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2020-21 Active Management Annual Evaluation and Review – Full Report

Full report on active management in the unregulated water sources of the Barwon–Darling, Gwydir and Macquarie–Bogan

October 2022



Bells Bridge, Macquarie River – Tim Hosking



Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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DPE-Water's Environmental Water Management Team

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Terminology

Term or abbreviation	definitions and descriptions
active environmental water (AEW)	<p>Water that the NSW Minister for Water identifies as requiring protection from extraction on a given day, in accordance with the active management procedures manuals for the unregulated Barwon–Darling, Gwydir and Macquarie–Bogan water sources. AEW includes:</p> <ul style="list-style-type: none"> • held environmental water (HEW) flowing from an upstream water source • planned environment water (PEW) from upstream water sources protected from extraction under the existing water sharing plan rules • licensed unregulated river water where the licence holder has notified the Minister that they want the water left in the unregulated river water source and protected from extraction.
active management rules	<p>Water sharing plan rules for the unregulated Barwon–Darling, Gwydir and Macquarie–Bogan water sources that enable the river operator to raise access thresholds by an amount necessary to protect active environmental water from extraction.</p>
announcements	<p>WaterNSW’s daily announcements of flow class and volumes distributed to licence holders.</p>
deviation	<p>An action by WaterNSW or DPE–Water that does not follow the active management procedures.</p>
DPE	<p>Department of Planning and Environment</p>
DPE–EHG	<p>Department of Planning and Environment–Environment and Heritage Group</p>
DPE–Water	<p>Department of Planning and Environment–Water Group</p>
Environmental Water Management Coordination Group	<p>A working group established to resolve issues relating to the implementation of NSW environmental water reforms. The group includes representatives from DPE–Water, WaterNSW and NRAR.</p>
individual daily extraction components (IDECs)	<p>A daily extraction limit for individual licence holders.</p>
mismatch	<p>The difference between distributed volumes (based on forecast flows) and volumes that should have been distributed (with the benefit of observed flows) for a management zone.</p>

Term or abbreviation	definitions and descriptions
NRAR	Natural Resources Access Regulator
'no-flow share' procedure	Procedure 19 in the current Barwon–Darling procedures manual which allows access to all licence holders if available water is greater than the sum of individual daily extraction components in their management zone.
one-gauge rule	Clause 49A (5) of the Barwon–Darling water sharing plan that allows the remaining functional gauge to be used to determine and announce access if the other gauge is not functioning.
partner agencies	DPE–Water, WaterNSW, DPE–EHG and NRAR.
procedures	The operational procedures for active management described in the procedures manuals established under the water sharing plans for the unregulated Barwon–Darling, Gwydir and Macquarie–Bogan.

Executive Summary

Between 1 December 2020 and 30 June 2021, the newly-implemented active management rules were applied to protect a total of 103 gigalitres (GL) of ‘active environmental water’ from extraction in the unregulated Barwon–Darling, Gwydir and Macquarie–Bogan. The rules were applied during three flow events in the Barwon–Darling (77.8 GL of held environmental water) and one in the Macquarie–Bogan (25.7 GL of held and planned environmental water) in which water subject to the rules was present. The active management rules were not applied in the unregulated Gwydir, as there were no upstream inflows of held environmental water during the review period.

The procedures were largely effective at protecting active environmental water, although some gaps exist

A key finding from the evaluation and review was that the procedures were largely effective at allowing active environmental water to remain in the water source for environmental purposes. Management of backflows from the Barwon–Darling into the Macquarie–Bogan, however, represents a gap in protection of active environmental water. Inconsistencies with access thresholds for Schedule 2 and 2A licences in the Barwon–Darling are another, smaller procedural gap, while systems to announce and protect active management flow events and manual travel time adjustments for active environmental water represent operational gaps in protection. Finally, challenges in assessing compliance monitoring information means there is some uncertainty around the level of water user compliance with active management procedures. This issue is being addressed through recommendations to improve the collation of information.

The procedures were mostly followed, with four deviations reported

The procedures were mostly followed, although four deviations were reported by WaterNSW. One deviation included two occasions in the Barwon–Darling when DPE–Water permitted two licence holders to pump above their individual daily extraction components (IDECs). The allowances were made to accommodate unique circumstances caused by mismatches from local rainfall and the one-gauge rule overlapping with ‘resumption of flows’ restrictions. On both occasions, risk management measures were put in place by DPE–Water to protect active environmental water.

Another notable deviation was WaterNSW overlooking a 1 day of 500 megalitre (ML) environmental water event in the Macquarie–Bogan, which meant it was unprotected. Post-event analysis showed the lack of protection did not affect the environmental flow event on this occasion.

The remaining deviations were minor and related to one corrected announcement following a system error and adjustments to Schedule 2 licences to account for active environmental water.

Managing flow forecasting uncertainty remains a key challenge for active management

The main residual risk to the effectiveness of active management is uncertainty in flow forecasting. This uncertainty contributes to mismatches between the announced/allocated volumes versus the observed or post-calculated flows in a management zone. WaterNSW manages this risk through their operational measures to minimise uncertainty.

A review of 'mismatch' data found WaterNSW's measures to be appropriately conservative, as the total proportion of 'under-announced' volumes were small – 1.2% of total active environmental water and 1.5% of total water available for extraction. That is, the measures strike an acceptable balance between being overly conservative and underestimating active environmental water and water available for extraction. However, the measures are complex to implement and several issues relating to the mismatch procedures were raised by partner agencies and stakeholders. These issues included water users' social licence to 'mine the tail' of flow events, suggesting further consideration of the mismatch procedures is required.

Sub-daily 'corrective' announcements could address the mismatch issues

To address the issues with forecasting uncertainty and mismatches, WaterNSW recommended sub-daily 'corrective' announcements be incorporated into the Barwon–Darling water sharing plan and procedures manual. Corrective announcements would enable a single adjustment on the day of the announcement, as flows become more certain, which could reduce mismatch volumes and its associated issues.

The 'no-flow share' procedure contradicts the Barwon–Darling water sharing plan and exacerbates mismatch volumes

The no-flow share procedure (Procedure 19) allows water users in the Barwon–Darling to access water without submitting an expression of interest, which is a requirement under the water sharing plan clauses 46(1) and 47(5). Procedure 19 also exacerbates mismatch volumes and allow non-extractive users to receive an extractive allocation.

The 'one-gauge' rule enabled access to water that would have otherwise been below thresholds

Another key issue is related to the 'one-gauge' water sharing plan rule in the Barwon–Darling (clause 49A(5)), where the remaining functional gauge is used to determine access if the other gauge is not functioning. This rule enabled licence holders to access water when flows were below thresholds at the non-functional downstream gauge but above thresholds at the functional upstream gauge. WaterNSW recommended that DPE–Water should amend the rule so access can be based on the forecast (modelled) flow, rather than the remaining functional gauge. WaterNSW recommended that DPE–Water should clarify that access is based on forecast (modelled) flow rather than recorded flows.

Addressing other issues raised by stakeholders will improve effectiveness and efficiency of active management

Other key issues from the review include:

- the need for new gauges on Marthaguy Creek upstream of the Terrigal confluence and replacing the Tara gauge (both being progressed through other projects)
- water user requests for real-time visualisations of active environmental water and extraction data reporting, which would also assist compliance monitoring for NRAR and increase transparency for partner agencies and stakeholders
- the need for more streamlined annual reporting methods for partner agencies
- several issues and recommendations related to specific operational and licence holder concerns, some of which are being progressed through other DPE–Water projects (i.e., the Macquarie Issues List and the Claydon Review Recommendations Implementation Project).

Summary of recommendations

The 38 recommendations are grouped into five themes— policy changes, document revisions, further investigations, operational improvements, and communications and engagement— according to the actions required for their implementation. The themes also provide a basis for planning and prioritising their implementation.

Water sharing plan, policy and procedural changes

- R.1 DPE–Water to enable sub-daily (corrective) announcements in the unregulated Barwon–Darling water source, through water sharing plan, procedures manual and operational changes, consider the implication on compliance monitoring.
- R.2 DPE–Water and WaterNSW to make the required changes to the Barwon–Darling Water Sharing Plan and procedures manual and develop systems to enable temporary trade of IDECs.
- R.3 DPE–Water to consider revising wording for access thresholds in the Barwon–Darling Water Sharing Plan (49A, Table B) from "more than" to "equal to or more than".
- R.4 DPE–Water and WaterNSW to revise trading rules between management zones in the Macquarie–Bogan to manage the impact of trading in-out entitlements with different in access thresholds.
- R.5 DPE–Water to remove the requirement to ignore the flow class threshold at a non-functioning flow reference point gauge when making flow class announcements in the Barwon–Darling for management zones that rely on 2 flow reference points (i.e., WSP sub-clause 49A (5), referred to as the "one-gauge rule"), to allow the use of forecast flows at both flow reference points to determine flow class access.

Document revisions

- R.6 DPE–Water to change the 'no flow share' procedure (Procedure 19 in the Barwon–Darling procedures manual) to prevent licence holders who did not submit an EOI from extracting water.
- R.7 DPE–Water and WaterNSW to complete investigations into travel times within a management zone greater than one day and their impact on licence holders in the Macquarie–Bogan.
- R.8 DPE–Water to advise licence holders in the unregulated Barwon–Darling, Gwydir and Macquarie–Bogan water sources on the maximum period that can be entered for an EOI.
- R.9 DPE–Water to include wording (based on any relevant WSP clauses) in the three procedures manuals relating to the period an announcement applies in the case of a system outage, and should clarify that the announcement covers both the flow class and flow share.

- R.10 DPE–Water to amend the three procedures manuals to require WaterNSW to provide a basic summary of active management events in the previous 12 months to 30 June to agencies by 31 August each year.
- R.11 DPE–Water to reinforce the requirement that IDECs shall not be exceeded under any circumstances by stating this in the Barwon–Darling procedures manual.
- R.12 DPE–Water to revise the Barwon–Darling procedures manual to clarify that multiple flow share announcements and flow class announcements (each of 24-hour duration) during times of "high flow" may be announced on one day ("high flow" to be defined) so long as WaterNSW operational practice of daily accounting is followed.
- R.13 DPE–Water to change reporting templates so that feedback, issues and their recommendations are tracked using a table format.

Further investigations

- R.14 DPE–Water and WaterNSW to review operational feasibility of the mismatch procedures.
- R.15 DPE–Water and Environmental Water Management Coordination Group to further investigate measures to protect AEW in Barwon–Darling backflows from extraction in the Macquarie, and then implement these measures.
- R.16 DPE–Water to resolve the issue with sleeper/irrigator licences in the unregulated Macquarie–Bogan being able to protect water instream.
- R.17 DPE–Water to consider changes to the WSP clause relating to use of the remaining functional gauge, when data from one gauge is not available [49A (5) Barwon–Darling WSP], to allow forecast flows instead of ignoring the non-functional gauge.
- R.18 DPE–Water and WaterNSW first explore the rationale behind the inclusion of Procedure 15.3 and Note 5 and then revise the procedure, the Barwon–Darling WSP, and the mandatory and discretionary conditions for Schedule 2 and 2A licences in the WSP to ensure consistency between all three instruments.
- R.19 WaterNSW to review the customer request to change the cut-off time for EOI submission (currently 9 am on previous day).
- R.20 WaterNSW to consider including a graphical representation of active environmental water on the WaterInsights portal, and implement where practical.
- R.21 WaterNSW to pursue opportunities to improve flow forecasting in the Barwon–Darling (in line with Claydon Review recommendations 2 and 3).
- R.22 DPE–Water and WaterNSW to make changes to the Gwydir procedures manual to reflect the practices of not announcing access when normal conditions apply in the Gwydir and only announcing on days when active management rules apply.
- R.23 DPE–Water to conduct an analysis on the likelihood of an issue between two licence holders in the Macquarie–Bogan.

- R.24 WaterNSW to consider development of a system/process to facilitate Aboriginal supplementary access licences in the Barwon–Darling.
- R.25 WaterNSW and NRAR to explore options for dynamic (near real-time) comparison of extraction data and daily access announcements.
- R.26 DPE–Water to investigate development and implementation of an active management event reporting portal so agencies can report events, track compliance, report issues and put forward recommendations throughout the year.

Operational improvements

- R.27 WaterNSW to change operational systems to prevent full IDEC announcement for licences that did not submit an EOI when the rules allow this.
- R.28 DPE–Water to review interim measures used by WaterNSW to address issues with Tara gauge and either endorse the measures or propose new measures.
- R.29 WaterNSW to identify extraction points along management zones in the Barwon–Darling and incorporate into the forecasting model to improve flow forecasts in the downstream zone.
- R.30 DPE–Water to change procedures to require environmental water licence holders to (a) nominate the end of the upstream regulated system as the delivery location when the water is then to be actively managed in the Barwon–Darling, and to (b) place such orders via iWAS.
- R.31 DPE–Water to progress the installation of the new gauge at Marthaguy Creek near upstream of the confluence with Terrigal Creek (prioritised in the Hydrometric Improvement Plan).
- R.32 WaterNSW to make access announcements from all prior water years publicly available through their WaterInsights portal.
- R.33 WaterNSW and NRAR to establish an advanced notification protocol to facilitate timely consideration of active management compliance monitoring.
- R.34 WaterNSW to replace/relocate Tara gauge and DPE–Water to update references to the gauge in the Barwon–Darling WSP and procedures manual.
- R.35 WaterNSW to revise announcement system to minimise opportunity for human error.
- R.36 WaterNSW to review and improve systems to ensure all active environmental watering events are reported and protected.
- R.37 WaterNSW to ensure impacts on active environmental water volumes are avoided when manually changing travel time.

Communications and engagement

- R.38 DPE–Water and WaterNSW to address stakeholder concerns around the resumption of flows rule through external communications.
- R.39 DPE–Water to notify licence holders of current trading rules between zones with different access thresholds.

1 Introduction

1.1 Background

On 1 December 2020, active management rules were implemented in the water sharing plans for the unregulated Barwon–Darling, Gwydir and Macquarie–Bogan water sources (see Appendix A – Where active management rules apply). The rules protect environmental flows that were previously available for extraction, replacing the need for temporary water restrictions.

The rules gave effect to the three procedures manuals for each water source which describe the operational procedures to protect active environmental water and reflect the principles and objectives outlined in the active management policy. For more details on active management see: [Active management | Environmental Water Hub | NSW Government \(industry.gov.au\)](#)

To clarify, the ‘active management rules’ are not directly related to the practice of ‘actively/adaptively managing’ environmental water for environmental outcomes. In NSW, this practice is the role of the NSW Environmental Water Manager, delegated responsibility of the Department of Planning and Environment–Environmental and Heritage Group (DPE–EHG), and the Commonwealth Environmental Water Holder (CEWH). From here on, ‘active management’, active environmental water (AEW) and ‘actively managed flow events’ refer only to the implementation of the active management rules.

1.2 Purpose

The purpose of the evaluation and review is to support learning and provide for improvements to active management rules and procedures, in line with the adaptive management/continuous improvement approach.

The evaluation and review did not include monitoring of environmental outcomes arising from the use of environmental water, since this is a DPE–EHG and CEWO responsibility.

This document is the “full review report”, as referred to in the [2020-21 Active Management Annual Evaluation and Review Summary Report](#). The purpose of this document is to present the detailed, technical findings and recommendations of the first annual evaluation and review into the implementation of active management between 1 December 2020 to 30 June 2021 – equivalent to the first ‘water year’ of implementation.

1.3 Contributors

The evaluation and review was conducted by DPE–Water, with input from partner agencies WaterNSW, DPE–EHG, and the Natural Resources Access Regulator (NRAR). The evaluation and review compiled information mainly from the nine annual statements provided by the partner agencies.

