.
- RMO assets.
- People and communities.
- Environment.
- Communications and information management

The Authority has reported in detail on its performance against each of the target outcomes.

## Key points

- The 2019/20 water year presented a range of challenges for river operations, including drought and bushfire.
- All jurisdictions were of the view that the MDBA performed well, including advancing a number of important initiatives.
- IRORG considers that all the general objectives for river operations were achieved in 2019/20. This performance is summarised and reviewed in Table 1.

**How to read Table 1:** A brief extract of Table 1 is provided below. The text [IN SQUARE BRACKETS AND CAPITALS] summarises the key content of the table, and the additional column to the right provides a description of how the colour coding applied the IRORG assessment column in Table 1 should be interpreted.

O&O Clause	Outcome area	Target outcome	IRORG comments/assessment*	Legend for IRORG assessment rating in the previous column
4(2)	<b>Water Storage and delivery accounting</b>  [GENERAL OBJECTIVE CATEGORY]		<b><i>IRORG considers that the objectives for water storage and delivery and accounting were achieved.</i></b>  [IRORG COMMENTS OR NOTES ON OVERALL ACHIEVEMENT AGAINST THE GENERAL OBJECTIVE. COLOUR OF CELL SHADING INDICATES IRORG ASSESMENT RATING]	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 5px;"><span style="width: 15px; height: 15px; background-color: #4F81BD; margin-right: 5px;"></span> Achieved</div> <div style="display: flex; align-items: center; margin-bottom: 5px;"><span style="width: 15px; height: 15px; background-color: #FFD700; margin-right: 5px;"></span> Qualified achievement</div> <div style="display: flex; align-items: center;"><span style="width: 15px; height: 15px; background-color: #FF8C00; margin-right: 5px;"></span> Not achieved</div> </div>
4 (2) (b) (i)	Water conservation  [INDIVIDUAL OUTCOMES UNDER EACH GENERAL OBJECTIVE]	The conservation of water and minimisation of losses  [BRIEF SUMMARY OF THE TARGET OUTCOME STATEMENT FROM O&O]	The Authority effectively managed losses in a year with high temperatures and low tributary inflows...  [IRORG COMMENTS OR NOTES ON ACHIEVEMENT AGAINST EACH OUTCOME AREA UNDER A GENERAL OBJECTIVE]	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 5px;"><span style="width: 15px; height: 15px; background-color: #90EE90; margin-right: 5px;"></span> Achieved</div> <div style="display: flex; align-items: center; margin-bottom: 5px;"><span style="width: 15px; height: 15px; background-color: #FFD700; margin-right: 5px;"></span> Qualified achievement</div> <div style="display: flex; align-items: center;"><span style="width: 15px; height: 15px; background-color: #FF8C00; margin-right: 5px;"></span> Not achieved</div> </div>

\* IRORG’s assessment of achievement against General O&O. Key to assessment levels is:

- Achieved – Intended outcome was fully achieved in line with the General O&O provisions, or was achieved with only relatively minor or limited deviations, which had no material impact (indicated by green shading in table).
- Qualified achievement – Intended outcome was generally achieved; however, some deviations from the intended outcomes occurred. Deviations were limited in duration, or were largely outside of the control of the MDBA and did not result in significant adverse impacts (*indicated by amber shading in table*).
- Not achieved - Intended outcome was generally not achieved, or deviations which occurred resulted in significant adverse impacts (*indicated by red shading in table*).

Table 1: Summary of MDBA performance against General O&Os for 2019/20

O&O Clause	Outcome area	Target outcome	IRORG comments/assessment*
<b>4(2)</b>	<b>Water Storage and delivery accounting</b>		<b><i>IRORG considers that the outcomes for water storage and delivery and accounting were achieved.</i></b>
4 (2) (b) (i)	Water conservation	The conservation of water and minimisation of losses	The Authority took a range of steps to operate the system efficiently in a year with high temperatures and low tributary inflows. Losses were within historic seasonal ranges. Transfers to Lake Victoria commenced early, within channel capacity in order to meet state water demands. Access to Mulwala Canal assisted in water conservation, and there were no spills from MDBA storages, and no periods of unregulated flow.
4(2) (b) (ii)	Preparation of accounts and water resource assessments	The accurate and timely preparation, delivery, review and, where necessary, amendment of water accounts and water resource assessments.	No jurisdictions raised material concerns with the accuracy or timeliness of accounts. Jurisdictions had confidence in the water resource assessments. The accounts also accurately tracked the volumes of water held in SA's storage right under Schedule G of the MDB Agreement. See also Section 7.4
4 (2) (b) (iii)	Delivery of state water orders	The delivery to the Southern Basin states of their authorised water orders unless physical constraints of the River Murray System prevent this from occurring.	The MDBA met all authorised state water orders in 2019/20. Careful forecasting and monitoring of demands, inflows and storage levels was used to guide system management.
<b>4 (3)</b>	<b>RMO assets</b>		<b><i>IRORG considers that the outcomes for RMO assets were achieved.</i></b>
4 (3) (b) (i)	Effective management of RMO assets	The effective management, maintenance, repair, renewal and replacement, and the protection of the security, of RMO assets.	No asset issues were experienced which limited the MDBA's ability to operate the system and deliver state water orders
4 (3) (b) (ii)	Emergency management	The effective management and mitigation of any emergency occurring at RMO assets.	No emergencies occurred in 2019/20
4 (3) (b) (iii)	Structural and operational integrity of RMO assets	Conduct river operations in ways that protect the structural and operational integrity of RMO assets	Operations were conducted in collaboration with state constructing authorities and within specified operating ranges.
4 (3) (b) (iv)	Flood management	The management of floods in accordance with the criteria established in the O&O.	There were no flood events in 2019/20
4 (3) (b) (v)	More effective environmental delivery	Use existing and new RMO assets to deliver environmental water more effectively.	MDBA used existing assets to support significant environmental deliveries, including through the use of the Barmah Millewa Forest regulators.

