

Active Management Procedures Manual

for the Macquarie-Bogan Unregulated Rivers
Water Source

12 February 2025

Acknowledgement of Country



Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Artist and designer Nikita Ridgeway from Aboriginal design agency – Boss Lady Creative Designs, created the People and Community symbol.

Active Management Procedures Manual

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Part A – Purpose and scope

Purpose

This Active Management Procedures Manual (the manual) outlines procedures the New South Wales (NSW) Government will use to implement active management to protect active environmental water (AEW) in the Macquarie-Bogan Unregulated River Water Source (**Macquarie-Bogan Water Source**).

This manual is established under clause 55A of the Water Sharing Plan for the Macquarie-Bogan Unregulated River Water Source 2012 (**Macquarie-Bogan WSP**).

The period for which this manual applies

This manual applies until superseded.

This manual will be reviewed annually in accordance with Procedure 32 – Annual evaluation and review of active management (below). Changes may arise because of this annual review.

Updates will be published on the department's website when approved.

Context

Active management protects held environmental water (HEW) from extraction by unregulated access licence holders for the Macquarie-Bogan Unregulated River Water Source, allowing this water to remain in the water source for its intended environmental purpose.

HEW is water available under a water access licence (WAL) for achieving environmental outcomes. The NSW and federal governments have acquired WALs for environmental purposes in the Macquarie-Bogan Unregulated River Water Source and its regulated and unregulated tributaries.

In NSW, HEW includes water available under a WAL that is:

- in an environmental water subcategory, or
- for a non-statutory environmental purpose agreed between the department and the water access licence holder, or
- subject to an adaptive environmental water condition imposed under section 8B, 8C, 8D or 62B of the *Water Management Act 2000* (WM Act), or

Active management will prevent the extraction of the HEW identified as AEW in accordance with the Macquarie-Bogan WSP and this manual.

Clause 51 of the Macquarie-Bogan WSP allows unregulated access licence holders in the Macquarie-Bogan, including environmental water holders, to protect water from extraction that is otherwise permitted to be taken. Other licence holders can also protect unregulated water if they choose to.

Water identified as planned environmental water (PEW) that flows from an upstream water source into an unregulated water source will not generally be protected from extraction under active management, to minimise the effect on historical reliability for downstream users.

However, active management does provide an operational mechanism to protect PEW arising from an upstream water source that is already legally protected from extraction and flowing into an unregulated water source where active management applies. Clause 53 (27) of the Macquarie-Bogan WSP requires that flows attributable to the release of water from the environmental water allowance (active) subaccount 2 (EWA2, active sub-allowance) from Burrendong Dam in the Macquarie regulated system are protected from extraction in several downstream unregulated water sources.

The areas where this procedures manual applies

This manual applies to four of the management zones described in the Macquarie-Bogan WSP and shown in Appendix A:

- Gum Cowal Management Zone
- Lower Macquarie River Upstream Management Zone
- Lower Macquarie River Downstream Management Zone
- Lower Marthaguy Creek Management Zone.

References to management zones in this manual refer to these four management zones of the Macquarie-Bogan, unless otherwise stated.

Objectives and principles for the implementation of active management

Active management is to be implemented in accordance with this manual and the objectives and principles set out in the Active Management in Unregulated Rivers Policy (the active management policy) outlined below.

The primary objective is to manage access to water in unregulated systems to allow HEW to remain in the water source for environmental purposes.

The secondary objectives are to:

- support compliance with measures to protect PEW, transparency, and equity of access
- provide certainty through enduring arrangements
- avoid reliance on temporary arrangements to protect HEW from extraction.

In implementing active management, the department will design solutions that:

- avoid unacceptable change to reliability and access characteristics – with material impacts mitigated or offset, and unintended gains avoided
- maintain economic opportunities while protecting AEW
- are evidence-based and outcomes-focused

- are simple, practical and cost-effective
 - support cultural and social outcomes, and
 - commit the department to continuous improvement through an adaptive management process.
-

Interpretation

Clauses referred to in this manual are clauses in the Macquarie-Bogan WSP, unless otherwise stated.

Terms and abbreviations used in this manual are defined in Appendix B. Appendices contain supporting information.

Part B – Regulatory framework

This chapter explains the regulatory framework that enables and guides active management in unregulated water sources in NSW.

Water Management Act 2000

The WM Act establishes the overarching water management priorities and provides the regulatory tools to manage flows to protect water for the environment, including preparing water sharing plans.

While active management will protect HEW and Macquarie EWA2 (active sub-allowance) from extraction in the Macquarie-Bogan Unregulated River Water Source, temporary water restrictions under section 324 of the WM Act will remain a tool for protecting other sources of environmental water, if such restrictions are determined to be in the public interest.

Water sharing plan provisions

This manual must be implemented in accordance with the Macquarie-Bogan WSP.

The Macquarie-Bogan WSP sets out the objectives, strategies and rules for sharing water between water users and the environment.

Restricting the taking of water to protect AEW is identified as a strategy to meet the targeted environmental objectives of the WSP (refer to clause 10 (3) (f)).

The following rules in the WSP enable the taking of water to be restricted to protect AEW:

- Clause 51 (1) allows licence holders to notify the Minister of their intent to have water that would otherwise be permitted to be taken under their access licence protected from extraction.
- Clause 53 (27) protects water from the Macquarie EWA2 from extraction. Water must not be taken from flows resulting from releases made according to clause 14 (22) of the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016 (or any relevant replacement plan).

- Clause 53A (2) allows the Minister to announce that for a specified period, water must not be taken under a specified access licence from a management zone where there is only either PEW resulting from the access rules specified in clause 53 of the Macquarie-Bogan WSP and AEW, or AEW.
 - Clause 53A (3) allows the Minister to announce a maximum amount of water permitted to be taken under a specified access licence to protect AEW.
 - Clause 53A (5) prohibits a licence holder taking water in excess of the volumetric limit announced by the Minister under subclause (3).
 - The definition in the dictionary of the WM Act defines AEW that requires protection from extraction.
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Active Management Procedures Manual

This manual is established under clause 55A of the Macquarie-Bogan WSP. Part F includes procedures for:

- identifying and determining AEW on any given day
- identifying the requirements for access licence holders intending to protect water from extraction to notify the Minister under clause 51
- assessing a notification and determining the amounts to be debited from access licence water allocation accounts under clause 51
- determining and announcing the presence of PEW and AEW under clause 53A, and
- announcing under clause 53A the water permitted to be taken under an access licence.

In addition, this manual includes information on:

- the regulatory framework that this manual is part of (Part B)
 - the responsibilities of agencies in implementing active management in the Macquarie-Bogan (Part C)
 - minimum consultation requirements (Part D)
 - operational overview (Part E)
 - managing risk (Part G), and
 - compliance (Part H).
-

Access licence and works approval conditions

Mandatory conditions imposed on WALs and water supply works approval (works approval) under Part 11 Division 2 and Division 3 of the Macquarie-Bogan WSP in accordance with sections 17 (c), 20, 66 (1)(a) and 100 (1)(a) of the WM Act:

- give effect to the Macquarie-Bogan WSP rules, including those that enable active management
- provide limits or restrictions on what is authorised by the WAL or works approval (what must not be done, or what must only be done), or

- place obligations on the holder that relate to what is authorised by the WAL or works approval (what must be done).

WAL and works approval holders must comply with mandatory conditions.

Mandatory conditions take legal effect once the licence or approval holder has been given written notice of any changes to licence and approval conditions under sections 67 (4) and 102 (4) of the WM Act.

Active management in unregulated rivers policy

The manual has been prepared to be consistent with the department's active management policy.

WaterNSW operating licence

WaterNSW will perform some of the ministerial responsibilities identified in the Macquarie-Bogan WSP.

The Minister has conferred functions of the Minister under the WM Act to WaterNSW through the WaterNSW operating licence. The operating licence enables WaterNSW to exercise its functions under the *Water NSW Act 2014*, in addition to the conferred functions of the WM Act.

Functions conferred relevant to active management in accordance with the Macquarie-Bogan WSP include:

- managing water allocation accounts
- imposing daily access rules, and
- managing access to daily flows other than supplementary water.

Each year, the Independent Pricing and Regulatory Tribunal audits and reports on WaterNSW's performance against the WaterNSW operating licence provisions.

Part C – Responsibilities

Responsibilities for implementing active management are shared between:

- Water Group in the NSW Department of Climate Change, Energy, the Environment and Water (the Water Group)
- WaterNSW
- Regional Delivery Division of Conservation Programs, Heritage, and Regulation Group (CPHR), and
- Natural Resource Access Regulator (NRAR).

Table 1 outlines the responsibilities of each organisation, specific to active management.

Table 1 Responsibilities and accountabilities for implementing active management

Organisation	Responsibilities
Water Group	<ul style="list-style-type: none"> • Prepare, review and amend the active management policy and regulatory framework where required, following the annual review process • Evaluate and recommend changes to water sharing rules to support active management • On behalf of the Minister: <ul style="list-style-type: none"> ○ prepare and publish the active management procedures manual under clause 55A of the WSP, and ○ amend the manual as necessary following the annual review and publish revisions • Annually review and evaluate the implementation of the manual against the objectives and principles of the policy • Consult with WaterNSW, the Regional Delivery Division of CPHR Group , NRAR and the Murray-Darling Basin Authority (MDBA) when conducting each annual review • Consult with licence holders and peak stakeholder groups when conducting each annual review • Consult with licence holders and peak stakeholder groups following any determination to vary the operation of active management including the policy, regulatory framework and the manual • Draft and impose mandatory conditions to effect water sharing rules, relevant to active management
WaterNSW	<ul style="list-style-type: none"> • Forecast river flows • Maintain flow forecasting tools • Keep an account of AEW through each management zone • Issue flow advice for water users and the public • On behalf of the Minister: <ul style="list-style-type: none"> ○ announce the maximum volume of water that can be taken under clause 53A(3), or water that must not be taken under clause 53A(2), and ○ receive notifications from licence holders who want to protect water otherwise permitted to be taken under clause 51. • Establish and operate systems to enable expressions of interest to be made and analysed • Invite expressions of interest to take water from relevant access licence holders

	<ul style="list-style-type: none"> • Provide operational reporting on active management, including regular environmental water use accounting during events • Provide access to data to NRAR to enable compliance monitoring and enforcement with active management • Submit an Annual River Operations Report on the management of access to water to protect AEW • Consult with unregulated river access licence holders or their representative groups before submitting the Annual River Operations Report • Contribute to the annual review of the manual • Contribute to the review of the active management policy
Regional Delivery Division of CPHR Group	<ul style="list-style-type: none"> • Work collaboratively with other environmental water holders (such as the Commonwealth Environmental Water Office, or CEWO) on planning and coordinating the use of HEW to improve flows in the Macquarie River and associated tributaries • Work collaboratively with WaterNSW when planning and using HEW to improve flows in the Macquarie River and associated tributaries • Submit an annual active management statement to the Water Group • Contribute to the annual review of the manual • Contribute to the review of the active management policy
NSW Natural Resources Access Regulator (NRAR)	<ul style="list-style-type: none"> • Monitor compliance with water sharing rules and licence conditions • Undertake inspections to ensure water use is occurring in accordance with announcements, by applying risk-based strategies, policies and procedures • Conduct compliance investigations and take enforcement actions where appropriate • Submit an annual active management statement to the Water Group • Contribute to the annual review of the manual • Contribute to the review of the active management policy

Part D – Consultation

Consultation is important to ensure active management evolves and improves in response to new information, insights and stakeholder feedback.

Table 2 outlines the minimum consultation requirements in implementing and evaluating active management within NSW.

Table 2 Minimum consultation requirements in implementing and evaluating active management

Who will be consulted	When will they be consulted	What will they be consulted on	How will they be consulted	Who is responsible
WaterNSW, NRAR, the Regional Delivery Division of CPHR Group and the MDBA	When conducting each annual review	The appropriateness, effectiveness and efficiency of the manual in meeting the objectives and principles of the policy and any proposed substantive changes to the manual arising from the annual review	The Water Group may establish an interagency working group or use an existing interagency forum for this purpose	The Water Group
Licensed water users, including environmental water holders and stakeholder representatives	When conducting each annual review	The appropriateness, effectiveness and efficiency of the manual in meeting the objectives and principles of the policy and any proposed substantive changes to the manual arising from the annual review	The Water Group may establish a stakeholder consultative group, use an existing forum or use an alternative engagement approach for this purpose	The Water Group
Licensed water users or their representative groups	Before submitting the Annual River Operations Report	Implementation issues	WaterNSW will determine the most appropriate means of consulting and may use existing forums for this purpose	WaterNSW

Part E – Operational overview

Under active management, we will identify and determine the volume of AEW at each gauge in the Gum Cowal, Lower Macquarie River Upstream, Lower Macquarie River Downstream and Lower Marthaguy Creek management zones. We will also control access so that an equivalent volume to that defined as AEW is protected from extraction and remains in the water source for environmental purposes.

