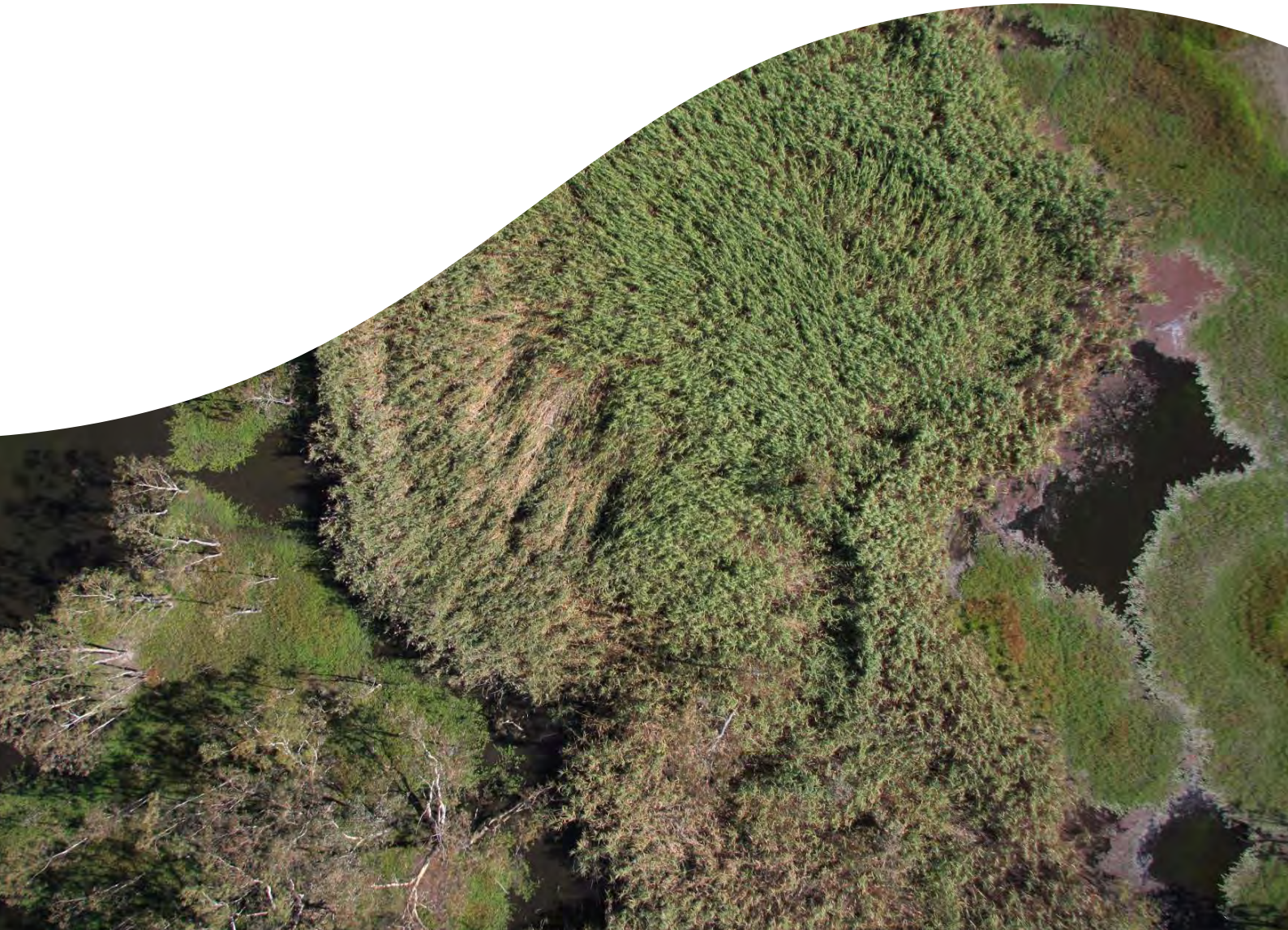
NSW GOVERNMENT

Natural Resources Commission

Final report

Review of the Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012

June 2023



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Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to traditional owners and Aboriginal peoples of the Plan area. The Commission recognises and acknowledges that Traditional Owners have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. We value and respect their knowledge in natural resource management and the contributions of many generations, including Elders, to this understanding and connection.

The Commission acknowledges the Traditional Owners and Local Aboriginal Land Councils representing several Aboriginal nations in the Macquarie-Bogan water sharing plan area and pays respect to Elders past, present and future, as well as Aboriginal peoples for whom the waterways of the Plan area are significant. The Commission also pays respect to the Tubba-Gah who have an established Indigenous Land Use Agreement and the active native title claimants in the Plan area, namely the Gomeroi People, the Ngemba, Ngiyampaa, Wangaapuwan and Wayilwan people, and the Warrabinga-Wiradjury people.

Cover image: Northern Macquarie Marshes Nature Reserve, 2021. John Spencer, NSW Department of Planning and Environment.

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Acronyms and units of measurement

Act	the *Water Management Act 2000* (NSW)
AWD	Available water determination
Basin Plan	*Murray-Darling Basin Plan 2012*
BDL	Baseline diversion limit
CEWO	Commonwealth Environmental Water Office
Commission	the Natural Resources Commission
DPI-Fisheries	Department of Primary Industries – Fisheries
DPE-EHG	Department of Planning and Environment – Environment and Heritage Group (the former Office of Environment and Heritage, subsequently Energy, Environment and Science)
DPE-Water	Department of Planning and Environment – Water
EEC	Endangered Ecological Communities
EWA	Environmental water allowance
HEVAE	High Ecological Values Aquatic Ecosystems
HEW	Held environmental water
IWCM	Integrated water cycle management
LALC	Local Aboriginal Land Council
LGA	Local government area
LTAAEL	Long-term annual average extraction limit
MER	Monitoring, evaluation and reporting
MDBA	Murray-Darling Basin Authority
ML	Megalitre (unit of volume equivalent to one million (1×10^6) litres
The Macquarie-Cudgegong Regulated Plan	*The Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016*
NRAR	The Natural Resources Access Regulator
NSW	New South Wales
Plan	The *Water Sharing Plan for the Macquarie-Bogan Unregulated River Water Sources 2012*
R	Recommendation
SDL	Sustainable diversion limit

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Executive summary

The Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012* (the Plan) as required under Section 43A of the *Water Management Act 2000* (the Act).

The Commission has assessed the extent to which Plan provisions have contributed to achieving environmental, social, cultural, and economic outcomes, and identified where changes to provisions are warranted. The issues identified in this review indicate a material risk that the Plan is not adequately contributing to the achievement of these outcomes. The Commission considers that the changes needed warrant extending the Plan for up to two years and then replacing it.

Most critically, the Plan does not contain a sustainable, numeric extraction limit for the Plan's 30 unregulated water sources. Based on *Basin Plan 2012* (the Basin Plan) estimates, unregulated river entitlement across the Macquarie-Bogan and neighbouring Castlereagh catchments greatly exceeds the baseline diversion limit (BDL). The current practice of using a default 100 percent annual water allocation in the absence of long-term annual average extraction limit (LTAAEL) compliance assessment means there is no assurance that planned environmental water or basic landholder rights are being protected as intended. This is inconsistent with the priorities of the Act.

Although provisions to protect active environmental water have been included in the Plan (introduction of active management rules in 2020), protections do not extend to planned environmental water originating from the Macquarie Regulated River along the full length of the system into the Barwon-Darling. This is despite the water sources in the two plan areas being hydrologically connected. There are also risks that the Plan does not adequately prevent water intended for the environment from being used for other purposes.

The Plan's unregulated river water sources are also highly connected to the regulated Macquarie/Wambuul River,[1] which is covered by a separate water sharing plan.[2] During dry times, large additional volumes of water are required to transfer regulated river water along the Albert Priest Channel to the Upper Nyngan weir pool. There are equity issues associated with the accounting for the transfer of water along the Albert Priest Channel, and there are challenges with assessing storage levels in the Nyngan weir pools that may impact the achievement of environmental outcomes in the Plan area.

The most recent drought has also highlighted the limitations in Plan provisions to protect critical environmental and town water needs during droughts. In the event of a drier future climate, major towns like Bathurst and Orange will likely face greater water security risks. These issues will coincide with potential increases in demand and competition for water resources across the catchment.

There are also many issues common to most water sharing plans still to be addressed, including limited support for Aboriginal water rights or engagement with Traditional Owners on Native Title claims and Indigenous Land Use Agreements (ILUAs), highly restrictive trading provisions and issues associated with floodplain harvesting in the catchment.

1 The NSW Government formally approved the dual naming of the Macquarie/Wambuul in 2021 after an application made by Bathurst Local Aboriginal Land Council in 2020.

2 *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016.*

Despite these issues, considerable work is being undertaken in the Plan area to understand environmental and town water needs and risks. This information can be drawn upon to quantify sustainable extraction and strengthen rules in a replacement Plan.

Overall finding on Plan extension and replacement

The Commission has identified several opportunities to improve outcomes that justify replacing the Plan. The Commission recommends an extension of up to two years to the existing Plan to allow time to undertake required data collection and analysis, consultation and development of amended provisions (see **Table 1**).

A summary of key areas to address to improve the Plan are outlined in **Figure 1**. To ensure clarity, the Commission has developed a detailed set of 16 recommendations (**Table 1**).

Figure 1: Key areas to improve Plan performance

Establishing sustainable extraction

The Commission continues to identify significant issues related to the establishment and management of extraction through LTAAELs. The Plan lacks a sustainable, numeric LTAAEL and there is limited data available on current water use in the Plan area. As a result, no assessment of compliance with the Plan LTAAEL has been undertaken.

Despite the absence of LTAAEL compliance, available water determinations (AWDs) have continued to be set at 100 percent for all users in the Plan area. There is a significant risk that extraction exceeds the LTAAEL in the Plan area, given that the unregulated river access licence entitlements in the Macquarie-Bogan and Castlereagh catchments are roughly five times greater than the BDL, which is defined broadly equivalent to the LTAAEL.

The Plan currently has a single LTAAEL corresponding to its extraction management unit (EMU). This limits the ability to manage the different risks from extraction across the Plan area.

Dual licence requirements intended to account for hydrologic connectivity between the Plan and the regulated Macquarie/Wambuul River also create a risk of double accounting against the LTAAEL.

Strengthening environmental protections

Although the NSW Government has taken steps to protect some managed water for the environment in the lower catchment through the active management mechanism, Plan provisions are not commensurate with the value of environmental assets in the Plan area.

There are risks that water intended for the environment is being used for other purposes.

Access rules associated with several water sources do not adequately protect low flows in the Plan area and are based on outdated information. These rules place the environment, basic landholders and town water supply at undue risk during periods of low water availability.

Recent Plan amendments enabling the construction of instream dams for town water purposes are not supported by a clear policy position showing how downstream environment and basic landholder rights can be adequately protected. Further, release requirements from existing instream structures need to be reviewed and aligned to ensure they meet their intended purposes.

Securing town water supply to meet future needs

Despite town water needs being largely met over the life of the Plan, communities faced severe water security risks during the most recent drought. Climate change projections indicate that similar droughts could occur more frequently in the future.

The Plan includes complex and inconsistent access rules that do not effectively protect high priority needs. This includes town water supply to major towns like Bathurst and Orange, which are experiencing significant growth.

Many town water supply dams and interregional pipelines are not referenced in the Plan, hindering effective management of extreme events. In the context of recent Plan amendments that enable local water utilities to apply for a water supply works approval to construct instream dams in the Plan area, the Commission notes that there is limited guidance on the approval and risk assessments associated with stormwater harvesting schemes, despite the likelihood that these schemes will become prevalent over the Plan replacement period.

The Plan area covers the Fish River Water Supply Scheme, which transfers western flowing waters east of the Great Dividing Range. The Scheme is critical to meet town and other water needs in, and beyond, the Plan area. Neither the Plan nor the major utility licence associated with the Scheme contain a set of drought restriction conditions specifying the reduction in water delivery from the Fish River Supply Scheme to customers based on prevalent drought conditions. These drought operation conditions should be codified in the Plan or on the major utility licence.

Improving outcomes in the Bulbodney Grahway Creek Water Source

The Bulbodney Grahway Creek Water Source contains the first and most critical connection point between the regulated and unregulated river systems in the Macquarie-Castlereagh catchment. There are several issues associated with the management of flows in this area.

During dry times, large additional volumes of water are required to transfer regulated river water along the Albert Priest Channel to the Upper Nyngan weir pool. This places communities like Nyngan and Cobar, the environment, and local industries at risk during dry times. There are equity issues associated with the accounting for the transfer of water along the Albert Priest Channel, and there are challenges with assessing storage levels in the Nyngan weir pools, which may impact on the achievement of outcomes in the Plan area.

Access rules for the Bulbodney Grahway Creek Water Source do not effectively protect inflows to the Nyngan weir pools, which supply town water for Nyngan and Cobar, support water-dependent aquatic species, and provide water for agricultural and mining operations in the mid-Macquarie-Bogan area. Cease to pump reference points for the two weir pools are also not aligned, resulting in uncertainty around the adequacy of thresholds.

Delivering outcomes for Aboriginal people

Critical state-wide barriers to Aboriginal water rights and the protection of cultural values remain. There was limited engagement and collaboration with Aboriginal stakeholders during Plan development. As a result, Aboriginal water-dependent cultural assets are not adequately identified and protected, and there is limited tangible water access or uses specified for Aboriginal people.

The Commission continues to raise concerns regarding the lack of acknowledgement and recognition of Native Title determinations and Independent Land Use Agreements (ILUAs) in water sharing plan provisions.

Also, additional shares have been offered under controlled allocations without evidence that Aboriginal water rights had been considered.

These issues are inconsistent with the *NSW Water Strategy*'s priority to '*recognise First Nations/Aboriginal People's rights and values and increase access to and ownership of water for cultural and economic purposes*', particularly regarding ownership of water.

Improving outcomes through trade

Current trading rules are complicated, ambiguous and highly restrictive. When the Plan was made, most of its water sources were categorised as having 'high' instream value, meaning trade into these sources was restricted. New data indicates that some of these water sources may have lower risk profiles, which could allow for trade to be expanded, provided environmental and other socioeconomic values are protected.

Given the close connectivity between the regulated and unregulated river systems, the Plan has separate trading rules for nearly all water sources. This creates significant complexities for stakeholders and WaterNSW and may hinder trade.

Access rules linked to trades between water sources are also not clear. This was highlighted in the 2020-21 annual evaluation and review of active management.

Improving the management of floodplain harvesting

Licensing of floodplain harvesting in the Macquarie-Castlereagh catchment has been delayed following the disallowance of amendments to the *Water Management (General) Regulation 2018*. Although floodplain harvesting licences have now been issued in the regulated Macquarie-Cudgegong Plan, there is no intention to issue floodplain harvesting licences in the unregulated Macquarie-Bogan Plan.

Rules to manage floodplain harvesting are only contained in the regulated Macquarie-Cudgegong Plan without adequate consideration of the interaction with the unregulated Plan provision and the impact on unregulated water sources in the Plan area.

In addition, there are works capable of floodplain harvesting that fall outside the gazetted floodplain that have not been assessed and which will not be managed under the regulated Macquarie-Cudgegong Plan. As part of the replacement process for the unregulated Macquarie-Bogan Plan, there is a need to expand the assessment of works on the floodplain in the Plan area to ensure these works are subject to the same rules, irrespective of whether they are governed by the regulated Macquarie-Cudgegong Plan or the unregulated Macquarie-Bogan Plan.