2 Annual evaluation and review requirements

Procedures 31, 25 and 32 of the Barwon–Darling, Gwydir and Macquarie–Bogan procedures manuals, respectively, outline the matters for consideration (or requirements) for the annual evaluation and review. The requirements are listed in Table 1 alongside the section in the report where they are addressed. Additional requirements, relating to stakeholder consultation and mismatch procedures, are listed elsewhere in the manuals and are discussed below Table 1. Several issues were raised by agencies without accompanying recommendations. Although issues raised by agencies are not a review requirement (only recommendations provided by agencies – Section 4.3) these are reported and addressed in Section 4.2.

Table 1. Matters for consideration and the sections of this report where they are addressed

Matters for consideration (review requirements)	Section of this report
a) Reporting on the implementation of improvements from previous reviews	No previous review
b) Issues relating to active management raised through consultation with stakeholders	Section 4.1 (stakeholders) Section 4.2 (agencies)
c) A summary of results and recommendations contained in reports provided by WaterNSW, NRAR and the DPE–EHG	Section 3 (results) Section 4.3 (agency recommendations)
d) Proposals for variations or new procedures brought forward by agencies or stakeholders	Covered in 4.3
e) An assessment of whether: <ul style="list-style-type: none"> procedures were followed for active management any deviations from the procedures occurred and any modifications to the procedures that may be required to avoid future deviations, where possible the current active management procedures and the associated operation provide for AEW to remain in the water source for environmental purposes the risk management measures in place are effective in protecting AEW and ensuring that access by water users to water above the access thresholds arising from other sources has not been impacted, and the active management procedures should be expanded, modified or remain unchanged. 	Section 5
f) Recommendations to change the manuals, the active management policy or [relevant] WSP rules relating to active management	Section 6

2.1 Stakeholder consultation

As well as Item 3 (b) shown in Table 1 above, Table 1 in all manuals requires DPE–Water to “consult with licence holders and peak stakeholder groups when conducting each annual review”. Stakeholder consultation is reinforced in Table 6 in the manuals (for Barwon–Darling and Gwydir, and Table 2 for Macquarie–Bogan) as a minimum requirement, specifying DPE–Water consult with “licenced water users, environmental water holders and stakeholder representatives” on “the appropriateness, effectiveness and efficiency of the manual in meeting the objectives and principles of the active management policy, and any proposed substantive changes to the manual arising from the annual review”. While DPE–Water did not directly consult with licensed water users or their representative groups, partner agencies carried out extensive consultation with these stakeholders.

2.2 Mismatch

Note 5 of Procedure 18 in the Barwon–Darling Procedures Manual states that “The NSW Department of Planning, Industry and Environment – Water will consider during the annual review if criteria are required to define when a response to a mismatch between forecast and observed AEW should be taken.” Note 2 in the Gwydir Procedures Manual is similar. This note is not included in the Macquarie–Bogan. See Section 5.3 for this assessment.

3 Actively managed events in 2020-21

The following sections provide a summary of information on events subject to the active management rules in the unregulated Barwon–Darling, Gwydir and Macquarie–Bogan, and details on NRAR’s compliance monitoring.

There were three actively managed flow events in the Barwon–Darling, none in the Gwydir and two in the Macquarie–Bogan during this period. Further analysis is provided in Appendix B – Active management event analysis.

NRAR conducted compliance monitoring for one event in the Barwon–Darling, during the ‘resumption of flows’ restrictions in January 2021. At the time of writing this report, NRAR have not yet provided the outcome of this compliance monitoring.

3.1 Barwon-Darling

There were three actively managed flow events in the Barwon–Darling Unregulated River Water Source between 1 December 2020 and 1 July 2021 and one compliance monitoring event during the resumption of flow restrictions from 12-29 January 2021.

Table 2. Barwon–Darling active management events in 2020-2021

Event	Start - finish	Zone flow protection started ¹	Location flow protection started	Event type (HEW / PEW)	Event size (GL)	Target asset / location	Volume at target (GL)	Volume at Wilcannia (GL)
1	22 Dec 2020 - 12 Mar 2021	Zone 1	Mungindi	HEW	9.7	Walgett	7.2	3.8
2	10 Mar 2021 - 5 May 2021	Zone 2	Mogil Mogil	HEW	36.7	N/A	N/A	16.6
3	20 May 2021 - 30 June 2021	Zone 2	Mogil Mogil	HEW	31.4	N/A	N/A	13.3

3.1.1 Event 1 – Barwon–Darling (HEW delivery from northern tributaries)

This event was a strategic action of the NSW and Commonwealth environmental water managers which aimed to refresh waterholes along the Barwon River, from Mungindi to Walgett. The event was initiated by HEW releases from the Border Rivers (896 ML arrived at Mungindi) and the Gwydir

¹ Refer to Figure A1 for specific management zones.

(4,362 ML arrived via Gil Gil) systems. The water from these releases reached the Barwon River in the first week of January 2021.

At the time of the releases, the flows from the releases were expected to align with a 41,000 - 45,000 ML block release from Keepit Dam in the Lower Namoi. The planned block release was comprised of mostly general security (approximately 18,000 ML) and with smaller proportions of high priority orders (approximately 4,000 - 5,000 GL) including Walgett town water, high security and stock domestic, and replenishment flows.

While HEW was on the way to the Barwon–Darling, heavy rainfall over the Gwydir and Namoi catchments in mid-December resulted in increased inflows from the Mehi and Thalaba systems. As a result, WaterNSW cut short the block release, having released on 9,437 ML between 16-21 December 2020.

Water from the Macquarie (ordered by the NSW Environmental Water Manager to support the Macquarie River and Macquarie Marshes) also reached the Barwon-Darling on 22 December 2020 at Geera gauge and, with the rainfall at this point, provided a flow further downstream in the Barwon–Darling.

During this event, a volume of Barwon–Darling unregulated licence HEW (3,796 ML) was also protected for environmental ‘use’ by the NSW and Commonwealth Environmental Water Managers along several management zones (Zone 2: 615 ML, Zone 4: 2,905 ML, Zone 8: 197 ML, Zone 11: 80 ML).

The Barwon–Darling Water Sharing Plan ‘resumption of flows’ rule was triggered on the 11 January 2021 after flows 90 consecutive days with flow below 200 ML/day were recorded at Wilcannia.

Continuing rainfall led to flow connectivity between Mungindi and Lake Wetherell by early February. On 24 January the ‘resumption of flows’ rule was partially relaxed, then fully relaxed on 29 January 2021. Flows decreased from February.

The last HEW in the Barwon–Darling system from this event arrived at Lake Wetherell on 12 March 2021.

3.1.2 Event 2 – Barwon–Darling (Barwon–Darling HEW protection through EOI)

The event commenced on 10 March 2021 when flows exceeded B class access thresholds at management zone 8, and 2.1 ML of HEW was protected by the NSW and Commonwealth Environmental Water Users through an EOI.

A total of 36,714 ML was protected during this event (Zone 2: 6,820 ML, Zone 4: 25,587 ML, Zone 8: 583 ML, Zone 11: 3,724 ML) from use of Barwon–Darling HEW.

HEW from Event 1 was still present at zone 13 and 14 until 12 March 2021.

This event was wholly comprised of protected volumes (for environmental use) from CEWO Barwon–Darling unregulated licences. No environmental water arrived from the upstream valleys during this event.

Widespread rainfall across the region produced significant inflows to the Barwon–Darling and allowed flow share announcements up to maximum EOLs for most of the days for both extraction

and protection. EOIs to protect Barwon–Darling HEW were removed during early April. The last protected HEW arrived at Lake Wetherell on 5 May 2021.

3.1.3 Event 3 – Barwon–Darling (Barwon–Darling HEW protection through EOI and upstream HEW from regulated Gwydir)

Event 3 commenced on 20 May 2021 when flows were protected by CEWH through EOIs simultaneously at Zone 2 (307 ML), Zone 4 (762 ML), Zone 8 (27 ML) and Zone 11 (231 ML).

A total of 27,824 ML was protected by CEWH through EOIs during this event (Zone 2: 3,758 ML, Zone 4: 20,513 ML, Zone 8: 189 ML, Zone 11: 3,724 ML).

The EOIs to protect water were resubmitted by CEWH towards the end of the event.

A relatively small volume of HEW (3,583 ML) arrived from a supplementary event in the regulated Gwydir, taking the total volumes of HEW protected in the Barwon–Darling during the event to 31,407 ML.

This event continued after 30 June 2021. As a result, the volumes flowing into Lake Wetherell after 30 June 2021 will be captured in the 2021-22 annual review report.

3.1.4 Compliance monitoring

NRAR monitored water take activity over the course of the ‘resumption of flows’ pumping restrictions between 12-29 January 2021. Satellite imagery was analysed to identify any possible increases in storage areas on properties with unregulated river access licences.

Five sites were identified using satellite imagery for further review. Based on desktop analysis it was considered unlikely a breach had occurred. Four sites are currently under investigation and the outcomes are yet to be determined.

This compliance monitoring did not test the active management rules, since all licenced water extraction was restricted during this period.

NRAR has not conducted any monitoring for compliance with the active management rules during this reporting period. The rollout of DPE–Water’s non-urban water metering reforms, however, are expected to make a substantial change to the department’s ability to monitoring compliance with active management rules.

3.2 Macquarie–Bogan

There was one actively managed flow event in the Macquarie–Bogan Unregulated River Water Source between 1 December 2020 and 1 July 2021.

There was another (supplementary) event where HEW flowed into the system but was not protected due to an oversight by WaterNSW. However, as HEW represented 20% or less of the total flows in the system during this event, WaterNSW made an assessment that there was no pumping impact to the HEW in the Lower Macquarie River (see Table 13 for WaterNSW’s analysis).

Table 3. Macquarie–Bogan active management events in 2020-2021

Event	Date start / finish	Zone flow protection started	Location flow protection start	AEW type (HEW / PEW)	AEW Total Volume (GL)	Target asset / location	Volume at target (GL)
Event 1 (Managed Environmental Water Event) ^a	1 Dec 2020 – 4 Feb 2021	Lower Macquarie River Upstream Mgmt. Zone	Marebone	HEW & PEW	25.7 (HEW = 13.4, PEW = 12.3)	Mid-Macquarie River, Macquarie Marshes, Lower Macquarie River	25.7
Event 2 (Supplementary flow event)	26 Mar 2022	Lower Macquarie River Upstream Mgmt. Zone	Marebone	HEW	0.5	Mid-Macquarie River, Macquarie Marshes, Lower Macquarie River	0.5

a - The annual environmental water event started 18 October 2020 at Marebone Weir. Only the volumes of AEW after active management started on 1 December 2020 are reported.

3.2.1 Event 1 – Macquarie–Bogan

Active environmental water (AEW) in the Macquarie–Bogan was not protected unless it had passed Marebone after active management commenced on 1 December 2020. The NSW Environmental Water Manager had started a Spring/Summer environmental watering event on 18 October 2020 at Marebone Weir.

Despite the environmental flow event physically starting earlier, for the purposes of this assessment, Event 1 was considered to start when HEW and PEW from this spring/summer event was delivered to Marebone from 1 December 2020. Event 1 flows passed Oxley gauge on 4 December 2020, Pillicawarina gauge on 7 December 2020 and Miltara gauge on 14 December 2020. The unregulated licence access conditions in these management zones were unaffected until the water subject to the active management mechanism entered each of the four management zones (shown in Table 12 and Figure A3).

No AEW was diverted into the Gum Cowal water management zone after 1 December 2020.

3.2.2 Event 2 – Macquarie-Bogan

A one-day order of 500 ML supplementary HEW at Marebone was placed on 26 March 2021. WaterNSW did not adjust access thresholds to account for the HEW and therefore it was not protected. A post-event analysis by WaterNSW (see Section 5.2) showed there was no pumping impact to the HEW.

The HEW flows passed Oxley on 28 March, Miltara on 8 April and Carinda on 10 April. HEW flows were estimated by WaterNSW to be less than 5 ML/day on 16 April when passing the Miralwyn property at the end of Macquarie River before the Barwon–Darling confluence.

4 Review

4.1 Issues raised by stakeholders

The issues raised by stakeholders (Table 4) came from partner agency's annual statements and the Macquarie Issues List. Stakeholders are considered licenced water users or their representatives.

In total there were:

- 19 issues raised by stakeholders relating to active management
- nine related to the Barwon-Darling, including a positive comment on active management implementation
- one related to the Gwydir
- nine related to the Macquarie-Bogan.

All issues from the Macquarie-Bogan are part of an ongoing list of issues referred to as the 'Macquarie Issues List' being addressed by the Environmental Water Management Coordination Group.

Where appropriate, recommendations are provided alongside the issues in Table 4. Comments in Table 4 explain if the issue has been resolved or does not require action.

Table 4. Issues raised by stakeholders and DPE–Water response

No.	Water source	Issue	Description	Recommendation / Comment
1	Barwon–Darling	Mismatch procedures	<p>Users expressed concerns with their ‘social licence’ and ‘mining the tail’ of events, even if catch-up access was announced by WNSW.</p> <p>Other issues include equity between classes and timing of access (from licence holder’s perspective).</p>	<p>R.14 to review mismatch</p> <p>R.1 to address timing of access</p>
2	Barwon–Darling	Resumption of flows (RoF) rule	<p>Customers raised several interpretation issues regarding the RoF rule.</p> <p>Concerns regarding relaxation of RoF and partial relaxation of RoF.</p> <p>Whether AEW is included in the calculation of relaxation trigger flow at different locations (such as 972 ML/day at Bourke for 10 days).</p> <p>Whether flow that passes Bourke before the RoF is triggered is included in the Bourke cumulative flow for relaxation of RoF rule (30 GL at Bourke rule).</p> <p>Whether the relaxation trigger of 10 days of flow above 972 ML/day at Bourke is for total or consecutive 10 days.</p> <p>Once forecast has been made that “should be it”. That is, no waiting around to see what happens (confidence levels). For example, if relaxation of RoF is announced based on Wilcannia flow forecast to exceed 400 ML/day for 10 days but it ended up with 9 days, whether the restriction will be re-introduced.</p> <p>Customers requested background information around the modelling and development of the RoF.</p>	R.38
3	Barwon–Darling	Trade of IDECs	Both temporary and permanent trade of IDEC should be allowed.	R.2

No.	Water source	Issue	Description	Recommendation / Comment
4	Barwon-Darling	Equity across northern basin (supp access)	Customers raised concerns regarding equity across the northern Basin, especially in relation to the supplementary access extracted in the northern valleys.	DPE-Water are addressing concerns about equity of access and the intent of active management rules as part of the Claydon Review recommendation 19 (e).
5	Barwon-Darling	Positive feedback on active management	Active management is working well in some areas, but more work needs to be done regarding managing access	-
6	Barwon-Darling	Cut off time for EOI	Customers requested whether it is possible to change the cut-off time of EOI submission at 9 am on the previous day.	R.19
7	Barwon-Darling	Pump failure and IDEC trade	Customers raised concerns regarding pump failure issues and suggested extraction allocation can be moved (traded) from one site to another (within the same zone).	R.2
8	Barwon-Darling	Visibility of AEW instream	Water users seeking increased visibility of environmental water in the river and currently being protected. Water users were also keen to see environmental water upstream (that will be protected and therefore result in an increased CTP).	R.20
9	Barwon-Darling	Under-allocation in announcements	Customers raised concerns regarding consistent under-allocation of water via announcements. Customers also indicated that it was better when water users looked after the water take decisions by themselves.	R.21 for flow forecasting improvements

No.	Water source	Issue	Description	Recommendation / Comment
10	Gwydir	Normal conditions announcements	<p>Customers did not want to be advised every day that “normal licence conditions apply”. Customers wished to be advised by exception if an active management event was occurring.</p> <p>Consultation with the only two licence holders impacted by active management in the Gwydir (both are in the Gingham).</p>	R.22
11	Macquarie–Bogan	Licence holder 2 – pump failure	If there is a pump failure between the licence holder’s properties, the available water for one could be taken by the other during take under volumetric limit.	Being addressed through Macquarie Issues List.
12	Macquarie–Bogan	Licence holder 2 – equitable sharing	Informal rostering via EOI as suggested by WaterNSW will not work between the licence holder’s properties. Licence holder 1 has indicated he wants to retain the right to access flows first. The issue is with property rights of licence holder 1 upstream. When ‘normal conditions’ or ‘prohibited’ access conditions apply there are no issues with property rights. But when ‘volumetric limit’ access conditions apply the available volume may be distributed as a proportion of their share component between the properties.	R. 22
13	Macquarie–Bogan	Licence holder 2 – disputed pump capacity	<p>WaterNSW to confirm pump capacity assumed to be 160 ML/day more likely to be higher (approx. 280 ML/day).</p> <p>WaterNSW have requested licence holder 1 and licence holder 2 confirm their installed pump capacities so they can be included in the current model. Licence holder 1 has confirmed, and pump capacity has been amended in the model accordingly. Still awaiting reply from Licence holder 2.</p>	Already addressed through the Macquarie Issues List.