The Macquarie-Bogan WSP establishes cease-to-pump (CtP) thresholds in the conditions for each WAL. Unregulated river access licence holders could previously take water when flows at flow reference points (river gauges) exceeded the CtP threshold nominated on their licence, provided

that all other licence access conditions and account management requirements were met. For the Lower Macquarie and Marthaguy Creek water sources, active management access arrangements will involve the river operator assessing the volumes available for take when AEW is present. To protect AEW from extraction in the Macquarie-Bogan Unregulated Water Source, we:

- will consider CtP thresholds and any AEW flowing into each management zone
- will advise when access is prohibited due to the presence of AEW, and
- may announce limits on the take for each 24-hour period, starting at 9 am each day when AEW is present.

At the end of each management zone, we will adjust the volume of AEW by its share of river transmission losses (such as losses to the riverbanks and bed, evaporation and transpiration).

We intend for flows to be shared between the environment and licensed water users on an event basis.

Table 3 outlines the procedures to be undertaken to protect AEW and determine access for licences in the Macquarie-Bogan, as well as procedures to support reporting and adaptive management. Each step is described further in subsequent sections. Some of these procedures are iterative.

Table 3 Daily, weekly and annual procedures for active management

Procedure	Purpose of procedure
Forecast flows and determining AEW Procedures 1 – 10	<p>To determine for each management zone forecasted inflows and transmission losses.</p> <p>To define AEW, determine AEW inflows from another water source or management zone and AEW losses.</p> <p>To determine the amount necessary to adjust CtP thresholds to protect AEW and PEW below the CtP thresholds.</p>
Monitoring and managing the intended sharing of river flows Procedures 11 - 12	<p>Monitor mismatch between forecast and actual AEW and flows and adjust future forecasts where required</p>
Issue flow advice Procedures 13	<p>To inform water users and the public on likely flows along the river, the potential for AEW to be in the river, the likelihood of access, and the progress of river flows.</p>
Seek expressions of interest from unregulated access licence holders Procedures 14 - 16	<p>To establish who wants to receive a share of the available water, once determined, to extract it or protect it.</p> <p>In submitting an expression of interest to protect water, a licence holder is notifying the Minister under clause 51 of their intent to protect water.</p>
Determine access conditions and the water available for	<p>To determine if access can occur and whether the available volume must be shared between licence holders who have</p>

unregulated river access licences Procedures 17 - 19	expressed an interest to protect the AEW and flows below the flow class thresholds.
Determine the maximum volume permitted to be extracted on a given day by each licence holder Procedures 20 - 23	To distribute the available water between licence holders who have expressed an interest in it, when there is not enough water for all licences holders to extract, expressed as a daily volumetric limit.
Announce the prohibition of access and volumetric limits Procedures 26 - 27	To inform licence holders on whether they can take water and, if necessary, the maximum volume they can take on any given day.
Determine the volume of AEW arising from a notification by an unregulated licence holder to protect the water from extraction (under clause 51) Procedures 26 - 27	Determine the volume of AEW arising from a notification by an unregulated licence holder to protect the water from extraction (under clause 51) that is to debited from the licence holder account. Debited unregulated water allocation accounts when water is extracted
Monitoring, evaluation, reporting and improvement Procedures 28 - 33	Record keeping required to support reporting, adaptive management, and compliance monitoring and enforcement. To inform annual evaluations of the appropriateness, efficiency and effectiveness of active management. To inform improvements to active management and amendments to this manual.
Deviations and managing risk Procedures 35 - 37	Allowances for deviations from standard procedures. Measures to manage risk of unintended outcomes.

Part F – Procedures

Forecasting flows and river transmission losses

Intent

Active management relies on forecasting flows entering and travelling along the river to:

- inform water users and the public on likely flows along the river, the potential for AEW to be in the river, the likelihood of access, and the progress of river flows
- provide forecast advice to licence holders and the general public before an extraction day
- determine the volume of AEW in each management zone
- determine the volume of available water in each management zone
- determine the volume of AEW that contributed to environmental purposes in each management zone (such as the volume of AEW that seeped into the riverbed and banks, evaporated or was taken up by vegetation), and
- determine the management actions in each management zone to protect the AEW.

Uncertainty in forecasting flows can arise from uncertainty in estimating water use, tributary inflows, river transmissions losses (including those that arise due to seepage into the bed and banks, and evapotranspiration, and which can vary significantly between events) or flow routing effects. This uncertainty must be managed to minimise any over- or underestimating of the volume of AEW that is protected or the available water, within the limits of operational feasibility and cost-effectiveness.

While it is impossible to entirely eradicate uncertainty, our aim is to achieve the intended sharing of flows between consumptive use and the environment by minimising any mismatch between the forecast and observed flows over time. We will do this by:

- considering the best information available on daily extraction volumes at each pump site, including metering and expressions of interest
- making the forecast, and the flow class and flow share announcements that rely on that forecast, as close as possible to the period of access to flows
- sharing river transmission losses proportionally
- basing initial and ongoing river transmission loss estimates on an assessment of the average losses for comparable past historical events, and
- adaptively adjusting ongoing loss forecasts based on the observed unaccounted difference so that mismatches arising from uncertainty in ongoing loss forecasts don't compound as an event proceeds.

For unregulated rivers, there may be very low or no flows before an event. These initial losses can be much higher than at other times due to the filling of depleted weir pools, natural river pools, and the saturation of dry river bed and banks following prolonged dry periods. This can result in considerable variations to initial flows. Analysis of past events indicate that a range of initial losses is possible, even when considering categorisation into similar events (such as wet, average, and dry antecedent conditions).

To minimise any bias in the difference between forecast and actual river transmission losses over time, the river operator will make forecasts of initial river transmission losses on the basis of the average or typical initial losses in comparable past events, and revise forecasting methods as more data becomes available.

Once flows have been established along a river reach, ongoing losses can be relatively small, as the bed and banks saturate. If flows are sufficiently large enough to break out of the main river channel and on to the wider floodplain, losses can increase again.

Adjusting loss forecasts to reflect observed trends in the current flow event will allow the river operator to adjust for current conditions, where appropriate. That way, we can better achieve the intended sharing of flows between consumptive use and the environment.

Procedure 1 – Forecasting flows from upstream gauged tributaries

1. WaterNSW will forecast inflows from upstream gauged tributaries as needed to estimate:
 - a. the total inflows each day into the Lower Macquarie Upstream, Lower Macquarie Downstream, Gum Cowal and Lower Marthaguy Creek management zones of the Macquarie-Bogan Unregulated River Water Source, and
 - b. inflows each day arising from AEW into each management zone of the Macquarie-Bogan Unregulated River Water Source that satisfies the definition of AEW under categories A, B, C and D in Table 16.
2. Existing procedures to forecast flows within the tributaries will be used to forecast total inflows into the Macquarie-Bogan Water Source and the proportion of inflows that satisfy the definition of AEW in Table 4.
3. WaterNSW will make reasonable endeavours to determine local rainfall that contributes to flow in the Macquarie, Marthaguy and Gum Cowal water sources that can be accessed by licence holders. When increased flow is observed at the downstream gauge in the management zone from rainfall, it will be available in the next management zone.

Appendix C lists the gauges used for active management.

Procedure 2 – Forecasting flows from upstream ungauged tributaries

The absence of flow observation points at each end of the water source increases the risk of forecasting errors, particularly in lower management zones. The river operator will estimate flow at the start and end of a management zone each day.

1. The river operator will include estimates of the volumes contributed by upstream ungauged tributaries and other inflows (such as runoff from local storms) in its forecast flows at the ends of each management zone.
2. Ungauged tributary inflows and runoff from local storms must be estimated for management zones when there has been a response in the calculated unaccounted differences that indicates an increase in ungauged inflows, and either:
 - a. significant local rainfall in that management zone, or in an ungauged tributary catchment that flows into that management zone
 - b. evidence of flows in ungauged tributaries.
3. Ungauged tributary inflows and runoff from local storms shall be estimated by comparing the observed unaccounted difference in the relevant management zone with the observed trends in the preceding days and weeks, and taking into account any other relevant information.

4. If the river operator assesses that there are ungauged inflows into a zone, the unaccounted difference will be adjusted for the purposes of estimating river transmission losses.
5. Where possible, standard recession tables are to be used based on actual flows at the gauges, observed rainfall in past days and rainfall forecast for the next few days.

Procedure 3 – Forecasting flows along the Macquarie-Bogan River

1. The river operator will forecast flows within the Lower Macquarie to estimate the volume of AEW as it moves and attenuates through the water source and to determine the available water for unregulated river access licences.
2. The river operator will forecast flows in each management zone using a daily operational model.
3. During periods of low or no flows, no formal flow forecasts are required for active management.
4. The river operator will each day record the information inputs and outputs for flow forecasting.
5. Flow forecasting performance and its impacts will be examined in the active management review process to identify sources of uncertainty and possible improvements.

Procedure 4 – Forecasting river transmissions losses

1. The river operator will estimate river transmission losses between gauges to forecast flows at each gauge and to assign losses arising from seepage, evaporation and evapotranspiration between gauges to both the AEW and other flows.
2. River transmission losses that provide environmental benefits along the river cannot be directly measured. River operators will use flow loss relationship tables as guidance when calculating losses and attributing a proportion of losses to AEW.
3. The loss tables will be reviewed annually, including a retrospective analysis of the daily unaccounted difference in each zone and the loss estimations.
4. Initial and ongoing loss estimates are to be based on an assessment of the average losses for comparable past historical events.
5. When flows first start, or change significantly, the river operator will forecast the resulting 'initial' river transmission losses, based on the average or typical initial losses in comparable past events.
6. WaterNSW must publish typical loss relationship tables for each affected management zone. The tables are used to forecast flows at the start of an event in each management zone, along with any other relevant information river operators have at hand as an event occurs. The event will be started based on the observed flow.
7. If the river operator on any day assesses the condition of the system and determines that loss should be ascertained using a method besides or as an enhancement to the loss table, the rationale should be documented alongside the daily record of loss volumes in the daily operational model. These exceptions should be reviewed as a specific item in the active management review.

8. WaterNSW will review tabulated flow-loss tables as necessary when new information becomes available, or when each stage of the meter rollout is complete and better water use data becomes available.
9. WaterNSW will provide a proposed updated loss table at the active management review, along with a rationale for the updated figures.
10. When flows are continuous and relatively stable, forecasts of river transmission losses will be based on the observed unaccounted differences in the preceding days and weeks.
11. Where preceding flows are not available or are significantly different (such as lower flow rates), ongoing loss estimates will be based on average losses (loss tables) for previous similar events.
12. Loss tables are based on an analysis of historical ongoing losses to establish average or typical ongoing losses for a range of events and antecedent conditions. These tables will form the basis of ongoing loss estimates that will be used to forecast flows in each management zone.
13. For all management zones, records will be made of the following:
 - a. the forecast losses for the day before the potential extraction day and actual unaccounted differences to observed flows
 - b. adjustments to water availability in response to mismatches between forecast and actual unaccounted differences and reasons for adjustments, and
 - c. adjustments to loss estimates and reasons for adjustments.
14. Notes must be made on departures to standard methods and any special event conditions for calculating any of the above.
15. To minimise the mismatch between forecast and actual losses during an event, WaterNSW may:
 - a. adaptively adjust ongoing loss forecasts based on observed losses during a flow event, and
 - b. adjust access during a flow event based on the cumulative mismatch between forecast and actual unaccounted differences.
16. Mismatches in the forecast and actual unaccounted differences based on observed flows will not be reconciled between events.
17. No adjustments should be made to the unaccounted differences for the purposes of estimating river transmission losses, unless it is suspected that a significant malfunction in flow or diversion measurement has occurred.