Table 1: Recommendations (R)

Overall recommendation	
R 1	The Plan should be: a) extended for up to two years until 30 June 2025, to allow time to complete data collection and analysis, consultation, and development of amended provisions b) replaced by 1 July 2025 at the latest, supported by the completion of the recommendations of this review.
Establishing sustainable extraction	
R 2	To support sustainable extraction and improve transparency, DPE-Water should as soon as possible in the next two years: a) establish and include numeric values for LTAAELs in the replacement Plan based on up-to-date information on all forms of extraction (including updated estimates of basic landholder rights, overland flow/floodplain harvesting activities in unregulated water sources (outside the designated floodplain area), and areas under plantation forestry) b) utilise clause 87(1)(a) to develop appropriate Plan provisions to effectively manage the impacts of floodplain interception activities in the Plan area. These provisions should align with and complement plan provisions relating to floodplain harvesting in the regulated Macquarie-Cudgegong Plan c) prioritise LTAAEL compliance assessment against numeric LTAAELs using best available estimates of extraction, and make this publicly available d) determine the likelihood of further "growth in use" from licenced entitlement holders and basic landholder rights and the impact of this estimated growth on licenced users and basic landholder rights to inform future available water determinations.
R 3	DPE-Water should ensure the replacement Plan includes: a) an exclusion clause in current provisions 32, 33 and 34 that exempts extractions under an unregulated (regulated supply) access licence and unregulated (regulated supply – local water utility) access licence from the LTAAEL calculations, while requiring them to be included in the regulated Macquarie-Cudgegong Plan b) a requirement for AWDs to be set conservatively if DPE-Water does not make and publish a reasonable estimate of annual extraction and assess compliance with the LTAAELs c) rules to enable the establishment of proactive AWDs to support sustainable numeric LTAAELs and revise account management rules (carryover and account limits), if necessary, to support any AWD changes. These proactive AWDs should be developed in consultation with stakeholders by Year 5 of the Plan d) provisions to account for the establishment of Native Title rights, water entitlements beneficially owned by First Nations, and cultural flows.

R 4	DPE-Water should: a) review the Plan's entitlement and estimated basic landholder rights volume and update these figures b) continue to update these entitlements and estimated basic landholder rights volumes whenever the Plan is being reviewed or amended c) undertake a risk assessment if the entitlement and basic landholder rights estimates change by more than 5 percent in any water source to determine whether Plan provisions remain adequate to protect the water source, the environment and basic landholder rights.
R 5	To support adaptive management during the term of the replacement Plan, the Plan should include a provision requiring DPE-Water to determine the sustainable level of extraction by Year 5 based on best available ecological requirements, hydrological and climate information. This information should be used to define the Plan's LTAAEL for each EMU.
Strengthening environmental protections	
R 6	As part of Plan replacement, to strengthen the protection of active environmental water in unregulated river water sources, DPE-Water should, in consultation with DPE-EHG and the CEWO, expand the list of water sources where active management applies.
R 7	To improve clarity regarding the delivery and protection of replenishment flows from the regulated river into unregulated river water sources, DPE-Water should: a) clearly stipulate in the Plan that water for the environment (HEW and the EWA2 water from the regulated river) must not be used to meet replenishment flow requirements in unregulated river water sources b) review the adequacy and appropriateness of existing replenishment flow requirements for unregulated river water sources given projected climate change c) clearly stipulate the conditions under which replenishment flows are to be provided based on climate variability, domestic and stock, and environmental needs d) include rules in the Plan that clarify how these flows will be announced and protected.
R 8	As part of Plan replacement, to address issues with current access rules, DPE-Water should: a) review the current hydrometric network to identify where the Plan can reference operational gauges for establishing flow classes and flow-based access rules for water sources that currently have a 'no visible' flow rule b) ensure all high environmental value water sources at medium to high risk from extraction have flow-based access rules that support connectivity and adequately protect water sources and their dependent ecosystems c) review if conditions attached to current water access licences and works approvals are appropriate to protect high priority needs, and ensure any changes to access rules from (a) and (b) are reflected in water access licence/works approval conditions.

R 9	To protect surface-groundwater connectivity associated with the Bell River, the Bell River alluvial aquifer and the karst landscape of Wellington Caves, DPE-Water should investigate whether linked access rules would mitigate the risk of surface water extraction on the significant water dependent values associated with Wellington Caves.
Securing town water supply to meet future needs	
R 10	As part of the Plan replacement process, DPE-Water should: a) review, and if necessary, revise existing access rules, town water storage release triggers and access licence dealings provisions in the Upper Macquarie to protect environmental, basic landholder rights and town water needs, including consideration of climate change, consistent with the principles and priorities of the Act b) review whether additional Plan provisions are needed to guide releases from existing and future town water storages (including stormwater harvesting schemes) to adequately protect environmental and basic landholder rights c) review and consolidate existing unregulated access licence conditions and works approval conditions and reflect these in the Plan provisions (instead of the schedules and appendices) d) ensure there are no further exemptions that enable the construction of in-stream dams on third-order or greater streams consistent with the principles and objects of the Act e) ensure any further in-stream dam proposals for town water supply purposes are subject to rigorous and transparent environmental and downstream impact assessment, supported by clear guidelines.
R 11	To better protect and prioritise town water during extreme events, DPE-Water should in the next 2 years: a) include explicit drought conditions (e.g., including appropriate release rules for Lake Oberon) for the major utility access licences held by WaterNSW in the Fish River Water Source. When developing these drought conditions, DPE-Water should consider the experiences of the 2017 – 2020 drought, including the introduction of section 324 orders in the Fish River Water Source; consult with WaterNSW on an appropriate set of drought conditions and then reflect these conditions on WaterNSW's major water utility licence b) in cases where water is transferred from one water source to another water source via town water supply system, ensure these inter-regional transfer arrangements are referenced in the Plan, and any necessary operational arrangements of the transfer infrastructure are accounted for in Plan provisions.
Improving outcomes in the Bulbodney Grahway Creek Water Source	
R 12	As part of the Plan replacement process, to improve accounting for water take in the Bulbodney Grahway Water Source, DPE-Water should: a) work with Bogan and Cobar Shire councils, Cobar Water Board and WaterNSW to analyse the transmission requirements associated with the transfer of water along Gunningbar Creek, the Albert Priest Channel and any relevant transfer pipelines, and revise the loss factors in clauses 53(11)(c), 53(12)(b) and 53(13)(b)

	b) review and revise the existing cease to pump conditions associated with the upper and lower Nyngan weir pools (clause 53(8) and 53(9)). This review should: ▪ be accompanied by a survey that determines the level in the lower Nyngan weir pool that represents 50 percent of the full capacity ▪ consider the environmental values associated with the weir pools and town water needs, and ▪ assess whether a joint trigger level for both the upper and lower Nyngan weir pool should be established. c) remove Clause 53(11)(b)[3].
Delivering outcomes for Aboriginal peoples	
R 13	As part of the replacement Plan, to deliver better outcomes for Aboriginal peoples through water management, DPE-Water should: a) include registered Native Title claims and ILUAs and allow sufficient time to undertake detailed engagement with the Traditional Owners and other Aboriginal knowledge holders to identify cultural values and provisions to protect and support these values b) reflect the dual naming of the Macquarie/Wambuul in the Plan c) identify and protect known high value cultural sites and undertake further work with a range of Traditional Owners and knowledge holders to better understand water values and uses, identify the rules to protect them, and support water access and use d) update amendment provisions to state that the Plan can be amended to protect cultural values based on best available information. Any future amendments that occur due to new information should occur in a timely manner e) undertake state-wide actions identified in the Commission's water sharing plan reviews to improve consideration and respect for Native Title and Aboriginal values in water sharing plans f) ensure Plan objectives and corresponding provisions are consistent with the NSW Water Strategy relating to Aboriginal peoples' rights and values and increase access to, and ownership of, water for cultural and economic purposes g) prioritise Aboriginal cultural rights and interest when making controlled allocations, and codify this process in relevant guidelines and policies, consistent with the objectives and principles of the Act.
Improving outcomes through trade	
R 14	To improve outcomes through trade, in the next two years, DPE-Water should: a) review and revise existing water access licence dealing provisions at an appropriate scale. This review should be based on the latest information on hydrologic stress, entitlement volumes, connectivity, HEVAE mapping and cultural assets and values, supported by an accompanying plain English explanatory document. In addition, this review should consider the interrelationships between the

[3] Clause 53(11)(b) states that 'Subclause (1) does not apply to the taking of water under an access licence where the licence holder is a member of the Albert Priest Channel Association'.

	unregulated and regulated water sharing plans and the impacts on all flow categories (including high flow dependent environmental values). b) implement the Plan-specific recommendations from the 2020-21 Active Management Annual Evaluation and Review – Full Report to: I. revise the trading rules between management zones in the Macquarie-Bogan to manage the impact of trading in and out of entitlements with different access provisions II. notify licence holders of current trading rules between zones with different access thresholds.
Improving the management of floodplain harvesting	
R 15	As part of the replacement Plan, DPE-Water should expand its assessment of works in the Plan area (e.g., works not covered by the regulated Macquarie-Cudgegong Plan and on the designated floodplain). The expanded assessment should ensure the take and diversion of these works is appropriately accounted for and these works do not impact high priority environment and basic landholder rights or constrain connectivity. This assessment should result in all works in the Macquarie catchment being subject to the same rules, irrespective of whether they are governed by the regulated Macquarie-Cudgegong Plan or the unregulated Macquarie-Bogan Plan and be consistent with the principles and objects of the Act.
Monitoring, evaluation and reporting	
R 16	To inform the replacement of the Plan and improve Plan specific MER, DPE-Water should, in consultation with other agencies: a) identify and address critical knowledge gaps b) specify what MER activities will be undertaken to address critical knowledge gaps, support transparency and adaptive management of the Plan in line with the NSW Water Sharing Plan Evaluation Framework and Prioritisation Tool (prioritise MER activities based on value and risk) c) strengthen stakeholder engagement in the lead up to, and during, the plan replacement process.
R 17	DPE-Water should also ensure that the replacement Plan: a) includes equity objectives and co-designed Aboriginal objectives and corresponding performance indicators b) specifies timely reporting requirements of the results of MER activities to support transparency and adaptive management. This should include but is not limited to reporting on: I. water management during extreme events that occur in the Plan area II. benefits for Aboriginal people arising from Plan provisions

1 Review background

1.1 Water sharing plans and the Commission's role

Water sharing plans are statutory instruments under the NSW *Water Management Act 2000* (the Act). They prescribe how water is managed to support sustainable environmental, social, cultural and economic outcomes. They intend to provide certainty for water users regarding how available water will be shared over the life of the water sharing plan, which is typically 10 years, unless extended.

The Plan commenced on 4 October 2012 and is due for extension or replacement on 1 July 2023. The Plan was amended five times, including in 2020 when alluvial water sources were removed as part of Basin Plan processes.

The Commission has a role under Section 43A of the Act to review water sharing plans within five years of expiry and report to the Minister on:

- the extent that a plan's water sharing provisions have materially contributed to the achievement of, or failure to achieve, environmental, social, and economic outcomes
- if changes to plan provisions are warranted.

The Commission may recommend extending or replacing plans depending on its review findings. Section 43A(3A) of the Act requires the Commission to consider potential compensation requirements resulting from recommended changes to a plan. Under the Act, compensation is payable by the state to access licence holders only in certain circumstances where water allocations under a water sharing plan are reduced.

The Commission must also consider the water management principles, including the water sharing principles, when reviewing plans.[4] The Act is clear that water sharing is not about balancing uses and values – it is about first providing for the environment and second recognising basic landholder rights above other uses. It specifies that the:

a) sharing of water from a water source must protect the water source and its dependent ecosystems, and

b) sharing of water from a water source must protect basic landholder rights, and

c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).[5]

Further, the water management principles should be prioritised in the order that they are set out above.[6] Water sharing plans must be evidence-based to achieve these outcomes.

1.2 Review approach

The Commission's review approach for water sharing plans is outlined on its website.[7] The Commission's review was informed by a range of evidence, including:

- **Consultation** – targeted engagement with government agencies, landholders, Aboriginal as well as industry, environmental and community organisations.

4 Section 5 of the Act.
5 Section 5(3) of the Act.
6 Section 9(1) of the Act.
7 Natural Resources Commission (2022) *WSP Reviews - Review approach*

- **Document review** – the Commission reviewed the Plan, its background documents, public reports and unpublished information from water management agencies, including DPE-Water. As required, the Commission considered other relevant state-wide and regional government policies and agreements.
- **Technical advice** – consultants provided peer review.
- **Submissions** – the Commission called for and considered public submissions via letters and calls to key stakeholders and advertising on the Commission's website. Stakeholders were asked to respond to the following five questions to assess the contribution of the Plan to environmental, social, cultural and economic outcomes:
  - To what extent do you feel the Plan has contributed to social outcomes?
  - To what extent do you feel the Plan has contributed to environmental outcomes?
  - To what extent do you feel the Plan has contributed to economic outcomes?
  - To what extent do you feel the Plan has contributed to meeting its objectives?
  - What changes do you feel are needed to the Plan to improve outcomes?

The Commission received 15 submissions, which are published on the Commission's website.

The Commission evaluated the Plan's performance against its stated objectives, strategies, and performance indicators. These were linked to environmental, social, cultural, and economic outcomes as required for this review.

The Commission would like to thank the community members from the Plan area who gave up their valuable time to provide input to this review. We suggest DPE-Water engage with depth and intent to further understand issues facing communities, particularly Aboriginal peoples, in the Plan area.

1.3 Relevant regional plans, policies and agreements

In reviewing the Plan, the project team considered the following plans, policies and agreements in accordance with Clause 43A(4)(b) of the Act:

- *NSW Water Strategy* – priority areas 1 to 6 under the strategy that are relevant to the Macquarie Bogan Plan area
- draft *Macquarie-Castlereagh Regional Water Strategy* documents
- *Macquarie-Castlereagh Water Resource Plan* documents, including the risk assessment and the *Macquarie-Castlereagh Long-Term Water Plan*
- *2020-21 Active Management Annual Evaluation and Review Report*
- *Aboriginal Water Strategy* – currently under development, noting the Commission did not have access to the draft strategy.

The Commission has also considered the *Murray-Darling Basin Plan 2012* (the Basin Plan) and the requirement under this plan to develop the *Macquarie-Castlereagh Surface Water Resource Plan*.[8] Portions of the Plan form components of the water resource plan.

The Macquarie-Castlereagh catchment is covered by one regulated water sharing plan (the Macquarie-Cudgegong plan and two unregulated water sharing plans (the Macquarie-

[8] DPE-Water (2020) *Macquarie-Castlereagh Surface Water Resource Plan*

Bogan and the Castlereagh plans). The Commission has also considered and aligned its recommendations (where relevant) with the recommendations from the review of the *Water Sharing Plan for the Castlereagh Unregulated River Water Source 2011*, which was released in June 2022.[9]

1.4 Parallel processes

The Commission notes that, in parallel with its water sharing plan review, DPE-Water is working towards accreditation of the *Macquarie-Castlereagh Surface Water Resource Plan* from the Murray-Darling Basin Authority (MDBA).[10] Findings from the Commission's review may have implications for the water resource plan when the replacement water sharing plan is developed.

9 Natural Resources Commission (2022) *Final report – review of Water Sharing Plan for the Castlereagh Unregulated River Water Source 2011*

10 The Commission notes that DPE-Water has submitted additional amendments to the catchment's water sharing plans, which have not been considered for this review.

2 About the Plan area

The Plan area covers the Macquarie and Bogan catchments in NSW's central west. It is comprised of 30 water sources spanning a diverse range of landscapes, from mountainous terrain to alluvial plains (**2**).[11]

Major rivers in the Plan area include the unregulated Macquarie, Cudgegong, Fish and Bogan rivers.[12] Burrendong Dam is a major water storage in the region, located at the confluence of the Macquarie/Wambuul and Cudgegong rivers.[13] Downstream of Burrendong Dam, the Macquarie/Wambuul River is regulated and flows through Wellington, Dubbo and Warren.[14] The regulated Macquarie/Wambuul River is covered by a separate Plan which is not subject to this review. Parallel to the regulated Macquarie/Wambuul River runs the unregulated Bogan River.

The Plan area makes up around 5.6 percent of the total area of the Murray-Darling Basin.[15] Connectivity to the rest of the Murray-Darling Basin via the Barwon River generally occurs during wet and median flow periods in the Macquarie/Wambuul River, and when there are unregulated flows in the Castlereagh River, Marthaguy and Marra creeks, as well as the lower Bogan River.