O&O Clause	Outcome area	Target outcome	IRORG comments/assessment*
<b>4(4)</b>	<b>People and communities</b>		<b><i>IRORG considers that the outcomes for people and communities were achieved.</i></b>
4 (4) (b) (i)	Maintenance of productive relationships	Productive relationships are maintained with river managers and other stakeholders.	The MDBA maintained effective relationships with jurisdictions and maintained contact and information exchange with a range of stakeholders around river operations. See also Section 7.10.
4 (4) (b) (ii)	Limit flooding damage	Subject to the O&O provisions, damage to downstream communities is limited when managing flooding.	No flood operations were required in 2019/20
4 (4) (b) (iii)	Mitigating water quality impacts	Events that may adversely affect the water quality mitigated.	Significant efforts were made to assess and develop mitigations for bushfire related water quality risks. MDBA monitored and managed the system to avoid other water quality risks, including from restart of flows in the Lower Darling.
4(4) (b) (iv)	Navigation and recreation	Navigational and recreational uses of the River Murray System are properly considered, including major public events using parts of the River Murray System	A calendar of river-based community events was included in the AOO and considered in the development of operational scenarios. Minimum water level targets at specified locations were met.
4 (4) (b) (vi)	Cultural heritage	Appropriate regard is given to cultural heritage matters.	Lake Victoria was operated in accordance with the cultural heritage protection strategy.
<b>4 (5)</b>	<b>Environment</b>		<b><i>IRORG considers that the outcomes for environment were achieved.</i></b>
4 (5) (b) (i)	Achieving multiple objectives	River operations are managed to ensure that multiple objectives can be achieved	MDBA facilitated significant environmental watering activities. Incorporation of environmental water demands in the AOO was significantly improved in 2019/20.
4 (5) (b) (ii)	Improving environmental watering practices	The knowledge, documentary and practice bases for effective environmental watering are all improved.	Review and documentation of the services and service standards provided for environmental watering activities was a significant advance. Further development of environmental watering documents and establishment of Environmental Water Improvement Group were also positive initiatives.
4 (5) (b) (iii)	Timely provision of advice	WLWG and any other relevant committee receive timely information about any significant actual or predicted change to the River Murray System's water resources.	WLWG & SCBEWC chairs were kept informed of the potential for unregulated flows; however, these did not ultimately occur as tributary inflows were able to be re-regulated.
4 (5) (b) (iv)	Reducing adverse environmental impacts	The risk of significant adverse environmental events is reduced, or impacts are mitigated.	The MDBA sought to minimise adverse environmental impacts associated with river operations, subject to continuing to meet state water orders.
4 (5) (b) (v)	Timely provision of environmental	The Authority will supply, in a timely manner, the Water Liaison Working Group and the	Summaries of daily environmental water use estimates were provided monthly to jurisdictions.

O&O Clause	Outcome area	Target outcome	IRORG comments/assessment*
	water use estimates.	participating government environmental water holders with relevant retail and wholesale level estimates of environmental water use if requested by WLWG	
<b>4 (6)</b>	<b>Communication and Information management</b>		<b><i>IRORG considers that the outcomes for communication and information management were generally achieved.</i></b>
4 (6) (b) (i)	Accurate river operations information	The Ministerial Council, BOC, the River Murray Operations Committee, WLWG, other relevant committees, other stakeholders with an interest in the Authority's river operations and the public are each provided with appropriate, timely and accurate information about the Authority's river operations.	The MDBA undertook a range of measures to provide information on river operations, including <ul style="list-style-type: none"> <li>▪ Regular reports to BOC, RMOC and Minco on system operations and resource availability</li> <li>▪ Bimonthly meetings of WLWG, with additional reporting on L. Victoria management.</li> <li>▪ River Murray Weekly reports (51)</li> <li>▪ Website updates and provision of flow data</li> <li>▪ Development and implementation of a comprehensive communication plan in collaboration with states.</li> <li>▪ Media releases (24)</li> </ul> See also Section 7.10.
4 (6) (b) (ii)	Communications with WLWG and BOC	Effective referral of matters to the WLWG & BOC.	Further detail on matters referred is provided in Section 6.
4 (6) (b) (iii)	Implementing review processes and outcomes	Any BOC recommendations in relation to the establishment, terms of reference, operations or recommendations of IRORG are implemented.	BOC approved new Terms of Reference for IRORG, which were implemented for the 2020 review.
4 (6) (b) (iv)	Management of hydrometric stations	Hydrometric stations forming part of RMO assets are managed according to best practice methods to collect, transfer, store and assure the quality of all data.	The MDBA contracts states to undertake hydrometric monitoring and is moving to ensure all states can provide formal assurance of data quality and methods. In the absence of formal assurance around methods and data quality, IRORG has opted for qualified achievement of this GO&O. IRORG has previously recommended development of an overall risk-based data quality assurance strategy and framework for the MDBA river operations.

# 5 Performance against Specific O&Os (O&O Clause 5)

The O&O document includes a range of Specific Objectives and Outcomes (SO&Os) for designated reaches of the River Murray System, designated river operation activities or specific assets.

For the 2019/20 water year, the SO&Os were expanded to include a number of new provisions to support the accounting processes for the implementation of Prerequisite Policy Measures in the River Murray.

IRORG’s assessment of the Authority’s performance in relation to each of the SO&Os for the 2019/20 water year is provided in Table 2. The MDBA also provided detailed reporting to the jurisdictions, so IRORG has focussed on reporting by exception on breaches of the SO&Os in Table 2.

## Key Points

- Overall, the Authority performed well in delivery against the SO&Os in 2019/20, as shown in the following table
- The variations that resulted in the one area of qualified achievement were minor, and the intended outcomes were achieved with no material adverse impacts.

Performance against SO&O	Number of SO&Os	Percentage
Achieved (or not applicable in 2019/20)	56	98%
Qualified achievement	1	2%
Not achieved	0	0%
<b>Total</b>	<b>57</b>	<b>100%</b>

Table 2: Assessment of MDBA performance against Specific O&Os for 2019/20

SO&O Ref. No. <sup>1</sup>	Summary interpretation of SO&O <sup>2</sup>	Assessment <sup>3</sup> (see notes for info. on ratings)	Comments or reference to further explanatory notes
1.1	Dartmouth Dam - maximum planned regulated release	Achieved	
1.2	Dartmouth Dam– Airspace management and flood operations.	Achieved	No flood operations in 2019/20
1.3	Dartmouth Dam - Maximum rate of rise and fall in River level during planned regulated release	Qualified achievement	Frequent minor breaches of rise/fall limits reported, with no identified material impacts. Some of the breaches were associated with AGL power station trips, whilst many associated with short term breaches often due to unavailability of telemetry data. Discussion with AGL on its performance in meeting targets, and/or further review to provide more relevant and achievable tolerances on acceptable rates of fall may be warranted.
1.4	Dartmouth Dam – Minimum planned regulated release	Achieved	
2.1	Hume Dam - Maximum planned regulated releases	Achieved	
2.2	Hume Dam – Maximum rate of fall in River level during planned regulated releases	Achieved	Two minor breaches of rate of fall– no adverse impact reported.
2.3	Hume Dam - Minimum planned regulated releases	Achieved	Some minor breaches at Heywood’s gauge, generally attributed to poor flow measurement accuracy at this location under low flows. Releases through dam outlets complied with minimum flow limits.
2.4	Hume Dam – Directed releases	Achieved	Note: new SO&O in 2019/20
2.5	Hume Dam - Assumed use for directed releases of HEW	Achieved	Note: new SO&O in 2019/20
2.6	Hume Dam - post flood operations, storage to be 99% of full capacity when demand exceeds inflows. Target airspace to be between 30 GL – 386 GL.	Achieved	No flood operations in 2019/20
3.1	Yarrowonga Weir (a) Maximum planned regulated flow downstream of Yarrowonga Weir when inundation of the Barmah-Millewa Forest is desirable (b) Maximum planned regulated flow through the Barmah Choke when inundation of the Barmah-Millewa Forest is undesirable	Achieved Achieved	
3.2	Yarrowonga Weir – flood operations	Achieved	No flood operations in 2019/20
3.3	Lake Mulwala - Management of pool level during the irrigation season.	Achieved	
3.4	Lake Mulwala – Supporting social and recreational use of lake.	Achieved	
3.5	Yarrowonga Weir – Minimum planned regulated release	Achieved	