Procedure 5 – Tracking losses to active environmental water volumes

As AEW flows through each management zone, it will be reduced by its share of the (forecast) river losses. These will be based on the ratio of actively managed environmental water to the total flow forecast at the start of the management zones.

1. The river operator will forecast the proportion of flows that are AEW at the gauges within each management zone. For each management zone where AEW is an inflow from the upstream management zone or from a tributary system:
 - a. the total flow entering the management zone will be reduced by the volume of AEW to forecast available water in that management zone, and

- b. the forecast volume of active environmental water passed on to the next management zone is calculated as:
 - i. the volume of AEW that entered the management zone (lagged for travel time) reduced by its proportional share of the forecast losses in that river reach, plus
 - ii. any volume of water protected from extraction from water access licences in the management zone.
2. In a management zone where AEW is first identified because of a notification under clause 51, zonal transmission losses will already have been recognised in calculating the available water. That volume of AEW will therefore be passed on to the next river reach without reduction.
3. Where a flow event occurs for a sufficient length of time, the river operator may adjust the forecast for AEW. These adjustments can take into account any observed mismatch in the actual and intended sharing between access licence holders and the environment during the current flow event (as described in the section entitled 'Monitoring and managing the intended sharing of river flows', on page 17).
4. Any adjustment to the forecast AEW for any cumulative mismatch in sharing during the event to date should:
 - a. be done consistently with any adjustments to the available water determination for this purpose, and
 - b. be distributed across that remaining period of access, where possible, after consideration has been given to the potential for further mismatches between forecast and actual flows.
5. Manual adjustments should not be made to the unaccounted differences arising from flow and extraction measurement errors or routing effects for the purposes of estimating river transmission losses.

Notes

1. The information used to forecast flows may include, but is not limited to:
 - a. orders for water made under HEW licences listed on the environmental water register
 - b. flow gauge readings from Hydstra (WaterNSW)
 - c. metering data
 - d. WAL details, including licence category (flow class), extraction point location, water account balance, authorised pumping capacity
 - e. the list of WALs with special licence conditions regarding water take, and details of these conditions.
 - f. expressions of interest (Eoi) from a licence holder (including information on water to be extracted or protected)
 - g. weather forecasts (from the Bureau of Meteorology)
 - h. simulated water distribution provided by a water distribution microservice
 - i. unregulated water identified as requiring protection for extraction, and

- j. water required for critical needs, Basic Landholder Rights, Native Title and other licence categories within the water source, to which the Macquarie-Bogan WSP and WM Act attribute a higher priority.
 2. Estimates of likely water use will be determined after considering information including expressions of interest, historical water use (where available) and pump capacity (where available).
 3. Unaccounted differences can be influenced by flow and extraction measurement errors (such as a river flow gauge not accurately measuring flow) or routing effects (such as changes in channel storage and associated alterations in apparent travel times). This may result in fluctuations in the calculated unaccounted difference (including unaccounted differences that are not always negative) for a management zone. These fluctuations typically cancel out over time and across management zones.
 4. A positive unaccounted difference could arise if a licence holder does not take all the water they are permitted to take under a daily flow share announcement.
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Identifying and determining AEW

Intent

Only water defined in the Macquarie-Bogan WSP as AEW and determined in line with this manual will be protected from extraction under active management.

AEW will include HEW arising from upstream water sources. This water would not be accessible to downstream unregulated river access licence holders if it was not recovered for environmental purposes and instead extracted upstream by the former licence holder or held in storage.

AEW will also include water arising from Macquarie EWA sub-account 2 (active). This water is protected in the water sharing plan, and active management provides a practical mechanism to prevent its extraction.

In addition, the Macquarie-Bogan WSP allows unregulated river access licence holders in the Macquarie-Bogan (including environmental water holders) to protect water from extraction through the Macquarie-Bogan Unregulated River Water Source. This enables unregulated HEW to be left in the water source for environmental purposes, realising the investment made in recovering these licences. All unregulated river access licences can protect water that would otherwise be permitted to be extracted, to ensure an equitable approach is applied to all licences and to provide an opportunity for environmental interests to negotiate environmental outcomes.

Planned environmental water from upstream water sources is not protected from extraction under active management in the Macquarie-Bogan other than the above-mentioned EWA2 (active sub-allowance), which is already identified for protection in the water sharing plan.

Procedure 6 – Identifying AEW

1. AEW is the water identified on any given day as arising from the following sources:
 - a. HEW flowing into the water source from an upstream water source

- b. planned environmental water arising from delivery of water from the EWA2 (active sub-allowance) in the Macquarie Regulated River Water Source, and
 - c. notification to the Minister by an environmental water manager or any unregulated licence holder intending to protect their unregulated held environmental water from extraction under clause 51 of the Macquarie-Bogan WSP.
2. Table 4 describes how AEW defined under the Macquarie-Bogan WSP is to be identified.
3. Inflows to the Macquarie-Bogan Unregulated Rivers Water Source arising from HEW licences not identified in Table 4 will not be recognised as AEW.

Table 4 Water to be identified as AEW in the Macquarie-Bogan Water Source

HEW flowing from a water source that is upstream of the Lower Macquarie Unregulated River Water Source
A - Inflows to the Lower Macquarie Unregulated River Water Source arising from delivery of account water under general security and high-security regulated river access licences on the NSW Environmental Water Register from the Lower Macquarie Regulated River Water Source.
B - Inflows to the Lower Macquarie Unregulated River Water Source arising from regulated river supplementary water licences listed on the NSW Environmental Water Register where a volume of water is debited from the account and recognised as AEW during a supplementary access event in the Lower Macquarie Regulated River Water Source.
Releases made according to clause 75 of the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016.
C - Inflows to the Lower Macquarie Unregulated River Water Source arising from releases of the EWA2 (active sub-allowance) in the Macquarie Regulated River Water Source, in accordance with clause 75 of the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016.
A notification by a holder of a licence listed as a non-statutory environmental water licence on the NSW Environmental Water Register within the Lower Macquarie Unregulated River Water Source of the licence holder's intention to protect the water from extraction under clause 51 of the Macquarie-Bogan WSP.
D - The volume identified on any given day as requiring protection from extraction that is otherwise permitted to be taken where a licence holder has notified the Minister that they want to protect the water from extraction.

Procedure 7 – Determining the volume of AEW arising from HEW flowing from a water source that is upstream of the Macquarie-Bogan Unregulated River Water Source

1. WaterNSW will determine and record daily the volume of AEW under categories A and B in Table 4 entering each management zone. It will do so based on orders or EWA2 (active sub-allowance) requests received for water delivered to the following points:

- a. the Southern and Northern Marshes, Marebone (gauging stations 421090 and 421088), minus water delivered to the Eastern Marshes
- b. the Eastern Marshes
 - i. when delivering allocations from high and general security licences, based on the orders and flows released to the Gum Cowal (Gum Cowal @ Bifurcation, gauging station 421146), or
 - ii. when delivering allocations from supplementary licences, based on water orders placed downstream of Marebone Break at gauging station 421088 and based on flows passing Bulgeregar Creek at the bifurcation, gauging station 421145.
2. WaterNSW will determine the amount of AEW under Category C in Table 4 based on a method documented by WaterNSW and agreed by the Department and published.

The quantity of water considered to be environmental water when delivering either licensed water (only general and high security) or EWA2 (active sub-allowance) or a combination of both is calculated and recorded as follows:

3. The Regional Delivery Division of CPHR Group places the order expressed as a volume at upstream Marebone Weir or nominating either the Macquarie River at downstream Marebone Weir (gauging station 421090) and or Marebone Break downstream regulator (gauging station 421088)
4. Water orders in volumes from supplementary licences that receive a flow share and meet the criteria for recognised environmental water are also recorded in WaterNSW's Water Accounting System (WAS) and captured in the daily river operations model. Supplementary access in the regulated Macquarie River is shared on the basis of installed maximum pump capacity of the licences ordered supplementary water. For the purpose of sharing supplementary access, the environmental licences are given a pseudo maximum pump capacity of 500 ML/day at upstream Marebone Weir, and of that only 200 ML/day could be ordered and delivered down the Marebone Break.
5. The request (high security and general security) or flow share (supplementary) is captured as water orders in WAS and also recorded on the WaterNSW's daily operations model, the official management tool used by WaterNSW. WaterNSW will provide relevant reports from WAS and river operations model containing volumes from held environmental water licences for use in active management process review specified in this manual.
6. For category A and C, river operators record and review the last 24 hours of flow data for each gauge (421090 and 421088), subtract downstream extractive water orders and associated losses, and calculate the remaining flow.
7. The remaining flow is compared to the orders placed under EWA2 and general and high-security licences.
8. The environmental water volume delivered at Marebone Weir downstream and at Marebone Break and recorded on the river operations model is the lower value of the remaining flow or the environmental order (currently, delivery up to 110 % of the order is allowed if extra flows are available) and flow share total. This volume is the volume of AEW as it enters the unregulated system, and the volume to be protected from extraction.

9. The proportion of environmental water (AEW) to available water (remaining water after removal of downstream orders and losses) is calculated at the gauges at Marebone and used as a basis for calculating proportions at downstream gauges.

Procedure 8 – Determining the volume of AEW arising from a notification by a licence holder to the Minister of the licence holder’s intention to protect the water from extraction under clause 51 of Macquarie-Bogan WSP

1. Unregulated river access licence holders who want to protect water from extraction must notify the Minister of their intention to protect water from extraction under clause 51 by submitting an Eol in protecting the water from extraction.
2. WaterNSW will identify and record the volume of AEW arising from each unregulated river access licence (Category D in Table 4) under clause 51 as the lesser of:
 - a. any volumetric limit announced by WaterNSW for that licence
 - b. the volume of water requested by the licence holder, or
 - c. the authorised daily pump capacity.
3. The volume determined under Procedure 9 will be identified as AEW entering the management zone downstream of the management zone it arises in.

Procedure 9 – Determining the volume of AEW flowing into a management zone

1. WaterNSW will calculate the volume of AEW flowing into a management zone each day as:
 - a. the volume of AEW flowing into the management zone directly from an upstream water source, plus
 - b. the volume of AEW flowing into the management zone from an upstream management zone (lagged for travel time) less its proportional share of the forecast losses in the upstream management zone, plus
 - c. the volume of AEW determined as arising in the management zone immediately upstream from a notification by a licence holder of the licence holder’s intention to protect the water from extraction under clause 51.

Procedure 10 – Determining the volume of AEW flowing out of the Macquarie-Bogan Unregulated River Water Source

WaterNSW will calculate the volume of AEW flowing out of the Macquarie-Bogan Unregulated Water Source each day as the volume of AEW arising from HEW flowing into the Barwon-Darling Water Source (lagged for travel time) reduced by its proportional share of the forecast losses in that management zone.

Notes

1. The NSW Environmental Water Register is maintained by WaterNSW and may be accessed at industry.nsw.gov.au/water/environmental-water-hub/public-register/environmental.

2. Tributary inflows arising from water access licences that do not meet the requirements in categories A, B, C and D in Table 4 will not be classified as AEW in the Macquarie-Bogan Unregulated River Water Source.
 3. The water identified as AEW under categories A, B and D will be protected from extraction in the Barwon-Darling unregulated water source until it attenuates to zero volume, or to the Darling River flow gauge at Wilcannia, whichever is the sooner.
 4. The water identified as AEW under Category C will be protected from extraction in downstream management zones until it attenuates to zero, or to the confluence of the Macquarie and Barwon Rivers, whichever is sooner.
 5. When these licence holders order water, the operator considers the order to be delivered to Marebone.
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Monitoring and managing the intended sharing of river flows

Intent

We intend to manage take so that an equivalent volume to that defined as AEW is protected from extraction during each event.

After each 24-hour period, we will compare the observed flows and observed losses to see if there are any unaccounted differences between the observations and the forecast flows and losses. This will allow us to check the effectiveness of the forecasts in determining AEW and setting access rules.

The difference between the forecast and post-calculated AEW flowing out of the management zone can be used to adjust the forecasts of AEW flowing into the next management zone. This will increase the likelihood that an equivalent volume to that defined as AEW will be protected during a flow event and there will be no unintended consequence to licence holders.

Procedure 11 – Monitoring mismatches between forecast and observed flows and intended sharing of flow

1. For each management zone where AEW is forecast, WaterNSW must:
 - a. calculate the observed river losses from the previous 24-hour period using observed flows and water use data
 - b. determine the post-calculated AEW that passed out of the management zone in the previous 24 hours using the observed river flows and losses
 - c. maintain a cumulative total of the daily difference between the forecast and post-calculated AEW leaving each management zone, and
 - d. maintain a cumulative total of the daily difference between the forecast and the observed water use.