No.	Water source	Issue	Description	Recommendation / Comment
14	Macquarie-Bogan	Barwon-Darling AEW backflow into lower Macquarie	Concerns about lower Macquarie unregulated licence holders accessing Barwon-Darling AEW at the bottom of the Macquarie system where water can back-up from the Barwon-Darling.	See Section 5.3 for further discussion.
15	Macquarie-Bogan	Licence holder 2 – Trading water from Marthaguy to Lower Macquarie and resulting CTP	DPE-Water to confirm with WaterNSW if water is traded from Marthaguy to an existing work on the Lower Macquarie downstream management zone does the 50 ML/day CTP apply or does the access condition of 75 ML/day apply?	R.39 for notification to licence holders and R.4 to revise trading rules
16	Macquarie-Bogan	Licence holder 3 – travel times	WaterNSW to ensure travel times are incorporated into the method and included in the Implementation Manual for active management. DPE-Water prepared a short paper on better incorporating travel times into the modelling and procedures manual. The EWMCG should review the paper and confirm a solution. The paper suggests dividing the management zones into sub-zones for announcements.	R.7
17	Macquarie-Bogan	EOI expiry	How long does an EOI last – one year or up to 20 years?	R.8
18	Macquarie-Bogan	Notification system outage	What happens in case of system failure in terms of notifications? For example, if all systems have an outage (i.e., iWAS, SMS, email etc.).	R.9 The following note has been included in all daily announcements, accessed via WaterInsights portal, "Note: If an announcement is not made for a period of time that applies after this Announcement, then this Announcement still applies"

No.	Water source	Issue	Description	Recommendation / Comment
19	Macquarie-Bogan	Visibility of proportions of AEW instream	Macquarie licence holders would like to know (at start of each management zone) the proportion of environmental water from the total flows and then within the environmental water how much or what proportion is EWA active, HEW, EWA translucency and protected water.	R.20

4.2 Issues raised by partner agencies

There is no requirement in the procedures manuals for the evaluation and review to consider issues raised by agencies which do not constitute a recommendation. Recommendations provided by agencies are presented in Section 4.3

This section considers issues raised by agencies that did not include specific recommendations from the agencies. It provides DPE–Water’s recommendations to address those issues. Recommendations are provided by DPE–Water alongside issues in Table 5 that have not been resolved.

In total, there were 19 such issues, all raised by WaterNSW:

- 16 related to the Barwon–Darling
- two related to the Macquarie–Bogan
- one related to the Gwydir
- 10 issues did not require recommendations to address the issues.

Table 5. Issues raised by partner agencies and DPE–Water response

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
20	WaterNSW	Barwon–Darling	Minimum EOI rule	WaterNSW customer field officer requested clarification regarding the Minimum EOI rule	-
21	WaterNSW	Barwon–Darling	Automatic apportioning rule	WaterNSW customer field officer also provided feedback that an automatic apportioning rule should be used to distribute the meter readings to A/B/C class usages	-
22	WaterNSW	Barwon–Darling	Mismatch procedures – drop of downstream flow class	For a mismatch distribution, forecast flow value of d/s reference station of a zone will drop below the actual CTP. For example, assume the calculated flow class of zone 10 is B class and adjusted CTP is 1,300 ML/day. If the forecast before extraction flow is 1,500 ML/day, B class allocation will be 200 ML (assuming no A class EOI). If we allocate 5 ML as mismatch, the forecast flow at Bourke after extraction will be 1,295 ML/day which is below the B class adjusted CTP. For zone 11 (Bourke to Louth), Bourke is the u/s reference station and forecast after extraction is below B class CTP. Even if Louth flow is 1,000 ML above the B class CTP, flow class for zone 11 will be A class as Bourke forecast flow after extraction is 5 ML below B class CTP. So, zone 11 customers will lose 1,000 ML allocation due to a 5 ML u/s mismatch.	R.14 WaterNSW reported that, during the reporting period, mismatch was adjusted in such a way that the downstream zone flow class did not drop due to the mismatch.

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
23	WaterNSW	Barwon-Darling	Mismatch procedures – maximum sum of EOIs significantly less than sum of IDECs	<p>As per procedure 19 of the manual, if the available volume exceeds the sum of IDECs for all licence holders eligible to take water from all classes, all licence holders with an IDEC can take 1 ML/daily flow share. When the sum of maximum EOIs of a zone is significantly less than the sum of IDECs and the available volume is more, then the system allocates volumes to all licences based on their maximum IDEC (including the licences which did not submit an EOI).</p> <p>Unless an EOI was submitted, no licences are tagged as extractive or non-extractive licences in the system. So, if a licence which generally protects water does not submit an EOI, it will get an extractive allocation under this rule. Furthermore, if the available volumes fluctuate around the sum of IDECs, a small variation in loss forecast will cause a large mismatch. As an example, if the sum of EOI in a zone is 2,000 ML and sum of IDEC is 6,000 ML. If the forecast calculation indicates that available volume is 5,900 ML then 2,000 ML will be allocated on that day. But if the back-calculated available volume done the next day is 6,000 ML (100 ML more than forecast), then there is an apparent mismatch of 4,000 ML. This is not a realistic representation of the lost opportunity to take water, as all licences that submitted an EOI received their maximum request.</p>	<p>R.27 & R.6 for no flow share rule.</p> <p>R.14 for mismatch.</p>

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
24	WaterNSW	Barwon-Darling	Mismatch procedures – mismatch due to under-pumping	Some licences have IDEC significantly higher than their pump capacity. If they submit IDEC as their maximum EOI, it will produce a mismatch which is not true. Let's assume a licence has IDEC of 2,000 ML/day but actual pumping capacity is 1,000 ML/day. Submitted maximum EOI for that licence is 2,000 ML/day. On a particular day, if that licence is allocated 1,500 ML, it will be able to pump only 1,000 ML and d/s gauge flow on the next day will likely be 500 ML above the CTP. That will generate a 500 ML mismatch. If that mismatch is allocated next day, the allocation will be increased, but that licence will not be able to pump that and increase the mismatch consecutively.	R.14 for mismatch
25	WaterNSW	Barwon-Darling	Mismatch procedures – distribution between classes	Currently mismatch is calculated as a total for the zone not separated by A/B/C class or Schedule 2/2A licences. In many cases, distributed volumes through mismatch may be allocated to a different class from which it was originally generated. For example, if a mismatch is created due to an under-allocation to A class and we allocate a mismatch adjustment within the following 2-3 days, it is possible B class licences will receive most of the mismatch adjustment volume. This is because if the flow is above the B class CTPs, any A class licences would have automatically gotten their full EOI irrespective of the mismatch adjustment. Furthermore, if a mismatch is generated by a Schedule 2/2A licence (some of these have specific CTPs linked to a specific reference station) and we redistribute that later as mismatch, it is unlikely that the redistribution will benefit that 2/2A licence only. It will be allocated to all the licences that are forecast to receive less than their EOI on that day.	R.14 for mismatch

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
26	WaterNSW	Barwon-Darling	RoF rule	During the RoF rule, only A class was allowed for a few days to make sure the targets of 30 GL at Bourke or 972 ML/day over 10 days are met. The system was not designed to automatically handle this partial access.	WaterNSW made manual adjustments to ensure only A class was allowed u/s of Bourke. The DPE-Water fact sheet has been updated to provide clarifications.
27	WaterNSW	Barwon-Darling	One-gauge problem	Barwon at Tara gauge is affected by the Walgett Weir raising project so flow data for that gauge has not been available since the commencement of active management. This is the d/s reference gauge for zone 5 and the unavailability of this gauge causes issues with zone 5 flow class announcements and available volume distribution. Due to unavailability of the d/s reference gauge (Barwon at Tara), flow data of the u/s reference gauge (Barwon at Collarenebri) was used to calculate available water for zone 5.	R.28 Zone 5 announcements have been manually adjusted for days when allocation could be impacted by unavailability of the Tara gauge. On other days general forecast rules have been applied. Until such time as the Tara gauge is fully replaced, WNSW will provide access to licence holders and manage the system based on the flows forecast to occur at Tara. WNSW is seeking specific endorsement from DPE-Water on this issue.

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
28	WaterNSW	Barwon-Darling	Travel time and extraction points	When travel time from the upstream to downstream end of a zone is more than one day, the forecasting model assumes that extraction is evenly distributed along the zone. This is not the case in most zones. Large extractions can cause poor flow forecasts at the zone's downstream gauge due to the uncertainty about when the effect of the extraction will reach the gauge. This can produce situations where the observed flow remains above the adjusted CTP and allocations are less than the requested EOIs. This is caused by uncertainty in the location of extractions and the time it takes for their extraction to affect the downstream gauge, rather than inaccurate flow routing. This can be improved by getting the exact location of extraction points and extraction details and updating the forecasting model to include these.	R.29
29	WaterNSW	Barwon-Darling	Minimum EOI	Some customers submitted their IDEC as their minimum and maximum EOI, and some submitted greater than 0 as their minimum EOI. If the available volume per share is less than the minimum EOI, no water is allocated to that licence and that volume is distributed to other licences. If minimum EOI of a licence is 30 ML and as per initial calculation available volume for that licence on that day is 29 ML, no water will be allocated to that licence. A recalculation will be done, and that 29 ML will be distributed to other eligible licences.	WaterNSW's EOI fact sheet has been updated to provide clarity regarding the impact of minimum EOI on the allocation process.

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
30	WaterNSW	Barwon-Darling	IDEC and pumping capacity	For some licences IDEC is significantly larger than the actual pumping capacity. When those licence holders submit IDEC as their maximum EOI, significantly higher volumes are allocated to them than they can extract. This causes inaccuracy in the flow forecasting and also reduces the volume that could have been allocated to other licences. After advising water users of this issue, customers have reduced their maximum IDEC where applicable.	<p>WaterNSW partially addressed through effective communication with the customers who have significantly higher IDEC than pump capacity. Customers later adjusted their maximum EOI to reflect their effective pump capacity.</p> <p>This issue will be addressed through the implementation of temporary trading of IDECs, underway as part of the Barwon-Darling WSP remake.</p>

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
31	WaterNSW	Barwon-Darling	IDEC change	If IDEC of a licence is changed or a new licence is created when an event is ongoing, allocation can be missed depending on the timing of the announcement approval. If the system extracts data from the Water Licencing System (WLS), before the change take effect, the announcement will have been made using the IDEC and EOI applicable before the change. Also, a new licence will not be able to submit an EOI for the next day after the 9 am cut-off time.	Issue has been managed by creating two new WALs - one in zone 10 and another one in zone 11. The IDEC was distributed from a single WAL in zone 10 and the old WAL was discontinued. The EOI was placed against the old WAL and there was no EOI submitted for the new WALs while next announcement was in preparation on the day of the WAL change. EOIs were updated in the system manually to ensure the customer was not impacted.
32	WaterNSW	Barwon-Darling	Access for schedule 2 and 2A licences	An issue was identified where the volumetric limits may not have correctly applied in the announcements made for Schedule 2 and 2A licences resulting in extractions greater than the rules allow and impacting equitable sharing of water. The issue was notified to DPE-Water on 1 Jan 21 however it was later identified that the issue is related to forecast period only and did not impact the allocation on announcement day	It was identified that the issue only impacted forecast days not actual announcements. This can be managed in the system by overriding the usage figure by the operator. A system-based solution has been identified.

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
33	WaterNSW	Barwon-Darling	Aboriginal supplementary licences	Aboriginal supplementary licences are not currently included in the system. If access for Aboriginal Supplementary licences is ever required, it will need to be managed entirely by manual processes.	R.24
34	WaterNSW	Barwon-Darling	Water ordered or nominated for upstream valleys	Some difficulties were experienced with tagging the actual environmental delivery location at the end of the regulated river systems. To avoid this issue, environmental licences need to nominate appropriate end-of-system delivery locations so that orders can be placed via iWAS.	R.30
35	WaterNSW	Barwon-Darling	Change of water year	The system distributes water to the licences that have water in their accounts (and that have submitted an EOI to extract water). The account balances in the Water Accounting System are not updated for extractive licence holders until meter readings are entered. In wet years, licence holders need to ensure that their meter readings are entered (if they leave an enduring EOI in place) and therefore keep receiving announcements to take water, and that they do not exceed their legal take for the year.	WaterNSW needs to run the model between midnight at the end of the water year and 7 am of the next morning. This is because water is not available in customer's accounts (to receive a distribution) until 12:00 am, 1 July 2021.
36	WaterNSW	Macquarie-Bogan	Additional phone numbers on EOI	Only two emails and one mobile number were allowed in the EOI form on iWAS.	WaterNSW have added fields for additional phone numbers.

No.	Agency	Water Source	Issue	Description	Recommendation / Comment
37	WaterNSW	Macquarie-Bogan	Sleeper/irrigator licences allowed to protect water instream	There are several 'inactive' access licences (likely some without linked works approvals) with entitlements that would impact access to 'active' users if these licences were to simultaneously protect flows instream.	R.16 The department does not distinguish between active and inactive licences. In the Macquarie Bogan, WaterNSW grant a licence holder access to extraction or protection of flows if the licence holder's access threshold is met, they have submitted an EOI, and all licence conditions are met. Licence holders have equal rights to access water.
38	WaterNSW	Gwydir	No WALs in Mallowa Creek Zone	WaterNSW issued two initial access announcements for the Mallowa Creek Management Zone on 1 and 2 December 2020. However, since the commencement of active management in the Gwydir it has been identified that apart from one domestic and stock licence, there are no access licences in the Mallowa Creek Management Zone. Notwithstanding the fact that there are no licences for which any access announcement was intended to apply, as per the Procedures Manual 18.4, standard access conditions apply if no announcement is made.	DPE-Water have given WaterNSW permission not to issue access announcements for the Mallowa because there are currently no licences in the water source.

4.3 Partner agency recommendations

Item 3 (c) and (d) of Procedures 31, 25 and 32 of the Gwydir, Barwon–Darling and Macquarie–Bogan manuals respectively require the report to include a summary of results and recommendations contained in reports provided by WaterNSW, NRAR and proposals for variations or new procedures, respectively. The summary of results is presented in Section 3 while the agency recommendations and proposal for variations or new procedures are presented below.

4.3.1 WaterNSW

Flexible announcements in the Barwon–Darling

WaterNSW recommends introducing ‘flexible announcements’. Flexible announcements refer to an extra announcement (one extra per day) that could be made for an announcement period. This would typically involve issuing an extra announcement ideally before (but not prescribed to be before) say 11am on the relevant day.