SO&O Ref. No. <sup>1</sup>	Summary interpretation of SO&O <sup>2</sup>	Assessment <sup>3</sup> (see notes for info. on ratings)	Comments or reference to further explanatory notes
4.1	Barmah-Millewa Forest Environmental Water Allocation accounting provisions	Achieved	No BMF EWA used in 2019/20
4.2	Barmah-Millewa Forest – Regulator operations	Achieved	
5.1	Wakool system – Use of system	Achieved	No transfers through the Wakool system in 2019/20
5.2	Edward River - Offtake operation	Achieved	
5.3	Gulpa Ck. - Offtake operation	Achieved	
5.4	Weraï Forest – Regulator operations	Achieved	
5.5	MDBA water orders d/s of Stevens Weir	Achieved	
7.1	Swan Hill – Minimum water level	Achieved	
8.1	Wentworth Weir – Minimum River Murray flow contribution	Achieved	
9.1	Lake Victoria – Operating Strategy	Achieved	
9.2	Lake Victoria - Inlet and outlet flow rates	Achieved	22 breaches of Rufus River min. flow target, no adverse salinity issues. There may be scope to improve the specification of this target.
9.3	Lake Victoria – Full supply level	Achieved	
9.4	Lake Victoria – Directed releases	Achieved	No directed releases in 2019/20
9.5	Lake Victoria level – Maximum rate of rise in lake level	Achieved	
9.6	Lake Victoria - Improving water quality using Lake.	Achieved	
10.1	Menindee Lakes - Maximum planned regulated release downstream	N/A	Menindee Lakes was not under MDBA control during 2019/20
10.2	Menindee Lakes – Maximum rate of rise and fall in flow rates downstream.	N/A	
10.3	Menindee Lakes - Minimum planned regulated releases	N/A	
10.4	Menindee Lakes - Directed releases	N/A	
10.5	Menindee Lakes – distribution of stored water.	N/A	
11.1	Lower Lakes Barrages – operations.	Achieved	
12.1	Harmony operation of Dartmouth and Hume Reservoirs	Achieved	
12.2	Harmony operation of Menindee Lakes and Lake Victoria	Achieved	
12.3	Additional Dilution Flows to SA	Achieved	
12.4	Bulk transfer from Dartmouth Reservoir to Hume Reservoir	Achieved	
12.5	Bulk transfers from Hume Reservoir to Lake Victoria	Achieved	
12.6	Management of rain rejection events	Achieved	

SO&O Ref. No. <sup>1</sup>	Summary interpretation of SO&O <sup>2</sup>	Assessment <sup>3</sup> (see notes for info. on ratings)	Comments or reference to further explanatory notes
12.7	Unregulated flow advice planning and communication	Achieved	
12.8	River flow variability.	Achieved	
12.9	Use of bypasses of the Barmah Choke	Achieved	
12.10	Lindsay River Allowance	Achieved	
12.11	Dealing with shortfalls in meeting water demands.	Achieved	
12.12	Adjustment of flows to SA for rating table changes.	Achieved	
12.13	Determining the minimum inflow prediction	Achieved	
13.1	Maintenance of the Water Accounts, including the Water Accounting Model, model code and associated data	Achieved	
14.1	Maintenance of the Water Resource Assessment model, including the model code and associated data.	Achieved	
14.2	Minimising the impacts of one state leaving a period of special accounting.	Achieved	
15.1	Advances of water – advances should support critical human water needs and the conveyance reserve, and procedures in SO&O 15.1 to be followed if advances are required.	Achieved	No Tier 2 or 3 water sharing arrangements were in place
15.2	Remedial actions are identified and implemented to support the provision of water for critical human needs, conveyance and the conveyance reserve.	Achieved	No Tier 2 or 3 water sharing arrangements were in place
15.3	Priority for water allocations is given to providing water to meet and deliver critical human water needs.	Achieved	No Tier 2 or 3 water sharing arrangements were in place
15.4	Setting aside the conveyance reserve	Achieved	

**Notes:**

1. SO&O reference is the Section number from the O&O document, Appendix A: Specific Outcomes and Objectives.
2. For full description of outcomes and interpretation, refer to the O&O document, Appendix A: Specific Outcomes and Objectives.
3. IRORG's assessment of achievement against SO&O. Key to assessment levels is:
  - Achieved – Intended outcome was fully achieved in line with the nominated targets in SO&O, or was achieved with only relatively minor or limited duration deviations from the targets, which had no material impact (*indicated by green shading in table*).
  - Qualified achievement – Intended outcome was generally achieved; however, deviations occurred that were either significantly outside targets or extended for a considerable period (e.g. around 10% of time or longer). Deviations did not result in significant adverse impacts (*indicated by amber shading in table*).
  - Not achieved - Intended outcome was generally not achieved, or deviations which occurred resulted in significant adverse impacts (*indicated by red shading in table*).

# 6 Other provisions in the O&O document

There are range of provisions in the O&O document that set out procedural arrangements to support and enable delivery of outcomes in the GO&Os and SO&Os. The MDBA's performance in relation to these provisions is summarised in this section of the report.

## Key Points

- IRORG believes that the Authority has generally complied with the requirements of Clauses 7 – 18 of the O&O document.
- Clause 8 has already been deleted from the O&Os, and IRORG has identified some opportunities for further simplification and clarification of these clauses.

## Emergencies [O&O Cl. 9]

The Emergency Action Plan remained in effect for 2019-20 as required under clause 9 of the O&O document. No emergencies arose and therefore the EAP was not enacted during 2019-2020.

## Preparation of AOO [O&O Cl. 10]

The O&O document requires the MDBA to prepare and adopt an Annual Operating Plan, now referred to as the Annual Operating Outlook (AOO), by 31 July each year. The Plan must have regard for the environmental watering plans of the Commonwealth, The Living Murray and Southern Basin States. WLWG and other relevant committees must also be consulted.