Procedure 12 – Managing mismatches between forecast and intending sharing of flow

1. WaterNSW may (at its discretion) adjust licence access based on the cumulative total daily difference between the forecast and post-calculated AEW or water available for use during a flow event, where the event occurs over a period that is longer than one day.
2. Any adjustments and reasons for adjustments must be documented.
3. Adjustments to licence access in response to observed cumulative mismatch during the event to date should be distributed across the remaining period of access, where possible. Consideration must also be given to the potential for further mismatches between announced and post-calculated licence access.
4. Mismatches between the forecast and post-event calculated licence access must not be reconciled between events.

Notes

1. Criteria for defining when action must be taken to manage a cumulative mismatch in an event have not been defined. Instead, WaterNSW will report by the end September each year on the cumulative differences between forecast and observed AEW and when adjustments were made.
 2. Adjustments to the available water will be applied in subsequent assessments and announcements.
 3. No changes will be made to announcements once they have been made.
 4. A mismatch between events will not be reconciled. Instead, approaches will be reviewed through annual reporting and the adaptive management approach to improve how uncertainty is managed.
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Issuing flow advice

Intent

Issuing flow advice before and during an event provides information to:

- assist licence holders in submitting an EoI and in business planning, and
- provide transparency for the public on the flows that may occur, the volume of AEW likely to be protected, and when and where licences are likely to be permitted to take water.

Procedure 13 – Issuing flow advice

1. WaterNSW will issue flow advice on the WaterNSW website for the Macquarie-Bogan Water Source as often as necessary, but at least weekly, when:
 - a. an inflow event is occurring in the upstream tributaries, to indicate (or update) what flows might occur in the Macquarie River, Marthaguy Creek or Gum Cowal-Terrigal Creek water sources, and whether any access for licensed water users is expected, or

- b. a flow event is occurring in the Macquarie River, Marthaguy Creek or Gum Cowal-Terrigal Creek water sources, to advise water users of the overall progress of river flows.
2. In consultation with environmental water managers, the following flow advice will be made:
 - a. a broad seasonal outlook
 - b. an outlook based on that given by the Bureau of Meteorology
 - c. the circumstances in upstream storages, and
 - d. any planned EWA2 (active sub-allowance) or HEW releases that would be actively managed in the Lower Macquarie.
3. Flow advice to inform water users and the general public will be made as often as necessary when:
 - a. an inflow event is occurring in the upstream tributaries that will provide AEW to the Lower Macquarie and Marthaguy Creek water sources, to indicate (or update) what flows might occur in the Lower Macquarie and Marthaguy Creek water sources, and whether any access for licensed water users is expected, or
 - b. a flow event is occurring in the Lower Macquarie and Marthaguy Creek water sources that includes AEW, to advise water users of the overall progress of river flows, and
 - c. at the conclusion of flow events that included AEW, to summarise how active management enabled sharing between water users and the environment.
4. Flow advice would be made available for the community generally. It will include:
 - a. advice indicating the management zones and dates where pumping is allowed, or where pumping would be likely to be permitted
 - b. where AEW is forecast to be present
 - c. an indication of the timing and magnitude of flows under a conservative flow forecast, based on an assessment of the maximum potential licensed water use consistent with (where information is available):
 - i. expressions of interest to access
 - ii. historical water use
 - iii. the current capacity to take water (such as on-farm storage and pump capacity), and
 - iv. conservative inflow and river transmission loss forecasts that are consistent with similar past events.

Notes

1. The broad seasonal outlook may be based on:
 - the Bureau of Meteorology outlook
 - the circumstances in upstream storages, and
 - any HEW releases that likely to be actively managed in the Lower Macquarie, Marthaguy and Gum Cowal water sources.

Expressions of interest

Intent

An Eol will be used to determine which unregulated river access licence holders intend to take or protect water. Licence holders must submit an Eol whenever they intend to extract or protect water.

When AEW is in a management zone, the Eol allows volumetric limits to be applied to share forecast flows between licence holders who want to extract or protect water in the Lower Macquarie Downstream, Gum Cowal and Lower Marthaguy Creek management zones. These limits apply when the available water determined from the forecast flow is lower than the interested licences holders' authorised pump capacity.

The Eol process is intended to maximise economic opportunities arising from the available water while meeting the environmental objective to protect AEW and identify licence holders who want to protect water.

Active management provides for environmental water holders and any other unregulated river access licence holders to protect water otherwise permitted to be taken in the water source for environmental purposes. The water must be protected from extraction to ensure other licence holders cannot take the water from a downstream management zone.

The Eol input along with the forecast flow will be used to determine the maximum volume of water that may be taken on a given day in a management zone, or under specified licences. The volume of water must also be protected from extraction.

Licence holders who want to protect water from extraction are to follow the same processes required of licence holders who want to extract water.

Procedure 14 – Establish an Eol process

1. WaterNSW will make an Eol process available to unregulated river licence holders who meet the requirements of this manual, to establish who wants to receive a share of the forecast flow for extraction or protection in-stream.
2. WaterNSW will provide flow advice indicating whether AEW is currently within the system or is expected to be within the near future. The flow advice should be provided as early as possible (at least five days before announcements are made) to allow licence holders time to submit, withdraw or revise their Eol.
3. WaterNSW's Eol system will enable licence holders to enter an Eol for future dates.
4. The Eol process will:
 - a. allow licensed water users and authorised representatives to submit, withdraw or revise an Eol over a specified 24-hour period up to 9 am the day before an announcement is made, for the period the licence holder nominates in their Eol
 - b. allow licence holders to notify that they want to extract water
 - c. allow licence holders to notify that they want to protect water from extraction
 - d. advise licence holders if their Eol is invalid

- e. set defaults for the minimum and maximum volume of water to be protected or extracted as 0 ML, and
 - f. allow licence holders to set other default values as a standing Eol.
5. WaterNSW may communicate about the Eol process when issuing flow advice.

Notes:

1. Announcements under clause 53A (3) may be made to reduce the maximum volume of water permitted to be taken to protect the AEW or water below the thresholds. This may be required if the sum of authorised pump capacities exceeds the water available to be taken or protected under unregulated access licences.
2. The Macquarie-Bogan WSP doesn't preclude seeking expressions of interest at other times, such as to support flow forecasting. However, the information in the Eol would not be used to determine the maximum volume of water permitted to be taken (that is, the volumetric limit announcement).
3. When the water available to licence holders in a relevant flow class exceeds the sum of the pump capacities for eligible licence holders in that flow class, a flow share announcement is not required.

Procedure 15 – Requirements for licence holders to lodge an Eol under clause 51 and mandatory licence conditions

1. An Eol must be submitted for each water access licence for each 24-hour period that the licence holder wants to extract or protect water.
2. To submit an Eol, licence holders must follow the process and use the system or any alternative process provided by WaterNSW.
3. A licence holder submitting an Eol must:
 - a. indicate if they want to extract water or protect water from extraction for each 24-hour period
 - b. provide the minimum and maximum requested volume for extraction or protection for each 24-hour period, or a default of 0 ML will be assumed, and
 - c. finalise their Eol by 9 am on the day before water is intended to be taken or protected.
4. An Eol submitted by a licence holder will be invalid if:
 - a. the water access licence is not current and/or
 - b. the water access licence has an authorised pump capacity that equals zero and/or
 - c. mandatory fields for the Eol are not completed.
5. A licence holder may:
 - a. submit an Eol for a single 24-hour period or multiple 24-hour periods
 - b. submit default values in the Eol that will apply into the future unless amended by the licence holder, and

- c. submit, withdraw or revise an Eol up to 9 am on the day before water is to be taken or protected.
- 6. Licence holders are requested to submit default values in their Eol, up to their installed pump capacity, or capacity to take on the access day.
- 7. The maximum volume that can be protected or extracted is the authorised pump capacity.
- 8. For each management zone for each day, the river operator will record, archive and make accessible the Eol data submitted by all licence holders. This will include a log of changes, and the date and time the Eol for each 24-hour period was locked (usually the morning of the day before access).

Procedure 16 – Requirements for licence holders intending to protect water from extraction by making a notification under clause 51(1)

- 1. Unregulated river access licence holders who want to protect water from extraction under clause 51 must submit an Eol.
- 2. The Eol notifies the Minister that the licence holder wants to protect water from extraction.
- 3. A separate expression of interest is required for each licence.
- 4. The Eol must specify:
 - a. that the licence holder wants to protect the water that is otherwise permitted to be taken
 - b. the period that the water is to be protected (one or multiple 24-hour periods)
 - c. the maximum volume they would like to protect from extraction for each 24-hour period, and
 - d. the minimum volume they would like to protect from extraction for each 24-hour period.
- 5. The maximum volume that can be protected from extraction is the lesser of:
 - a. the authorised pump capacity, and
 - b. volumetric limit announced for the licence.
- 6. A licence holder:
 - a. can choose to have some or all of the volume available under their licence protected from extraction, and
 - b. cannot protect and also extract a proportion of the volume available on the same day.
- 7. WaterNSW will record, archive and make accessible a record of notifications to protect water, including the:
 - a. licence number
 - b. the maximum volume they would like to protect from extraction for each 24-hour period, which is the desired take for each day up to pump capacity (default values if no other notification is current and a default notification has been received)
 - c. the minimum volume they would like to protect from extraction for each 24-hour period
 - d. the volume identified by the Minister as AEW on each day, and
 - e. a log of changes to notifications by licence holders.

Notes

1. WaterNSW will provide details on how to submit an Eol on the WaterNSW website and through educational programs and advice.
2. The maximum volume that can be protected or extracted is the authorised pump capacity under a licence.
3. A licence holder with zero authorised pumping capacity cannot extract water or protect water from extraction.
4. Environmental water managers are likely to protect available water with water access licences held for environmental purposes.
5. An Eol will not be limited by the account balance or annual take limit, as the account balance and annual take on a given day may not be known if metering and telemetry are not in place.
6. There is no guarantee that the Eol will be filled.
7. The volume requested in the Eol is not the volume permitted to be taken or the volume protected.
8. While an Eol is not required if an announcement is not made under clause 53A (3), it is unlikely that this will be known before an Eol for the next access period closes. This effectively means that an Eol must be submitted under all scenarios.
9. Licence holders will receive a mandatory condition requiring them to have placed an Eol with WaterNSW in situations where announcements are made under clause 53A(3). Taking water in this circumstance without an Eol is a breach of licence conditions. Licence holders will receive further education materials when they are formally notified and receive their Statement of Conditions.
10. WaterNSW will not roster access among licence holders. Licence holders may choose to roster access among themselves in circumstances where the volume of available water is less than the sum of the eligible authorised pump capacities in a management zone, and enter rostering results as their Eol.

Determining prohibition of access, available water and announcing volumetric limits under clause 53A (3)

Intent

Access determination must consider other water sharing plan rules including PEW provisions, access rules such as exemptions, and discretionary conditions.

This manual describes the means for determining the flow rates and thresholds relevant to unregulated take that are necessary to protect AEW. Access thresholds will be adjusted by the extent necessary to protect the AEW present from extraction. If the flow is assessed against the adjusted CtP threshold for a licence and does not equal or exceed it, take will be prohibited for that licence.

AEW and water below the adjusted pumping thresholds may not be fully protected from extraction if take from eligible licences has collectively exceeded the available water above the adjusted CtP thresholds. This can potentially occur when:

- forecast flows exceed adjusted CtP thresholds, and
- the pump capacity in a management zone exceeds the available water above the adjusted thresholds.

The water sharing plan provides for the available water to be distributed among licence holders by setting daily extraction limits for each management zone, to protect AEW or water below the flow class thresholds. The daily extraction limits under access licences in each management zone will be the volume available above the CtP thresholds for the licence.

Procedure 17 – Assessing flow against modified CtP thresholds and AEW volume

1. Each day during a flow event, WaterNSW will assess whether the river flows at gauges linked to CtP licence conditions in each management zone at the start of the next 24 hours are forecast to exceed the CtP thresholds for each licence:
 - a. under normal access conditions, and
 - b. considering the estimated rate of active environmental water (i.e. the adjusted CtP) if active environmental water is present.
2. If flows exceed the sum of the CtP threshold and the AEW at the CtP reference point, the licence holder is eligible to take water, subject to other licence conditions. This may be constrained by the issuing of a volumetric limit in cases where the available volume is less than the total potential for take in that management zone.