An extra announcement would only be upwards. That is, it would provide for increased (not a reduced) access to licence holders (protection and extraction)

The issues that flexible announcements aim to address include local rainfall, identification of travel time issues, dealing with a mismatch, possibly also notification (to WNSW) of reduced take compared to EOI or other operational reasons (see issue 22 a-d in Table 6).

Communication around any extra announcements would be issued in the same way as per normal announcements but would need to be clearly branded differently. Flexible announcements would need to be supported by rules, procedure manuals and WNSWs’ corporate systems.

See R.1 to address issues caused by local rainfall, travel time and mismatch and to allow users to notify WNSW of reduced take compared to their EOI.

Revise mismatch procedures

WaterNSW recommends a revision in the mismatch rule is required to avoid lowering of the flow class in the downstream zone as a result of the mismatch volume in the upstream zone, for reasons discussed in issue no. 22 in Table 6.

See R.14 relating to a review of the mismatch rule.

No flow share rule

WaterNSW recommends a revision of the “no flow share” rule which currently allows all licences to extract water even if a licence does not submit an EOI. This is contradictory to the WSP clauses 46(1) and 47(5) which indicate an EOI must be submitted to extract water.

See R.1 to address lowering the downstream flow class as a result of the mismatch volume and R.6 for relating to the “no flow share” rule.

Wording of CTP threshold

WaterNSW recommended that the wording in the Barwon–Darling WSP should be changed from “more than” to “equal to or more than” as WaterNSW understands this to be the intent of the rule.

Whilst this was part of the WSP, it is only an issue because of the application of water sharing arrangements under active management.

R.3 DPE-Water to consider revising wording for access thresholds in the Barwon–Darling Water Sharing Plan (49A, Table B) from "more than" to "equal to or more than".

One gauge issue

According to Barwon–Darling WSP clause 49A (5), if flow data is not available for one of the two reference gauges, the flow class announcement should be made using the flow class threshold that applies at the remaining functional gauge. The WSP rule conflicts with the operating regime of providing access based on forecast flows.

The procedure manual requires forecast flows to be used for announcements and the operational model still forecasts flows regardless of whether the gauge information is available or not. Furthermore, it is not possible for the model to temporarily ignore flow information (either forecast or actual flow), as suggested by the WSP.

WaterNSW recommends changing the Barwon–Darling WSP clause 49(A)5 to enable the use of forecast flows from an unavailable gauge.

R.5 Consider changes to WSP clause relating to use of the remaining functional gauge, when data from one gauge is not available [49A (5) Barwon–Darling WSP], to allow forecast flows instead of ignoring the non-functional gauge.

Tara gauge

The Tara gauge is 'back water' affected by the upgraded Walgett weir and now only provides water level data, not flow data. The Tara gauge will be replaced by a new gauge at Caloola upstream of Tara. Once the replacement gauge is established, there will be a period where both gauges will be used to assist with correlation (with the old Tara gauge providing level data only).

Before the new gauge at Caloola completely replaces the Tara gauge, the following issues and changes need to be considered:

- Changes to the WSP – the reference to the gauge and the impacted Management Zone

- Changes to licences – need to determine how many licences are “between” Tara and Caloola and notify them of the changes required to their licence. Need to also look at special licences that may reference Tara

- Changes to the licencing systems, data bases, operational models.

Until such time as the Tara gauge is fully replaced, WaterNSW will provide access to licence holders and manage the system based on the flows forecast to occur at Tara as an interim measure.

WaterNSW recommends using the interim measure to manage the issues at the Tara gauge and is seeking specific endorsement from DPE–Water on this issue.

R.28 DPE–Water to review interim measures used by WaterNSW to address issues with Tara gauge and either endorse the measures or propose new measures.

R.34 WaterNSW to replace/relocate Tara gauge and DPE–Water to update references to the gauge in the Barwon–Darling WSP and procedures manual.

4.3.2 DPE-EHG

Change in reporting processes

DPE-EHG requested a change in the annual reporting process, so AEW event details are provided to them first. There is currently no requirement in the procedures manual requiring WNSW to provide active management event data to DPE-EHG or NRAR prior to their reporting.

R.10 DPE-Water to amend the three procedures manuals to require WaterNSW to provide a basic summary of active management events in the previous 12 months to 30 June to agencies by 31 August.

Install new gauges

To improve implementation of active management DPE-EHG recommended a stream flow gauge is installed on Marthaguy Creek near upstream of the confluence with Terrigal Creek. A gauge at this location will provide data that can be used for compliance (i.e., to check if water users pumped without proper participation in the EOI process). DPE-EHG does not hold information on this.

Without investment in additional gauging or information on the compliance with the announcements, the data available to DPE-EHG to detect if water volume is protected is largely inadequate. While DPE-EHG can examine time series data and look for anomalies (as done in Appendix B – Active management event analysis, Figure 9), we do not have clear base case information on the expected relationships between gauges. This is because DPE-EHG do not know when pumping may have occurred during the instrumental record. Further work to establish clearer expected relationships between gauges when pumping is known not to have been occurring would be useful to determine upper and lower thresholds of concern for future reporting.

The Hydrometric Improvement Plan (DPE 2021) includes a gauge at this location as the second in a list of top-ranked northern Basin sites for installation or upgrade. The plan also explains that top-ranked sites will be assessed for viability and the initial five sites will be installed by June 2022.

R.31 DPE-Water to progress the installation of the new gauge at Marthaguy Creek near upstream of the confluence with Terrigal Creek (prioritised in the Hydrometric Improvement Plan).

R.25 WaterNSW and NRAR to explore options for dynamic (near real-time) comparison of extraction data and daily access announcements.

4.3.3 NRAR

Extraction data

NRAR commented that progressive implementation of the non-urban metering framework will support active management compliance monitoring. NRAR recommends WaterNSW and NRAR explore options for dynamic comparison of extraction data and active management rules.

This recommendation from NRAR aligns with the Claydon Review Recommendation 18.

Announcement records

NRAR recommends that an accessible archive of announcement records should be maintained by WaterNSW and DPE-Water.

R.32 WaterNSW to make access announcements from all prior water years publicly available through their WaterInsights portal.

Advanced notification protocol

NRAR suggest WaterNSW and NRAR should establish an advanced notification protocol to facilitate timely consideration of active management compliance monitoring.

R.33 WaterNSW and NRAR to establish an advanced notification protocol to facilitate timely consideration of active management compliance monitoring.

5 Evaluation

Item 3 (e) of Procedures 31, 25 and 32 of the Gwydir, Barwon–Darling and Macquarie–Bogan manuals, respectively, require the report to include an assessment of whether:

- procedures were followed for active management
- any deviations from the procedures occurred and any modifications to the procedures that may be required to avoid future deviations, where possible
- the current active management procedures and the associated operation provide for AEW to remain in the water source for environmental purposes
- the risk management measures in place are effective in protecting AEW and ensuring that access by water users to water above the access thresholds arising from other sources has not been impacted
- the active management procedures should be expanded, modified or remain unchanged.

5.1 Were procedures followed and any deviations?

Procedures were largely followed across the three water sources where active management rules apply. An assessment of deviations (i.e., which procedures were not followed) is provided in Table 6.

The findings in Table 6 are based on information provided in the annual statements and supporting information (flow data and analysis) provided by partner agencies, mainly those from WaterNSW. Additional evidence includes the publicly available record of announcements, as well as the additional functionality to support active management, provided on WaterNSW's WaterInsights portal. Deviations, marked with a "Y" are discussed in further details

It is worth noting that an independent review into the implementation of active management (as well as RoF and IDECs) in the Barwon–Darling during 1 December 2020 to 31 March 2021 attributed much of the success of the implementation of these new rules in the Barwon–Darling to the "adherence to recently developed procedures manual/guidance documents" (Claydon, 2021).

Table 6. Assessment of deviations from procedures (value in brackets corresponds to deviation no.)

Procedure category	Any deviations?		
	Barwon-Darling	Gwydir	Macquarie-Bogan
Forecasting flows and river transmission losses	N	N	N
Identifying, determining and monitoring active environmental water	N	N	Y (4)
Monitoring and managing the intended sharing of river flows	N	N	N
Issuing flow advice	N	N	N
Expressions of interest	N	N/A	N
Adjusting access thresholds	Y (2)	N/A	N/A
Determining the water available and maximum volume permitted to be taken	N	N/A	N/A
Determining the flow class	N	N	N
Daily management approach	N/A	N/A	Y (4)
Access announcements	Y (2,3)	N	N
Debiting water allocations accounts	N	N	N
Monitoring, evaluation, reporting and improvement	N	N	N
Deviating from procedures outlined in this procedures manual	N	N/A	N

WaterNSW declared three deviations in their annual reports (Table 8), all of which occurred in in the Barwon-Darling. DPE-EHG reported another in the Macquarie-Bogan. None of the four deviations represented a material risk to the protection of AEW, with Deviation 4 providing greater protection to AEW. One deviation (Deviation 1), however, was a deviation from a Barwon-Darling WSP rule.

Each deviation is summarised in Table 8, with associated recommendations provided to avoid such deviations occurring again.

Table 7. List of deviations from the procedures manual (and WSP)

ID	Description	Water Source	Procedure	WSP Clause
1	Two occasions where two licence holders were allowed to pump above their IDECs	Barwon–Darling	N/A	42A
2	One corrected announcement following a system error	Barwon–Darling	25	N/A
3	Adjusting schedule 2 licences to account for AEW	Barwon–Darling	15.3, Note 5	N/A
4	One AEW event (500 ML) in Macquarie–Bogan was not announced and not protected	Macquarie–Bogan	24	53A (2, 3)

5.1.1 Deviation 1 – Two occasions where licence holders were allowed to pump above their IDECs

On two separate occasions, two separate licence holders (one in management zone 10 and one in management zone 5) were granted permission by DPE–Water to extract more than their respective IDECs. These occasions represent a deviation from clause 42A of the Barwon–Darling WSP which limits take to 1 ML per daily flow share or less.

Management Zone 10

The first occasion was initiated by local rainfall in an ungauged section, which could not be captured in the flow forecast. As a result, the licence holder in Zone 10 missed 216.4 ML of A class access between 9 am 6 January 2021 and 9 am 7 January 2021. Procedure 12 of the Barwon–Darling procedures manual provides for make-up announcements to account for the mismatch between forecast and observed flows. However, due to both the impending resumption of flows restriction on 12 January 2021 and the licence holder’s existing EOI in place (for full IDEC each day until 12 January) any mismatch adjustment in the days leading up to 12 January would result in the licence holder exceeding IDEC.

Procedure 18.4 states that “mismatches between the forecast and post-event calculated water available must not be reconciled between events”. WaterNSW discussed the issue with DPE–Water and approval was given for the licence holder to extract the missed volume by exceeding her/his IDEC, but not exceeding the 304.5 ML total daily A-class extraction limit in management zone 10.

WaterNSW then contacted the licence holder via email on 8 January confirming the same volume (216.4 ML) would be allowed to be extracted before 9 am 12 January 2021, but they could not exceed the total daily A-class extraction limit for the zone, meaning an additional 88.1 ML per day could be pumped on top of 216.4 ML until 9 am 12 January 2021 unless any other A class licences placed an EOI.

A review of flow data provided by WaterNSW shows that during the four days from 8-11 January there was 81 ML of HEW that flowed into Management Zone 10. Although 3,069 ML was allocated for extraction during that 4-day period, total flows through this management zone after extraction

were 5,748 ML, and all HEW flowing through the system was protected in the downstream zone. This means HEW was not at risk of extraction as a result of the allowance to pump above IDEC.

Management Zone 5

The second occasion arose from two factors – the Barwon @ Tara gauge being out of service and a conflict between Barwon–Darling WSP clause 49A (5) and WaterNSW’s operational (forecasting) practice.

The Barwon @ Tara gauge (422025) is the downstream reference gauge for management zone 5 (Collarenebri to upstream Walgett weir pool management zone) and was inundated by the Walgett weir raising project. Data from the gauge has been unavailable since active management commenced 1 December 2020.

According to Barwon–Darling WSP clause 49A (5), referred to as the ‘one-gauge rule’, if flow data is not available for one of the two reference gauges, the flow class announcement should be made using the flow class threshold that applies at the remaining functional gauge. That is, the missing gauge should at Tara be ignored in the forecast and only Collarenebri gauge should be used.

The one gauge rule does not reflect the CARM forecasting model’s ability to provide a flow forecast at a missing gauge. The rule is also impractical, as it is very difficult to ‘turn off’ a gauge in the CARM forecasting model. WaterNSW resolved to use the forecast rather than ignore the Tara gauge as per the WSP when making flow class announcements. This conflict between the operational practice and the WSP clause led a zone 5 licence holder to dispute the 9 am 9 January to 9 am 10 January 2021 announcement, which was based on forecast at the missing gauge rather than the WSP clause.

The licence holder contacted WaterNSW and claimed they missed out on 385.8 ML (their full IDEC) of access as a result of the operational practice of forecast flows when the WSP one-gauge rule should have been used. It was confirmed that if only Collarenebri gauge had been used to forecast flows, then A class access would have been announced when only low flow class access was announced, and the licence holder would have had access to his/her full IDEC of 385.8 ML.

WaterNSW raised the dispute with DPE–Water. DPE–Water allowed the licence holder to extract 385.8 ML before 9 am 12 January 2021 via email on 9 January 2021 and allowed the licence holder to pump above his/her IDEC. Pumping above IDEC was required as the licence holder already had full IDEC EOs in place for those day up to 9 am 12 January when the resumption of flows rule would be triggered.

A review of flow data provided by WaterNSW shows that during the three days from 9-11 January there was 0 ML of HEW that flowed into zone 5. This means HEW was not at risk of extraction as a result of the allowance to pump above IDEC.

Summary

Both deviations arose when new or untested occurrences (i.e., local rainfall and the one-gauge issue) intersected with the challenge to re-allocate missed volumes in the lead up to the first-ever resumption of flows event. These occurrences led to DPE–Water making allowances so that missed volumes were offset to avoid any material impacts to licence holder access, while managing risks HEW by ensuring the management zone total daily extraction limit was not exceeded.

While the deviation should fall under circumstance 2 for deviating from the WSP, DPE–Water views the two allowances to access volumes above IDECs as stop-gap solutions used to address unforeseen circumstances in the first year of active management. Therefore, it could be considered under circumstance 1. Furthermore, HEW was not placed at risk from extraction as a result of the allowances, and such measures will not be used again. However, no such allowances will be made in the future.

See R.1 to address local rainfall impacts

See R.5 to address one-gauge issue

See R.27 regarding interim measures for Tara gauge

R.11 DPE–Water to reinforce the requirement that IDECs shall not be exceeded under any circumstances by stating this in the Barwon–Darling procedures manual.

R.34 WaterNSW to replace/relocate Tara gauge and DPE–Water to update references to the gauge in the Barwon–Darling WSP and procedures manual.

5.1.2 Deviation 2 - One corrected announcement following a system error

On one occasion access was allowed outside the usual announcement procedure (Procedure 25) due to a system/human error. In management zones 6 and 7, the announcement that applied from 9 am 11 March 2021 did not announce access to B class as it should have. This impacted licence holders in the Walgett Weir Pool management zone (Management Zone 6) and those downstream in the Walgett to Boorooma management zone (Management Zone 7). To correct the issue, customers were called immediately and emailed advising that they could pump their IDEC (i.e., what the announcement should have advised). There were seven WALs and four customers impacted. The emails authorised a total of 511.7 ML available for extraction.

Summary

This occurrence represented a deviation from Procedures 25 (4) that states a flow share announcement cannot be amended or retracted. Since the correction sought to announce the originally intended flow class announcement determined by the forecast model, it did not pose a risk to protection of AEW. This deviation did not fall under circumstance 1 or 2 as it was a human error.