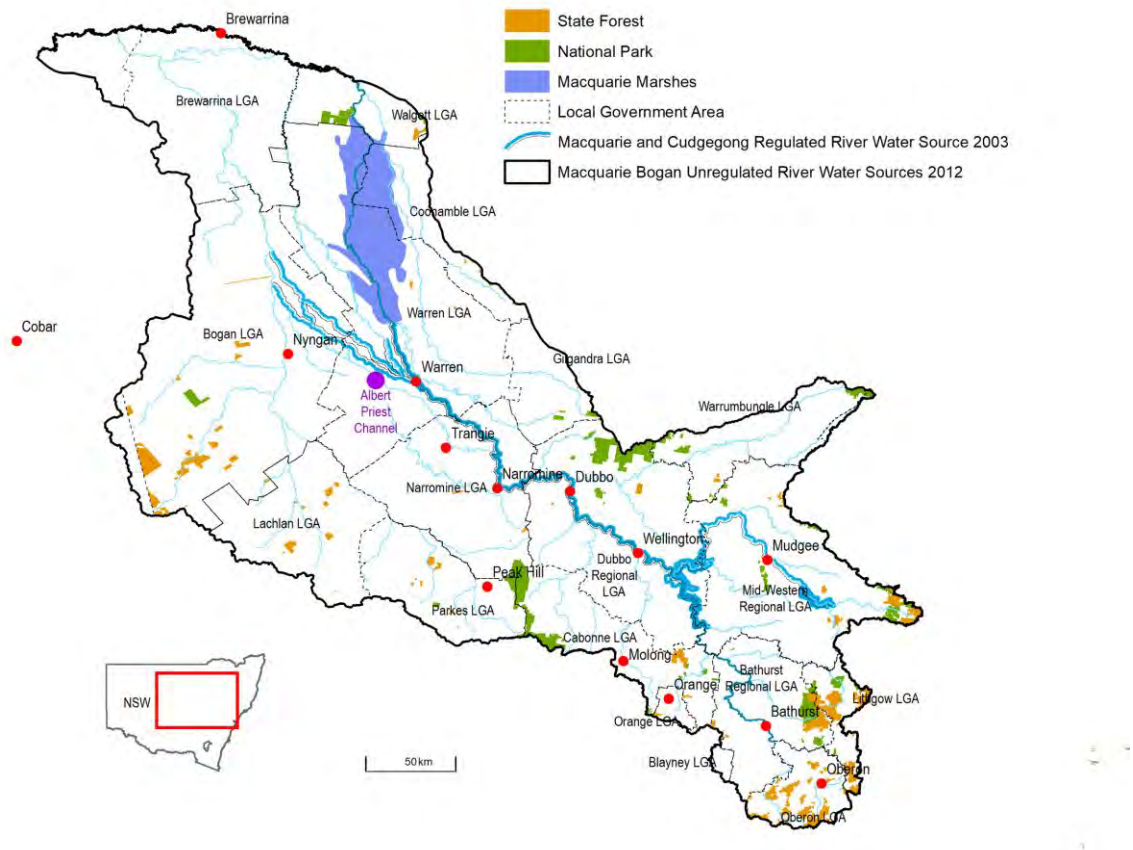

Figure 2: Plan area

11 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
12 Part 1, Section 4 of the Plan.
13 DPI-Office of Water (2012) *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*
14 DPI-Office of Water (2012) *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*
The regulated Macquarie/Cudgegong water sharing plan is not subject to this review.
15 MDBA (2022) *Macquarie-Castlereagh Snapshot*

The Plan area includes Traditional Owners representing several Aboriginal nations, three Native Title Groups and 20 Local Aboriginal Land Councils (see **Figure 3**). These nations have longstanding and continuing ties to Country and hold the rivers, wetlands and waterways, including many billabongs, in the Plan area in high regard.

As of May 2023, there is an active Indigenous Land Use Agreement (ILUA) with the Tubba-Gah[16] in the Plan area. In addition, there are three active Native Title claims for the Gomeroi people, the Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan peoples, and the Warrabinga-Wiradjuri peoples.

The proportion of Aboriginal and Torres Strait Islander peoples in the Plan area is larger compared with the average NSW population (2.9 percent). The largest communities reside in the Bogan and Cobar local government areas (LGAs) (18 percent and 14 percent respectively).[17]

Figure 3: Native Title applications in the Plan area

The Plan area's most significant environmental asset is the 220,000-hectare Macquarie Marshes in the lower end of the catchment, approximately 20,000 hectares of which is listed under the Ramsar convention.[18,19,20] The Macquarie Marshes are a complex of individual wetlands, including extensive areas of Common Reed, River Red Gum woodlands

[16] National Native Title Tribunal (2022) *Search Native Title Applications, Registration Decisions and Determinations*

[17] Australian Bureau of Statistics (2022) *New South Wales 2016 All Persons Quick Stats*

[18] Department of Climate Change, Energy, the Environment and Water (n.d.) *Macquarie catchment*

[19] ..... The Commission notes that four Ramsar wetlands had an Article 3.2 notification of change in ecological characters. Ramsar (2012), *Resolution X1.4* from the 11th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar, Iran 1971)

[20] ..... Australian Government (2010), *Likely change in ecological character of the Macquarie Marshes Ramsar Site – Statement of Reason*

and water couch meadows across three 'sub-systems' – the Northern, Southern and Eastern Marshes. They are particularly noted for their role in hosting large-scale colonial waterbird events during wet years including straw-necked ibis (*Threskiornis spinicollis),* intermediate egret (*Ardea intermedia)*, great egret *(Ardea alba)*, Australian painted snipe *(Rostratula australis)*, magpie goose *(Anseranas semipalmata)* and glossy ibis *(Plegadis falcinellus)*.[21]

Other environmental values present in the catchment include endangered ecological communities (EEC) and threatened species.[22] Seven of twenty native fish species in the Macquarie valley are listed as threatened under the NSW *Fisheries Management Act 1994*. They include flathead galaxias (*Galaxias rostratus*) which are listed as Critically Endangered; trout cod (*Maccullochella macquariensis*), southern purple spotted gudgeon (*Mogurnda adspersa*), Macquarie perch (*Macquaria australasica*), freshwater catfish (*Tandanus tandanus*) of the Murray-Darling Basin, and the western population of olive perchlet (*Ambassis agassizii*) which are listed as Endangered; and silver perch (*Bidyanus bidyanus*) which are listed as Vulnerable. Five native fish species are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: flathead galaxias and silver perch (Critically Endangered), trout cod and Macquarie perch (Endangered), and Murray cod (*Maccullochella peelii*) (Vulnerable).

In addition, a diverse range of vegetation communities are found in the area, including black box, river red gum, lignum, reedbeds and coolabah.

Just under 190,000 people live in the Plan area,[23] including in Bathurst, Orange, Oberon and Nyngan. Bathurst and Orange rely heavily on the Plan's unregulated water sources, as do communities in the Oberon and Cabonne LGAs, as well as the Blue Mountains and Lithgow areas, which are supplied by the Plan's Fish River Water Source.[24] The NSW and Australian governments have invested heavily in the Plan area to promote regional growth, including the Inland Rail Project and the Central West Renewable Energy Zone.[25]

The economy in the Plan area is highly diverse:

- the upper Plan area[26] is well known for vegetable and fruit production including apples, pears and stone fruits such as cherries, peaches, apricots, and plums. The area is also home to many vineyards close to Orange and Mudgee, which are a significant tourist attraction.
- the mid-Macquarie-Bogan Plan area[27] is used predominantly for grazing, while the fertile river flats of the Macquarie and Bell rivers are intensively cropped. Lucerne, oilseeds, maize and cotton are grown in this part of the Plan area, with pockets of cattle and sheep production. Several copper, gold, lead, zinc and silver mining operations are located along the border between the Bogan and Lachlan catchments.

21 DPE-EHG (2021) *Macquarie-Castlereagh Long Term Water Plan*
22 DPE-EHG (2021) *Macquarie-Castlereagh Long-Term Water Plan*
23 DPE-Planning (2022) *NSW Common Planning Assumption Population Projections*
24 WaterNSW (n.d.) *Fish River Water Supply Scheme*
25 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
26 The Commission refers to the area above the Burrendong and Windamere dams as the upper Plan area.
27 The Commissions refers to the area between Burrendong and Windamere dams and the Macquarie Marshes as mid-Macquarie. The Commission notes that agricultural producers in this area frequently have access to more than one water source, including regulated water from the Macquarie/Wambuul River.

- the lower Macquarie-Bogan Plan area[28] is used for floodplain grazing and opportunistic cotton production.

Agriculture has adapted to the variability in surface water supplies by building farm dams and supplementing water needs with groundwater, where available.[29] Mining operations rely predominantly on water supply from the regulated system due to consistent water needs. However, some mining operations hold a mix of both regulated and unregulated water licences and have access to alternative sources of water, including recycled wastewater.[30]

Like the landscape, the region's climate varies considerably spatially, ranging from temperate conditions in the elevated regions around Orange to semi-arid conditions on the alluvial plains downstream of Warren.[31] Temporal variability in the region's climate was also high during the Plan period, with the region experiencing severe drought conditions during 2017-20, followed by significant flooding events in 2021 and 2022.

The region is expected to experience further changes in rainfall patterns and increases in temperature.[32] DPE's climate analysis developed for the regional water strategies indicates that average annual rainfall in the area could decrease over the next 40 years. In addition, the area may also experience less frequent, but high intensity, rainfall events.[33] Droughts may become more frequent and longer, with temperatures and evapotranspiration expected to increase. This will influence rainfall runoff and inflows into the region's major storages and will impact on overall water availability in the catchment.[34] The probability of the area experiencing another drought like the one experienced in 2017-20 could increase from 1 in 1,000 years to 1 in 30 years by 2070 under a dry climate change scenario.[35]

28 The Commission refers the area below the Macquarie Marshes and downstream of the Nyngan Weir Pools as the lower Plan area.
29 DPI-Office of Water (2012) *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*
30 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
31 DPE-Water (2022) *Ibid.*
32 DPE-Water (2022) *Ibid.*
33 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy: Shortlisted Actions – Consultation Paper*
34 DPE-Water (2022) *Ibid.*
35 DPE-Water (2022) *Ibid.*

3 Establishing sustainable extraction

A fundamental role of a water sharing plan is to define how much water can be extracted by licensed users, ensuring the remaining water is adequate to protect the water sources and their dependent ecosystems and basic landholder rights. The regular assessment of LTAAEL compliance and response to any exceedance is an important part of protecting the environment, basic landholder rights and the sharing of water, as intended by the Act and Plan. The Plan establishes rules to manage extractions at three scales:

- **Long term:** The LTAAEL controls the maximum amount of water that can be extracted over the long term in the extraction management unit.[36] Setting this limit is critical; a limit that is too high will reduce the amount of water remaining for the environment and downstream water users, while a limit that is too low reduces economic and social opportunities. LTAAEL assessment should include all extraction for consumptive (non-environmental) use, including basic landholder rights. The Plan has a single descriptive LTAAEL for one extraction management unit. The Plan also includes provisions referring to the Basin Plan for calculating the 'sustainable diversion limit' (SDL) and assessing SDL compliance in the Plan area (see **Box 1**).[37]
- **Medium term**: available water determinations (AWDs) allocate the volume of water that can be extracted under access licences each year. The Plan requires AWDs to be used to retrospectively reduce extraction if the LTAAEL is exceeded. To date, AWDs have not been used to reduce risks to the Plan's water sources.
- **Short term**: daily access rules define when licensees can extract water. They are intended to protect the needs of the environment, basic landholder rights and water utilities on a daily basis.

This chapter focuses on the use of LTAAELs and AWDs to manage extraction. The Commission continues to identify significant issues related to the establishment and management of extraction through LTAAELs across its reviews, including several in this Plan area:

- the Plan lacks sustainable, numeric extraction limits at the appropriate scale (**Section 3.1**)
- there is uncertainty about the level of extraction and interception activities in the Plan area (**Section 3.2**)
- LTAAEL compliance assessments have not been undertaken (**Section 3.3**). In the absence of these assessments, the Plan should require a precautionary AWD to be implemented to address the risk of overextraction and safeguard the priorities under the Act (**Section 3.4**)
- future AWDs need to be proactive (**Section 3.5**)
- Separate EMUs are needed to address localised (**Section 3.6**)
- the entitlement shares and basic landholder rights volumes in the Plan area have changed over the Plan period but have not been updated in the Plan (**Section 3.7**)
- there is a high probability that current extractions are counted against two different LTAAELs due to the complex licensing arrangements that account for the close

36 Divisions 2 and 4, Part 6 of the Plan.
37 Division 3, Part 6 of the Plan.

hydrologic connection between the regulated and unregulated river system (**Section 3.8**)

- the Plan does not make provisions for emerging issues, including cultural flows (**Section 3.93.9**).

Box 1: Baseline diversion limits and long-term average annual extraction limits

The Basin Plan provides an additional framework that sets limits on the amount of all surface water and groundwater that can be sustainably taken from a particular area (for example, an SDL resource unit) within NSW's Murray-Darling Basin catchments. These limits are referred to as sustainable diversion limits (SDLs).[38] To establish the SDL in each water resource unit, authorities had to determine how much water was extracted and intercepted (on an average annual basis) from each water resource unit prior to the development of the Basin Plan, up until 30 June 2009. This is referred to as the baseline diversion limit (BDL).[39]

Since 2021, the Inspector General of Water Compliance is responsible for monitoring and reporting on Basin states' compliance with SDLs.[40] Basin states, including NSW, are required to report on water take in SDL resource units within inland NSW areas in accordance with Section 71 of the *Water Act 2007*. The *Water Act 2007* and Basin Plan have not only added an additional layer of reporting, and assessment, but compliance with SDLs is based on a broader definition of all forms of water take and interception activities, including take from watercourses, run-off dams, floodplain harvesting, commercial plantation (net take) and basic landholder rights.

For this review, the above reference to the Water Act and Basin Plan requirements is relevant given that:

- the Plan references the SDL in Part 6, Division 3
- the definition of the Plan's LTAAEL and the definition of the Basin Plan's BDL is broadly equivalent[41]
- the MDBA has defined numerical estimates of BDLs for unregulated water sources in the Macquarie-Castlereagh catchment area.[42]

3.1 The Plan lacks sustainable, numeric extraction limits

The Plan establishes a single LTAAEL to align with the Plan's single extraction management unit (EMU). As with many water sharing plans, the Plan's LTAAEL is not specified numerically (in ML per year) but is described as the sum of historic extractions. The Commission has a recurring recommendation that DPE-Water should define numeric LTAAELs based on sustainable levels of extraction, to:

- protect environmental and community needs consistent with the water management principles for water sharing in Section 5(3) of the Act
- manage extraction and development impacts on connected water sources

38 MDBA (2022) *Current diversion limits for the Basin*
39 The SDL for a resource unit is the BDL minus the water recovery target. The recovery target has been set at 2,750,000 ML (or 2,750 gigalitres) for the entire basin, and the recovery target for each water resource unit, along with the BDL, is specified in Schedule 2 of the Basin Plan.
40 Clause 6.04 of the *Basin Plan 2012*
41 Schedule 2 of the *Basin Plan 2012* and Clause 32 of the Plan.
42 MDBA (n.d.) *Current Baseline and Sustainable Diversion Limits*

- support efficient LTAAEL compliance monitoring and allow action to be taken through AWDs if extraction limits are exceeded
- provide clarity and transparency to stakeholders of overextraction risks
- underpin an effective water market and the valuing of water as a limited resource.

Recent risk assessments conducted for the *Macquarie-Castlereagh Surface Water Resource Plan*[43] identified several water sources or groups of water sources where risks from extraction may warrant the establishment of separate LTAAELs, including risks around:

- insufficient water being available for the environment across a range of flow regimes in the upper and lower Bogan River water sources as well as the Lower Macquarie River Water Source, downstream of the Macquarie Marshes. These water sources have a small number of large volumetric entitlements and are important to support connectivity to the Barwon River.
- insufficient water being available for the environment in the upper Plan area, particularly in the Fish River Water Source, the Macquarie River above Burrendong Water Source and the Campbells River Water Source. These water sources have a large number of small volumetric entitlements, experience pressures from basic landholder rights take and are important for town water supplies.
- the ability to meet the environmental watering requirements in some of the unregulated rivers in the mid-Macquarie, including the Bulbodney Grahway Creek Water Source. This water source has very complex licensing arrangements given the close interactions between the regulated and unregulated rivers (see **Chapter 6**).