Procedure 18 – Determining available water

1. The volume available will vary from licence to licence depending on the CtP flow rate specified in the licence access conditions.
2. The river operator will determine the available water based on data held at 9 am on the day before the announcement applies, and the forecasts made.
3. For each 24-hour period during an event that may include active environmental water, the river operator will:
 - a. assess whether the flows at the gauge specified in the licence conditions are likely to exceed the CtP thresholds adjusted by the volume of AEW forecast to be present, and
 - b. determine the available water for each licence for any 24-hour period, if river flows are forecast to exceed the adjusted CtPs at the start of the 24 hours.
4. The river operator may adjust the available water to take into account any observed mismatch in the actual and intended sharing between access licence holders and the environment, as determined in accordance with procedures 14(1) and 14(2) during a flow event, where that flow event occurs for a sufficient length of time. Any adjustments and reasons for adjustments will be documented.

5. Where a significant period of access is still expected to be available, any adjustment to the available water in response to any observed cumulative mismatch in sharing during the event to date should be distributed across that remaining period of access, where possible. Consideration should be given to the potential for further mismatches between announced and post-calculated available water.
6. Mismatches between the forecast and post-event calculated available water will not be reconciled between events. Instead, approaches will be reviewed through annual reporting and the adaptive management approach to reduce uncertainty.
7. Specific methods for determining available water in each management zone are described in the Daily Management Approach section of this manual.

Procedure 19 – Determining if a volumetric limit announcement under clause 53A (3) is required

1. A volumetric limit announcement under clause 53A (3) is required if AEW is present and the available water in a management zone is less than the total pumping capacity of licence holders who have submitted an EoI for that zone, so that extraction is limited to only the available water.
2. The available water is distributed among licence holders who are eligible to extract. That is, their adjusted CtP and other licence conditions are met, and they have submitted an EoI.
3. The available water is divided amongst the eligible licence holders based on their proportion of total shares of all eligible licences in the management zone, and any current intent to take notified by a licence holder.
4. If there are licences with different CtP conditions in a management zone, licence holders may have access to different available water. A segmented approach will be required to assess and distribute volumes between different numbers of licences, depending on their eligibility.
5. The proportion of total available water allocated to a licence holder will be expressed as a daily volumetric limit and will be the sum of the licence holder's share of all contributing sources of water.
6. Because of the number of unique licence conditions and multiple water source contributions along the Lower Macquarie Downstream management zone, the zone is divided into several subzones to calculate AEW present, the eligibility of licences, available water and volumetric limits if required. The management approach for each subzone is described below

Notes

1. Access licence holders can take in accordance with their normal licence conditions if a volumetric limit announcement is not required and access is not prohibited.

Daily management approach

Procedure 20 – Lower Macquarie River upstream management zone (Oxley to Miltara)

1. Calculate the proportion of flow passing Marebone Weir that is AEW, taking into account the supply of water to the remaining downstream regulated water users.
2. Calculate the proportion of flows passing the Oxley flow gauge each day that is AEW by applying the proportion determined at the Macquarie downstream of Marebone Weir to the forecast flow at Oxley, allowing for an appropriate travel time.
3. If total flows at Oxley exceed the sum of the CtP and the AEW at Oxley flow gauge, announce that access is available for all licence holders in that zone.
4. Management response:
 - a. If the Oxley flow is less than or equal to the CtP (500 ML/day) plus AEW flow, then access is prohibited.
 - b. If the Oxley flow is greater than the CtP (500 ML/day) plus AEW flow, then access is permitted for licence holders who have submitted an Eol. The total volume available for licence holders ($V_{subzone1-0}$) is Oxley flow minus AEW minus 500 ML/d.
 - c. Licences eligible to receive a volumetric limit > 0 are those where the flow minus AEW exceeds the licence CTP. Each licence's daily volumetric limit is calculated by distributing $V_{subzone1-0}$ between the eligible licences in proportion to their unit shares. If the volume distributed to a licence exceeds the lesser of its authorised pump capacity or Eol maximum requested volume, then this excess volume is redistributed to other eligible licences, up to their authorised pump capacity and Eol maximum requested volume.
 - d. There is no need to announce a volumetric limit whenever the sum of authorised pump capacity in the management zone is less than: total flow at Oxley, minus the sum of AEW and 500 ML/day.
 - e. If there is no AEW, then normal licence conditions apply (flow is all unregulated).

Procedure 21 – Gum Cowal management zone

Daily approach

Subtract the AEW volume, losses and replenishment flow volume from the flow at the Gum Cowal Bifurcation gauge to determine the available volume, if any.

Management response

1. Only licence holders who have submitted an Eol will be permitted access through normal licence conditions or a volumetric limit announcement.
2. If there is no forecast AEW from the Gum Cowal regulator, then normal licence conditions apply (flow is all unregulated).
3. If the forecast release from the Gum Cowal regulator is equal to the forecast AEW and replenishment release, then access is prohibited (flow is all AEW or replenishment flows).

4. If the forecast release at Gum Cowal regulator is greater than forecast AEW plus the replenishment release, two resulting scenarios may require different responses:
 - a. If the forecast release at Gum Cowal regulator minus the forecast AEW and the replenishment release is less than the authorised pump capacity of licences, then announce a daily volumetric limit that is equal to the forecast release minus the forecast AEW and the replenishment release.
 - b. If the forecast total release at Gum Cowal regulator minus the forecast AEW and the replenishment release is greater than or equal to the authorised pump capacity of licences, then announce that access is permitted subject to normal licence conditions (flows available for take will exceed maximum water use, and no daily volumetric limit is required).

Procedure 22 – Marthaguy Creek below Terrigal Creek

Daily approach

1. Calculate the proportion of daily flows at Terrigal Creek outflow gauge (upstream Marthaguy Creek) that is AEW by adjusting the proportions used at the Gum Cowal regulator for any licensed take of water and applying it to the flows at Terrigal Creek (upstream Marthaguy Creek), allowing for flow travel times.
2. Forecast the total flow in the Marthaguy Creek at Carinda each day based on the total flows at Terrigal Creek, and flows at Carinda over previous days.
3. In the absence of an Upper Marthaguy stream gauge installation, estimate the proportion of flow forecast to pass Marthaguy Creek at the Carinda flow gauge that is AEW using a river flow and transmission loss relationship between Terrigal Creek (upstream Marthaguy) and Marthaguy Creek at Carinda.

Management response

1. Only licence holders who have submitted an EoI will be permitted access through normal licence conditions or a volumetric limit announcement.
2. If there is no forecast AEW at Carinda on the Marthaguy Creek, then normal licence conditions apply.
3. If the forecast total flow at Carinda on Marthaguy Creek is less than CtP (50 ML/day) plus the forecast AEW at Carinda, then access is prohibited (flow is all below the CtP, AEW).
4. If the total forecast flow at Carinda on the Marthaguy Creek is greater than CtP (50 ML/day) plus the forecast AEW, then two resulting scenarios will require different responses:
 - a. If the forecast total flow at Carinda on the Marthaguy Creek minus the forecast AEW is less than the authorised pump capacity of licences, then announce a daily volumetric limit equal to the total forecast flow minus the forecast AEW
 - b. If the forecast total flow at Carinda on the Marthaguy Creek minus the forecast AEW is greater than or equal to the authorised pump capacity of licences, then announce access is permitted subject to normal licence conditions (flows available for take will exceed maximum water use, and no daily volumetric limit is required).

Procedure 23 – Lower Macquarie River downstream managements zone (Miltara to Barwon River)

Daily approach

1. Calculate the proportion of flows passing the Miltara flow gauge each day that is AEW by applying the proportion determined at the Oxley flow gauges to the observed flow at Miltara, allowing for an appropriate travel time. This should be done after adjusting the proportions for any take by licences, diversions and any flows left in-stream by licence holders choosing to protect flows in-stream.
2. Use flow minus loss forecasts (Procedure 4) to forecast the remaining volume for extraction available to each licence holder, depending on the location of their extraction site.
3. The available volumes and volumetric limits will need to be calculated sequentially for each subzone so that likely extractions from upstream licences in the management zone, and volumes from entering tributaries can be considered. The licence subzones are:
 - upstream of Carinda (subzone 1)
 - downstream of Carinda to Marthaguy confluence (subzone 2)
 - Marthaguy confluence to Brewon (subzone 3), and
 - Brewon to the Barwon confluence (subzone 4).

Macquarie River upstream of Carinda (subzone 1)

1. The available volumes for licences in the Macquarie River upstream of Carinda are based on the proportion of flow at Miltara that is not AEW (with forecast losses deducted) plus any forecast gains minus CtP.
2. The available volume for licences is restricted so that extraction by a licence is not forecast to cause the flow at the reference gauge to fall below the licence's CtP condition.
3. The total available volume (unrestricted by licence conditions) is:

$$V_{\text{subzone1-0}} = \text{flow}_{\text{Miltara}} - \text{loss}_{\text{Milt.Car.}} - \text{AEW}_{\text{Miltara}}$$

where:

- $\text{loss}_{\text{Milt.Car.}}$ is the net loss that occurs between Miltara and Carinda gauges, and
 - $\text{AEW}_{\text{Miltara}}$ is the total AEW volume calculated to be passing the Miltara gauge.
4. Only licence holders who have submitted an EoI will be permitted access through normal licence conditions or a volumetric limit announcement.
 5. If there is no AEW, then normal licence conditions apply (flow is all unregulated).
 6. If $V_{\text{subzone1-0}}$ equals 0 and AEW is present, then access is prohibited (flow is all AEW).
 7. If $V_{\text{subzone1-0}}$ is greater than 0, then certain conditions apply for licences in subzone 1:
 - a. If $V_{\text{subzone1-0}}$ is greater than or equal to the sum of the authorised pump capacity of licence holders who have submitted an EoI plus the largest CtP of all those licence holders, then access is permitted subject to normal licence conditions (flows available for take will exceed maximum water use, and no daily volumetric limit is required), or

- b. If $V_{subzone1-0}$ is less than the sum of the authorised pump capacity of licence holders who have submitted an Eol plus the largest CtP of all those licence holders, then a daily volumetric limit will be announced.
- c. The volumetric limit for each licence in subzone 1 is calculated as follows:
 - i. For the visible flow condition licence, calculate $VolumetricLimit_{subzone1-0}$ by distributing $V_{subzone1-0}$ up to the lesser of the licence holder's authorised pump capacity and the maximum volume requested in the Eol.

$$V_{subzone1-50} = \max \left\{ V_{subzone1-0} - \sum VolumetricLimit_{subzone1-0} - CTP_{license}(50 \text{ ML/d}), 0 \right\}$$

- ii. For licence holders with a 50 ML/day CtP condition, calculate their $VolumetricLimit_{subzone1-50}$ by distributing $V_{subzone1-50}$ between the licences in proportion to their unit shares. If the volume distributed to a licence holder exceeds the lesser of their authorised pump capacity and the maximum volume requested in the Eol, then this excess volume is redistributed to other licences with the same CTP condition, up to their authorised pump capacity and the maximum volume requested in the Eol.

$$V_{subzone1-245} = \max \left\{ V_{subzone1-0} - \sum VolumetricLimit_{subzone1-0} - \sum VolumetricLimit_{subzone1-50} - CTP_{license}(245 \text{ ML/d}), 0 \right\}$$

- iii. For licence holders with a 245 ML/day CtP condition, calculate $VolumetricLimit_{subzone1-0}$ by distributing $V_{subzone1-245}$ to the licence up to the lesser of the authorised pump capacity and the maximum volume requested in the Eol, where:
 - $share_{subzone1-245}$ is the number of shares for a 245 ML/day CtP licence
 - $share_{subzone1-50}$ is the number of shares for a 50 ML/day CtP licence
 - $share_{subzone1-0}$ is the number of shares for a visible flow condition licence
 - $\sum Share_{subzone1-X}$ is the total sum of shares for licences in subzone 1 with the visible flow/CTP condition of X that have submitted an Eol.