R.35 WaterNSW to revise announcement system to minimise opportunity for human error.

5.1.3 Deviation 3 - Adjusting schedule 2 licences to account for AEW

WaterNSW have been adjusting access thresholds for a schedule 2 licence (WAL 33722) to account for AEW. This action represents a deviation from Procedure 15 (3) and Note 5 of the Barwon–Darling procedures manual (shown below).

Procedure 15 (3)

WaterNSW will adjust the access rules specified in column 2 of schedules 2 and 2A when AEW is forecast [to] be present, except for the following WALs:

- 33722

- 33622
- 33667
- 33671
- 35396, and
- 36274.

Note 5

Access thresholds for the following licences listed in schedules 2 and 2A will not be adjusted to protect AEW:

WAL 33622, 35396, 36274, 33671 – these are domestic and stock access licences that are not affected by the presence of AEW

WAL 33722, 33622 and 33667 – these access licences do not reference a flow rate at a river gauge as a cease to take condition. Therefore, their access thresholds cannot be adjusted based on the AEW.

Subclause 47(4) of the Barwon–Darling WSP states that the access rules for schedule 2 and 2a licences may be adjusted by the Minister to protect AEW:

47 Access rules for specific access licences

(4) The Minister may adjust an access rule referred to in Column 2 of Schedule 2 or Schedule 2A by an amount determined by the Minister as necessary to protect Active Environmental Water in accordance with the Active Management Procedures Manual.

WAL 33722 has a mandatory condition (MW6993-00001) on its works approval that reflects the WSP. The works approval also includes a discretionary condition (DK5993-0000) which explicitly applies unadjusted B class access thresholds and provides no condition to adjust access thresholds to account for AEW. The discretionary condition is consistent with Procedure 15 (3) that does not require the access thresholds to be adjusted to protect AEW.

Mandatory condition

MW6993-00001

Water must not be taken under WAL number 33722 or WAL number 33622 when water is flowing from Thalaba Creek into the Pagan Creek offtake adjacent to TSR 3677, Parish of Pagan, County of Denham. The Minister may adjust this access rule by an amount determined by the Minister as necessary to protect Active Environmental Water in accordance with the Active Management Procedures Manual.

Discretionary condition

DK5993-00001

A. Water must only be taken using water supply works authorised by this approval [ESID120211], located on the Barwon River, under WAL number 33722 (85AL753336) when flows are in the B Class, which means that the flow is greater than: i. 500 ML/day at Barwon River at the Collarenebri Main Channel gauge [No. 422003], and ii. 430 ML/day at Barwon River at the Tara gauge [No. 422025].

After noting the conflicting conditions, WSP clause and procedure, WaterNSW sought advice from DPE-Water as to whether WAL 33722's access thresholds should be adjusted or not. Following the advice from DPE-Water, WaterNSW adjusted WAL 33722's access thresholds to account for AEW.

Summary

DPE-Water consider this deviation from Procedure 15 (3) to have improved protection of AEW in the Barwon-Darling Unregulated River water source, consistent with circumstance 1 to allow deviations. There is a, however, a need to resolve the conflicting and confusing conditions relating to WAL 33722 and any other schedule 2 or 2A licences.

R.17 DPE-Water and WaterNSW first explore the rationale behind the inclusion of Procedure 15.3 and Note 5 and then revise the procedure, the Barwon-Darling WSP, and the mandatory and discretionary conditions for Schedule 2 and 2A licences in the WSP to ensure consistency between all three instruments.

5.1.4 Deviation 4 - One AEW event (500 ML) in Macquarie-Bogan was not announced and not protected under active management rules

There was a one-day supplementary water order (@ 500 ML/d) placed by DPE-EHG on 26 March 2021 at Marebone. Due to an oversight, the announcement under active management for that event was missed. However, an analysis prepared by WaterNSW (see Table 13 in Appendix B - Active management event analysis) shows that no impact to environmental water was observed throughout lower Macquarie active management zones. All environmental water assessed to have been delivered at Marebone on 26 March 2021 passed downstream of the river and did not flow into the Gum Cowal management zone.

Summary

The deviation represents a deviation of the clause 53A (2, 3) of the WSP for the Macquarie-Bogan unregulated water source and falls under circumstance 2.

See R.34

R.36 WaterNSW to review and improve systems to ensure all active environmental watering events are reported and protected.

5.2 Were the procedures and their associated operations effective?

5.2.1 Effectiveness of procedures

In their current form, the procedures manuals largely provide for AEW to remain in the water source for environmental purposes. However, there are two gaps in the procedures and overarching WSPs that need to be filled to better protect AEW. These gaps are (1) protection of AEW in Barwon–Darling backflows into the lower Macquarie and (2) protection of AEW from specific Schedule 2 and 2A licences.

Protection of AEW in Barwon–Darling backflows into Lower Macquarie

Currently, the Macquarie–Bogan procedures manual and the Macquarie–Bogan WSP (and licence conditions) provide no protection from unregulated licence holders accessing AEW in Barwon–Darling backflows.

Macquarie unregulated river licence holders near the confluence with the Barwon–Darling have ‘visible flow’ licence conditions that have historically allowed them to access back-flows from the Barwon–Darling. Access to backflows for these licence holders changed when active management was implemented in the Macquarie–Bogan. Active management rules now mean that the ‘visible flow’ condition does not apply when both AEW is present in the Macquarie–Bogan and the available volume is less than the sum of total pumping capacity in the Lower Macquarie River Downstream management zone.

AEW in Barwon–Darling backflows is at risk of extraction when there is no AEW component to flows in the Macquarie–Bogan management zone, or when there is a mix of AEW and available volume, and the available volume is greater than the sum total pumping capacity within the management zone. The likelihood of AEW being extracted in the Barwon–Darling backflows when available water in the Macquarie–Bogan is greater than the total pumping capacity in the management zone, however, is very low as the magnitude of flows down the Macquarie would physically prevent Barwon–Darling AEW flowing back up into the Macquarie–Bogan (Table 9).

Table 8. Scenarios where AEW in Barwon–Darling backflow is at risk of extraction in the Macquarie–Bogan

No.	AEW present in M-B	Available water present in M-B	Flow share announcement	Visible flow condition applies	Barwon–Darling backflow can be accessed	AEW in B–D backflows at risk?
1	No	Yes	No	Yes	Yes	Yes
2	Yes	No	No	No	No	No
3	Yes	Yes	Yes	No	No	No
4	Yes	Yes	No	Yes	Yes	Unlikely

DPE–Water and WaterNSW have been aware of this issue since early 2021 and have developed a list of options to address the issue. As an interim solution to best protect AEW in Barwon–Darling backflows, WaterNSW has been issuing ‘no access’ or ‘limited access’ notifications to these licence holders when they could potentially access the AEW.

Any Barwon–Darling AEW extraction by Macquarie licence holders would appear as an unaccounted difference/loss at the next downstream gauge in the Barwon–Darling. This would result in reduced available volumes for downstream Barwon–Darling licence holders, and reduced volumes of AEW recognised through the system. While the extraction in the Macquarie would be recorded, a lack of accounting for these extractions in the Barwon–Darling may have impacts on other long-term accounting.

This issue represents the largest gap in AEW protection in the procedures manual. Further work by DPE–Water and partner agencies is required to identify the most appropriate solution. A long-term solution will likely involve Macquarie–Bogan WSP changes; however, this is several years away as the remake of the plan is not due until June 2023.

Protection of AEW from specific Schedule 2 and 2A Barwon–Darling licences

WaterNSW raised an issue with Procedure 15.3 which does not require access thresholds to be adjusted, to account for AEW, on six Barwon–Darling licences in Schedule 2 and 2A. It is unclear what the rationale was for the inclusion of this procedure. In practice, WaterNSW did adjust access thresholds to account for AEW, which is reported as deviation (Deviation 4) in Section 5.2.

Procedure 15.3 therefore creates a gap or, at the very least, some uncertainty in how AEW is protected from extraction by holders of these six licences.

5.2.2 Associated operations

The current operations relating to active management carried out by WaterNSW largely provide for AEW to remain in the water source for environmental purposes. There are, however, several issues and recommendations below which if addressed would improve protection of AEW.

Unprotected AEW event in the Macquarie–Bogan (Deviation 5)

As discussed in 5.2 *Any deviations from procedures*, 500 ML of HEW was not announced or protected in the Macquarie–Bogan. WaterNSW reported that this occurred due to an oversight but had no impact on the protection of AEW.

This oversight represents a gap in the associated operations for protection of AEW. WaterNSW need to review their systems to ensure all AEW events are reported and protected.

Adjusting travel time when AEW is present

WaterNSW reported that manual changes in travel time within a zone can present a risk to AEW in that zone. Manual changes to travel time are limited to increments of whole days, which can cause inaccurate accounting of AEW in the zone at the time.

WaterNSW need to look into method to reduce impacts to AEW when manually changing travel time to better protect AEW in that zone.

Access to compliance and extraction information

In their annual statement, DPE–EES highlighted the importance of access to extraction and compliance information, so that they could conduct their own compliance activities. DPE–EES were particularly interested in whether water users extracted water without submitting an EOI and explained that they did not have the information to do this. DPE–EES can only examine time series data at flow gauges and look for anomalies (as they did in Figure 9 in Appendix A) but have no clear base case information to assess what was expected versus what occurred.

No evidence presented of AEW extraction although no active management compliance monitoring

Along with the assessments of effectiveness above, it is important to note that there has been no evidence presented of AEW being extracted in the three water sources between 1 December 2020 and 30 June 2021. Conversely, the only compliance monitoring conducted by NRAR was during the RoF period (12-29 January 2021) in the Barwon–Darling, which did not necessarily assess compliance with the active management mechanism.

Summary

There are gaps in both the procedures manual and associated operations. DPE–Water and WaterNSW need to work together to address these to ensure the active management mechanism is effective at protecting AEW and is also viewed by stakeholder to be effective.

- R.15 DPE-Water and partner agencies to further investigate measures to protect AEW in Barwon–Darling backflows from extraction in the Macquarie, and then implement these measures.
- R.37 WaterNSW to ensure impacts on active environmental water volumes are avoided when manually changing travel time.

5.3 Were the risk management measures effective?

The procedures manuals require an assessment of whether the risk management measures in place for active management are effective in:

- protecting AEW
- ensuring that access by water users to water above the access thresholds arising from other sources (i.e., available water) has not been impacted.

The procedures manuals identify ‘uncertainty in forecasting flows’ as the principal residual risk to both protection of AEW and access to available water. The uncertainty is a result of the inherent variability in natural river systems and the limitations in measuring and estimating flow parameters. This uncertainty leads to differences between announced (based on the forecast) flows and actual (measured or post-calculated) flows. The procedures manuals also require this evaluation and review to consider whether criteria are required to define when a response to a mismatch between forecast and observed AEW should be taken.

5.3.1 Risk management measures

There are eight risk management measures listed in the procedures manuals, employed mostly by WaterNSW, with the aim of striking a balance between over-estimating and underestimating available water and AEW, while remaining operationally feasible. The eight risk management measures for WaterNSW are:

1. consider the best information available on daily extraction
2. make the forecast/prohibition to access/volumetric limit announcements as close to the period of access as possible
3. share river transmission losses proportionally
4. base initial and ongoing loss estimates on historic loss
5. adjust the ongoing loss forecast to prevent mismatches compounding
6. adjust access to address cumulative mismatches
7. increasing the frequency of announcements
8. continuous improvement (better information and metering, conduct reviews and evaluations).

5.3.2 Assessment

As part of risk management measure 8, WaterNSW provide information on flow events in their annual reports, summarising differences between forecast and actual available volumes, losses and AEW. The mismatch totals for available water, losses and AEW, across all events in the Barwon–Darling and Macquarie–Bogan, are shown in Table 10.

The values in the “AEW mismatch” column are the sum of mismatch in losses and mismatch in AEW announcement. For example, if in Zone 2 of the Barwon–Darling, AEW arriving from upstream is 100 ML and WaterNSW forecast that there will be a loss of 20 ML, then AEW at the end of the system will be 80 ML. If an EOI to protect AEW in Zone 2 of 300 ML is in place, and (based on the forecast) WaterNSW allocate 200 ML for protection, then the AEW for the start of zone 3 will be $80 + 200 = 280$ ML. If there was a local rainfall event, which caused the actual flow to be higher than forecast, enough to for WaterNSW to have allocated 300 ML instead of 200 ML, and there was no loss, then the end of system EOI could have been $100 + 300 = 400$ ML. So, there is a AEW mismatch of $400 - 280 = 120$ ML.

Table 9. Forecast minus post-calculated totals

Unregulated Water Source	AEW mismatch forecast minus post-calculated AEW (ML)	Available water mismatch announced available water minus post-calculated available water (ML)	Losses mismatch forecast minus actual river losses (ML)
Barwon–Darling	11	-14,546	-32,139
Gwydir	N/A	N/A	N/A
Macquarie–Bogan	-1,226	34	-1,138
TOTAL	-1,215	-14,512	-33,277

Table 10. Total volumes of AEW and available water announced and mismatch %

Unregulated Water Source	AEW	Available water
Barwon–Darling	77,800	924,760
Gwydir	N/A	N/A
Macquarie–Bogan	25,700	16,444
Total	103,500	941,204
Mismatch %	-1.2	-1.5

Effectiveness in protecting AEW

Table 9 and Table 10 show:

- In the Barwon–Darling, 11 ML of AEW was protected under the active management rules that would not have been protected based on the post-calculated flows.
- In the Macquarie–Bogan, 1,226 ML was not protected under the active management rules that would have been protected based on post-calculated flows.
- Across these AEW events, the total volume of AEW protected in the Barwon–Darling was 77,800 ML and Macquarie–Bogan was 25,700²ML (not including the 500 ML from Event 2), totalling 103,500 ML.

Therefore, across the two water sources where active management events occurred in 2020-21, forecasting uncertainty led to 1,215 ML of AEW not being protected under the active management rules, that would have been protected if forecasting was 100% accurate. This underestimate represents 1.2% of the total volume of AEW in 2020-21.

Effectiveness in not impacting available water

Table 9 and Table 10 show:

- In the Barwon–Darling, 14,546 ML was not made available to licence holder that would have been made available based on post-calculated flows (not considering the impact of the ‘no flow share’ or ‘full IDEC allocation’ rule). The greatest mismatches occurred across event 2 (11,485 ML) and event 3 (3,223 ML) – see the mismatch analysis in Table 12 in Appendix D – Mismatch Analysis for further information.
- In the Macquarie–Bogan, 34 ML was announced that would not have been announced based on post-calculated flows (not considering the impact of the ‘no flow share’ or ‘full IDEC allocation’ rule).
- Across these AEW events, the total volume of available water in the Barwon–Darling was 924,760 ML and Macquarie–Bogan was 16,444 ML, totalling 941,204 ML.

Therefore, across the two water sources where active management events occurred in 2020-21, 14,514 ML was not made available to licence holders as a result of forecasting uncertainty (not considering the impact of the ‘no flow share’ or ‘full IDEC allocation’ rule). This underestimate represents 1.5% of the total volume of available water in the two water sources in the 2020-21 period when the active management rules applied.

Sources of uncertainty

In regard to the source of uncertainty, Table 10 shows that losses are a major source of forecasting uncertainty. In the Barwon–Darling, 32,139 ML in losses occurred that were not forecast. In their Barwon–Darling annual report, WaterNSW explain that large differences in forecast and actual losses were caused by sudden rainfall and unexpected losses between Wilcannia and Lake Wetherell in the Lower Darling. Sudden rainfall in the early stages of events makes it impossible to redistribute the additional volumes, as all licences were already receiving their full allocation (equal to their maximum EOI).