The AOO for 2019/20 was adopted and published on the MDBA website on 31 July 2019, following extensive consultations with WLWG and SCBEWC. In accordance with clause 10(1)(c), RMOC received the AOO at its meeting on 5 September, and the document was provided to BOC on 20 November 2019. The RMO has revised its process of referral to avoid future delays.

IRORG has reviewed the 2019/20 AOO and the process of its development. All jurisdictions reported high levels of satisfaction with the MDBA's improved processes for giving regard to the environmental watering plans of the Commonwealth, The Living Murray and Southern Basin States.

The AOO was reviewed monthly in consultation with WLWG, including the provision of quarterly summaries of data relating to the implementation as required under the O&O. Clause 10(3) of the O&O document also requires the AOO to be reviewed in October every year. The MDBA reviewed the AOO in consultation with WLWG, at the end of October and again at the end of November 2019.

The revised AOO was published in December 2019, the delay arising from continuing negotiations regarding the projected Goulburn IVT deliveries.

The MDBA complied with the requirements for development of the AOO. It is also noted that in July 2019, just prior to the publication of the initial AOO, the Victorian Minister wrote to the MDBA requesting new limits on the maximum volumes of water called out from the Goulburn IVT account during summer. Whilst it was not practical to fully revise the AOO document to incorporate these new scenarios and still meet the July publication deadline, IRORG suggests that it may have been appropriate for the MDBA to add a disclaimer to the July AOO to flag that these new IVT call out targets had not yet been included, and that the October revision of the AOO would address this.

## Determining state water entitlements [O&O Cl. 11]

The MDBA is required to determine the volume of each state's water entitlement by making water resource assessments available monthly, or at such other intervals as the WLWG recommends. The Authority is also required to undertake water resource assessments for several possible scenarios of future water availability.

The MDBA advised that 21 separate water resource assessments were prepared and provided to the jurisdictions in 2019/20, including three second year assessments (in January, February and April 2020). The Authority also provided members of BOC and RMOC with summaries of the assessments as required by Clause 11(7).

## Water accounts [O&O Cl. 12 (1)]

IRORG has inspected the water accounts supplied by the Authority and confirmed that they meet the requirements set out in the O&O document.

The Authority prepared monthly water accounts for each Southern Basin State. No jurisdiction reported any concerns about the provision of the water accounts. Some issues regarding obtaining final use data from states and retrospective account adjustments were raised and are addressed in Section 7.4 of this report.

## Annual River Operations report [O&O Cl. 12 (2)]

The Authority is required to prepare and give BOC and RMOC an Annual River Operations Report by 31 July each year. The Report is required to summarise the river operations carried out by the Authority during the preceding water year; indicate the degree to which the general and specific objectives and outcomes were achieved, including any departures from the general and specific outcomes and objectives that were approved by BOC; set out each matter which the Authority referred to the Committee for determination; and set out any other significant resolutions made, or actions taken by either or both of the Committee and the Authority in relation to river operations.

The Authority is also required to provide a copy of this Report to IRORG by 1 August each year. The River Murray System Summary of River Operations report for 2019/20 Water Year was made available to IRORG on 31 July 2020.

## Matters referred

IRORG reviewed the performance of the MDBA against clauses 7, 13, 14, 15, 16 and 18 of the relevant O&O document, all of which require the MDBA to refer specified circumstances or events to governance bodies.

## Referring instances of possible non-compliance to others [O&O Cl. 7]

If the MDBA concludes that it may be unable to achieve one or more of the general or specific objectives and outcomes because of a conflict between either or both of those objectives and outcomes, or for any other various specified reasons, it is required to seek the advice of the WLWG, on the need for further referral to RMOC or BOC.

The Authority advised that no instances of conflict between achieving the objectives and outcomes and or possible non-compliance was identified during 2019/20, and therefore no referrals were made under Clause 7.

## Matters referred to BOC for determination [O&O Cls. 13, 14 and 15]

**Clause 13** states that the Authority must refer to BOC for determination, after first seeking the advice of the RMOC on any decision that the Authority proposes to make in relation to river operations that has the potential to have a material effect on a State water entitlement. Except for sub-clause 13 (1) which directly relate to clause 33 of the Agreement, this a general clause covered by the more detailed requirements of clauses 14, 15 and 16.

**Clause 14** states that the Authority must refer to the Committee for determination, after first seeking the advice of the RMOC, matters arising from the following circumstances:

- a) Insufficient channel capacity if it is likely to result in either insufficient water for downstream orders for water, or downstream channel capacity being exceeded if all downstream orders for water are met.
- b) Reduction in water allocations within a State if such an adjustment is likely to require a State to reduce the volume of allocations it has previously announced.
- c) Matters referred to BOC by the Authority when it has received notification from two or more members of BOC re matters not covered by the O&O document, and that the matter has the potential to have a material effect on a State water entitlement.

**Clause 15** states that the Authority must refer to the Committee for determination, after first seeking the advice of the RMOC, any matter that:

- a) is not dealt with in, or is inconsistent with, a specific objective, a specific outcome or with any other provision of the O&O document; or

- b) two or more members of the WLWG consider may have the potential to have a material effect on any State water entitlement because a determination relating to that matter may require a State to reduce the volume of allocations it has previously announced as being available to water entitlement holders in that water year.

Also, if the Authority considers that any of the following events is reasonably likely to occur, it must notify the WLWG as soon as practicable:

- c) Special accounting, where the Authority declares or terminates a period of special accounting pursuant to clauses 123 or 129 of the Agreement.
- d) Direction about a valley account, where the Authority gives, amends or cancels a direction about water standing to the credit of a valley account pursuant to sub-clause 11(4) of Schedule D of the Agreement.
- e) Unregulated flows, as defined in sub-clause 15(2)(c) of the O&O; including notifying the Chair of SCBEWC.
- f) Variation of monthly quantities for SA, where the Authority varies any monthly quantity which South Australia is otherwise entitled to receive, pursuant to clause 90 of the Agreement.
- g) Change in the Authority's ability to direct releases from Menindee Lakes.
- h) Internal spill within the meaning of clause 116 of the Agreement.

A range of notifications were made in accordance with Clause 15, including:

- In November 2019, the WLWG advised that BOC needed to determine if the MDBA should limit the monthly volume of Goulburn IVT over the summer period as requested by Victoria.
- Also, in November, the MDBA acted on advice from WLWG to seek Ministerial Council approval to waive the provision for the 2019–20 end of season minimum reserve to be held in Lake Victoria.

IRORG has not identified any instances where a required notification was not provided.