As part of the replacement Plan, DPE-Water should review the appropriateness of establishing a single numeric LTAAEL for the Plan versus establishing separate LTAAELs for different portions of the system. Establishing numeric LTAAELs will provide a figure against which to assess and manage risk of exceedance and provide transparency for stakeholders regarding the extraction limit.

Once DPE-Water has developed a numerical LTAAEL (or LTAAELs) and included it in the replacement Plan, DPE-Water should progress work to review the LTAAEL (or LTAAELs) to ensure it is sustainable and based on the best available data and science, including the most up-to-date understanding of the region's historic, current and future climate. The current definition of the Plan's LTAAEL is not based on an assessment of sustainability. Instead, it is set to historic use averaged over the period 1 July 1993 to 30 June 1999 (plus basic landholder rights and plantation forestry take that existed on 30 June 2009). This level of extraction has not been assessed to consider if it meets the objects and principles of the Act, including maintaining the health of water dependent ecosystems.

DPE-Water should include a provision requiring that the sustainable level of extraction be determined by Year 5 of the replacement Plan. This may result in a new LTAAEL. The Commission understands that establishing a sustainable, numeric LTAAEL may require DPE-Water to redirect resources to prioritise this work. This should be considered a high priority. Once sustainable numeric LTAAELs are established, they should be included as tables in the Plan to increase transparency and support water take compliance.

The development of water resource plans, regional water strategies and the *Water Reform Action Plan*, has seen significant work being progressed to inform the establishment of a sustainable LTAAEL in the unregulated Plan areas in the Macquarie-Castlereagh

[43] DPE-Water (2020) *Macquarie-Castlereagh Surface Water Resource Plan*, Schedule D.

catchment. Some of this work[44] has also resulted in DPE-Water improving its hydrologic models to better reflect system operations, offtake nodes and interactions between Plan areas.

As they stand, these models provide an important tool to better understand water take in the Plan area and assess risks to the environment and high priority needs. As DPE-Water progressively enhances its modelling capabilities these models will become an asset in the development of sustainable LTAAELs.[45]

DPE-Water has also progressed a significant body of work to better understand the region's historical climate. In particular, the regional water strategy work will enable a comparison between the last 120-years of historical climate with paleoclimate records. At a minimum, this will provide valuable information as to whether the current Plan provisions have likely been adequate to meet the objects of the Plan and the Act based on the 'known' historical climate.[46]

DPE-Water's commitment to progress work on assessing the impacts from future climate change will be critical to inform how the Plan's provisions – including the LTAAEL – may need to be adapted. This should be part of DPE-Water's adaptive management approach and should factor in the refinement of the Department's climate change work which is currently underway.

3.2 Uncertainty and risks around the level of extraction and interception activities

One of the key reasons a numerical LTAAEL has not been established is the significant uncertainty about the level of extraction and interception activities in the Plan area due to limited metering, insufficient understanding and assessment of overland flow and floodplain harvesting diversions, and unquantified growth in basic landholder rights take.

Since the commencement of the Plan, there have been significant changes in the Macquarie-Castlereagh catchment that have impacted on water extraction and interception activities.[47] The region has a fast-growing population and is home to diverse industries, including new emerging industries like pumped hydro[48] and critical mineral extraction. Key uncertainties around current extraction are:

- **Basic landholder rights:**[49] The Plan includes numerical estimates for domestic and stock rights take. However, updated estimates developed by DPE-Water indicate that there has been significant growth in basic landholder rights take – in some water sources equating to nearly four times the estimates currently in the Plan.[50]

44 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
45 The Commission notes that improvements can be made to the transparency of the hydrological models, including providing easy-to-understand information about the limitations of models in accounting for water use. This includes documenting and understanding the assumptions, uncertainties, limitations, approaches in modelling and the extent to which inaccuracy in modelling may affect LTAAEL compliance status.
46 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*, pages 36 – 45.
47 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
48 Interviews: Central NSW Joint Organisation, 17 October 2022; Upper Macquarie councils, 17 October 2022.
49 Basic landholder rights (domestic and stock rights, harvestable rights and Native Title rights) do not require a water access licence under the Act. These rights fall outside the scope of the NSW non-urban metering reforms and no reasonable use guidelines for basic landholder rights currently exist. It is therefore difficult to determine the actual annual take from basic landholder rights in the Plan area.
50 The Commission acknowledges the methodology to estimate take under basic landholder rights has changed.

Areas of particular concern include the Summerhill Creek Water Source and the Macquarie River above Burrendong Water Source, where significant growth in basic landholder rights take is coupled with large population growth. Stakeholders have also raised concerns about the expansion of harvestable rights extraction in the upper Macquarie region, which warrants further investigation.

- **Town water:** The upper Macquarie region has been one of the fastest growing areas in inland NSW (surpassed only by the upper Murrumbidgee) (**Chapter 5**). The NSW Government projections forecast that the Bathurst Regional Council and Orange City Council areas will grow annually by a further 1.27 percent and 0.88 percent respectively, by 2041.[51] These fast-growing areas rely on unregulated rivers and creeks in the upper Macquarie region.[52]
- **Industry:** The Plan area is home to many diverse industries, including specialised agriculture, food processing and tourism in the upper Macquarie; mining around the Bogan and Cobar LGAs; and floodplain grazing and opportunistic annual crop production in the lower Macquarie. The Macquarie-Castlereagh catchment also has close linkages between the regulated and unregulated rivers (see **Chapter 6**).[53]

  It is important to note that water-dependent industries are required to hold a water access licence to take water for commercial production, unless these industries have alternative contractual arrangements through existing town water supply systems.

  Although annual water extractions for commercial production vary and depend on water availability, the Commission suggests that the Plan's estimate of take by licenced entitlement holders (which is based on historical average use over the period 1 July 1993 to 30 June 1999) is inadequate and does not capture the economic changes that have taken place in the Plan area. Despite the absence of comprehensive and broad-scale metering, the roll out of the non-urban metering reform will provide an important indication of water extraction by industry in the Plan area.[54] New technologies like remote sensing could also help fill some gaps in the meter roll out.
- **Overland flow/floodplain harvesting:** The extent of overland flow extraction/floodplain harvesting activities in the Plan area is currently not well understood. The Plan outlines that the LTAAEL for the unregulated water sources (which includes the annual extraction of water by floodplain harvesting activities) is equivalent to the average floodplain harvesting take over the period from 1 July 1993 to 30 June 1999 for which floodplain harvesting (unregulated river) access licences may be issued in these water sources (Clause 32).[55] However, no floodplain harvesting

51 NSW Treasury (2020) *NSW Common Planning Assumptions Population Projections*

52 Local councils in the upper Macquarie region have indicated to the Commission that the local water utility licence volumes have generally been sufficient to meet town water demand. However, complex and administratively burdensome arrangements associated with accessing water from multiple sources have hindered an efficient and cost-effective utilisation of water for some councils. (Interviews: Central NSW Joint Organisation, 17 October 2022; Upper Macquarie councils, 17 October 2022).

53 A better understanding of water take by water users in the lower part of the Plan area (lower Bogan and lower Macquarie) would contribute to a better understanding of the overall water take in the Plan area and how the regulated and unregulated water sharing plans interact.

54 DPE-Water (2022) *Non-urban metering*

55 The Basin Plan's BDL for the Macquarie Castlereagh resource unit (SS20) includes a numeric estimate for take from floodplain harvesting (excluding the take under basic landholder rights). This estimate is calculated by summing the quantity of water that would have been taken by those forms of take for each year of the historic climate conditions under NSW water management law (as if the applicable water sharing plan was not suspended) as of 30 June 2009. It is unclear whether these estimates align with the actual floodplain harvesting activities that currently occur in the Plan area.

licences have been issued in the Plan area, nor is there any intention to do so (see **Chapter 9**).[56]

In addition, while provision 87(1)(a) outlines that the Plan may be amended to effectively manage floodplain harvesting within these water sources, no rules have been established to manage floodplain harvesting in the Plan area.

Several structures have been constructed on the Plan's floodplain areas. There is no evidence that these structures have been reviewed, assessed or authorised. The *Draft Floodplain Management Plan for the Macquarie Valley Floodplain 2018*[57] shows that there are works in around 106,200 hectares of the Macquarie floodplains, but the *Floodplain Management Plan for the Macquarie Valley Floodplain Order 2021*[58] only considers 32,600 hectares of the floodplain. The remaining 73,400 hectares are not covered by a designated floodplain and thus fall outside of the NSW Floodplain Harvesting Policy (see **Section 9.3**). DPE-Water has previously indicated that in unregulated systems, the take of overland flow outside of a designated floodplain is incorporated into the unregulated river access licences. Despite this, the Commission remains unclear whether DPE-Water has considered the interaction with existing provisions in the unregulated Plan areas to effectively manage floodplain harvesting in the Macquarie catchment. Also, the Commission is unclear whether all take and diversion of water in the lower Bogan and lower Macquarie through existing works are appropriately accounted for. The Commission understands that the impact of several floodplain structures in the Plan area remain unassessed, despite their location in an identified 'hotspot' area (see **Recommendation 15**).[59]

- **Plantation forestry interception:** There are significant areas of plantation forestry in the upper Macquarie area, particularly around Bathurst and Oberon.[60] Information about current take from interception activities is often limited and based on long-term average estimates from Plan development.[61] Given the extent of commercial plantation forestry in the Plan area, further work is required to better understand the extent of interception activities by commercial plantation and their contribution to overall extraction.[62]

In addition, major policy reforms have likely influenced changes in extraction in the Plan area or changed the opportunities to extract water. These reforms may have also changed the risks to different water sources in the Plan area.

Significant water entitlements previously held by consumptive water users in the regulated Macquarie-Cudgegong regulated plan area were transferred to the NSW Government as part of the RiverBank program[63] and the Commonwealth Environmental Water Holder as part of the Basin Plan water recovery program (i.e. held environmental water (HEW)).[64] Given the close linkages between the regulated and unregulated rivers in the Macquarie

56 The document *Macquarie Valley: Floodplain harvesting in water sharing plans* (published March 2021) did not address floodplain harvesting in the Plan area and only indicated that floodplain harvesting access licences would only be issued for the Macquarie and Cudgegong Regulated River Water Sources, which falls under the *Water Sharing Plan for the Macquarie and Cudgegong Regulated River Water Sources 2020*
57 DPE-Water (2019) *Floodplain Management Plan for the Macquarie Valley Floodplain 2018*
58 DPE-Water (2021) *Macquarie Valley Floodplain*
59 Legislative Council (2022) *Budget Estimates 2021-2022 Supplementary Questions*
60 DPI (2021) *NSW Plantations authorisations snapshot 2020-2021*
61 MDBA (2020) *Sustainable diversion limit (SDL) accounting improvements strategy 2020 – 2025*
62 The Basin Plan requires extraction from interception activities such as commercial plantation forestry to be determined.
63 NSW Government water for the environment holdings in the Macquarie valley at 30 June 2017 was total 52,786.5 ML. This includes 2,916 ML of unregulated entitlement.
64 Department of Climate Change, Energy, the Environment and Water (n.d.) *Environmental water holdings*

Castlereagh catchment, the acquisition and use of these acquired entitlements could change the patterns of flows in streams in the lower Macquarie and lower Bogan Rivers since the (held) environmental water is not extracted. The changed river flows could trigger 'commence to pump' thresholds for downstream licence holders, which would contribute to overall extraction in the Plan area.

The Commission notes that Plan amendments in 2020 introduced active management mechanism' provisions[65] to address this potential take of HEW[66] delivered from the regulated system by licenced entitlement holders in the downstream unregulated river systems.[67] However, active management does not apply to all unregulated water sources in the Plan area (**Section 4.1**). In addition, there is currently limited information available to fully understand the impact of the water entitlement recovery process under the Basin Plan on potential activation of other licenced entitlements in the Plan area.[68]

DPE-Water removed four alluvial groundwater sources from the Plan in 2020 for the purpose of developing the Macquarie-Castlereagh Water Resource Plan. This occurred despite the known connectivity between surface water and groundwater resources, including in the Bell and Talbragar alluvial groundwater sources.[69] For example, the Bell River is both a losing and a gaining system. The upper reach of the river receives baseflow from the alluvial groundwater source in times of low rainfall. Where the alluvial flat broadens out, this baseflow gradually diminishes as the river loses flow to the alluvium. Observation from landholders suggest that groundwater yields in the Bell alluvial groundwater source are closely linked to whether the Bell River is flowing.[70] Although a review of the groundwater plan is beyond the scope of this review, it is important that the interaction between these surface water and groundwater sources are better understood to ensure extraction and interception activities can be better estimated and accounted for in both the unregulated and groundwater plans. For highly connected groundwater sources, take from the river should be accounted for in the relevant groundwater water plan LTAAEL.

The risks associated with potential growth in extraction due to the factors described above are high, given there is a large volume of entitlement on issue across both unregulated water sharing plans in the Macquarie-Castlereagh catchment. The current sum of unregulated water entitlement on issue across the Plan area and the *Water Sharing Plan for the Castlereagh Unregulated Rivers Water Sources 2012* is 231,655 unit shares, with 207,968 unit shares in the Macquarie Bogan water sharing plan area and 23,687 unit shares in the Castlereagh water sharing plan area.[71]

In the absence of numerical LTAAELs in the Plan, the Commission cannot directly assess the implications of this level of entitlement. However, as the Basin Plan's definition of the BDL for unregulated water sources is broadly consistent with the definition of the Plan's

65 Plan amendments to enable active management occurred on 1 July 2020.
66 The protection extends to some planned environmental water like the EWA sub-account 2 water.
67 Clauses 51(1), 53(27), 53A(2), 53A(3) and 53A(5) of the Plan.
68 Sustained greater activation of previously unused unregulated water access licence poses a material risk to unregulated water sources in the Plan area. As outlined in Section 3.1, the Plan's LTAAEL is based on historic use by unregulated water licence holders averaged over the period 1 July 1993 to 30 June 1999 (plus basic landholder rights and plantation forestry take that existed on 30 June 2009) and no further assessment of the actual level of extractions in the Plan area has occurred since the Plan was made. Sustained greater activation of unregulated water licences in the Plan area beyond the average historic use over 1993 – 1999 levels would lead to LTAAEL exceedance. The risk associated with greater activation of unregulated licences is currently not managed effectively due to the practice to provide 100 percent AWDs every water year (see Sections 3.3 and 3.4).
69 Consistent with a state-wide approach, highly connected aquifer access licences that relate to unregulated water sources may be managed daily.
70 Department of Planning and Environment (2018) *Macquarie-Castlereagh Alluvium Risk Assessment*
71 Natural Resources Commission (2022) *Water sharing plan reviews*

LTAAEL,[72] the Commission is of the view that the BDL for the unregulated water sources in the Macquarie-Castlereagh area should be roughly equivalent to the sum of the LTAAELs across the two unregulated water sharing plans in the Macquarie Castlereagh area.

The current Basin Plan estimate of the unregulated BDL in the Macquarie Castlereagh area is 44,000 ML.[73] Although the Basin Plan does not distribute the BDL for unregulated water sources between the two plan areas, the entitlement on issue across the two unregulated plans is over five times the Basin Plan's BDL for the area. The level of entitlement raises significant risk that water extraction could exceed the Plan's extraction level, especially in the Macquarie-Bogan Plan area, which has the larger share of licenced entitlements.

The Commission acknowledges that given the lack of information about the actual water extraction and interception activities in the Plan area, it is not possible to say with certainty whether there has been an exceedance of the LTAAEL. However, the ratio of entitlement volume (across the two unregulated Plan areas) to the BDL creates a significant risk and increases the likelihood that current extraction may have exceeded the Plan and Basin Plan limits.