² Does not include the 500 GL in Event 2

WaterNSW also explain that between Wilcannia and Lake Wetherell losses were as high as 12,000 ML/day and a gain of more than 5,000 ML/day, although these differences do not impact announcements as they are at the end of the unregulated system. In the Macquarie–Bogan, losses of 1,138 ML occurred that were not forecast.

As another contributing factor, WaterNSW explained that the mismatch created due to full IDEC allocation rule (the ‘no-flow share’ in Procedure 19 of Barwon–Darling procedures manual where all licence holders in a zone can take up to their IDEC when the total available volume exceeds the sum of IDECs in that zone) also created large mismatch volumes. The ‘no-flow share’ procedure also contradicts the Barwon–Darling water sharing plan clauses 46(1) and 47(5), as it does not require water users to submit and EOI. The recommended review and revision of the ‘no-flow share’ procedure (R.6) should also consider the procedure’s impacts of mismatch.

Discussion

The values reported in Table 9 and Table 10 show that forecasting uncertainty (caused by factor such as localised and unexpected rainfall at the start of events, unpredictable losses and the ‘no flow’ share rule) leads to conservative announcements, which lead to overall underestimation-mismatches for both AEW and available water.

To determine whether the measures struck a balance between over-estimating and underestimating announcements, while also remaining operationally feasible, both components of this assessment need to be considered.

The overall percentages of underestimation mismatches for AEW and available water are small (1.2% for AEW and 1.5% for available water), and similar, suggesting an acceptable level of systematic conservatism.

In regard to the operational feasibility of the mismatch risk management measures, WaterNSW regard their feasibility to be questionable. WaterNSW explained that mismatch procedures are an accepted and agreed-upon approach, however, mismatch is a difficult procedure to implement, considering the additional analysis and the expectations created by the mismatch measure to resolve all issues caused by uncertainty. WaterNSW supports the implementation of sub-daily/corrective announcements to address the forecasting uncertainty.

Considering that 14,546 ML was not made available in the Barwon–Darling (although a small percentage of flows), it is understandable that licence holders there raised concerns regarding consistent under-allocation of water via announcements (See Issue 9 in Table 5). Therefore, it is important to continue to communicate the cause of future mismatches to licence holders, like those described above.

Summary

Further review of the mismatch is required to assess its operational feasibility. A solution could be to pause mismatch while corrective, sub-daily announcement are implemented.

The no-flow share rule can also be revised to minimise mismatch volumes.

In regard to whether criteria are required, to define when a response to a mismatch between forecast and observed AEW should be taken, since mismatch requires further assessment of its operational feasibility, this assessment will be deferred for the next annual evaluation and review.

See R.14 to further review mismatch

See R.1 to implement corrective, sub-daily announcements

See R.6 to revise the no-flow share procedures

5.4 Are changes to the procedures required?

The following recommendations from this annual evaluation and review (Table 11) require or potentially require changes to the procedures manuals:

Table 11. Recommendation from this evaluation and review requiring or potentially requiring changes to the procedures

	Recommendation	Change required to procedures?
R.1	DPE-Water to enable sub-daily (corrective) announcements in the unregulated Barwon-Darling water source, through water sharing plan, procedures manual and operational changes, consider the implication on compliance monitoring	Y
R.2	DPE-Water and WaterNSW to make the required changes to the Barwon-Darling Water Sharing Plan and procedures manual, and develop systems to enable temporary trade of IDECs	Y
R.5	DPE-Water to remove the requirement to ignore the flow class threshold at a non-functioning flow reference point gauge when making flow class announcements in the Barwon-Darling for management zones that rely on 2 flow reference points (i.e., WSP sub-clause 49A (5), referred to as the "one-gauge rule"), to allow the use of forecast flows at both flow reference points to determine flow class access.	Y
R.6	DPE-Water to change the 'no flow share' procedure (Procedure 19 in the Barwon-Darling procedures manual) to prevent licence holders who did not submit an EOI from extracting water	Y
R.7	DPE-Water and WaterNSW to complete investigations into travel times within a management zone greater than one day and their impact on licence holders in the Macquarie-Bogan (as being progressed through the Environmental Water Management Coordination Group)	potentially
R.8	DPE-Water to advise licence holders in the unregulated Barwon-Darling, Gwydir and Macquarie-Bogan water sources on the maximum period that can be entered for an EOI.	Y
R.9	DPE-Water to include wording (based on any relevant WSP clauses) in the three procedures manuals relating to the period an announcement applies in the case of a system outage, and should clarify that the announcement covers both the flow class and flow share.	Y

	Recommendation	Change required to procedures?
R.10	DPE-Water to amend the three procedures manuals to require WaterNSW to provide a basic summary of active management events in the previous 12 months to 30 June to agencies by 31 August	Y
R.11	DPE-Water to reinforce the requirement that IDECs shall not be exceeded under any circumstances by stating this in the Barwon-Darling procedures manual	Y
R.12	DPE-Water to revise the Barwon-Darling procedures manual to clarify that multiple flow share announcements and flow class announcements (each of 24-hour duration) during times of "high flow" may be announced on one day ("high flow" to be defined) so long as WaterNSW operational practice of daily accounting is followed.	Y
R.14	DPE-Water and WaterNSW to review operational feasibility of the mismatch procedures	potentially
R.18	DPE-Water and WaterNSW first explore the rationale behind the inclusion of Procedure 15.3 and Note 5 and then revise the procedure, the Barwon-Darling WSP, and the mandatory and discretionary conditions for Schedule 2 and 2A licences in the WSP to ensure consistency between all three instruments	Y
R.22	DPE-Water and WaterNSW to make changes to the Gwydir procedures manual to reflect the practices of not announcing access when normal conditions apply in the Gwydir and only announcing on days when active management rules apply	Y
R.24	WaterNSW to consider development of a system/process to facilitate Aboriginal supplementary access licences in the Barwon-Darling	potentially
R.26	DPE-Water to investigate development and implementation of an active management event reporting portal so agencies can report events, track compliance, report issues and put forward recommendations throughout the year	potentially
R.27	WaterNSW to change operational systems to prevent full IDEC announcement for licences that did not submit an EOI when the rules allow this	Y
R.28	DPE-Water to review interim measures used by WaterNSW to address issues with Tara gauge and either endorse the measures or propose new measures	potentially
R.30	DPE-Water to change procedures to require environmental water licence holders to (a) nominate the end of the upstream regulated system as the delivery location when the water is then to be actively managed in the Barwon-Darling, and to (b) place such orders via iWAS.	Y

	Recommendation	Change required to procedures?
R.31	DPE-Water to progress the installation of the new gauge at Marthaguy Creek near upstream of the confluence with Terrigal Creek (prioritised in the Hydrometric Improvement Plan)	potentially
R.33	WaterNSW and NRAR to establish an advanced notification protocol to facilitate timely consideration of active management compliance monitoring	potentially

The Claydon Review (Claydon, 2021) also made the following recommendations for procedural changes:

- R4 - Investigate feasibility of sub-daily announcements. This aligns with R.2 recommendation in this evaluation and review to implement flexible announcements
- R8 - Update procedures manuals to required report after every resumption of flows event.
- R11 - Remove reference to “initial conservative estimate” in the procedures manual.

These three Claydon Recommendations are being addressed through the Claydon Review Recommendations Implementation Project, managed by the Environmental Water Management Team.

6 Policy recommendations

The recommended changes to relevant policy and legislation as part of this evaluation and review are listed below.

6.1 Active management in unregulated rivers policy

The Active Management Policy for Unregulated Rivers remains fit for purpose, so no changes are proposed.

6.2 Water sharing plan recommended changes

There are a total of five recommended changes to water sharing plans within the 38 recommendations:

- Sub daily (corrective) announcement for the Barwon–Darling – R.1
- Temporary trade of IDECs in the Barwon–Darling – R.2
- Wording of Barwon–Darling access threshold – R.3
- Trading rules between Macquarie–Bogan licence holders with different access threshold – R.4
- One gauge rule in the Barwon–Darling – R.5

Further investigation into water sharing plan rules also include:

- Protecting AEW in Barwon–Darling backflows from extraction in the Macquarie–Bogan – R.15
- Sleeper licences in the Macquarie–Bogan – R.16

The Claydon Review also included the following recommendation changes relating to active management:

- Recommendation 6 – temporary trading of IDECs in the Barwon–Darling (relates to R.2)
- Recommendation 19 a – (relating to the resumption of flows rule in the Barwon–Darling) reset the cumulative flows past Bourke to zero if trigger is met within a trigger period.

R.1, R.2, and R.5 recommended water sharing plan changes from this review have already been included in the amended Barwon–Darling water sharing plan currently on public exhibition:

See more information at industry.nsw.gov.au/water/plans-programs/water-sharing-plans/recently-on-public-exhibition/barwon-darling.

7 Next steps

The next steps in the continuous improvement of active management will be (1) determine which recommendations to progress (2) consult with stakeholders on the proposed changes to the active management rules and procedures and (3) plan the implementation of the changes.

DPE-Water, with partner agencies, will determine which recommendations to progress.

Licence holders and peak stakeholder groups will be consulted on the changes to vary water sharing plans, the Active Management in Unregulated Rivers Policy or the three active management procedures manuals and their associated operations.

DPE-Water will prepare a workplan to implement the 38 recommendations from the review in collaboration with partner agencies. The plan will prioritise the recommendations for policy changes and documentation revisions, specifically any updates to the three procedures manuals and the Barwon-Darling Water Sharing Plan. In carrying out the workplan, DPE-Water will collaborate with partner agencies, and managers of relevant projects and programs.

8 References

- Claydon, G. 2021. Independent Assessment of the Initial Implementation of the Resumption of Flows Rule, IDECs and Active Management in the Barwon–Darling: 01 December 2020 to 31 March 2021, Final report by independent reviewer Greg Claydon, commissioned by DPE-Water, 14 September 2021.
- DPE (NSW Department of Planning and Environment) 2020. Active Management in Unregulated Rivers Policy (DOC19/50437), DPE–Water, February 2020
- DPE (NSW Department of Planning and Environment) 2020. Active Management Procedures Manual for the Barwon–Darling Unregulated Rivers Water Source (INT20/32976), December 2020
- DPE (NSW Department of Planning and Environment) 2020. Active Management Procedures Manual for the Gwydir Unregulated Rivers Water Source (INT20/57481), December 2020
- DPE (NSW Department of Planning and Environment) 2020. Active Management Procedures Manual for the Macquarie–Bogan Unregulated Rivers Water Source (INT20/32978), December 2020
- DPE (NSW Department of Planning and Environment) 2021. Hydrometric Improvement Plan (DOC21/162984), DPE–Water, November 2021
- DPE (NSW Department of Planning and Environment) 2021. Resumption of flows rule in the Barwon–Darling Unregulated River Water Source (PUB19/434) , DPE–Water, March 2021.
- WaterNSW 2021. How to guide – Lodge an expression of interest (EOI) for active management. Access online 12 June 2022

Appendix A – Where active management rules apply

Table 12. Where active management rules apply in NSW

Unregulated Water Source	Unregulated water sharing plan management zone	Figure
Barwon–Darling	All management zones	Figure A1
Gwydir	Upper Gingham Watercourse Management Zone Lower Gingham Watercourse Management Zones Mallow Creek Water Source	Figure A2
Macquarie–Bogan	Lower Macquarie River Upstream Management Zone Lower Macquarie Downstream Management Zones Gum Cowal Management Zone Lower Marthaguy Creek Management Zone	Figure A3

Figure A1. Active management rules apply across all fourteen-management zone in the Barwon-Darling Unregulated River Water Source

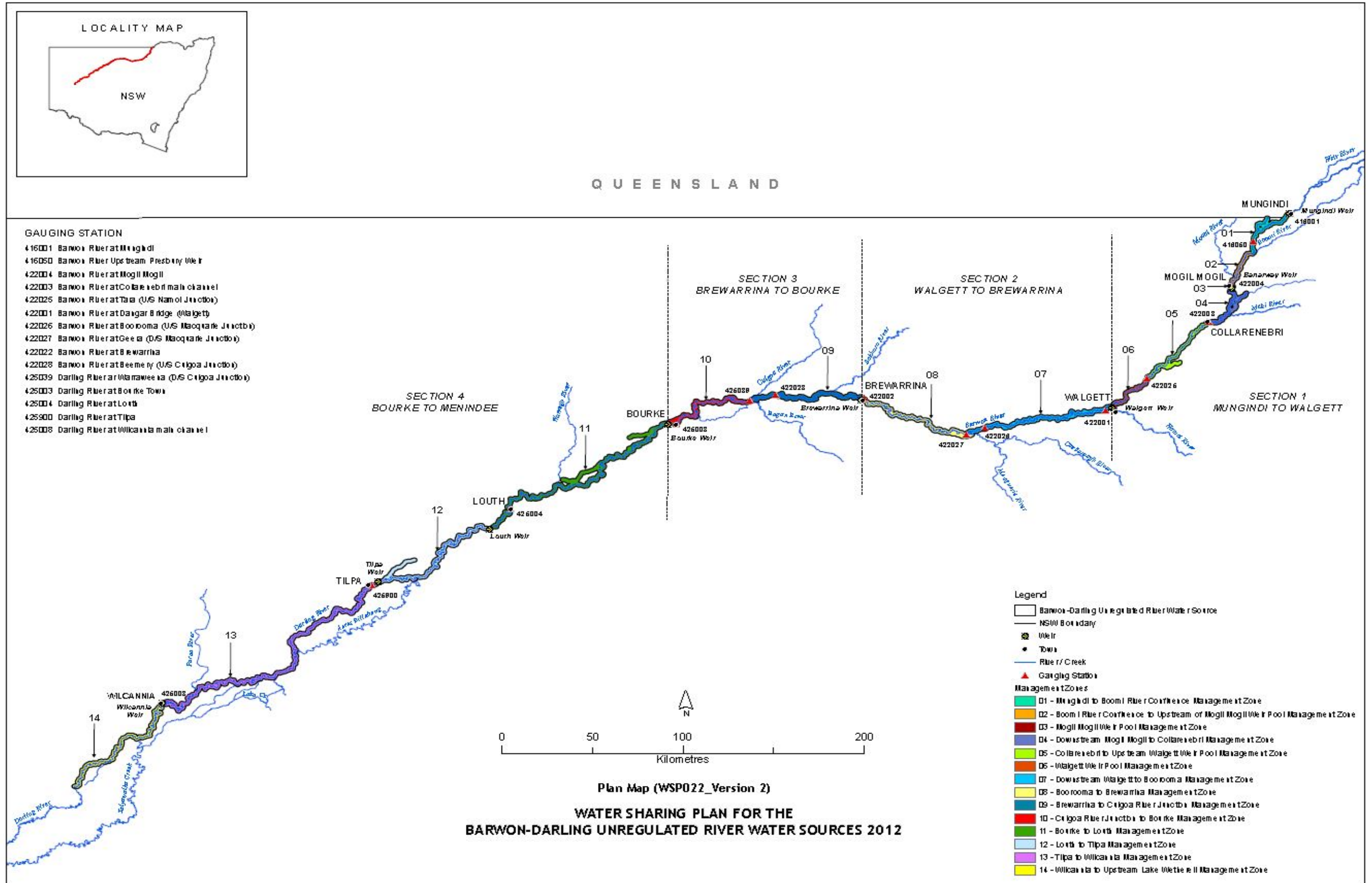


Figure A2. The three management zones where active management rules apply in the Gwydir Unregulated River Water Sources