## Matters which need not be referred to BOC [O&O Cl. 16] if the Authority seeks the advice of the Water Liaison Working Group

Clause 16 of the O&O document requires the Authority to notify the WLWG when it proposes to exercise a function relating to river operations which might be regarded as being of particular significance, and to consider any relevant advice from the WLWG.

The MDBA advised that there were no operational activities or exercise of its functions which it considered a Southern Basin State might regard as being of "particular significance", and therefore no notifications to WLWG were required under this clause. No jurisdiction contradicted this advice.

## Providing relevant information [O&O Cl. 18]

When it refers matters to WLWG, RMOC or BOC, the MDBA is required to give those bodies all information available to the Authority that is relevant to the matter referred, together with any further information sought.

In 2019/20, and all previous review years, IRORG found no evidence from jurisdictions that the Authority was not providing full information to advisers and decision-makers. Given the high level of scrutiny on these issues by experienced water managers from the jurisdictions, IRORG believes it is highly unlikely that the Authority would not provide relevant information in the course of its normal business. The necessity of this clause has been questioned previously by IRORG.

## Review and Revision [O&O Cl. 19]

BOC is obliged to review the operation of the Objectives and Outcomes document at least annually, and to have regard for IRORG's report as part of its review of the O&O document operation. BOC reviewed the current O&O document during 2019/20 and determined that no amendments were required.

IRORG has reviewed the effectiveness of clauses 7, 13, 14, 15, 16 and 18 of the 2019/20 O&O document. All of the six clauses above address important matters of operational governance: is the MDBA relating appropriately with its governing bodies, WLWG, RMOC and BOC with information, advice and determinations? Taken as a whole, these clauses are wordy and complex, somewhat overlapping (e.g. paragraphs 14(1)(b) and 15(1)(b)), in some cases unnecessarily cautious and outdated (e.g. clause 18), resulting in difficulties for the MDBA to report progress against, and IRORG to assess compliance.

Whilst this is not a major issue, the rationalisation of these six clauses is desirable in the interests of clarity and simplicity. IRORG has previously recommended a rationalisation of clauses 13, 14 and 15. At that time, RMOC didn't allocate a priority to pursuing these changes. IRORG now observes that clauses 7, 13, 14, 15, 16 and 18 could be included in any future streamlining of O&Os, all of which relate to governance.

# 7 Issues relevant to the General and Specific O&Os

In the course of its 2019/20 review of river operations, IRORG has identified a number of opportunities for improvements to current operating arrangements. These are discussed below, with a cross reference to the General O&O (GO&O) or Specific O&O (SO&O) that each issue relates to.

## 7.1 Operational trade-offs [GO&O 4.2]

The general objectives and outcomes which fall within the water storage and delivery accounting category are at the very core of the role of the MDBA's River Murray Operations group. They set out the outcomes that the jurisdictions value around:

- The delivery of authorised water orders to the southern basin states
- The conservation of water and minimisation of losses
- Accurate and timely accounting and assessment of water resources

In the past, quite often all of these outcomes could be simultaneously achieved. More recently, the reduction in Barmah Choke capacity, shifts in the location and timing of demands for both consumptive and environmental deliveries, together with hotter, drier conditions as climate change bites, have made delivering on all these outcomes far more challenging.

The 2019/20 water year again highlighted the tensions and trade-offs inherent in managing river operations. Operators started the year with Lake Victoria at low levels, ready to harvest valuable tributary inflows entering the River Murray downstream of Lake Hume. Whilst water availability was limited, careful analysis indicated that peak demands over the summer downstream of the Barmah Choke were likely to be similar to previous years. There was no water able to be accessed from the Darling system, and operators were aiming to avoid calling out water from the Goulburn at high rates over the summer to minimise environmental damage. This meant that Lake Victoria needed to be brought up to higher levels before the summer. When the dry conditions continued through winter and early spring, the MDBA consulted with jurisdictional water managers and decided to commence transfers from Lake Hume earlier than normal to minimise losses. Whilst this action reduced the risk of shortfalls over the summer and made efficient use of available resource, it also increased the risk that if weather conditions had turned wetter, valuable tributary inflows might not be able to be harvested into Lake Victoria. These trade-offs are shown conceptually in Figure 3.

Figure 3: Trade-offs in river operations



Careful analysis, coupled with frequent monitoring and review of operational plans resulted in all demands being met, no physical spills from storages and efficient water transfers in 2019/20. This was a positive outcome, perhaps aided by an early 2020 autumn break that reduced demands for water. As noted earlier, the need to navigate through these difficult trade-offs is becoming more frequent<sup>8</sup>.

IRORG also notes that some jurisdictions may also have different perspectives on the relative importance of meeting all demands versus maximising water harvesting or reducing losses. This leaves the MDBA in the difficult position of having to develop a consensus solution and work with WLWG to meet competing objectives in an environment of uncertainty in relation to the future weather and water demands.

IRORG **recommends** that the MDBA consider adopting a more quantitative risk assessment approach to provide improved clarity and assist in making complex river operations trade-off decisions.

Such an approach could involve the development of a tailored risk framework which covers:

- Risk assessment processes including probability assessment and development of consequence scales to support evaluation of risk around lost harvesting, occurrence of shortfalls etc.
- In conjunction with the jurisdictions, development of clear, explicit risk appetite statements which would define:
  - What risks are tolerable.
  - What are intolerable levels of risks.
  - The triggers for action when approaching intolerable risks.
  - Agreed mitigation actions that might be considered for implementation.

---

<sup>8</sup> Refer also to Independent Panel for Capacity Project Review Report to Murray Darling Basin Ministerial Council <https://www.mdba.gov.au/sites/default/files/pubs/ipcpr-minco-final-report-2019.pdf>

Whilst IROrg believes that a clearer, risk-based approach will assist and improve decision making, it will not be a panacea for the underlying causes of these trade-offs. There will still be a need to address capacity constraints and manage water demands and extraction within finite limits.

## 7.2 Capacity sharing and shortfall risks [GO&O 4(2)(b)(iii)]

IROrg has previously identified the resolution of capacity sharing and shortfall risks as one of the most critical issues facing the joint venture in relation to river operations. Since then, IROrg has made a number of recommendations on this issue, and jurisdictions again unanimously identified this as their highest priority strategic issue during the 2020 review.

Additionally, all jurisdictions provided positive feedback on the progress made by the MDBA on this project in 2019/20. IROrg was briefed on the key issues and project progress, and noted the strong framework around the project, including:

- Clear objectives, including those agreed by the Ministerial Council.
- Guiding principles to support identification and assessment of feasible options.
- Establishment of a clear work program, with appropriate resources in place.