Based on the uncertainties associated with actual water extraction and interception activities in the Plan area, DPE-Water should ensure the numeric LTAAEL (or LTAAELs) is based on the most up to date information on all forms of extraction and interception activities in the Plan area, including updated estimates of take from basic landholder rights, overland flow/ floodplain harvesting activities in unregulated rivers, and interception activities from plantation forestry.

DPE-Water should also continue to analyse the likelihood of further growth in use from licenced entitlement holders and basic land holder rights, and the expansion of interception activities in the Plan area. This analysis should identify the potential impact of growth in use of existing licence holders and basic landholder rights in order to inform LTAAEL compliance assessment and the setting of future AWDs.

3.3 LTAAEL compliance assessment has not been undertaken

Establishing and ensuring compliance with sustainable, numeric LTAAELs has been a key recommendation in the Commission's water sharing plan reviews but, to date, DPE-Water has not adopted these recommendations. The Plan audit found compliance with LTAAELs was not given effect to and the lack of implementation of clauses relating to LTAAEL assessment and compliance gives a very high likelihood that the Plan is not meeting its intended objectives.[74] This issue remains, and the Commission strongly recommends that DPE-Water undertakes and reports on LTAAEL assessments as an immediate priority.

LTAAEL assessment requires numeric LTAAELs (**Section 3.1**) and a reasonable estimate of actual annual extraction. A lack of perfect information regarding extraction should not prevent DPE-Water from making the best estimates possible based on available information to assess LTAAEL compliance. As a principle of ecological sustainable development, DPE-Water should apply the precautionary principle, which states that a lack of perfect information should not be used as a reason for postponing measures to prevent environmental degradation where there are threats of serious or irreversible environmental

72 For unregulated water sources, the Basin Plan requires that the long-term annual average extraction of water is limited to the historic extraction averaged over the period from July 1993 to June 1999, plus basic landholder rights at 2009 and commercial plantation forestry interception at 30 June 2009.

73 MDBA (2022) *Current Baseline and Sustainable Diversion Limits*

74 Alluvium and Vista (2019) *Audit of the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvium Water Sources 2012*

damage. The precautionary principle is one of the principles of ecologically sustainable development committed to under Object 3 (a) of the Act.

The last Plan audit found that DPE-Water had only partially given effect to clauses 33 and 34[75] of the Plan and had not given effect to clause 35 of the Plan,[76] related to the calculations, assessment and compliance with the LTAAELs. The auditor considered that if these clauses are not being given effect to there is a very high likelihood that the objectives of the Plan are not being met.

Stakeholders also reiterated this concern, saying that the water sharing plan had failed to contribute to environmental outcomes because '*water extraction is not assessed against limits*'.[77] These stakeholders also added that the '*water sharing plans allow economic advantage to be gained by those upstream, as the extraction is not assessed for compliance against the extraction limits. The rights of water users downstream are eroded*'.[78]

DPE-Water has previously indicated that annual reporting against the SDL is required under the Basin Plan, suggesting that this reporting requirement provides sufficient information as to whether extraction limits within the Plan area have been complied with. Although the Commission acknowledges that DPE-Water complies with the Basin Plan's reporting requirements, this does not mitigate the risks of LTAAEL exceedance because:

- DPE-Water does not undertake a physical assessment of annual actual extractions (and interception activities) in the Plan area, thereby failing to comply with Sections 34(1) and 36(1) of the Plan.
- DPE-Water reports to the MDBA on extractions across two unregulated plan areas in the Macquarie Castlereagh catchment area, making it difficult to differentiate and analyse take that occurs in the unregulated water sources in the Plan area.
- The Macquarie-Castlereagh Surface Water SDL is not the same as the Macquarie-Bogan unregulated water sources LTAAEL. As such, this reporting does not meet the requirements of the water sharing plan made under the Act.[79]
- DPE-Water lacks a comprehensive understanding of all types of water extraction and interception activities in the Plan area.
- DPE-Water has not finalised and released reasonable use guidelines for basic landholder rights.
- The MDBA allows for the reporting to be based on estimates of historical long-term average use. The Commission understands that DPE-Water merely reports the same estimate of historic average extraction over the period from 1993-1999 each year.

Even if DPE-Water meets the minimum requirements set by the MDBA for SDL compliance reporting, DPE-Water should make every attempt to assess extractions more accurately in the Plan's unregulated water sources to ensure the obligations and objects of the Plan and the Act are adhered to. DPE-Water should prioritise assessing LTAAEL compliance and

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75 The Commission notes that the reference relates to clauses of a previous version of the Plan that was in force when Alluvium and Vista conducted an audit of the Plan in 2018.

76 Alluvium and Vista (2019) *Audit of the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvium Water Sources 2012*

77 Submission: Nature Conservation Council, received 1 May 2022.

78 *Ibid.*

79 The Commission acknowledges that NSW is required to undertake an assessment of compliance with the long-term average SDL in accordance with Div 2, Part 4 of Chapter 6 of the Basin Plan. This requirement does not replace an obligation to assess compliance with the Plan's LTAAEL under clause 34(1) of the Plan.

make these assessments publicly available, on an annual basis, to transparently flag the risk of reduced AWDs for users.

Assessing actual extractions in the Plan's individual unregulated water sources will also help determine whether there is a need to develop individual LTAAELs for different EMUs.

Considering the overall share component in the Plan area, the distribution of entitlements across individual unregulated water sources and the growth of basic landholder rights over the life of the Plan, the establishment of different LTAAELs in separate EMUs will enable better management of extractions and provide better insights as to whether there is a need for future Plan amendments. It will also help mitigate impacts on water users in other unregulated water sources within the Plan area as exceedance of the LTAAEL in an individual water source could be managed more locally, instead of reducing future available water determinations to all licence holders of the same class across the Plan area.

The roll-out of the *NSW Non-Urban Metering Policy*[80] will provide valuable information to better understand water extraction and interception activities in the Plan area. However, many works in the unregulated water sources will be exempt from the policy, including:

- a large number of small volume entitlement holders in the upper Macquarie[81]
- those users who undertake floodplain harvesting activities in the lower Macquarie and Bogan areas for which licences have not been issued[82]
- basic landholder rights take.

Despite the gaps in metering, the work of the Natural Resources Access Regulator (NRAR) shows that other methods are available to assist in an assessment of current water extraction in the Plan area.[83] These include:

- remote sensing methods to detect significant increases in water use and crop growth over time
- surveys of logbooks as can be required under the water sharing plan and water access licence and works approval conditions
- periodic repeat of the volumetric use survey to update the 1993-1999 figures
- proxies such as electricity bills. This would require pumping equipment to be appropriately calibrated to allow for an assessment of water use.

The Commission supports NRAR's trialling of new technologies and inspecting properties to ensure water users' compliance with the laws. The Commission considers that these technologies can be leveraged by DPE-Water to undertake LTAAEL compliance assessment without waiting for metering data to become available.[84]

80 DPE-Water (2022) *Non-urban metering*
81 DPE-Water (2022) *Ibid.*
82 DPE-Water (2022) *Floodplain harvesting licence rules in the water sharing plan for the Macquarie valley*
83 NRAR (2022) *How we use technology*
84 The Commission notes that the Non-Urban Water Metering Policy provides for exemption to the metering requirement. Consequently, complete metering of all water take in the Plan area will not occur under the current Non-Urban Water Metering Policy.

3.4 A conservative approach to AWDs is needed

The Commission has considered additional steps DPE-Water should take to adequately protect water sources, the environment, communities and basic landholder rights until sustainable, numeric LTAAELs are established and adhered to.

Despite the uncertainty about extraction in the Plan area, DPE-Water has continued to make AWDs equivalent to 100 percent of the licenced unregulated water entitlements at the beginning of each water year. This allocation approach creates considerable risks that LTAAELs are being exceeded as licence holders are legally entitled to take all water allocated to them.[85]

This has implications for the environment as well as downstream water users, which is inequitable and inconsistent with the priorities of the Act.

In recent reviews of the water sharing plans for the Castlereagh and NSW Border Rivers unregulated river water sources,[86] the Commission suggested DPE-Water sets conservative AWDs in the Plans' EMUs until appropriate LTAAEL compliance assessment is implemented in the Plan areas. These compliance assessments are a Plan requirement but have not yet been implemented, despite the Plan approaching expiry. Lack of LTAAEL compliance assessments poses a risk to the environment, domestic and stock use, and town water supplies, as well as to other water users. This risk needs to be mitigated through AWDs. DPE-Water should set conservative AWDs utilising all information on conversions from area to volume for all licence categories and information from the water resource plan risk assessment.

In the absence of any LTAAEL compliance assessment, the Commission encourages DPE-Water to set AWDs at a ratio of the updated BDL to the sum of unregulated river access entitlements (i.e., the LTAAEL) in line with the precautionary principle. This update will provide a tangible figure for stakeholders to highlight the risks of the current AWD approach to the Plan's water sources. It also provides an incentive to landholders to report their actual take and encourage the development of sustainable, numeric LTAAEL and conduct LTAAEL assessment in the Plan area.

The Commission acknowledges that an AWD reduction based on the ratio of the updated BDL to the unregulated river access entitlements would have a significant impact on licence holders and the regional economy.[87] The Commission stresses that such a method should only be applied where DPE-Water has not implemented an alternative approach to conducting LTAAEL compliance to ensure the Plan's environmental water and basic landholder rights are appropriately protected.

The Commission also notes that a considerable number of volumetric conversions occurred after the current BDL estimates were developed, based on 1993-1998 estimates of licensed extraction and 2009 take estimates for other forms of take. This data must be included in the estimates. The roll-out of the non-urban metering reform also allows DPE-Water to develop a more refined AWD approach. The Commission supports DPE-Water implementing a risk-based approach and using best available data to set AWDs in line with the precautionary principles. However, it is the Commission's view that there must be a requirement to protect environmental water and basic landholder rights if DPE-Water does not implement the LTAAEL compliance required by the Plan.

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85 Water take is governed by the Plan rules and rules associated with any relevant works approvals.
86 NRC (n.d.) *Water sharing plan reviews*
87 The Commission notes that allowing growth to occur unchecked will have an even greater and inequitable impact in the future.

The risk that AWDs may need to be significantly reduced to comply with the LTAAEL may not be transparent to water license holders. DPE-Water should engage with licensees as soon as practical to communicate the risks of LTAAEL exceedance, and potential consequences of reduced future AWDs. Engaging with stakeholders would allow DPE-Water to better understand potential impacts on licensees and the regional economy, including areas of risk and may help develop more nuanced AWD adjustments to adequately protect the environment with the least impact on licensees.

3.5 Future available water determinations need to be proactive

The Plan could be improved to ensure the efficient use of available water. The current process of setting AWD equivalent to 100 percent of licenced entitlements in unregulated water sources independent of catchment conditions and then relying on temporary water restrictions under Section 324 of the Act is leading to poor outcomes across NSW. Managing to a numeric, sustainable long-term limits should allow for AWDs to vary between years based on a range of conditions. To improve outcomes for the Plan, a shift is required to move to proactive AWDs and more timely compliance responses.

In contrast to unregulated water sharing plans, AWDs for regulated rivers are proactive and based on considerations such as water held in storage, carryover, and estimated drought inflow sequences. The Plan's LTAAEL is based on the historical extraction between July 1993 and June 1999. This level of extraction was affected by both the level of activation and climate during that time. The LTAAEL and AWDs need to be able to accommodate different climatic conditions and consider carryover volumes to address and mitigate risks to unregulated water sources.

At the start of each water year, the following aspects should be considered as part of the Macquarie-Bogan Plan AWD announcement process:

- **the level of activation** - DPE-Water should consider the level of activation in the Plan area to determine short-term water management decisions, including annual AWD announcements to manage the hydrologic stress to the Plan's unregulated water resources during droughts.[88]
- **the amount of carryover**[89] - the regulated river AWDs consider carryover before allocating additional water. The current unregulated carryover rules have been applied across all NSW unregulated plans without considering climate variability and seasonality or risks and outcomes.

  Allowing large amounts of carryover to build up renders LTAAEL compliance ineffective as it can take many years for water held in accounts to be reduced before extraction drops to that required to meet the LTAAEL. Responses to exceedances above the average can occur years after the exceedance, often at times when climatic conditions are such that no reductions are required.
- **the risk to urban water supplies** - the Plan also notes that other statutory tools are available to manage for climatic variability within a water source, for example, temporary water restrictions under Section 324 of the Act. The Commission considers the potential use of Section 324 restrictions for town water supply and turning off the

88 Despite its support to consider the level of activation in a Plan area, the Commission is supportive of revising Plan provisions, including access rules, solely on the level of activation in a Plan area.

89 The maximum amount of unused water allocation that can be carried over from one water year to the next in unregulated river access licence accounts will be 100 per cent of the share component (where this is expressed in megalitres), or 1 megalitre per unit share (where share component is expressed in unit shares). In addition, account management provisions for unregulated river access licences operate under a three-year cycle.

Plan's provisions to manage water scarcity is sub-optimal and not transparent. AWDs continued to be allocated at 100 percent while towns such as Bathurst and Orange were on water restrictions, which is not in accordance with the priorities of the Act.

- **historical and predicted climatic conditions -** the Plan requires the same volume to be allocated irrespective of the prevalent climatic conditions. The Plan notes that the effects of climate variability are recognised by having provisions that limit water availability on a long-term average basis.[90] Using a long-term average, which is a fixed number, does not recognise or allow for adjustments for climate variability between years. Having AWDs that are based on the actual volume of water available would seem logical and should be a goal of the Plan.

  Comparing current and predicted climatic conditions to those experienced between 1993 and 1999 highlights the duration and intensity of droughts that could occur in the Plan area. Past climate and future climate change both indicate the likelihood of drier periods having higher frequency, duration and scale. The paleoclimate work for the regional water strategies has shown the climate has greater extremes, with longer periods of drought than recent recorded history. Climate change is projected to cause changes in monthly rainfall patterns and lower average annual rainfall in most NSW inland catchments, higher temperatures, and lower evapotranspiration leading to lower runoff and inflows. This magnifies the risks that the Plan may not be able to effectively meet the Act's water management and water sharing principles.

  DPE-Water should develop and implement a proactive AWD approach to address climate variability. Having a risk-based AWD process can be used to better manage variability and may be able to replace carryover provisions. It should provide licensees adequate certainty to assess their inter-annual risks but be responsive to annual weather systems.

By Year 5 of the Plan, DPE-Water should, in consultation with stakeholders, develop and implement the use of proactive AWDs and revise any necessary account management rules (setting of AWDs as well as carryover and account limits) to support any AWD changes.

3.6 Separate extraction management units could help address localised risks

The Plan area has a highly variable water use profile and associated risks, driven by the region's variable geography, rainfall, environmental values, industries and demographics. Currently, the ability to manage different extraction risks in different areas in a targeted way is limited, as LTAAEL compliance and AWDs are applied at the EMU-scale. In the case of the current Plan this is the entire water sharing plan area.[91] This issue is further compounded by other geographically complex provisions, that are not appropriately targeted to the scale of issues or intended Plan outcomes (see **Chapters 4, 5** and **6**).

A major consequence of a single EMU is that any impacts from an LTAAEL exceedance are spread across all license holders, regardless of whether or not extraction exceedances are driven by localised activities. Having multiple EMUs enables LTAAEL compliance responses and other management responses to be more targeted, which could avoid potential inequities between licensees of the same type.

[90] i.e., Clauses 14(a) and 14(b) of the Plan set out how the effects of climatic variability on river flow in the Plan area are recognised.

[91] There is currently only a single EMU covering the whole plan area, with LTAAEL compliance and AWDs applied at the EMU scale.

In addition, the spatial distribution of water access licences and their associated licenced entitlement volumes lend support for multiple EMUs to better manage the risks to water sources in the Plan area. Smaller units with a few water sources allow for a tailoring of accounting and management rules, whereas larger units with many water sources need to account for the greatest risk, even if that high risk only occurs in a few water sources. There is a risk that local environmental and economic impacts of extraction can be hidden as LTAAEL compliance would be assessed across a large and variable area.