Macquarie River between Carinda Gauge and the Marthaguy confluence (subzone 2)

1. The available volume for licences in the Macquarie River between the Carinda gauge and the Marthaguy confluence is the forecast flow at Miltara, any gains between Miltara and Carinda, minus AEW and any subzone 1 licence extraction or protection.

$$V_{subzone2} = flow_{Miltara} - loss_{Milt.Marth.} - AEW_{Miltara} - \sum VolumetricLimits_{subzone1}$$

2. Only licences that have submitted an Eol will be permitted access through normal licence conditions or a volumetric limit announcement.
3. If there is no AEW, then normal licence conditions apply (flow is all unregulated).
4. If there is no available volume $V_{subzone2}$ u/s Carinda for any licences and AEW is present; then access is prohibited (flow is all AEW).

5. Licences only have access if the available volume $V_{subzone2}$ exceeds the licence's visible flow or CTP condition.
6. If there is available volume downstream of Carinda $V_{subzone2}$, then for licences in subzone 2:
 - a. if the available volume downstream of Carinda \geq authorised pump capacity of all licences who have submitted an Eol, and the available volume exceeds the CTP for all licence holders who submitted an Eol, then access is permitted subject to normal licence conditions (flows available for take will exceed maximum water use, and no daily volumetric limit is required)
 - b. if the available volume downstream of Carinda $<$ authorised pump capacity of all licences who have submitted an Eol, then a daily volumetric limit will be announced. Licences eligible to receive a volumetric limit > 0 are those where the available volume exceeds the licence CTP. Each licence's daily volumetric limit $VolumetricLimit_{licence}$ is calculated by distributing $V_{subzone2}$ between the eligible licences in proportion to their unit shares. If the volume distributed to a licence exceeds the lesser of its authorised pump capacity and Eol maximum requested volume, then this excess volume is redistributed to other eligible licences, up to their authorised pump capacity and Eol maximum requested volume.

Macquarie River between the Marthaguy confluence and Brewon gauge (subzone 3)

1. The available volume at the confluence of the Macquarie River and Marthaguy Creek is the sum of the following, with appropriate allowance for travel times:
 - a. the available water for the Macquarie River downstream of Carinda (subzone 2) less subzone 2 licence extraction or protection, and less the forecast losses, plus
 - b. the available water for the Marthaguy Creek at Carinda management zone less the Lower Marthaguy management zone licence extraction or protection, and less the forecast losses,

$$V_{macquarie} = flow_{Miltara} - loss_{MilBrewon} - AEW_{Miltara} - \sum VolumetricLimits_{Subzone\ 1} - \sum VolumetricLimits_{Subzone\ 2} + forecast\ gains$$

$$V_{marthaguy} = flow_{Marthaguy.Carinda} - AEW_{Mc.Carinda} - Loss_{MCCar.Brewon} - \sum VolumetricLimits_{Marthaguy}$$

$$V_{subzone3} = V_{macquarie} + V_{Marthaguy}$$

where:

- $loss_{MilBrewon}$ is the net loss estimation calculated to occur on Macquarie River flows between Miltara and Brewon
- $AEW_{Mc.Carinda}$ is the total volume of active environmental water calculated to be present at the Marthaguy Carinda gauge, and
- $loss_{MCCar.Brewon}$ is the net loss estimated to occur on Marthaguy Creek flows between Marthaguy gauge at Carinda and Brewon.

2. Only licence holders who have submitted an Eol will be permitted access through normal licence conditions or a volumetric limit announcement.
3. If there is no AEW, then normal licence conditions apply (flow is all unregulated).
4. If there is no available volume $V_{subzone3}$ for any licences and AEW is present, then access is prohibited (flow is all AEW).

5. Licence holders only have access if the available volume $V_{subzone3}$ exceeds the licence's visible flow condition.
6. If there is available volume $V_{subzone3}$, then the following conditions apply for licences in subzone 3:
 - a. If the available volume is greater than or equal to the authorised pump capacity of all licence holders who have submitted an Eol, then access is permitted subject to normal licence conditions (flows available for take will exceed maximum water use, and no daily volumetric limit is required).
 - b. If the available volume is less than the authorised pump capacity of all licence holders who have submitted an Eol, then announce a daily volumetric limit.

Macquarie River downstream of Brewon gauge (subzone 4)

1. The available volume at the confluence of the Macquarie and Barwon Rivers is the sum of the following, with appropriate allowance for travel times:
 - a. the available volume in subzone 3, less any subzone 3 licence extraction or protection and forecast losses, plus
 - b. the flow in the Castlereagh River at Gungahman less the forecast losses

$$V_{macquarie} = V_{subzone3} - loss_{BrewonBD} - AEW_{Miltara} - AEW_{Mc.Carinda} - \sum VolumetricLimits_{Subzone\ 1} - \sum VolumetricLimits_{Subzone\ 2} - \sum VolumetricLimits_{Subzone\ 3} + forecast\ gains$$

$$V_{castlereagh} = flow_{Gungahman} - Loss_{CR.Gun.BD}$$

$$V_{subzone4} = V_{macquarie} + V_{castlereagh}$$

where:

- $loss_{BrewonBD}$ is the net loss estimation calculated to occur between Brewon and the end of the Lower Macquarie downstream management zone
 - $loss_{CR.Gun.BD}$ is the net loss estimated to occur to the flow passing the Castlereagh gauge at Gungahman between that gauge and the end of the Macquarie system, and
 - $V_{subzone4}$ is the available volume.
2. Only licence holders who have submitted an Eol will be permitted access through normal licence conditions or a volumetric limit announcement.
 3. If there is no AEW, then normal licence conditions apply (flow is all unregulated).
 4. If there is no available volume $V_{subzone4}$ for subzone 4 for any licence holders and AEW is present, then access is prohibited (flow is all AEW).
 5. If there is available volume $V_{subzone4}$ and:
 - a. it is greater than or equal to the authorised pump capacity of licence holders in subzone 4 who have submitted an Eol, announce access is permitted subject to normal licence conditions (flows available for take will exceed maximum water use, and no daily volumetric limit is required)
 - b. it is less than the authorised pump capacity of users in subzone 4 who have submitted an Eol, then announce the available volume as a daily volumetric limit. Each licence's daily

volumetric limit $VolumetricLimit_{licence}$ is calculated by distributing $V_{subzone4}$ between the eligible licences in proportion to their unit shares. If the volume distributed to a licence holder exceeds the lesser of the authorised pump capacity and the maximum volume requested in the Eol, then the excess volume is redistributed to other eligible licence holders, up to their authorised pump capacity and the maximum volume requested in the Eol.

Notes

1. Active shares for the purposes of determining volumetric limits are any entitlements that are attached to a valid works approval or are on the environmental register. This does not prevent any 'inactive' shares from submitting an Eol at any time. A valid Eol for extractive use requires that all other conditions for extractive access are met.

Announcing access

Intent

WaterNSW must announce access when there is AEW present and licence holders have the potential to otherwise access AEW.

WaterNSW will determine and announce a volumetric limit for licences in the Lower Macquarie Downstream management zone if the available water is less than the eligible pump capacity for the management zone, and there is AEW present.

Licence holders do not have to calculate adjusted thresholds themselves, but must consult the official announcement channels to determine if take is prohibited for that day under their licence, and whether take is constrained by volumetric limits.

If there is no announcement about the prohibition of take or volumetric limits, licence holders must adhere to conditions and thresholds stated on their licence, including submitting an Eol if they intend to access water.

Appendix D depicts the announcement process.

Procedure 24 – Making prohibition of access and volumetric limit announcement under clause 53A (2) and (3)

1. Water NSW will:
 - a. make announcements by 7 am that will apply for 24 hours from 9 am on that day
 - b. publish announcements on the WaterNSW website, and
 - c. communicate announcements to licence holders via email and SMS.
2. Each announcement will specify:
 - a. the management zone the announcement applies to
 - b. the period the announcement applies for
 - c. the date and time that the access announcement was made

- d. whether volumetric limits under clause 53A (3) applies, and
 - e. prohibition of access for licence holders or licence classes whose access conditions are not met.
3. If WaterNSW has not issued an announcement for a specific period of time, then normal access conditions apply.
 4. Announcements can be made daily during an event. Otherwise, if there is sufficient confidence in the forecast flows, access announcements may specify more than one 24-hour period of access, each of which may have a different level of access.
 5. Announcements for each management zone can be made for different periods. For example, there may be an announcement for Zone 1 that is for one 24-hour period and an announcement for Zone 2 that is for three 24-hour periods.
 6. An announcement cannot be retracted.
 7. Prohibition of access must be announced for a specified management zone if there is only the following present in that management zone:
 - a. PEW resulting from the access rules specified in clause 53 of this Plan and AEW, or
 - b. AEW.
 8. Prohibition of access for individual licences or licence classes must be announced if AEW is present and access conditions are not met (for example, if the adjusted flow threshold is higher than the forecast flow).
 9. The daily total volumetric limit for a management zone is equal to the available water determined in accordance with this procedures manual and the daily calculation approach for that management zone.
 10. Daily volumetric limits must be announced if the available water is less than the eligible pump capacity for any management zone and there is AEW present.
 11. A volumetric limit announcement will:
 - a. be made for periods when a volumetric limit announcement is determined to be required under clause 53A (3)
 - b. be made by 7 am on the day the volumetric limit announcement applies, and
 - c. apply for a 24-hour period from 9 am.
 12. Volumetric limit announcements must include:
 - a. the management zone the announcement applies to
 - b. the period the announcement applies for
 - c. the date and time that the access announcement was made, and
 - d. a maximum extraction announcement under clause 53A (3) in ML/day for each licence class, licence or group of licences. Note that there may be different extraction limits for different licences in each management zone, and in each subzone in the Lower Macquarie Downstream management zone.

Procedure 25 – Method for licence holders to determine if extraction is permitted

1. Licence holders must check for announcements on all days they intend to access water. For events where AEW may be present as indicated by flow advice, licence holders must check for the prohibition of take, and volumetric limit announcements for their licence before they start pumping, and check again when the announcement expires.
 2. For events where no AEW is present, take will not be prohibited and no volumetric limit will be announced under active management, and licence holders may take water in accordance with the conditions on their licence if they have submitted an Eol.
 3. Water must not be taken under an unregulated river access licence during any period for which an announcement has been made under clause 53A (3), unless the licence holder has a volumetric limit announced for their licence/s.
-

Debiting water allocations accounts

Intent

Water extracted or protected must be debited from water allocation accounts to ensure equitable treatment among licence holders.

This manual establishes a procedure for debiting water allocation accounts when unregulated water that would otherwise be permitted to be extracted is protected from extraction. This ensures that the water allocation account is reduced by the volume determined as requiring protection from extraction. The water debited is 'used' in the water source for environmental purposes.

Procedure 26 – Determining the amounts to be debited from access licence water allocation accounts under clause 51 (when unregulated water has been identified and determined to be protected from extraction)

1. The river operator will debit the water allocation account relating to a licence listed as a non-statutory environmental water licence on the NSW Environmental Water Register where the licence holder has noted that they want to protect water otherwise permitted to be taken under clause 51 (3) by the volume identified as AEW on each day.
2. The volume protected for extraction will be the volume debited from the water allocation account. This volume will be either the volumetric limit allocated to the account, the pump capacity in the case of normal access conditions, or the volume in the notification sent to the river operator, less any proportional unaccounted difference – whatever is the lesser amount.

Notes

1. Water allocation accounts of licence holders (including environmental water holders) who have notified in their Eol that they intend to protect water will be debited by the volume of water otherwise permitted to be extracted.

Procedure 27 – Debiting unregulated water allocation accounts when water is extracted

1. An Eol and announcements will not be considered in debiting a water allocation account when water is extracted.
2. WaterNSW will debit water allocation accounts for extractive use in accordance with existing procedures (for instance, based on the recorded take).
3. WaterNSW will provide for licence holders to specify their preference for the priority order of debiting when water is extracted where multiple access licences are linked to one works approval.
4. This manual may be reviewed if there is evidence that water allocated to unregulated river access licences under clause 53A (3) as a result of an Eol is not extracted and impacts access by other licence holders in a management zone.

Notes

1. If water permitted to be taken is not taken, the volume not taken will be available in the next management zone for redistribution (as a positive unaccounted difference).
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Monitoring, evaluation, reporting and improvement

Intent

Active management in the Macquarie-Bogan Water Source is a significant change to the traditional management of unregulated river systems. An adaptive management approach is required to enable learning and improvements to rules and procedures. The department will review the implementation of active management annually. Appendix E summarises the annual review cycle.