Despite the positive progress, there are still a number of complex issues to work through before enduring solutions can be put in place. IROrg makes the following observations to support the excellent work being undertaken:

- The problems around diminishing system capacity and increasing peak demands are getting worse, but solutions are difficult/costly
- There is a need for continued focus on this problem, as it will take time to generate an enduring consensus around the best solution(s).
- Whilst the MDBA is providing project resources, some of the issues and potential options (e.g. land use planning and extractions limit compliance) will be within the remit of the jurisdictions, so appropriate State resources will also be needed to support development of solutions. This will require continued attention and support from BOC to ensure these resources are available.
- Regardless of any potential infrastructure “fixes” that may be implemented to provide additional capacity to augment the Choke, there will still be a finite capacity limit. We should expect to face shortfalls at some time, and IROrg considers development of effective shortfall response plans is an essential step.

The horticultural developments emerging in the lower and mid-Murray are sophisticated, high value enterprises, which may hold a portfolio of different water products from different jurisdictions. In such a dynamic environment, there is a high need for adaptive, responsive capacity sharing solutions that provide sufficient flexibility to meet the changing needs of water users in an equitable manner. IROrg urges all parties to adopt a “*best for all water users (consumptive, environmental and cultural)*” approach to the development of solutions.

## 7.3 Management of IVT call outs [GO&O 4(2)(b)(iii)]

The MDBA must call out water owed to the River Murray system from tributary IVT accounts, in order to protect the reliability of water entitlements on issue in the Murray system. Calling out some of this water during peak summer demand periods can also assist in avoiding delivery shortfalls.

When IVT accounts were first developed in the early 1990s, they were expected to cater for modest volumes of water that might trade between systems, and there was little need for detailed rules for their management. Trade in the connected southern MDB has expanded massively beyond these early assumptions, and significant volumes of water can pass through IVT accounts. As IRORG has previously noted, there is now a need to provide greater clarity around the management of call outs from IVT accounts, and in particular how to balance competing objectives including enabling intersystem trade and protecting the environmental condition of the basin's rivers.

The formal request made in 2019/20 to limit summer flows in the lower Goulburn River is an example of jurisdictions addressing these challenges. However, this created a number of challenges for river operators, and IRORG makes the following observations:

- IRORG understands that states, as “owners” of these tributaries, have responsibilities in setting reasonable flow limits. Part of this responsibility also includes the obligation to establish defensible rules that protect the environment from unacceptable harm, whilst not unnecessarily restricting trade.
- The MDBA, as operator of the River Murray system is responsible for calling water out from IVT accounts (in accordance with any state flow limits or rules) and notifying WLWG accordingly. The MDBA should only call out IVT water when it can be used to effectively meet current or forecast water demands.
- Schedule D of the MDB Agreement includes provisions for making protocols to clarify the operation of a range of these matters.
- There appears to be some confusion or lack of clarity around some of these roles and responsibilities and how they should or do interact.
- Whilst the MDBA has no direct responsibilities for management of tributaries under the Agreement, there are wide ranging requirements under the Basin Plan and the Water Act 2007 for all parties to prepare plans and to manage flows which support the achievement of multiple objectives, including the environmental protection of Basin rivers. IRORG believes it is incumbent on BOC, the MDBA and the jurisdictions to have regard for protection of the environmental condition of tributary streams when calling out IVT deliveries. It was also noted that there were reports of erosion damage to the Edward River in 2019/20, possibly due to sustained high summer flows.
- It is important for management of tributary flows and IVT call outs to be considered as part of the wider question of capacity sharing and shortfall risks. IRORG was encouraged to see that this is on the radar of the Capacity Policy Working Group.
- BOC is encouraged to give consideration to the need for development of an SO&O to clearly set out roles and responsibilities in relation to IVT call out from all tributary rivers.

## 7.4 Water accounting [GO&O 4(2)(b)(ii), O&O Cl. 14(1)(b)]

In the course of the 2020 review, several matters were identified in relation to the maintenance of accurate accounts of state water shares.

IRORG was advised that from time to time there have been delays experienced in the provision of final metered use data from some jurisdictions. Whilst operational estimates of diversions can be used for system management, access to accurate usage data provides better understanding of potential demands and capacity management issues. IRORG is of the view that states need to ensure they are meeting their obligations in this area so that the MDBA has access to the best available data to support river operations and planning.

Despite the best efforts of all parties, from time to time data incorporated into the accounts will require correction as more accurate information becomes available. This has not been a major issue to date; however, there is potential for difficulties to arise if corrections to accounts data have a material impact on state water shares, after allocation decisions have been made in good faith based on the original accounts data.

IRORG **recommends** that the MDBA and jurisdictions develop principles to guide the application of retroactive updates to accounts in circumstances where there may be a material impact on water available to a state. (The outcomes of this work may also be captured in a specific O&O).

## 7.5 Loss reporting and management [GO&O 4(2)(b)(i)]

Losses are an inevitable part of river management and are heavily influenced by a range of factors, many of which are outside the control of the system operators. It is also recognised that a good understanding of losses and the drivers of loss in river systems will assist in better forecasting the volumes of water needed to cover losses and improve system management. Understanding loss processes also takes on a new importance as climate change reduces water availability and increases some of the key drivers of loss, such as temperature and reduced soil moisture. Better understanding of losses will also support continuous improvement around estimating environmental water usage on floodplains and possible changes in transmission losses as water demands move to new locations.

This has been an area of high focus for the MDBA and some good work is being done. The MDBA is also working to implement the Source modelling platform<sup>9</sup> as the basis for its water accounting system. This will offer enhanced capabilities to model and analyse losses in further detail than has been practical to date.

---

<sup>9</sup> eWater Source is Australia's National Hydrological Modelling Platform. In 2008, COAG adopted a National Hydrological Modelling Strategy, and all Australian governments have committed to adopting Source as a nationally consistent approach to hydrological modelling.

Experience elsewhere in developing water savings programs has also shown that a strong focus on loss monitoring and analysis can sometimes offer important insights into processes that drive high losses and may assist in identifying new loss management techniques. For all of these reasons, IRORG **recommends** that the MDBA continue to focus on enhancing the monitoring, analysis and reporting of losses in the River Murray system.

## 7.6 Environmental water delivery and accounting [GO&O 4(5)]

Environmental water delivery and accounting is a relatively new field of water management, and knowledge is developing rapidly. It has also been an area that has raised many issues and questions in previous river operation reviews.

In 2019/20, the MDBA and jurisdictions established the Environmental Water Improvement Group (EWIG), which provides a forum for river managers, water delivery agencies and environmental water managers to communicate and collaborate on improving environmental water ordering, delivery, measurement and accounting in the River Murray system. The primary focus is on medium-term issues, rather than day to day operational issues.