The Plan established the single EMU in 2012,[92] when the original water sharing plan was developed. At this stage, the implications of a single EMU would not have been evident. An Amendment clause was included in this Plan to add, remove or modify an EMU, including the water source to which it applies.[93] However, this provision has not been implemented. As part of the replacement Plan, DPE-Water should assess the benefits and risks of multiple EMUs. Areas where the Commission considers there to be specific management risks that would benefit from having a discrete EMU include:

- **the upper Macquarie area** - water sources in the upper Macquarie catchment are important for growing regional centres, yet this area contains many small volumetric entitlements and has seen growth in basic landholder rights extraction (see **Chapter 5**). Establishing a separate EMU and assigning a separate LTAAEL to this part of the Plan area would allow for a more targeted management of the risks to the water sources and help protect the environment, basic landholder rights and town water needs, especially during drought.[94]
- **the lower Macquarie-Bogan area** – water sources in the lower Macquarie-Bogan catchment contain a smaller number of large volumetric entitlements (see **Chapter 9**), many of which are influenced by flows from the regulated Macquarie/Wambuul River (see **Chapters 3** and **6**) and flows in the Barwon-Darling during high flow events. Water take in this part of the Plan area is often opportunistic and fluctuates year-on-year. Given the close and complex interconnections between different Plan areas, the associated EMUs and the floodplain management plans, water use in this part of the Plan area could be better managed by a separate EMU. To go one step further, the Commission suggests that there could be merit in reviewing the Plan boundaries to determine whether there are benefits in reallocating and joining parts of the lower Macquarie-Bogan and Castlereagh Plan areas with the Barwon-Darling EMU to enable more appropriate and targeted management of water sources (including floodplain management) in this area (see **Chapter 9**).

In recent water sharing plan reviews, the Commission noted that some risks and equity issues are managed by having more than one EMU, for example, the NSW Border Rivers Unregulated Plan and Murrumbidgee Unregulated Plans.[95] Having more than one EMU allows management actions and water sharing plan rules to be targeted to the risks in the area where the extraction impacts are occurring.

In addition, splitting the Plan area into multiple EMUs would reduce risks and improve equity and environmental outcomes, allowing accounting rules to consider geographic-specific objectives and extraction patterns. Establishing these EMUs would support the implementation of other recommendations in this review, including implementing active management (**Chapter 4**) and addressing town water risks (**Chapter 5**)**.**

92 This EMU also contained four alluvial groundwater sources.
93 Clause 78(c) of the Plan.
94 Local water utility licences have priority over other licences under the Act. As such, allowing excessive carryover by unregulated river access licence holders that could lead to increased extraction above historical levels during drought would be inconsistent with the Act's priorities.
95 These water sharing plans have two and four EMUs respectively.

3.7 Estimated entitlement needs to be updated regularly

The entitlement shares and basic landholder rights volumes in the Plan area have changed since the Plan was first made. Although there are several possible reasons for the difference between actual and estimated shares, the Commission continues to hold the view that DPE-Water should update estimated entitlement shares and basic landholder rights in water sharing plans whenever the plan provisions are reviewed and updated.

Updating these figures is important to:

- provide transparency and clarity to licence holders, including information as to the potential risk of future water allocation reductions once DPE-Water has established a numeric LTAAEL (or LTAAELs) and undertakes appropriate LTAAEL compliance assessment
- indicate if there are emerging risks in a water source that need to be reviewed and assessed[96]
- provide a trigger that could be used by DPE-Water to initiate a review of the adequacy of the Plan provisions necessary to manage risk in the Plan area.

As highlighted in previous water sharing plan reviews, the discrepancies between actual and estimated entitlement shares and basic landholder rights volumes in the Plan could impact the Plan's water sources, the environment and water users. This is because the adequacy of current Plan provisions, including daily access rules, are based on an understanding of hydrological stress, which is closely linked to the level of entitlements.

If actual entitlement shares and basic landholder rights volume are higher than the Plan's estimates, there is greater risk that access rules and other Plan provisions may not be adequate to protect the ecological needs of these water sources, their water-dependent ecosystems and basic landholder rights' needs, and also impact downstream water users.

The Commission recommends that DPE-Water reviews and updates the Plan's estimated entitlement shares and basic landholder rights volume based on best available information and continues to update these figures whenever the Plan is amended, or at a minimum every five years. In addition, DPE-Water should undertake a risk assessment if the entitlement shares and basic landholder rights volume changes by more than 5 percent in any water source to determine whether the current Plan provisions remain adequate to protect the water source, the environment and basic landholder rights.

3.8 There is a risk of duplication in extraction accounting

The Plan includes a share component for two specific water access licence classes that recognise the close hydrologic connectivity between the regulated Macquarie/Wambuul river system and the unregulated water sources in the Plan area. These licences are called unregulated river (regulated supply) access licences and unregulated river (regulated supply - local water utility) access licences.[97] According to the Plan, the estimated total share component for these two licence classes is 70,751 ML per year, distributed across three water sources.[98]

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96 The Commission notes that DPE-Water would need to undertake a risk assessment to determine risks to the water source.

97 Clauses 29 and 30 of the Plan.

98 The only water source that contains a share component for the unregulated river (regulated supply – local water utility) access licence class is the Bulbodney Grahway Water Source. This licence is used to

Provisions 53(12) and 53(13) of the Plan describe the access provisions for these two licence classes, particularly the condition that water cannot be taken under these licences unless the holder also has a corresponding share component nominated in the Macquarie and Cudgegong Regulated River Water Source at the time the water is taken in the unregulated streams.

Given the dual licence requirements, there is a risk that extractions under the unregulated (regulated supply) access licence and unregulated (regulated supply – local water utility) access licence could be counted against LTAAEL twice – first, as an extraction from the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016* and then secondly, as an extraction from the Plan.

The current Plan provisions do not provide for an exemption that would exclude the extractions under the unregulated river (regulated supply) access licence or the unregulated river (regulated supply – local water utility) from the calculations of the Plan's LTAAEL.

The Commission notes that in the absence of a numerical LTAAEL and the lack of an LTAAEL compliance assessment, there is no direct evidence that duplicate counting is occurring in the Plan area. However, this potential issue should be resolved when establishing a numeric LTAAEL (or LTAAELs) in the Plan area.

DPE-Water should include an exclusion clause in provisions 32, 33 and 34 that exempts extractions under an unregulated (regulated supply) access licences and unregulated (regulated supply – local water utility) access licence from the LTAAEL calculations, while requiring them to be included in the regulated plan.

When resolving the accounting issue, DPE-Water should also consider the accounting of the transmission and conveyance requirements associated with the transfer of water between the regulated and unregulated river systems. The Commission is of the view that this issue could be resolved via amendments to individual licence holders' water accounts to enable some flexibility in the accounting of losses as these will vary with climate and catchment conditions (see **Section 6.1**).

3.9 Cultural flows should be considered in sustainable extraction limits

Cultural water entitlements and cultural flows are expected to become an increasingly important component in water planning and management.[99] This is evident by DPE-Water's work towards developing Cultural Watering Plans (CWP) which seek to inform the Department's review of existing policy frameworks to identify opportunities for greater Aboriginal access and ownership of water.[100] As this work progresses, it is likely that water entitlements beneficially owned by First Nations will be established (or acquired), as well as cultural flows implemented in particular Plan areas.

To meet the spiritual, cultural, environmental, social and economic needs of First Nations, entitlements and flows may have variable consumptive and non-consumptive components.

provide water supply to Nyngan and Cobar. The water sources that contain a share component for an unregulated river (regulated supply) access licence class are the Bulbodney Grahway Creek Water Source, the Ewenmar Creek and the Lower Bogan River Water Source.

99 Cultural flows are defined as '*water entitlements that are legally and beneficially owned by the (First) Nations and are of a sufficient and adequate quantity and quality to improve the spiritual, cultural, environmental, social and economic conditions of those Nations*'.

100 DPE-Water (n.d.) *Water About Cultural Watering Plans*

In this context, DPE-Water should consider how to support First Nations holding these entitlements and how to account for cultural flows.[101]

DPE-Water should make provisions in the replacement Plan to account for these water entitlements beneficially owned by First Nations as well as for cultural flows. It will be important to explicitly integrate reporting of cultural flows into water accounting. This would include the development of a conceptual framework to correctly account for cultural flows that will be used for consumptive and non-consumptive purposes. The establishment of sustainable LTAAELs should also consider these new and emerging issues to ensure future LTAAELs and their compliance can account for cultural water uses.

In addition, Australia's Native Title law recognises the traditional rights and interests to land and water for Aboriginal people. The *Native Title Act 1993* (Cth) specifically recognises Native Title water rights, stating that 'a Native Title holder is entitled, without the need for an access licence, water supply works approval or water use approval, to take and use water in the exercise of Native Title rights' (Section 55(1)).

Anyone holding Native Title rights with respect to water can take and use water in accordance with the laws and customs by which the title is held.[102] There are several Native Title applications in the Plan area,[103] therefore it will be important that the development of a sustainable LTAAEL accounts for any future Native Title rights. It will also be important that DPE-Water engages with Native Title holders or registered claimants in remaking the Plan and developing sustainable LTAAELs.

3.10 Recommendations

R 2	To support sustainable extraction and improve transparency, DPE-Water should as soon as possible in the next two years: a) establish and include numeric values for LTAAELs in the replacement Plan based on up-to-date information on all forms of extraction (including updated estimates of basic landholder rights, overland flow/floodplain harvesting activities in unregulated water sources (outside the designated floodplain area), and areas under plantation forestry) b) utilise clause 87(1)(a) to develop appropriate Plan provisions to effectively manage the impacts of floodplain interception activities in the Plan area. These provisions should align with and complement plan provisions relating to floodplain harvesting in the regulated Macquarie-Cudgegong Plan c) prioritise LTAAEL compliance assessment against numeric LTAAELs using best available estimates of extraction, and make this publicly available d) determine the likelihood of further "growth in use" from licenced entitlement holders and basic landholder rights and the impact of this estimated growth on licenced users and basic landholder rights to inform future available water determinations.

101 MDBA (2020) *Sustainable diversion limit (SDL) accounting improvements strategy 2020 – 2025*

102 As stated in Section 211(2) of the *Native Title Act 1993* '*... the law does not prohibit or restrict the Native Title holders from carrying on the class of activity, or from gaining access to the land or waters for the purpose of carrying on the class of activity, where they do so for a) the purpose of satisfying their personal, domestic or non-commercial communal needs; and b) in exercise or enjoyment of their native title rights and interest'.*

103 National Native Title Tribunal (2022) *Search Applications, Registration Decisions and Determinations*

R 3	DPE-Water should ensure the replacement Plan includes: a) an exclusion clause in current provisions 32, 33 and 34 that exempts extractions under an unregulated (regulated supply) access licence and unregulated (regulated supply – local water utility) access licence from the LTAAEL calculations, while requiring them to be included in the regulated Macquarie-Cudgegong Plan b) a requirement for AWDs to be set conservatively if DPE-Water does not make and publish a reasonable estimate of annual extraction and assess compliance with the LTAAELs c) rules to enable the establishment of proactive AWDs to support sustainable numeric LTAAELs and revise account management rules (carryover and account limits), if necessary, to support any AWD changes. These proactive AWDs should be developed in consultation with stakeholders by Year 5 of the Plan d) provisions to account for the establishment of Native Title rights, water entitlements beneficially owned by First Nations, and cultural flows.
R 4	DPE-Water should: a) review the Plan's entitlement and estimated basic landholder rights volume and update these figures b) continue to update these entitlements and estimated basic landholder rights volumes whenever the Plan is being reviewed or amended c) undertake a risk assessment if the entitlement and basic landholder rights estimates change by more than 5 percent in any water source to determine whether Plan provisions remain adequate to protect the water source, the environment and basic landholder rights.
R 5	To support adaptive management during the term of the replacement Plan, the Plan should include a provision requiring DPE-Water to determine the sustainable level of extraction by Year 5 based on best available ecological requirements, hydrological and climate information. This information should be used to define the Plan's LTAAEL for each EMU.

4 Strengthening environmental protections

The Macquarie catchment has significant environmental values, including the internationally and culturally significant[104] Macquarie Marshes, which straddle the regulated and unregulated river water sources in the lower catchment and can extend more than 220,000 hectares when fully inundated.[105] The Macquarie Marshes are the focus of targeted environmental watering, with 'held' and 'planned' environmental water from the regulated system delivered to the marshes to support environmental values.

There is a high degree of interaction between unregulated and regulated river water sources in the Macquarie-Castlereagh catchment. Inundation of the Macquarie Marshes is highly dependent on flows from the regulated Macquarie/Wambuul River. Major effluent creeks, including Gunningbar Creek, Duck Creek and the artificial Albert Priest Channel (see **Section 6.1**), deliver regulated flows from the Macquarie/Wambuul River to unregulated river water sources, including the lower Bogan River, Gum Cowal/Terrigal Creek and Crooked and Marram creeks. As a result, the regulated and unregulated systems need to be managed as a whole to provide for connectivity within and between water sources, including with the Barwon River.

In 2020, the NSW Government took steps to protect water for the environment through implementing the 'active management' mechanism to protect managed environmental water in some unregulated river sections. The Commission acknowledges this initiative and the benefits associated with protecting active environmental water, with further opportunities to improve use of the active management mechanism within the Plan area (**Section 4.1**) and expand it to other plan areas in NSW. Amendments to the Plan in 2020 also resulted in changes to the Plan's environmental objective and the inclusion of targeted environmental objectives, including one for connectivity. However, further work is required to align strategies in the Plan with these objectives.

There are many other water dependent ecosystems in the Plan area that require protection. However, provisions to protect these assets are not commensurate with their values. There are also opportunities to better align Plan provisions with the Plan's new connectivity and other environmental objectives, noting that the Macquarie is hydrologically connected to the Barwon River. Key issues include:

- water intended for the environment is at risk of being used for other purposes (**Section 4.2.1**)
- rules for meeting replenishment flows and their protection are unclear, and risk not being met or effectively protected (**Section 4.2.2**)
- in several water sources access rules do not adequately protect low flows and are not based on the latest information (**Section** Error! Reference source not found.)
- improved understanding of the surface-groundwater connection between surface flows in Bell River, alluvial groundwater and the karst landscape of Wellington Caves (**Section Error! Reference source not found.**).

The Commission also notes that rules that prohibit instream dams were amended for town water supply purposes and that environmental releases from instream town water supply dams require review. These issues are discussed in **Sections 5.6** and **5.3**, respectively.

104 The Commission acknowledges the significance of the Macquarie Marshes to the Wayilwan, Gomeroi/Kamilaroi, Ngemba, Ngiyampaa and Wiradjuri Nations.

105 Green D., Petrovic J., Moss P., Burrell M. (2011) Water resources and management overview: Macquarie-Bogan catchment, NSW Office of Water, Sydney.

4.1 Protection of active environmental water can be strengthened

In July 2020, the Plan was amended to include provisions for the active management mechanism and align the Plan with the *Active Management in Unregulated Rivers Policy,*[106] with these rules taking effect on 1 December 2020. The policy was developed by the NSW Government in response to its commitment to better manage water for the environment as part of its *Water Reform Action Plan*.[107] The intent of the Action Plan was to reduce reliance on temporary water restrictions to protect environmental flows. The primary objective of the active management mechanism is to protect held environmental water (HEW) from extraction by unregulated river access licence holders in selected catchments. It also provides for the protection of certain types of planned environmental water.[108] The *Active Management Procedures Manual for the Macquarie-Bogan Unregulated Rivers Water Source*[109] was also developed in accordance with Clause 55A of the Plan to support implementation.

In the Macquarie-Castlereagh catchment, water for the environment provides a range of benefits, including supporting the internationally significant Macquarie Marshes. The Marshes span regulated and unregulated river water source areas, namely the Lower Macquarie River Water Source and the lower part of Marthaguy Creek Water Source (downstream of Terrigal Creek junction), which are covered by the *Water Sharing Plan for the Macquarie-Bogan Unregulated River Water Sources 2012*.