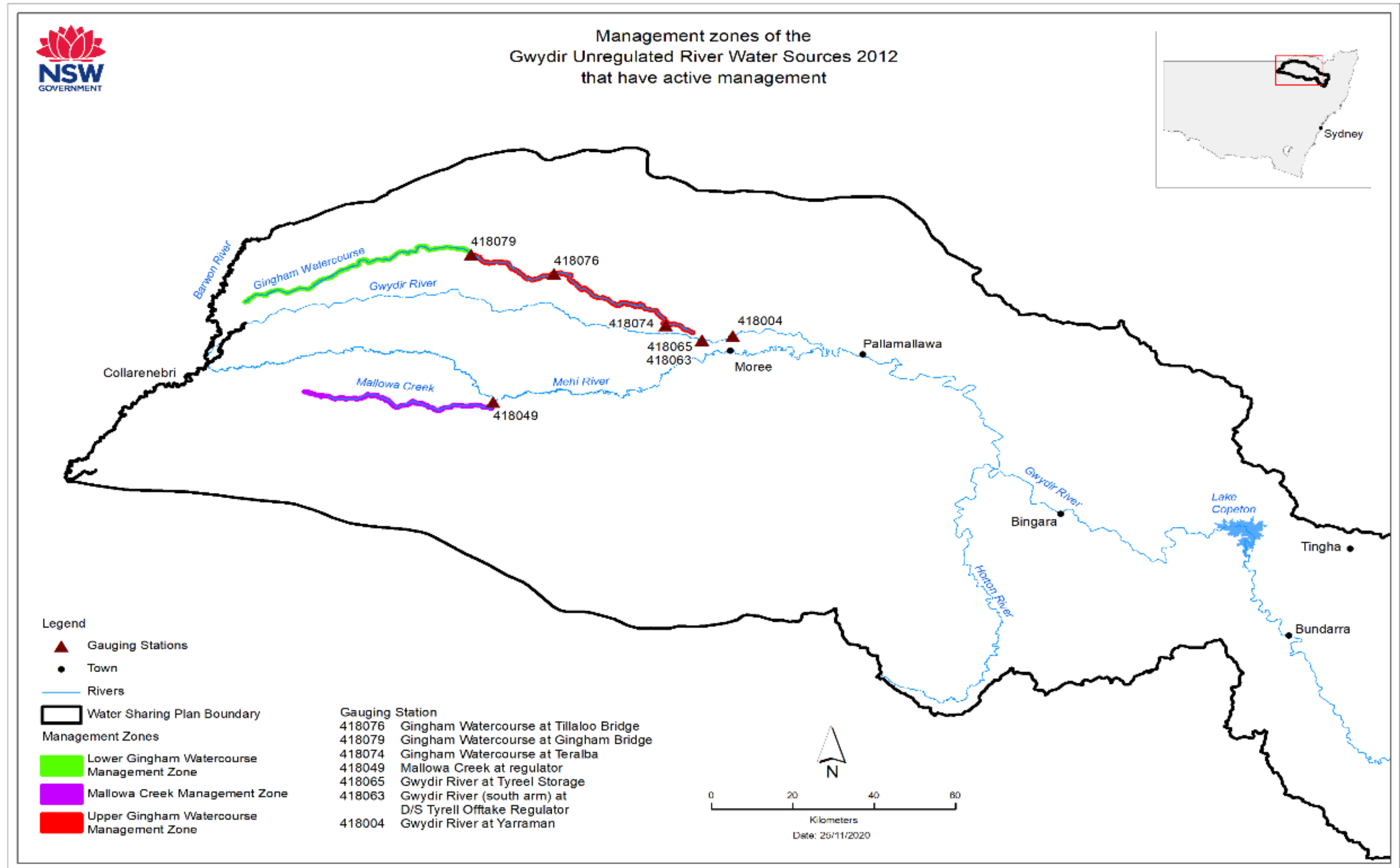
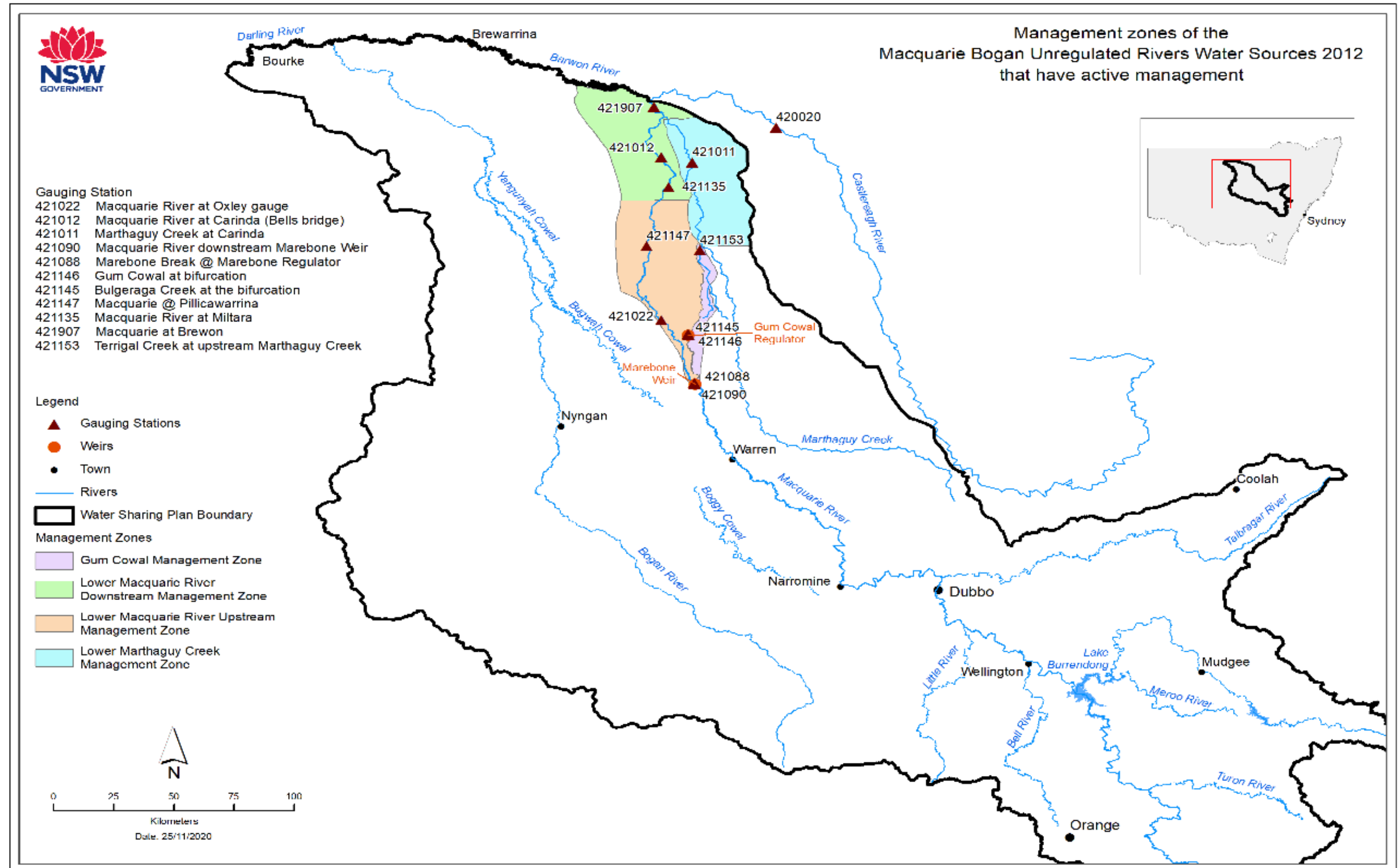


Figure A3. The four management zones where active management rules apply in the Macquarie–Bogan Unregulated River Water Source



Appendix B – Active management event analysis

Further analysis of active management events, prepared by partner agencies, is presented here.

- WaterNSW’s Barwon–Darling analysis in Figure 4, Figure 5 and Figure 6 show the total daily volumes of active environmental water and water available for extraction across Event 1, 2 and 3, respectively.
- Macquarie–Bogan analysis is shown in Figure 7, Figure 8 and Figure 9:
- WaterNSW’s Figure 7 provided Event 1 analysis at the Oxley gauge.
- DPE–EHG’s Figure 8 provides further analysis of Event 1 at the of the last three Macquarie gauges upstream (Miltara 421135, Bells Bridge 421012, Brewon 421907) and downstream of the Macquarie/Barwon–Darling River confluence (422027-422026). DPE–EHG identify three minor anomalies between the upstream and downstream gauges but reported that the causes of the anomalies are unknown.
- DPE–EHG’s Figure 9 shows flow accounting at Marebone weir from 1 July 2020 until 1 May 2021. The AEW before 1 December 2020 should be ignored as active management rules had not yet been implemented.

Figure 4. Daily total active environmental water and extraction allocation for Event 1 in the Barwon–Darling (provided by WaterNSW)

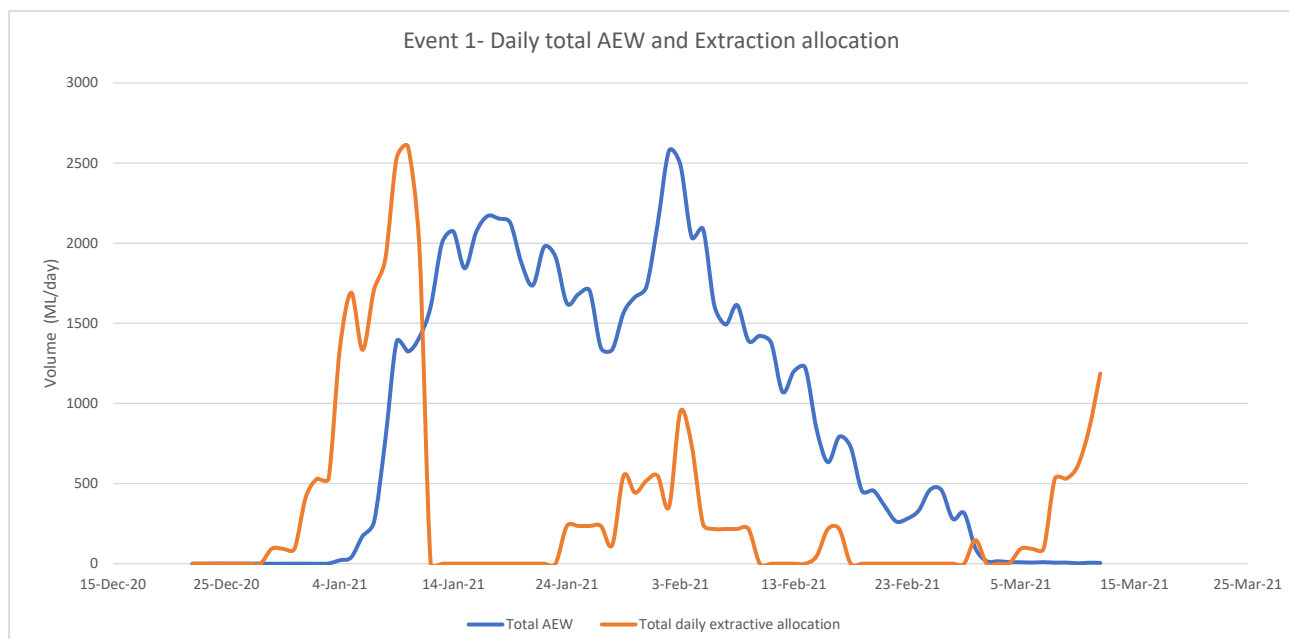


Figure 5. Daily total active environmental water and extraction allocation for Event 2 in the Barwon–Darling (provided by WaterNSW)

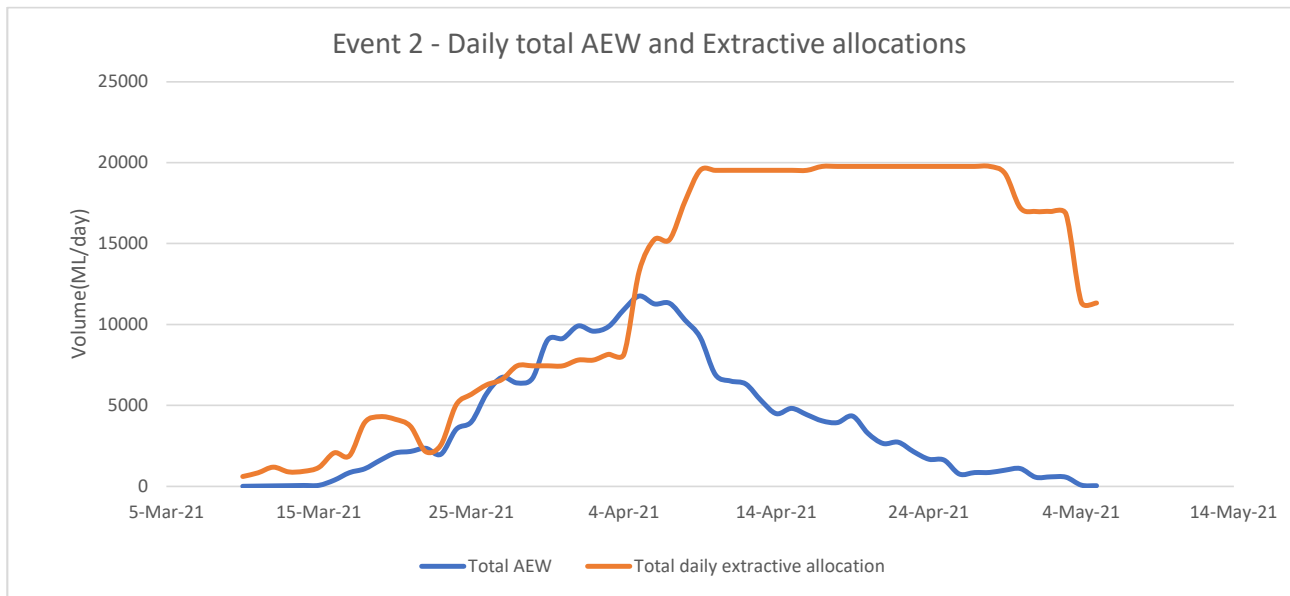


Figure 6. Daily total active environmental water and extraction allocation for Event 3 in the Barwon–Darling (provided by WaterNSW)

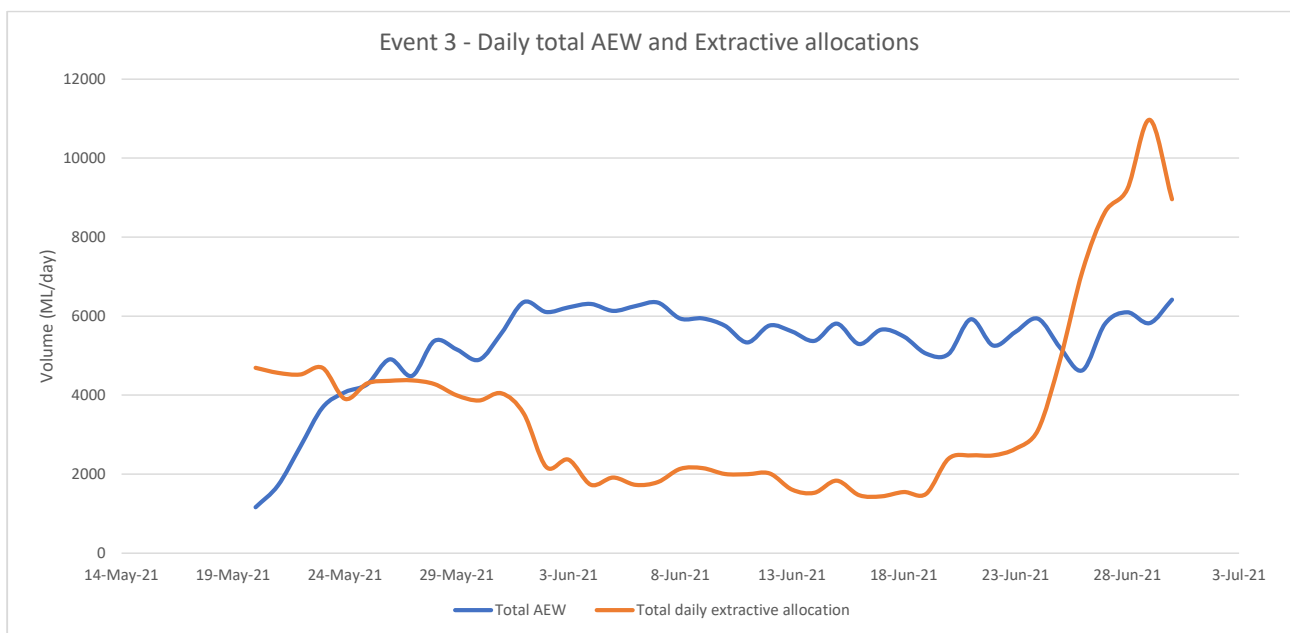


Figure 7. Daily total active environmental water, EOI max, CTP threshold and flow at Oxley gauge for Event 1 in the Macquarie–Bogan (provided by WaterNSW)