EWIG has already overseen the delivery of a Level of Service Review which reviewed and documented the services and service standards currently provided for environmental watering activities and potential future improvements. The establishment of EWIG and delivery of this work has been well received by all jurisdictions. EWIG has also developed a prioritised register of environment water management issues that need to be addressed. A workplan is also being developed to address improvements to the Prerequisite Policy Measures for managing and accounting for environmental water.

The MDBA has also advised that environmental water governance will be further boosted by establishment of a strategic, high level Environmental Water Committee (EWC) which will advise BOC on a range of environment water matters, including policy advice on improved integration of environmental water and river operations. This initiative, together with the technical assessment and development work enabled through EWIG, provides a strong framework for identifying and resolving environmental water management challenges.

Previously, in the absence of these forums, IRORG has frequently been asked to advise on environmental water management issues as they arose. Whilst IRORG will maintain a continuing interest in these matters, in recognition of the new mechanisms now available, where relevant, IRORG will refer matters to EWIG and EWC for consideration. and continue to monitor progress on resolution of these matters.

One of the underlying questions that is relevant to many issues around environmental water delivery is how to ensure equitable treatment of environmental and consumptive water deliveries. As noted in previous IRORG reviews, the following questions need to be addressed by applying a coherent set of principles:

- Under what circumstances is the assumed environmental use/loss the additional water cost/impact arising from the environmental water delivery?
- When is environmental water delivery just another part of the overall water use spectrum?
- Environmental water delivery may fall within either of these options at different times - what are the principles we can apply to determine the appropriate treatment?

IRORG urges the jurisdictions and MDBA to use these new forums to develop a consistent set of principles to guide how we consider environmental water deliveries and treatment of assumed use/losses.

## 7.7 Bushfire water quality risks [GO&O 4(4)(b)(iii)]

As noted in Section 3, during the 2019/20 summer, bushfires affected large parts of the River Murray catchments. MDBA staff undertook significant work to map burnt areas, assess water quality risks and develop potential mitigation actions.

Droughts and floods are an entirely predictable part of water management in Australia, and the MDBA has developed response plans and contingency plans to deal with these extremes. Similarly, bushfire has long been a risk in water catchments; however, as evidenced last summer, climate change is influencing the frequency, scale and intensity of bushfire events. Bushfires in catchments pose long term risks around water availability, but in the short term there are major risks to water quality. Bushfire can also impact on MDBA assets in catchments. For example, the loss of water system monitoring assets could leave the authority without the essential data feeds needed to manage water systems effectively during a fire event.

The MDBA needs to be prepared and have a clear plan to respond to bushfire risks to its water system management functions. IRORG also observes that events like bushfires can change rapidly and raise new challenges for organisations with limited or no advance warning. Many organisations activate formal incident response structures in these sorts of situations to ensure that there is strong organisation wide co-ordination and management of activities and resources in place. Effective incident management processes also allow for the rapid scaling up of response activities if required.

IRORG **recommends** that the MDBA develop a business continuity plan for responding to bushfire, and that it also considers the use of formal incident management processes for these types of events.

## 7.8 Improving operational planning and forecasting [GO&O 4(2), O&O Cl. 10]

The root causes of many of the issues discussed in this review can be traced back to climate driven changes to water availability, and changes to the location and nature of demands for water. These changes are happening rapidly, and require adaptive, responsive management.

Water system operations essentially involve the assessment of water supply and demands and the development and implementation of plans to match supply to demand to the maximum extent possible. Whilst simple in concept, this involves monitoring and collecting large amounts of data across very large systems and then analysing that data to support a rolling process of developing, reviewing and updating of operational plans. To do this in a more responsive and adaptive manner, the capacity to collect and rapidly analyse water system data is critical.

The MDBA have been working on the implementation of new tools to enhance their ability to develop operational plans. The key tool is the Source water system modelling platform which can be run in operational planning mode to rapidly develop forecasts, plans and scenarios for system operations. IRORG strongly supports this initiative and encourages the MDBA and jurisdictions to allocate a priority to its implementation.

## 7.9 SO&O targets [Multiple SO&Os]

The SO&Os include a range of targets for minimum and maximum planned flows, and rates of change in flows at various key sites across the system. Setting clear targets for acceptable operational outcomes is an important element of establishing transparent and accountable river operations.

For some time, IRORG has noted that a number of the current targets don't appear to have sufficient regard to the accuracy of operations that is feasible/possible with current water management infrastructure or the limits on accuracy at some flow monitoring sites. Again in 2019/20, several SO&Os continue to experience minor technical breaches of targets with no identified significant adverse impacts. IRORG is strongly of the view that setting realistic targets and then monitoring performance against these targets is a key plank in continuous improvement.

IRORG **recommends** that the MDBA establish a program to progressively review relevant SO&O targets to establish meaningful indicators with realistic tolerances appropriate for operation of a large, complex water system. As noted, the breaches being experienced to date are relatively minor, so IRORG believes that a staged program over several years is acceptable.

## 7.10 Information provision [GO&Os 4(4)(b)(i), 4(6)(b)(i)]

Operating the River Murray system provides vital water services and multiple benefits to many organisations and communities. Effective communications and co-ordination are critical to successful system management and service delivery.

The MDBA has directed significant effort and attention to communications and information provision for many years. IRORG has noted the additional focus on enhanced communications and information provision (e.g. expanded flow data online etc) over the 2019/20 water year, and jurisdictions generally noted with appreciation the communication activities of the MDBA in many areas.

During the course of its 2020 review, IRORG has identified some further opportunities for enhanced communications and information provision that could be considered for inclusion in MDBA and/or jurisdictional programs:

- Changes to the location and timing of water demands are being driven by changes in irrigated agriculture and the expansion of environmental water deliveries. Historical river flow patterns may no longer apply, and landholders and other stakeholders (e.g. recreational users) are likely to want access to relevant information on future flow patterns. Whilst some of this information is available, it may be distributed across a range of websites. Websites also require interested parties to remember to visit the site.  
The MDBA, through the state constructing authorities already provides SMS or email information services in relation to flood operations downstream of storages. There may be merit in considering expanding these types of automated subscription flow information and alert services to cover a wider range of sites on the River and its anabranches etc that may be of interest to communities.
- The state water agencies that are members of WLWG are generally responsible for advising environmental water holders of WLWG advice on relevant issues such as accounting treatment for environmental water deliveries etc. IRORG has become aware of some instances where this flow of information is not always working effectively. IRORG is of the view that states should ensure they are keeping all water holders well informed on these water accounting and delivery matters.

# 8 Conclusion

IRORG has reviewed the MDBA's performance in relation to compliance with the provisions of the O&O document across the 2019/20 water year.