Rules in both the regulated and unregulated river water sharing plans are intended to provide for the Macquarie Marshes and other environmental outcomes. Specifically, the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016* includes provisions for an environmental water allowance (sub-accounts 1 and 2) from Burrendong Dam.[110] Prior to the active management mechanism taking effect in the Plan area on 1 December 2020, the environmental water allowance sub-account 2 active (EWA2) releases were not protected from extraction by unregulated river access licence holders. Active management mechanism rules to '*restrict the take of water to protect Active Environmental Water*'[111] in the lower Macquarie now protect the EWA2 (active sub-allowance) water[112] and HEW.

The Commission acknowledges that the rules to protect active environmental water[113] are a relatively recent addition to the Plan, but these rules have been implemented since they

106 NSW Government (2021) *Active Management in Unregulated Rivers Policy*

107 DoI (2017) *Securing our water: NSW Government Water Reform Action Plan*

108 DoI (2017) *Ibid.*

109 DPE-Water (2020) *Active Management Procedures Manual for the Macquarie-Bogan Unregulated Rivers Water Source*

110 Clause 14(12)(c) in the *Water Sharing Plan for the Macquarie Regulated River Water Source 2016* sets out Environmental Water Allowance (EWA) rules for the Macquarie Marshes and the Macquarie River downstream of Burrendong Dam. It has two sub-allowances:
a) sub-allowance 1 (translucent), which is released under the provisions of Clause 14(16), is triggered by inflows during part of the year and receives three fifths of the EWA volume
b) sub-allowance 2 (active), which is released under the provisions of Clause 14(22) at any time of year under the advice of the Environmental Flow Reference Group (EFRG) and receives two fifths of the EWA volume.

111 Clause 10(3)(f) of the Plan.

112 Clause 53(27) of the Plan requires that flows attributable to the release of water from the environmental water allowance (active) sub-account 2 (EWA2, active sub-allowance) from Burrendong Dam in the Macquarie regulated system are protected from extraction in several downstream unregulated water sources.

113 The Plan defines active environmental water as the water in these water sources 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 the following:

came into effect and are considered in the scope of the Commission's water sharing plan review. DPE-Water evaluated and reviewed the active management mechanism for the period 1 December 2020 and 30 June 2021 with a report published in October 2022.[114] Four flow events were evaluated including three in the Barwon-Darling and one in the Macquarie. The Commission supports this evaluation and its transparency. However, stakeholders engaged as part of the Commission's water sharing plan review stated they were not consulted on the implementation of the active management mechanisms or its evaluation. Some of the issues raised by stakeholders as part of the evaluation and as part of the water sharing plan review warrant changes to the Plan and also the active management procedures manual for the Macquarie-Bogan area.

In the Macquarie-Bogan area, active management mechanism rules currently apply to four unregulated river management zones:

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

The first event that was actively managed in the Plan area under the new rules occurred between 1 December 2020 and 4 February 2021. This event comprised both HEW and planned environmental water and had a target volume of 25.7 gigalitres.[115] Just over half of this volume comprised HEW (13.4 gigalitres), with the difference comprising EWA2 water. It commenced in October as a spring/summer flow before active management mechanism rules came into effect on 1 December 2020, meaning around two months of this event was not protected. During this event, the active management mechanism applied to two of the four Macquarie-Bogan management zones as active environmental water was not being diverted down Gum Cowal Management Zone when the rules came into force.[116]

There was also a second event originating from the use of regulated supplementary licences that took place in March 2021, which comprised 500 megalitres of HEW. However, it was not announced and therefore not protected through the active management mechanism. DPE-Water reported this as a deviation from Clause 53A (2, 3) of the Plan.[117] WaterNSW indicated that it was unlikely this water was extracted based on its analysis, with the HEW accounting for 20 percent or less of flows in the system at the time.[118] As a result of this deviation, DPE-Water's evaluation of the active management mechanism recommended that WaterNSW review and improve its systems. The Commission supports these improvements to maximise the outcomes associated with the delivery of environmental water into the unregulated part of the catchment.

(a) held environmental water flowing from a water source that is upstream of one of the following management zones— (i) Gum Cowal Management Zone, (ii) Lower Macquarie River Upstream Management Zone, (iii) Lower Macquarie River Downstream Management Zone, (iv) Lower Marthaguy Creek Management Zone,
(b) 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
(c) releases made according to Clause 14 (22) of the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016*

114 DPE-Water (2022) *2020-21 Active Management Annual Evaluation and Review*
115 DPE-Water (2022) *Ibid.*
116 Water was not diverted into Gum Cowal Management Zone during the period that the active management mechanism applied.
117 DPE-Water (2022) *2020-21 Active Management Annual Evaluation and Review*
118 DPE-Water (2022) *Ibid.*

The effectiveness of the rules to protect the first event is not entirely clear given limited metering in the unregulated river water sources, limitations of hydrological models and no compliance monitoring by NRAR during this event.[119] However, the Commission understands that the active management mechanism was implemented to protect and provide for connectivity through the lower Macquarie and to the Barwon-Darling River (based on flows passing the Miltara (421135) gauge) and also contributed to the inundation of more than 10 percent of the Macquarie Marshes (21,573 hectares).[120]

The Commission understands an interagency Environmental Water Management Coordination Group[121] is addressing a list of issues for the Macquarie catchment. Two key issues identified in the evaluation of active management that need to be addressed through Plan replacement to improve clarity and ensure flows are adequately protected are:

- **backflows from the Barwon-Darling** – the risk of unregulated water access licence holders in the lower Macquarie being able to access active environmental water in the Barwon-Darling if water backs up into the lower Macquarie
- **access rules that apply to traded water** – clarifying which access rules apply for trades between management zones (see **Section 8.2**).

At present if there is no active environmental water announced in the Macquarie-Bogan area, the active management rules would not apply to licence holders in the lower Macquarie near the junction with the Barwon-Darling. Current conditions mean that these licence holders could extract water if there is a visible flow at their pump site, even if that water is originating from backflows resulting from active environmental water in the Barwon-Darling. This is inconsistent with the intent of the active management policy and is an equity issue that needs to be resolved. While the evaluation of active management considered this risk to be low,[122] it is a loophole that needs to be addressed as part of Plan replacement and through changes to the active management procedures manuals for the Macquarie and Barwon-Darling.

The Plan also needs to clearly reflect which access rules apply when water is traded from one management zone into another where this is permitted under the Plan. The Commission notes that DPE-Water and WaterNSW intend to revise the trading rules to clarify which access rules apply (Recommendation 4 from the active management evaluation and review and **Recommendation 14** of the Commission's water sharing plan review).[123] Access rules for the relevant water source that water is traded into should apply where there are flow-based access rules. The review of trade rules should consider possible changes to access rules that may arise from new information regarding environmental water requirements and a review of the hydrometric network. For example, there is a need to raise access thresholds in high value water sources where take is currently permitted if there is a visible flow at the pump site.

As part of the water sharing plan review, stakeholders indicated that active management and associated Plan provisions could be strengthened. In particular, the water sources where the active management mechanism applies should be expanded to include other water sources that may potentially receive HEW from the regulated river. For example, Ewenmar Creek, Bulbodney Grahway and the Lower Bogan water sources. In its submission to the review, the Commonwealth Environmental Water Office (CEWO) indicated that:[124]

119 DPE-Water (2022) *Ibid.*
120 CEWO (2021) *Macquarie River Valley 2020–21 water use*
121 A working group established to resolve issues relating to the implementation of NSW environmental water reforms. The group includes representatives from DPE-Water, WaterNSW and NRAR.
122 DPE-Water (2022) *2020-21 Active Management Annual Evaluation and Review*
123 DPE-Water (2022) *Ibid.*
124 Submission: CEWO, received 31 May 2022.

'Ensuring other relevant unregulated water sources are covered by active management would help transparency, compliance and prevent the need to seek s324 orders.'

4.1.1 Protection of environmental water in Ewenmar Creek Water Source

Ewenmar Creek is an important ephemeral creek with 1,289 megalitres of entitlement. Under current access rules take is not to occur unless there is visible flow at Oxley Highway bridge, meaning that there is limited protection of low flows under the Plan. Ewenmar Creek received a high HEVAE consequence score[125] when assessed during the development of the *Macquarie-Castlereagh Surface Water Resource Plan*, indicating that the water source has high instream values that are at risk from extraction. This score is partly attributed to Ewenmar Creek providing habitat for threatened fish species such as eel-tailed catfish (*Tandanus tandanus*), which is listed as endangered under the NSW *Fisheries Management Act 1994*. Low to medium flows in this water source could not be modelled to inform the Macquarie-Castlereagh risk assessment,[126] meaning the risk for low to medium flows has not yet been assessed.

During drought conditions in autumn 2019, around 800 megalitres of water for the environment was delivered to Ewenmar Creek to support critical refuge.[127] This water was delivered by the NSW and Commonwealth governments in partnership with Tenandra Irrigation Scheme, providing for the reconnection of four pools along a 15-kilometre stretch of Ewenmar Creek, specifically to Methalibah Reserve. Landholder agreements were used to protect the environmental water from extraction given current access rules would not have protected this water. Extending the active management mechanism to this water source would overcome the need for landholder agreements for every individual event and possible temporary water restrictions to protect flows. Paired with adequate compliance this would help ensure the Plan is adequately protecting the water sources and their ecosystems consistent with the Act priorities and the Plan objectives.

4.1.2 Protection of environmental water in Bulbodney Grahway Water Source

The upper and lower Nyngan weir pools are situated along the unregulated Bogan River in the Bulbodney Grahway Water Source (upstream of the Lower Bogan Water Source). The Plan includes provisions that allow for drawdown of both weir pools for town water supply, domestic and stock use and irrigation. The access rules are not consistent between the two weir pools and there is no infrastructure for near real-time monitoring of water levels (see **Section 6.3**).

The weir pools are part of the lowland Darling River aquatic ecological community, which is listed as a threatened ecological community under the *Fisheries Management Act 1994* and supports a range of species, with 102 species recorded during fauna surveys conducted in 2019-20.[128] Nine threatened species were observed during this survey period, including the olive perchlet (*Ambassis agassizii*), whose western population is listed as endangered under the *Fisheries Management Act 1994*. The olive perchlet population in the weir pool was critical for repopulating areas where this species had become locally extinct. Several hundred fish were captured during the drought in 2019 and formed part of a captive breeding program before being released into the upper Macquarie/Wambuul River.[129]

125 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
126 NSW Department of Industry Water (2018) *Ibid.*
127 CEWO (2020) *Macquarie River Valley 2018-2019 Water Use*
128 Eco Logical Australia (2020) *Nyngan Weir Pool, Second Ecological Assessment*. Prepared for Bogan Shire Council.
129 DPI-Fisheries (2022) *Current projects on Olive perchlet: conservation stocking*

In 2019, during drought conditions, around 300 megalitres of environmental water was used to top up the lower Nyngan Weir Pool.[130] DPE-EHG advised the Commission that it was important to manage this delivery to mitigate the risk of extraction of this water from the weir pool by ensuring the water level did not trigger water access by licence holders. If the active management mechanism was to be applied to this water source, environmental water could be protected and environmental water managers would not need to limit environmental water delivery within the constraints of pool drawdown rules. The current drawdown rules could also be strengthened, but the Commission acknowledges this could adversely impact water users reliant on the weir pools. Changes to pool drawdown levels would need to be consistent with the priorities of the Act and would ideally be supported by continuous water level monitoring.

Expanding the active management mechanism to the Bulbodney Grahway Water Source would also provide for the protection of environmental water delivered from the regulated Macquarie/Wambuul River through the Albert Priest Channel into the Nyngan weir pools. However, losses along the channel would need to be considered and how they can be minimised to maximise the environmental outcomes associated with water for the environment.

In addition, to these measures DPE-Water also need to revisit the access rules upstream of the weir pools and whether they adequately protect low flows (see **Section 6.3**).

4.1.3 Protection of flows into the Barwon-Darling

The Lower Macquarie River Water Source is an unregulated river water source covered by the Plan. The active management mechanism provides for the protection of active environmental water through this water source. The active management procedures manual includes procedures for the daily management of active environmental water in both the upstream (Oxley to Miltara) and downstream (Miltara to the Barwon River) management zones.[131]

There is a procedure for calculating the volume of HEW that flows out of the Macquarie-Bogan Unregulated River Water Source into the Barwon-Darling (procedure 10).[132] This water is then protected through the Barwon-Darling until it attenuates to zero or to the flow gauge at Wilcannia.

However, 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[133] are not protected into the Barwon-Darling. Clause 73 (2) of the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016* states that the Macquarie EWA is to be used to improve environmental outcomes in the Macquarie Marshes, and the Macquarie River between Burrendong Dam and the Macquarie Marshes. The active management procedures manual includes a note that the EWA2 (or Category C water in the procedures manual) '*will not be protected from extraction in downstream management zones until it attenuates, or to the confluence of the Macquarie and Barwon Rivers, whichever is sooner*.'[134]

130 CEWO (2020) *Macquarie River Valley 2018-2019 Water Use*
131 DPE-Water (2020) *Active Management Procedures Manual for the Macquarie-Bogan Unregulated Rivers Water Source*
132 DPE-Water (2020) *Ibid., Procedure 10 – Determining the volume of AEW flowing out of the Macquarie-Bogan Unregulated River Water Source.*
133 As per Clause 14 (22) of the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016*
134 DPE-Water (2020) *Active Management Procedures Manual for the Macquarie-Bogan Unregulated Rivers Water Source* p.16.

Some stakeholders support the protection of the Macquarie EWA releases (EWA1 translucent and EWA2 active sub-allowances) given they can be critical in supporting the environment in a range of conditions but also communities, particularly during dry times. Protection of this water is considered by the Commission as being consistent with the connectivity objectives included in both the Macquarie-Bogan and Barwon-Darling water sharing plans given they can potentially contribute to longitudinal connectivity along and between these hydrologically connected water sources. However, this would require changes to the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016,* which is not the scope of this water sharing plan review as well as changes to the active management procedures manual for the Macquarie-Bogan.

4.2 Management of replenishment flows requires improvement

Part 12 of the Macquarie-Cudgegong Regulated Plan contains requirements to provide replenishment flows to seven unregulated river water sources.[135] This water is intended to support domestic and stock needs in the specified unregulated river water sources, but it also provides related environmental benefits associated with refilling pools and water holes and can potentially help with mitigating water quality issues. Depending on the flow characteristics and antecedent conditions, replenishment flows can also help with providing connectivity and aid fish movement. The CEWO reported that replenishment flows helped to partially meet identified environmental demands of some creeks during the drought in 2017-18.[136]

However, the Plan does not effectively protect water for the environment from being used for other purposes such as replenishment flows.

4.2.1 Environmental water at risk of being used for other purposes

While the active management mechanism is a positive step in protecting water for the environment in some unregulated reaches, during the Plan review the Commission was informed of circumstances where water intended for the environment was used for other purposes. Specifically, the CEWO raised concerns that managed water for the environment had been diverted from the Macquarie Marshes down Milmiland Creek via the Little Milmiland Creek Regulator, with the operation of the regulator having a '*negative impact on the ability of environmental water to contribute to inundation of critical Macquarie Marshes sites following extended dry periods*.'[137]

Milmiland Creek is an effluent creek of the Macquarie/Wambuul River situated near the southern Macquarie Marshes in the Marra Creek Water Source. Water can enter the creek via the Little Milmiland Creek Regulator. A works approval exists for the regulator, which specifies the conditions under which the dropboards are removed at the regulator i.e., when there is a period of 230 days or more without flow.

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135 Clause 58 of Part 12 of the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016* provides for replenishment flows to:
(a) the Backwater Boggy Cowal Water Source
(b) the Lower Nyngan Weir Pool Management Zone in the Bulbodney Grahway Creek Water Source
(c) the Upper Nyngan Weir Pool Management Zone in the Bulbodney Grahway Creek Water Source
(d) the Lower Bogan River Water Source
(e) the Lower Macquarie River Water Source
(f) the Marra Creek Water Source
(g) the Marthaguy Creek Water Source.