The review relies on data and reports provided by other agencies.

Data used in active management is to be recorded, archived and accessible to government agencies to support reporting, adaptive management and compliance monitoring and enforcement.

The adaptive management cycle starts with reports that provide the necessary information to inform the annual evaluation of active management and to ensure it is transparent.

An Annual River Operations Report documents the implementation of active management, including the forecasting and accounting of flows, losses, AEW and licensed water use, and management responses. Reports from the Regional Delivery Division of CPHR Group and Natural Resources Access Regulator will document any issues that arose in protecting AEW, monitoring and enforcing compliance, and recommendations for improvements to ensure the objectives and principles of active management are met.

Procedure 28 – Data capture, archiving and record-keeping requirements

1. WaterNSW will capture and archive the information in Table 5 for each management zone for each day.

2. WaterNSW will make the data outlined in Table 5 accessible to the department for reporting and evaluation and to NRAR for compliance monitoring and enforcement purposes.

Table 5 Data to be captured, archived and made accessible

Purpose	Recording and archiving requirements
Issuing flow advice	Flow advice issued
Forecasting flows	<ul style="list-style-type: none"> Installed irrigation infrastructure (number of pumps and their capacities, on-farm storage capacities) All observed or reported input data (observed flows, water use, on-farm storage volumes, weir pool levels/volumes, rainfall, evaporation, Eol) to forecast losses and flows, and calculate the amount of available water announced each day for each management zone Daily outputs of flow forecasting Actual unaccounted differences Adjustments in response to mismatches between forecast and actual unaccounted differences and reasons for adjustments Adjustments to loss estimates and reasons for adjustments
Identifying and determining AEW	<ul style="list-style-type: none"> Volume of AEW entering from each tributary or upstream water source (and its licence source) Volume of AEW entering the management zone from an upstream management zone of the same water source Volume of AEW identified as arising from within the management zone (such as the unregulated water determined to be protected under clause 53) and the water access licence number that the AEW is attributed to The volume of AEW flowing out of the Macquarie-Bogan Unregulated River Water Source
Accounting for Losses of AEW	<ul style="list-style-type: none"> Losses assigned to AEW in each management zone
Expression of interest	<ul style="list-style-type: none"> Data submitted in Eols, including a log of changes to Eols Date and time Eols for each 24-hour period were locked Data exported from Eols at 9 am on the day before the announcement and used to set volumetric limits
Requirements for licence holders intending to protect water from extraction under clause 51	<ul style="list-style-type: none"> Notifications (through Eol) to protect water including the: <ul style="list-style-type: none"> licence number maximum volume they would like to protect from extraction for each 24-hour period, and

	<ul style="list-style-type: none"> — minimum volume they would like to protect from extraction for each 24-hour period • Volume identified and determined as AEW on each day
Determining and making the prohibition of access announcements under clause 53A (2) and volumetric limit announcements under clause 53A (3)	<ul style="list-style-type: none"> • Prohibition of access announcements made (including details of announcements) • Volumetric limit announcements (including details of announcements) • Licences permitted to take on each day, whether access was prohibited, limited or in accordance with normal licensing conditions for each licence • Water available on each day • Maximum volume permitted to be taken under each access licence • Adjustments to the amount of available water to reduce any mismatches between announced and post-calculated volumes of available water and AEW
Monitoring the intended sharing of access to river flows	<ul style="list-style-type: none"> • Daily post-calculated available water and AEW entering from each tributary or upstream water source (segmented between held environmental water and EWA2 licence sources) • Daily mismatches between announced and post-calculated volumes of available water and AEW • The volume of AEW identified as arising from within the management zone (that is, the unregulated water identified to be protected under clause 51) for each licence • The proportion of total flow that is AEW at the boundary of each management zone • The volume of reduction of AEW due to losses in each management zone

Procedure 29 – Monthly and annual river operation reporting requirements

1. During active management events, WaterNSW must submit a monthly summary of the event to the Water Group or otherwise publish on their website. This will include daily data for AEW inflows, volumes protected in each zone and AEW tracking at key locations.
2. By 30 September each year, WaterNSW will submit an Annual River Operations Report to the Water Group. This report will include:
 - a. a description of the active management undertaken during the relevant water year
 - b. the performance in meeting:
 - i. the intended sharing outcomes for each flow event during the relevant year
 - v. the relevant requirements of the Macquarie-Bogan WSP

- vi. the requirements set out in this manual, and
- vii. a general description of the flow events and water use that occurred
- c. a summary account on a monthly or event basis of the:
 - i. inflows of AEW
 - ii. additional volumes of water identified as requiring protection, arising from notifications to the Minister (under clause 51)
 - iii. volumes of AEW passing key points
 - iv. volumes of AEW flowing into the Barwon-Darling
 - v. expressions of interest placed by unregulated river access licences, and
 - vi. water available to unregulated river access licence holders (to be protected or extracted)
 - vii. qualitative risk that AEW would have been extracted if active management was not in place, taking into account the event conditions.
- d. a comparison on a monthly or event basis of the:
 - i. announced available water with the post-calculated volume of available water; separately for consumptive and HEW licences and by zone
 - ii. forecast and actual river losses
- e. documentation of:
 - i. feedback received from consultation with stakeholders on the implementation of active management
 - ii. issues that arose in the implementation of active management and details of how any issues were managed, and
 - iii. deviations from the procedures outlined in this manual and details of why the deviations were necessary
- f. recommendations to:
 - i. address issues that arose in implementing active management
 - ii. improve the efficiency or effectiveness of active management, and
 - iii. avoid future deviations, where possible
- g. any other matter relevant to active management that the department may request following consultation with WaterNSW.
- 3. WaterNSW may consult with Macquarie-Bogan unregulated river access licence holders to seek feedback on the implementation of active management for that water year and include a summary of any such feedback in the Annual Rivers Operation Report.

Procedure 30 – Annual active management statement from the Regional Delivery Division of CPHR Group

1. By 30 September each year, the Regional Delivery Division of CPHR Group will submit the following information to the Water Group:

- a. a brief description of environmental events that used active management to protect environmental water during the previous water year
 - b. a qualitative indication of how important the active environmental water was for achieving environmental objectives¹
 - c. documentation of:
 - i. any issues that arose in the expression of interest process
 - ii. any issues that arose in the accounting of AEW, and
 - iii. feedback from consultation with stakeholders on active management
 - d. recommendations to:
 - i. address issues, and
 - ii. improve the implementation of active management.
2. The Regional Delivery Division of CPHR Group may consult with environmental water holders and stakeholders in preparing its annual statement.

Procedure 31 – Annual active management statement from the Natural Resource Access Regulator

1. By 30 September each year, NRAR will submit to the department documentation of:
 - a. relevant compliance outcomes
 - b. any issues that arose in monitoring or enforcing compliance with active management provisions, and
 - c. recommendations to address those issues or improve the operation of active management.

Procedure 32 – Annual evaluation and review of active management

1. The Water Group will conduct an annual evaluation and review of the implementation of active management after considering reports provided by WaterNSW, NRAR and the Regional Delivery Division of CPHR Group.
2. In undertaking the review, the Water Group must have regard to the objectives and principles set out in the active management policy.
3. By the end of March each year, the Water Group will prepare an active management annual evaluation and review report. This report will include:
 - a. reporting on the implementation of improvements from previous reviews
 - a. issues relating to active management raised through consultation with stakeholders

¹ Note that the Water Group will combine this information with WaterNSW advice about the risk that AEW would have been extracted in each event if active management was not in place. This information will be used by WaterGroup to assess the significance of the rules for achieving environmental outcomes.

- b. a summary of results and recommendations contained in reports provided by WaterNSW, NRAR and the Regional Delivery Division of CPHR Group
 - c. proposals for variations or new procedures brought forward by agencies or stakeholders
 - d. an assessment of whether:
 - i. procedures were followed for active management
 - ii. any deviations from the procedures occurred and any modifications to the procedures that may be required to avoid future deviations, where possible
 - iii. the current active management procedures and the associated operation provide for AEW to remain in the water source for environmental purposes
 - iv. 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
 - v. the active management procedures should be expanded, modified or remain unchanged.
 - e. recommendations to change this manual, the active management policy or the Macquarie-Bogan WSP rules relating to active management.
4. Proposals to support changes or improvements to the operation of active management may be brought forward for consideration in the review by WaterNSW, NRAR, environmental water holders including the Regional Delivery Division of CPHR Group, the Murray-Darling Basin Authority, water users or any other party. Proposals must be supported by appropriate evidence and analysis.
 5. By 30 June each year, the department will publish a summary of the annual review, including any findings of the review and recommendations.

Procedure 33 – Amendments to the manual

1. The Water Group is responsible for ensuring that appropriate changes to the regulatory framework are made to give effect to any recommendations arising from this review, in consultation with key stakeholders. The department will endeavour to complete amendments by the end of June each year depending on complexity.
2. The department may make amendments to this manual of a non-material manner without consulting.

Notes

1. WaterNSW may issue a report on the progressive outcomes of sharing at any time during an event.

Deviating from procedures outlined in this procedures manual

Intent

The Macquarie-Bogan WSP defines the water to be identified as AEW and protected from extraction, and provides for available water to be shared among water users. It is critical that the volume of AEW and the water available to unregulated licence holders is appropriately quantified to meet the objectives and principles of active management.

Since active management is a new process, it is to be expected that circumstances may arise that were not anticipated. Some flexibility in applying the procedures may be required to meet the objectives and apply the principles.

Outlining the circumstances under which deviations from procedures are permissible and how deviations from the manual are managed supports transparency and improves active management over time.

Any deviations from the manual are to be documented by WaterNSW in the Annual River Operations Report. This report will be considered by the department during the annual evaluation and review active management.

The only circumstances in which procedures are to be deviated from are if current procedures are not feasible or compromise the primary objective or principles of active management.

There are no circumstances that allow deviation from the rules in the WSP.

Procedure 34 – Allowances for deviations from standard procedures

1. Under all circumstances, WaterNSW and the department must implement active management in line with water sharing rules outlined in the Macquarie-Bogan WSP.
2. Applying the procedures outlined in this manual should be guided by the objectives and principles in this manual and the intent of each procedure. Where there is uncertainty, WaterNSW and the department will adopt a precautionary approach to minimise the potential for active management to have detrimental impacts on, or create unintended benefits for, licence holders.
3. WaterNSW must notify the department in writing of the deviation, at the time, or within five working days of the deviation occurring.
4. WaterNSW must:
 - a. seek clarification from the department when the manual is not explicit on procedures
 - b. document the deviation in the Annual River Operations Report that is submitted to the department, include the reason for deviating from the procedures, and outline possible modifications to current procedures that may be required, and
 - c. ensure that any deviations from procedures are guided by the objectives and principles outlined in this manual and the intent of the procedures.

5. The department must document and consider in the Active Management Annual Evaluation and Review report:
 - a. any deviation from the procedures outlined in this manual
 - b. any circumstances identified during the implementation of active management where the manual is not explicit on the procedures, and
 - c. if and how deviations from the manual can be addressed by amending the manual.
-

Part G – Managing risk

The way we implement active management is important in managing the risk of:

- not protecting the volume of AEW present in a water source or management zone and
- affecting access by water users to water above the access thresholds arising from sources other than AEW.

Procedure 35 – Causes of residual risk

The principal residual risk arises from the uncertainty in forecasting flows due to the inherent variability in natural river systems.

Forecasting flows primarily relies on forecasting river transmission losses arising from seepage, evaporation and evapotranspiration. The losses associated with these processes cannot be measured. Uncertainty in forecasting flows can arise from uncertainty in estimating water use, river transmissions losses, tributary inflows, errors in flow or use measurements, or flow routing effects.

Procedure 36 – Consequences of risk

If the observed flow in a management zone is subsequently found to be higher than expected as forecast losses are overestimated, then more water could have been made available for access. The reverse risk also exists, where actual flows are subsequently found to be lower than expected because forecast losses have been underestimated, and the full volume of AEW is not protected.

Procedure 37 – Managing risk

A balance must be struck in managing such uncertainties and so minimise overestimating or underestimating the volume of environmental water protected, or the potential effects on water available to unregulated river access licence holders. This must occur within the limits of operational feasibility and cost-effectiveness.