The 2019/20 water year was quite challenging for river operators. The dry conditions of the previous two years continued through spring and summer, and severe bushfires affected large parts of upper Murray catchments during the 2019/20 summer. Conditions changed significantly from January onwards, with significant rainfall in the northern basin and above average rainfall occurring across the southern basin in March and April.

IRORG's assessment is that the MDBA performed well throughout 2019/20 and monitored system performance closely and responded appropriately with adjustments to operations in the face of these challenging conditions. All jurisdictions endorsed this overall assessment of the MDBA's performance.

IRORG considers that all the general objectives for river operations were achieved overall in 2019/20, despite one specific outcome area receiving a "qualified achievement rating". The area in question was the management of hydrometric stations. The MDBA contracts states to undertake hydrometric monitoring, and advised IROG that it is moving to ensure all states can provide formal assurance of data quality and methods. Whilst the states use competent staff and experienced contractors, in the absence of formal assurance around methods and data quality, IROG opted to assign a qualified achievement rating.

The Authority also performed well in complying with the specific objectives and outcomes. In total, 98% of the SO&Os were fully achieved, whilst the one area of qualified achievement related to minor breaches of flow targets which had no material impact on river operations, the environment, or communities.

IRORG believes that the Authority has generally complied with range of provisions in the O&O document that set out procedural arrangements to support and enable delivery of outcomes in the general and specific O&Os.

The MDBA has also delivered a number of important initiatives during 2019/20. There has been a substantial focus on improving communication activities to ensure stakeholders are better informed around the river operations and water management issues. The MDBA also undertook a Level of Service Review which reviewed and documented the services and service standards currently provided for environmental watering activities and identified potential future improvements. This work was overseen by the newly formed Environmental Water Improvement Group (EWIG), which provides a forum for river managers, water delivery agencies and environmental water managers to communicate and collaborate on improving environmental water ordering, delivery, measurement and accounting in the River Murray system. Jurisdictions warmly endorsed the formation of EWIG as a positive initiative.

The widespread summer bushfires created significant potential water quality risks associated with flushing of ash and debris into waterway and MDBA storages in rainfall events after the fire. MDBA staff undertook significant work to map burnt areas, assess water quality risks and develop potential

mitigation actions. Fortunately, no major water quality problems occurred, aided by post-bushfire rainfall of low intensity

Whilst the MDBA performed well in its river operations activities, as noted the season posed a range of challenges and issues that had to be worked through in conjunction with the jurisdictions. IRORG has identified and commented on a range of these issues in this review and made a number of recommendations to support continuous improvement in performance. These issues include the following matters<sup>10</sup>:

- River operations seeks to balance a range of objectives, covering meeting state orders for water, avoiding shortfalls, maximising harvesting opportunities, and managing the system efficiently to conserve resources. In recent times, the reduction in Barmah Choke capacity, shifts in the location and timing of demands for both consumptive and environmental deliveries together with hotter, drier conditions as climate change bites, have made delivering on all these outcomes far more challenging. IRORG **recommends** that the MDBA consider adopting a more quantitative risk assessment approach to provide improved clarity and assist in making complex river operations trade-off decisions (2020.01).
- The resolution of capacity sharing and shortfall risks is one of the most critical issues facing the joint venture in relation to river operations. Jurisdictions again unanimously identified this as their highest priority strategic issue during the 2020 review.

All jurisdictions provided positive feedback on the progress made by the MDBA on the Capacity Sharing and Shortfall Risks project in 2019/20. Whilst the MDBA is providing project resources, some of the issues and potential options (e.g. land use planning and extractions limit compliance) will be within the remit of the jurisdictions, so appropriate State resources will also be needed to support development of solutions.

It is also noted despite whatever infrastructure “fixes” may be implemented to provide additional capacity to augment the Choke, there will still be a finite capacity limit. We should expect to face shortfalls at some time, and IRORG considers development of effective shortfall response plans to be an essential step.

- The MDBA must call out water owed to the River Murray system from tributary IVT accounts, in order to protect the reliability of water entitlements on issue in the Murray system. In 2019/20 Victoria made a formal request to limit high summer flows in the lower Goulburn river associated with IVT call outs. This created a number of challenges for river operators, however IRORG is of the view that it is incumbent on BOC, the MDBA and the jurisdictions to have regard for protection of the environmental condition of tributary streams when calling out IVT deliveries.

---

<sup>10</sup> Where a recommendation has been made, the number in brackets is the recommendation number assigned to each recommendation for future reference – e.g. 2020.01 is the first recommendation made in the 2020 review report.

BOC is encouraged to give consideration to the need for development of an SO&O to clearly set out roles and responsibilities in relation to IVT call out from all tributary rivers.

- Water accounting is an essential task for effective water resource management. IRORG is of the view that states need to ensure they are meeting their obligations to provide final metred use data in a timely manner so that the MDBA has access to the best available data to support river operations and planning.

Despite the best efforts of all parties, from time to time data incorporated into the accounts will require correction as more accurate information becomes available. IRORG **recommends** that the MDBA and jurisdictions develop principles to guide the application of retroactive updates to accounts in circumstances where there may be a material impact on water available to a state (2020.02).

- Losses are an inevitable part of river management and are heavily influenced by a range of factors, many of which are outside the control of the system operators. Understanding loss processes also takes on a new importance as climate change reduces water availability and increases some of the key drivers of loss, such as temperature and reduced soil moisture.

This has been an area of high focus for the MDBA and some good work is being done. IRORG **recommends** that the MDBA continue to focus on enhancing the monitoring, analysis and reporting of losses in the River Murray system (2020.03).

- As noted earlier, bushfires affected large parts of the River Murray catchments in 2019/20. MDBA staff undertook significant work to map burnt areas, assess water quality risks and develop potential mitigation actions. In order to build on this good work, IRORG **recommends** that the MDBA develop a business continuity plan for responding to bushfire, and that it also considers the use of formal incident management processes for these types of events (2020.04).
- The SO&Os include a range of targets for minimum and maximum planned flows, and rates of change in flows at various key sites across the system. Setting clear targets for acceptable operational outcomes is an important element of establishing transparent and accountable river operations. Some of the current targets don't appear to have sufficient regard to the accuracy of operations that is feasible/possible with current water management infrastructure. IRORG **recommends** that the MDBA establish a program to progressively review relevant SO&O targets to establish meaningful indicators with realistic tolerances appropriate for operation of a large, complex water system (2020.05).
- The MDBA have been working on the implementation of new tools to enhance their ability to develop operational plans. The key tool is the Source water system modelling platform which can be run in operational planning mode to rapidly develop forecasts, plans and scenarios for system operations. IRORG strongly supports this initiative and encourages the MDBA and jurisdictions to allocate a priority to its implementation.

*The Independent River Operations Review Group – an advisory committee established by, and reporting to, the Murray-Darling Basin Authority*