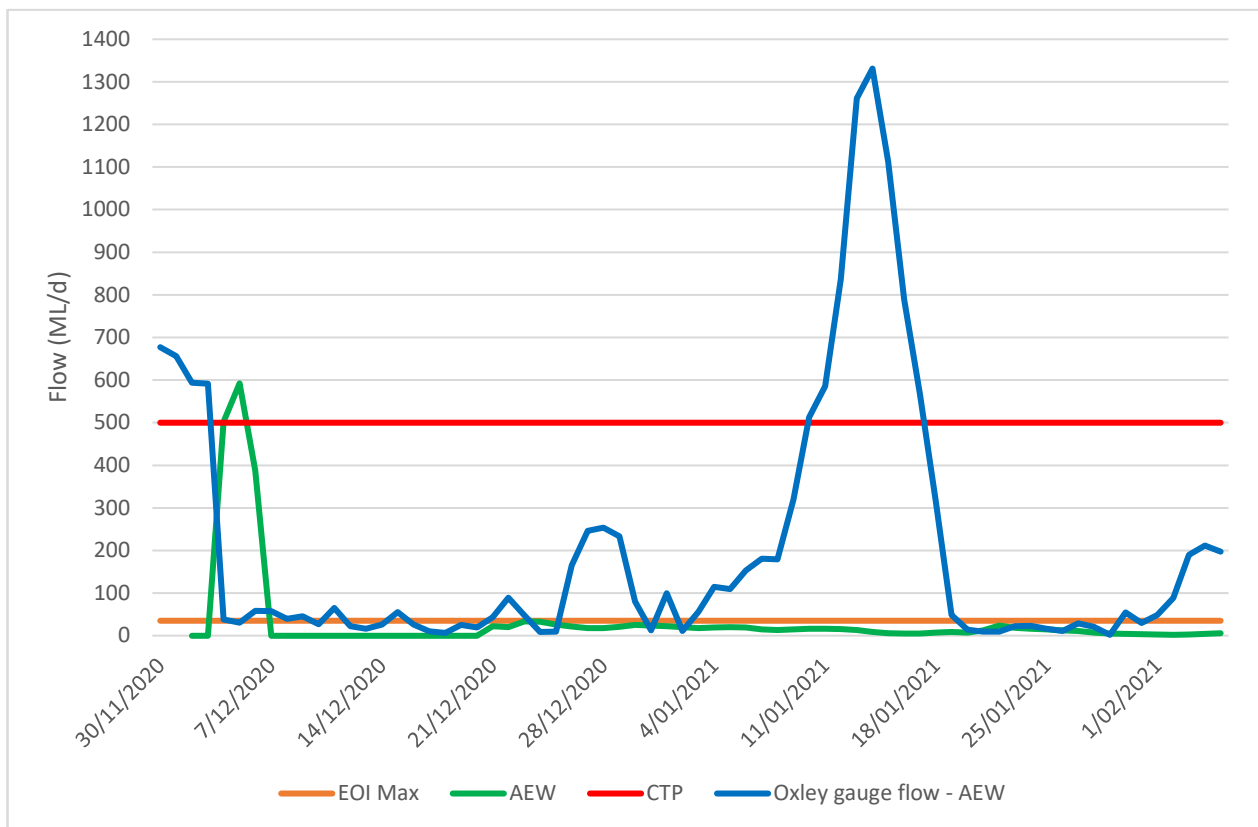


Figure 8. Anomalies between last three Macquarie gauges upstream and downstream of the Macquarie/Barwon–Darling River confluence during Event 1 (provided by DPE-EHG)

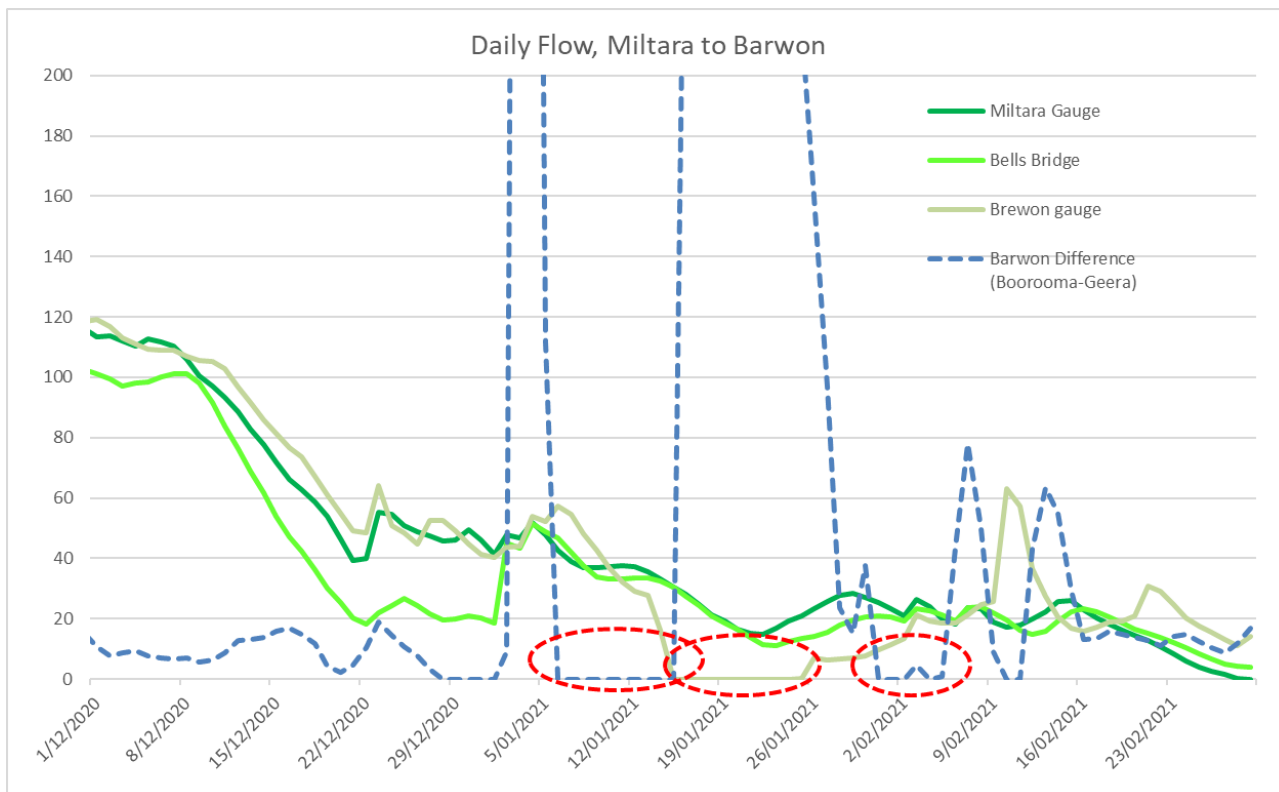
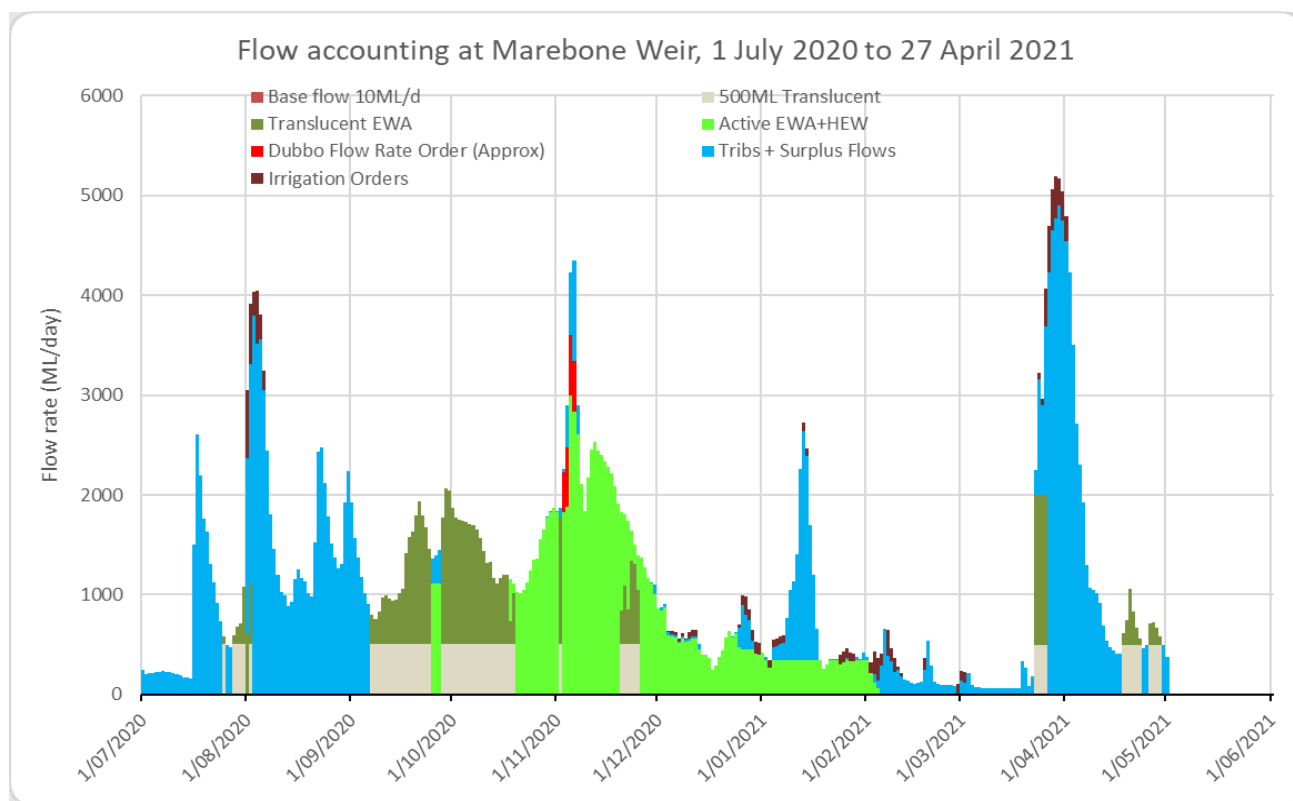


Figure 9. Flow accounting at Marebone Weir (provided by DPE-EHG) (NOTE – the chart shows AEW before 1 December 2020, when active management rules were implemented. AEW before 1 December 2020 should be ignored)



Event 2 Analysis

Table 13 uses estimated values of AEW to assess the impact on access with and without the AEW announcement and therefore the impact on AEW. Table 13 shows flows at the gauges within management zones of the lower Macquarie as the event progressed downstream.

Working down through Table 13 shows no AEW was ordered for the Gum Cowal management zone, so there could be no impact from the unannounced AEW in this zone.

In the Macquarie U/S management zone, the flow at Oxley on 28 March 2021 was 1,605 ML/day of which 322 ML/day would have been announced as AEW. Because the flow rate was well above the access threshold, the AEW announcement and access would have remained at 'normal', meaning there would have been no impact on access if the unannounced AEW had been announced by WaterNSW.

In the Macquarie D/S sub zone 1, flow at Miltara on 8 April 2021 was 66 ML/day, of which only 12 ML/d would have been AEW (based on post-calculated losses from the Oxley gauge). The access threshold in that zone was 50 ML/day (at Carinda gauge), however, the licence holder in that zone confirmed there was no extraction. Therefore, there was no impact to AEW.

In Macquarie downstream sub zone 2, flow at Carinda on 10 April 2021 was 55 ML/day of which only 10 ML/day was AEW. The access threshold in that zone is 75 ML/day so flows were below the access threshold and no extraction was possible. Therefore, there was no impact from the unannounced AEW.

Access in sub zones below Marthaguy confluence was 'normal' due to higher flows in the system provided by Marthaguy Creek and Castlereagh River. There was no AEW in those subzones. Therefore, no impact to environmental water.

Table 13. Analysis of the unannounced active environmental water flow event in the Macquarie–Bogan (provided by WaterNSW)

Zone	Gauge	Date	Actual Flow (ML/d)	Estimated AEW (ML/d)	Access threshold (ML/d)	Access with announcement	Access without announcement	Impact
<i>No active management</i>	Marebone D/S River	26-Mar	2,493	500	N/A	N/A	N/A	N/A
	Marebone Bk	26-Mar	1,587	0	N/A	N/A	N/A	N/A
Gum Cowal	Gum Cowal@ Bifurcation	26-Mar	214	0	N/A	Normal	Normal	No impact
	Gum Cowal @ Oxley	1-Apr	4	0	N/A	N/A	N/A	N/A
	Marthaguy @ Carinda	13-Apr	1,901	0	50	Normal	Normal	No impact
Macquarie U/S	Oxley	28-Mar	1,605	322	500 ³	Normal	Normal	No impact
Macquarie D/S Sub zone 1	Miltara	8-Apr	66	12	50 ⁴	Volumetric (0 ML/d Access)	Normal	No impact
Macquarie D/S Sub zone 2	Carinda	10-Apr	55	10	75 ⁵	Volumetric (0 ML/d Access)	Normal	No impact
	Castlereagh @ Gungalman	11-Apr	1,257	0	N/A	N/A	N/A	N/A
Macquarie D/S Sub zone 4	Upstream Miralwyn	16-Apr	2,304 ⁶	< 5	N/A	Normal	Normal	No impact

³ @ Oxley

⁴ @ Carinda

⁵ @ Carinda

⁶ Estimated

Appendix C – Mismatch analysis

Table 14 and Table 15 show mismatch totals for available water, losses and AEW, in each AEW event in the Barwon–Darling and Macquarie–Bogan, respectively, as a breakdown of Table 9.

Table 14. Barwon–Darling mismatch analysis of forecast minus post-calculated totals

Event	Announced (ML)	AEW mismatch forecast minus post- calculated AEW (ML)	Available water mismatch announced available water minus post-calculated available water (ML)	Losses mismatch forecast minus actual river losses (ML)
Flow Event 1	28,873	-2,366	162	30,533
Flow Event 2	717,059	1,427	-11,485	-70,692
Flow Event 3	178,828	950	-3223	8,020
Total	924,760	11	-14,546	-32,139

Table 15. Macquarie–Bogan mismatch analysis of forecast minus post calculated totals

Zone	Announced (ML)	AEW mismatch forecast minus post- calculated AEW (ML)	Available water mismatch announced available water minus post-calculated available water (ML)	Losses mismatch forecast minus actual river losses (ML)
Upstream	2,984	-1,076	35	-922
Sub zone 1	264	89	5	-55
Sub zone 2	279	-109	0	-84
Sub zone 3	0	-134	n/a	-77
Sub zone 4	12,917	4	-6	n/a
Total	16,444	-1,226	34	-1,138