While uncertainty is impossible to eliminate, the Department will seek to minimise any mismatch between the forecast and actual flows. We will:

- consider **the best information available on daily extraction volumes** at each pump site, including metering and expressions of interest
- **make the forecast, and the prohibition of access, and volumetric limit announcements that rely on that forecast, as close as possible to the period of access to flows.** This

means announcements may only be made for single 24-hour periods. Where the forecast certainty is better, announcements may be made earlier and/or for longer periods

- **share river transmission losses proportionally** by assigning river transmission losses to the environment at the end of each management zone based on the ratio of environmental water at the start of the management zone compared to the total flows
- **base initial and ongoing loss estimates on an assessment of the average losses for comparable past historical flow events**, using loss tables and a range of travel times and adjusting ongoing losses based on observed losses during an event
- **adaptively adjusting ongoing loss forecasts** based on the observed unaccounted difference so that mismatches arising from uncertainty in ongoing loss forecasts don't compound as an event proceeds
- **adjusting access** during an event **to address cumulative mismatches** on previous day/s between forecast and actual unaccounted differences
- **increasing the frequency of announcements** to allow for operational responses to be made
- **use an adaptive management approach** to ensure active management continuously improves and is responsive to improved information, insights, infrastructure, tools and systems. This will include:
 - **improving information over time** to reduce flow forecasting uncertainty by reviewing exiting flow and rainfall measurement, and taking advantage of opportunities to increase the number of measurement points
 - introducing a new **metering** framework to improve the standard and coverage of non-urban water meters
 - **annually reviewing and evaluating** the effectiveness of active management and enabling potential amendments to procedural manuals following recommendations from the review.

Part H – Compliance

The Natural Resources Access Regulator (NRAR) is the independent regulator and is responsible for monitoring and enforcing compliance with the WM Act, and associated WSP rules.

The WSP rules and associated mandatory conditions set the active management operational framework. NRAR will apply its risk-based approach to active management compliance. Ensuring compliance from water users is key to the ongoing success of the environmental reforms.

Licence holders must comply with their licence conditions. This includes complying with announcements and the requirements to submit Eols, rather than the previous requirement to monitor flow at gauging stations.

NRAR runs a range of compliance, monitoring and auditing campaigns in the WSP area. Campaigns may be focused regionally, on particular industries or other targeted programs. The regulator relies on a wide range of data sources, such as metering records, logbooks, satellite and aerial imagery and conducting site inspections.

To determine if a licence holder was permitted to take water, and the maximum volume permitted to be taken under that licence in a specified period, NRAR refers to data sets, including, but not limited to:

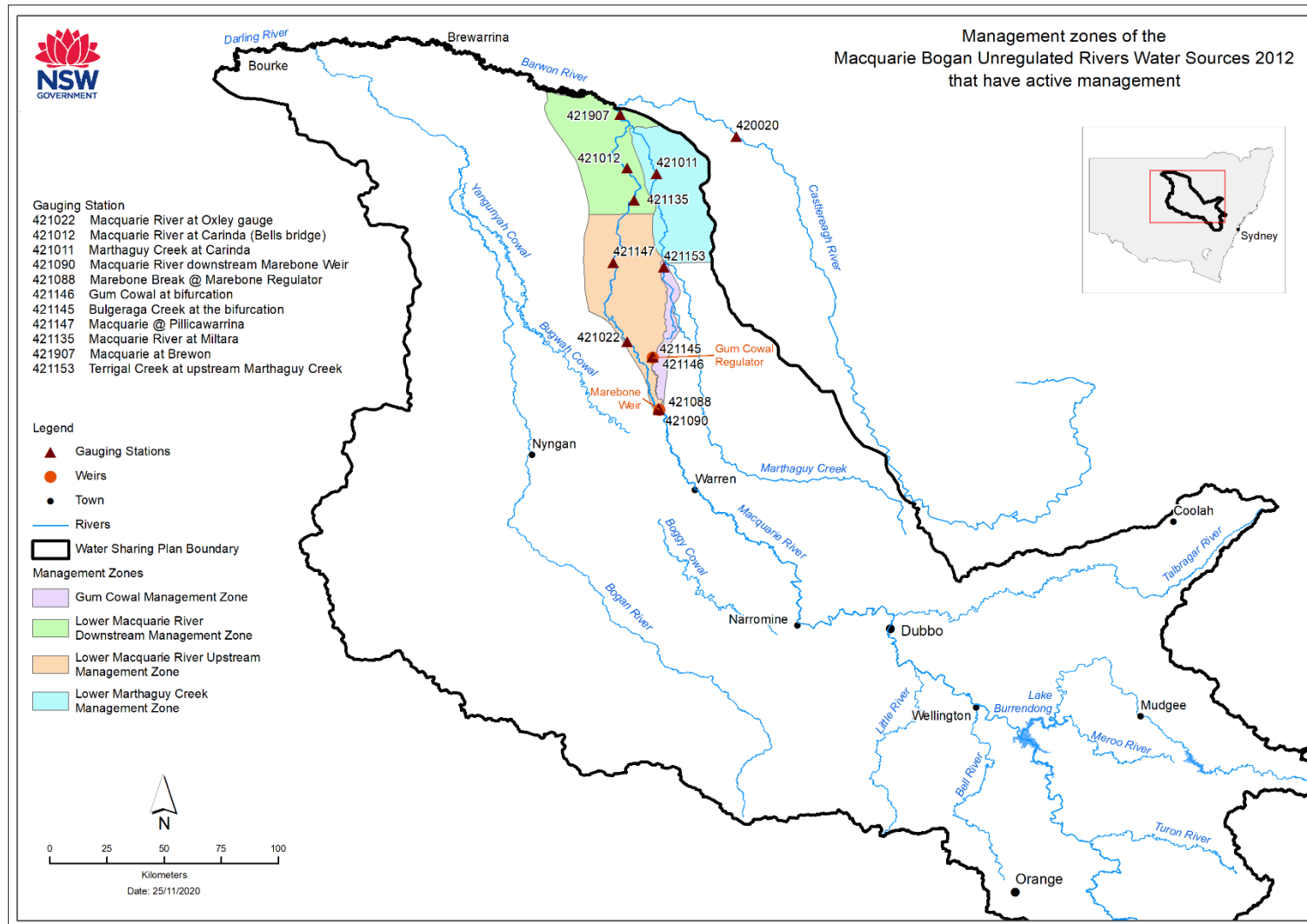
- prohibition of access announcements
- volumetric limit announcements
- whether an EoI was required and submitted
- the flows recorded at flow reference points.

Beyond compliance, monitoring and audits, NRAR responds to suspected breach reports with a range of enforcement actions and/or by investigating. A risk-based approach is applied to ensure proportionate enforcement action is taken in accordance with the NRAR Regulatory Policy and NRAR Regulatory Framework. Enforcement actions are published in the NRAR Public Register. Reports on NRAR's compliance activities and outputs to date are also published on NRAR's website.

This approach ensures that NRAR delivers on its principal legislative objectives to:

- ensure effective, efficient, transparent and accountable compliance and enforcement measures for natural resources management legislation, and
- maintain public confidence in the enforcement of natural resources management legislation.

Appendix A – Management zones in the Macquarie-Bogan



Appendix B – Terms and abbreviations

Term or abbreviation	Definition
AEW	<p>Active Environmental Water.</p> <p>AEW is water in the water source identified or determined by the Minister on any given day as requiring protection from extraction, in accordance with the Active Management Procedures Manual, that arises from:</p> <ul style="list-style-type: none"> • held environmental water flowing from a water source that is upstream of one of the following management zones: <ul style="list-style-type: none"> — Gum Cowal Management Zone — Lower Macquarie River Upstream Management Zone — Lower Macquarie River Downstream Management Zone, or — Lower Marthaguy Creek Management Zone • a notification by a licence holder to the Minister of the licence holder's intention to protect the water from extraction under clause 51 of this Plan, and • releases made according to clause 65 of <i>the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2020</i>.
Available water	The volume of water available to unregulated river access licences on any given day. Available water for a licence on any day may be affected by active management mechanisms and other licence conditions, and water sharing plan rules.
Basic landholder rights	Domestic and stock rights, harvestable rights or native title rights.
CEWO	Commonwealth Environmental Water Office
CEWH	Commonwealth Environmental Water Holder
Cease-to-pump rules	Any term or condition on a water supply work approval, an access licence or <i>Water Act 1912</i> entitlement that prohibits the taking of water in a particular circumstance.
CtP thresholds	Commence-to-pump/cease-to-pump thresholds.

	The minimum flow rate at which a licence holder may commence to pump in an unregulated river or stream, or the flow rate below which the licence holder must cease to pump.
Day	The 24-hour period from 9 am on any day to 8.59 am the following day.
The department	Department of Climate Change, Energy, the Environment and Water
DEW	Discretionary Environmental Water A subset of PEW that can be called on by environmental water managers in a similar way to water in licensed accounts. It includes Environmental Water Allowances and Environmental Contingency Allowances set in water sharing plans.
Regional Delivery Division of CPHR Group	Regional Delivery Division of Conservation Programs, Heritage, and Regulation Group
Water Group	Water Group in the Department of Climate Change, Energy, the Environment and Water
Eol	Expression of interest
NSW Environmental Water Register	The register of Held Environmental Water maintained by WaterNSW, and accessible at industry.nsw.gov.au/water/environmental-water-hub/public-register/environmental .
HEW	Held environmental water. Water that is available under a water access licence for achieving environmental outcomes.
Macquarie-Bogan WSP	Water Sharing Plan for the Macquarie-Bogan Unregulated River Water Source 2012
Macquarie-Bogan Water Source	Macquarie-Bogan Unregulated River Water Source
Management zone	An area within a water source in which rules particular to that management zone will apply – for example, volumetric limits and prohibition of access. Management zones are defined in the Macquarie-Bogan.
MDBA	Murray Darling Basin Authority
PEW	Planned environmental water. PEW is water that is committed for fundamental ecosystem health or other specified environmental purposes, either generally or at specified

	<p>times or in specified circumstances. It cannot, to the extent committed, be taken or used for any other purpose.</p> <p>PEW is identified and managed through rules in water sharing plans established under the <i>Water Management Act 2000</i>.</p>
Regulated river	A river that is declared by the Minister, by order published in the Gazette, to be a regulated river.
Supplementary water access licence	This licence (including a subcategory of such a licence) entitles its holder to shares of water from a water source that is a regulated river.
River	<p>Includes:</p> <ul style="list-style-type: none"> • any watercourse, whether perennial or intermittent and whether comprising a natural channel or an artificially improved natural channel • any tributary, branch or another watercourse into or from which a watercourse referred to in the above point flows, and • anything declared by the regulations to be a river, whether or not it also forms part of a lake or estuary, but not including anything declared by the regulations not to be a river.
Unregulated rivers	Any river not declared by the Minister in the Gazette as a regulated river. This includes rivers without major storages, or dams, as well as rivers where the storages do not release water downstream. In unregulated rivers, orders cannot be placed for the upstream release of a licensed allocation. Instead, both licence holders and the environment rely on natural flows.
Volumetric limit	The maximum volume of water that may be taken on any day under an access licence when it is specified in an announcement. It is the sum of the licence holder's share of all contributing sources of water.
WAL	Water access licence
Water Available	The volume of water available to unregulated river licences on any given day.
works approval	Water supply works approval
Water source	<p>The whole or any part of:</p> <ul style="list-style-type: none"> • one or more rivers, lakes or estuaries, or • one or more places where water occurs on or below the surface of the ground (including overland flow water flowing over or lying there for the time being). <p>This includes the state's coastal waters.</p>

	Each water source referred to in this manual is defined in the relevant water sharing plan.
WM Act	<i>Water Management Act 2000 (NSW)</i>
WSP	Water sharing plan

Appendix C – Hydrometric stations used for active management in the Macquarie-Bogan Unregulated River Water Source

Gauge number	Gauge name
421022	Macquarie River @ Oxley gauge
421012	Macquarie River @ Carinda (Bells Bridge)
421011	Marthaguy Creek @ Carinda
402090	Macquarie River d/s Marebone Weir
421088	Marebone Break @ Marebone Regulator
421146	Gum Cowal @ Bifurcation
421145	Bulgeraga Creek @ Bifurcation
421147	Macquarie @ Pillicawarrina
421135	Macquarie River @ Miltara
421907	Macquarie @ Brewon
421153	Terrigal Creek @ u/s Marthaguy Creek
420020	Castlereagh @ Gungahman

Appendix D – Flow diagram for announcements