136 CEWO (2019) *Portfolio management plan: Macquarie valley 2018-19*

137 Submission: CEWO, received 31 May 2022.

In 2017-18 and 2018-19, the Little Milmiland Regulator was opened when environmental water was being delivered to the Macquarie Marshes. The CEWO advised the Commission that the diversion of water via the regulator impacted the extent, depth and duration of inundation of the Marshes.[138]

While there is a requirement to provide replenishment flows to Marra Creek Water Source under Part 12 of the Macquarie-Cudgegong Regulated Plan, this water sharing plan and the Macquarie-Bogan water sharing plan do not specify operating rules for Milmiland Creek infrastructure. Plan rules also do not appropriately prevent the diversion of water intended for the environment. Without prescribing operating arrangements for Milmiland Creek, including the conditions when these flows must be delivered or the source of water for meeting these requirements, the water sharing plans do not adequately prevent water for the environment being used to meet other needs along Milmiland Creek.

4.2.2 The Plan lacks clarity regarding the protection of replenishment flows

The Plan includes provisions that are intended to provide for the protection of replenishment flows originating from the regulated river. Clause 53(26) states that these flows must not be taken under an access licence other than a domestic and stock access licence. However, the rules to protect these flows need to be strengthened given the majority of unregulated river access licences have conditions that allow users to pump when there is a visible flow at their pump site.

The Plan includes a note that implies the Minister can protect these flows by ordering temporary water restrictions (under s324 of the Act). However, the Commission notes that these temporary water restrictions occur outside of the Plan and can take up to several weeks to arrange, which may not align with the timeframes for delivering a replenishment flow. For this reason, the Macquarie-Bogan unregulated and Macquarie-Cudgegong regulated river water sharing plans should specify how these flows are announced and protected, not rely on this information to be communicated via temporary water restrictions made under a s324 order.

Although the replenishment flow requirements currently sit in the regulated Macquarie-Cudgegong Plan, they have implications for outcomes in the unregulated Macquarie-Bogan Plan area that is the focus of this water sharing plan review. On this basis the replacement Plan process should revisit the replenishment flow needs based on contemporary information and this should then inform the Macquarie-Cudgegong Plan. For example, DPE-Water should investigate a suggestion made by WaterNSW during the audit of the Macquarie-Cudgegong Plan that only up to 8,000 megalitres is required to replenish Marra Creek Water Source compared to the current upper limit of 15,000 megalitre established under Part 12 of the Macquarie-Cudgegong Plan.[139] If DPE-Water were to revise down the upper limit form 15,000 ML to 8,000 ML the replenishment flow may not adequately refill pools (to support drought refugia and environmental values) and support domestic and stock needs as intended. This needs to be investigated before any changes to the replenishment flow rules occurs.

Of particular importance for connectivity and to meet the Plan's connectivity objective is the provision for a biannual replenishment flow of up to 50 megalitres per day from 'Miltara' (below the Macquarie Marshes) to the Barwon River. However, neither the regulated Macquarie-Cudgegong Plan nor the unregulated Macquarie-Bogan Plan prescribe the maximum duration of this replenishment flow or how it is announced to alert

138 *Ibid.*
139 Natural Resources Commission (2022) *Audit of the implementation of the Namoi, Gwydir and Macquarie regulated water sharing plans*

water users (other than domestic and stock users) not to take this water. The effectiveness of this flow rate in providing adequate connectivity also needs to be tested.

A recent audit of the implementation of northern regulated river water sharing plans by the Commission, including the Macquarie-Cudgegong Plan found that replenishment flows were not delivered as required during the 2018-19 water year.[140] This was during a period of record minimum inflows to Burrendong Dam. While this is an implementation issue, it has implications for the outcomes in the unregulated Macquarie-Bogan Plan area and resulted in the Commission suggesting that:[141]

> *'WaterNSW develop Standard Operating Procedures to document processes and guide decision-making as to when and how replenishment flows will meet the needs under the plan provisions in accordance with the plan dictionary definitions'.*

As noted in **Section** Error! Reference source not found., there is scope as part of Plan replacement process to prescribe more clearly when replenishment flows are to be delivered depending on the conditions of the receiving water course. In the case of Milmiland Creek the works approval for the regulator establishes when water is diverted down the creek based on the time between inflows. This would provide clarity for domestic and stock users, irrigators and WaterNSW regarding when replenishment flows will be delivered and should be codified in the Plan.

4.3 Inadequate protection of low flows

There is limited data available to determine the adequacy of the Plan provisions for meeting environmental needs and mitigating water quality risks, particularly in periods of low flow. The key mechanisms to protect the environment on a daily basis are cease-to-pump and commence-to-pump rules that afford a level of low flow protection. However, these are generally based on visual observations of flows and pool capacity as there are limited gauge stations in the Plan area's unregulated river water sources.

It is likely that the protection of low flows afforded by current access rules is not sufficient for key ecological functions (or other high priority needs, like town water) and does not currently account for recent climatic conditions. It is important to assess the impacts of current access rules on in-channel connectivity, water quality and habitat persistence, with modelling where possible. Given that the years 2017-20 contained some of the driest on record in the catchment, any analysis must consider these more recent conditions where flows and habitat persistence and viability were very low. Modelling with information from this dry period should be considered for use in developing new rules for the Plan as this will help to set more relevant environmental protections.

The risk assessment undertaken as part of the development of the *NSW Macquarie-Castlereagh Rivers Surface Water Resource Plan* identifies several water sources with medium to high risks for different flow components. As part of the risk assessment DPE-Water also determined HEVAE consequence scores based on an assessment of ecological values and functions, and extraction pressure in each water source. One third (10 out of 30) water sources in the Plan area received a high to very high HEVAE consequence score.[142] These include Bulbodney Grahway Creek system, Coolbaggie Creek system, Ewenmar Creek system, Fish River, Little River, Lower Bogan River, Lower Macquarie River and Marra Creek system, Marthaguy Creek and Wambangalong Whylandra system. Many of these

140 Natural Resources Commission (2022) *Ibid.*
141 Natural Resources Commission (2022) *Ibid.* Suggested action 2.1.
142 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*

water sources have highly altered flow regimes, with increased cease to flow periods and low flows.

New strategies are needed to mitigate risks to key components of the flow regime for these water sources, particularly to low flows and increased periods of no flow, with a changing climate potentially contributing to accelerated drying (see **Section 5.2**). Any potential rule changes would need to be subject to an assessment of environmental benefits and social and economic impacts, and stakeholder consultation on possible impacts.

Action 3.1 of the *NSW Water Strategy* is to '*consider the NSW Long-Term Water Plans to protect and enhance ecological systems*'.[143] Long-Term Water Plans are intended to guide water planning by establishing the volume, timing, duration and frequency of flows for achieving environmental outcomes and are an important information source for improving access rules in the unregulated river water sources covered by the Plan.

The *Macquarie-Castlereagh Long-Term Water Plan* identifies several water sources where changes to access rules could improve environmental outcomes.[144] However, they are not just constrained to water sources with high to very high HEVAE consequence scores. For example, the *Macquarie-Castlereagh Long-Term Water Plan* recommends changes to rules for the Macquarie River above Burrendong Water Source which has a medium HEVAE consequence score.[145] The Long-Term Water Plan also recognised the difficulty in analysing low flows for some water sources such as the Lower Bogan due to data gaps. Examples of where access rules should be strengthened are outlined below.

4.3.1 Bulbodney Grahway Creek System Water Source

Bulbodney Grahway Creek system is discussed in detail in **Section 4.1.2** and **Chapter 6** of the report. Drawdown rules for the upper and lower Nyngan weir pools and access rules for the upper management zone of the Bulbodney Grahway Creek Water Source should be revisited to ensure weir pool inflows and the environmental values associated with the weir pools are adequately protected.

4.3.2 Ewenmar Creek Water Source

According to the Macquarie-Castlereagh water resource plan risk assessment, the hydrological alteration of flows in Ewenmar Creek has not yet been assessed for cease to flow and low flows due to a lack of hydrological data. However, larger flows and overbank flows were assessed as highly altered.[146] The current access rule that stipulates licence holders must not take water from this water source if there is no visible flow in Ewenmar Creek at the Oxley Highway bridge is likely inadequate for protecting low flows and supporting connectivity. The *Macquarie-Castlereagh Long-Term Water Plan* recommends monitoring of changes in water usage and revisiting access rules if there are any changes. However, this would require effective monitoring of extraction.[147]

4.3.3 Little River Water Source

There are currently a range of conditions that apply to access licences in the Little River Water Source. Some have been carried across from *Water Act 2012* conditions and

143 NSW Government (2021) The *NSW Water Strategy*
144 DPIE (2019) *Macquarie-Castlereagh Long Term Water Plan Part B*
145 DPIE (2019) *Ibid.*
146 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
147 DPIE (2019) *Macquarie-Castlereagh Long Term Water Plan Part B*

reference the Little River at Obley gauge and have a 5 ML per day cease to take. Based on DPE-Water's hydrologic analysis, these existing conditions do not adequately protect low flows, with the *Macquarie-Castlereagh Long-Term Water Plan* recommending an investigation into increasing the commence to pump to 25 ML per day at 'Little River at Obley no.2' gauge (421048). The Commission supports this investigation and understands that changes to access rules may impact on water users but would provide environmental and community benefits associated with prioritising environmental needs and also town water supply. Any investigations should consider positive and negative impacts including social and economic impacts.

4.3.4 Campbells River Water Source

The Campbells River Water Source received a medium HEVAE consequence score, with cease-to-flow and base flows highly altered.[148] The Campbells River is impounded by Ben Chifley Dam and is an important water source for Bathurst's town water supply. Potential changes to the operation of Ben Chifley Dam for town water supply purposes could pose further risks to the flow regime of the Campbells River whereby existing access rules may not be adequate for protecting environmental needs.

If changes to the operation of Ben Chifley Dam occur there is a risk of reduced releases downstream of the dam and extraction of riparian flows by downstream users. Downstream access rules (specifically for the Campbells River Downstream Management Zone) would need to be amended to ensure that the environment is prioritised and protected.

Section 5.3 of this water sharing plan review discusses better protection of Bathurst's town water supply including review of clause 53(15) of the Plan. Clause 53(15) imposes restriction on licence holder access in the Campbells River Water Source (Campbells River Downstream Management Zone). Any such changes must consider the needs of the environment as a priority including the protection of key components of the flow regime.

4.3.5 Macquarie River above Burrendong Dam

The Macquarie River above Burrendong Dam Water Source is split into three management zones. The Plan included an amendment provision to allow for changes to the access rule for the Macquarie Tributaries Management Zone once flow records can be established at a telemetric gauge.[149] Given the high instream values associated with this water source, significant volume of entitlement (over 8,000 ML), and high risk to low flows there is merit in adopting more stringent access rules than those that currently apply (see also **Chapter 5**).

In 2011 a gauge was installed in this management zone on the Macquarie River downstream of Long Point (421192). The *Macquarie-Castlereagh Long Term Water Plan* recommends investigating a commence-to-pump threshold of 70 ML per day at this gauge.[150] Such an investigation would need to consider the environmental benefits, but also social and economic impacts. A first flush rule to support pool replenishment following cease-to-flow periods may also be warranted, but requires further investigation.

148 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
149 Clause 81(2)(b)(6) of the Plan.
150 DPIE (2019) *Macquarie-Castlereagh Long-Term Water Plan Part B*

4.3.6 Lower Macquarie River Water Source

The Lower Macquarie River Water Source is split into three management zones (Gum Cowal, Lower Macquarie River Upstream and Lower Macquarie River Downstream management zones). The water source has very high instream values given it partially includes the Macquarie Marshes, has hydrological connectivity with the Barwon River, and the occurrence of threatened fish and an EEC.[151] It also has the highest level of entitlements in any water source in the Plan area (45,220 ML per year which includes 3078 ML of special additional high flow access licences). Flows are moderately to highly altered, with the *Macquarie-Castlereagh Risk Assessment* determining the risks associated with an altered flow regime are not tolerable.[152]

Active management rules are intended to protect HEW and EWA2 water through the Lower Macquarie to the Barwon River (see **Section** Error! Reference source not found.). However, the *Macquarie Castlereagh Long-Term Water Plan* indicates there may also be a need to protect the first flush in this water source and investigate possible changes to the current pump threshold of 50 ML per day at Macquarie River at Bells Bridge (Carinda) for unregulated river access licence holders in the Lower Macquarie River Downstream Management Zone.[153] This would be subject to further investigation and stakeholder consultation.

4.4 Improved understanding of surface-groundwater connections to Wellington Caves

Wellington Caves, which are situated in the Bell River sub-catchment of the Macquarie-Castlereagh, are categorised as a karst landscape and recognised as a high priority groundwater dependent ecosystem. The caves hold significant environmental values, with a highly significant invertebrate community and syncarid crustaceans (termed 'living fossils') recorded in the subterranean waters of the caves.[154] They are also known to contain significant deposits of Pleistocene mammal fossils – likely the largest in Australia.[155]

Wellington Caves are associated with the Lachlan Fold Belt MDB Groundwater Source, which is included in the *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources Order 2020* (the Groundwater Plan). The karst system is listed in Table B, Schedule 2 of the Groundwater Plan.

When the Macquarie-Bogan Plan was developed there was limited knowledge of the extent of surface and groundwater connection. The Bell River displayed characteristics of a river overlying a limestone formation given intermittent flows.[156] However, there was limited understanding of connectivity with the karst landscape. An amendment provision was included in Clause 81(2)(v) of the Plan to allow for access rules to be changed if it was shown the caves are dependent on surface water. This amendment provision has not been used to date.

In 2010, the University of New South Wales received funding as part of the Commonwealth Government's Super Science program to undertake advanced monitoring of select sites

151 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
152 NSW Department of Industry Water (2018) *Ibid.*
153 DPIE (2019) *Macquarie-Castlereagh Long Term Water Plan Part B*
154 Wellington Council (2008) *Wellington Caves Plan of Management, December 2008*
155 Wellington Council (2008) *Ibid.*
156 Department of Innovation, Industry, Science and Research (2012) *The Super Science Initiative at Wellington Caves*

throughout Australia, including the Wellington Caves.[157] One of the areas the program sought to address was the limited knowledge of the extent of connection between surface and groundwater in the Bell River Alluvium and limestone. Research into drip rates has shown variable connection to surface and groundwater, with subsequent expansion of monitoring to understand variation in drip rates.[158]

A more recent study indicates there is strong hydraulic connection, with the Bell River losing and recharging the aquifer.[159] Groundwater extraction of around 1,370 ML per year was attributed to groundwater levels falling up to 1.5 metres, but leakage from surface water flows was found to recharge the alluvial and karst aquifers. However, further investigation is necessary to determine which process is causing significant groundwater level declines when the Bell River is not flowing. Further work is also required to determine whether linked access rules for the Macquarie-Bogan and Groundwater Plans would help to protect the caves system. This would ideally occur in the near future.

Data that is being collected at the Wellington Cave project site is now available through the National Research Infrastructure for Australia portal.[160] DPE-Water is encouraged to engage with researchers from the University of New South Wales (UNSW) to determine appropriate access rules to support the hydraulic connectivity between Bell surface waters, alluvial and karst aquifers.

4.5 Recommendations

R 6	As part of Plan replacement, to strengthen the protection of active environmental water in unregulated river water sources, DPE-Water should, in consultation with DPE-EHG and the CEWO, expand the list of water sources where active management applies.
R 7	To improve clarity regarding the delivery and protection of replenishment flows from the regulated river into unregulated river water sources, DPE-Water should: a) clearly stipulate in the Plan that water for the environment (HEW and the EWA2 water from the regulated river) must not be used to meet replenishment flow requirements in unregulated river water sources b) review the adequacy and appropriateness of existing replenishment flow requirements for unregulated river water sources given projected climate change c) clearly stipulate the conditions under which replenishment flows are to be provided based on climate variability, domestic and stock, and environmental needs d) include rules in the Plan that clarify how these flows will be announced and protected.
R 8	As part of Plan replacement, to address issues with current access rules, DPE-Water should:

157 Department of Innovation, Industry, Science and Research (2012) *Ibid.*
158 Jex, C, N., Mariethoz, G., Baker, A., Graham, P., Andersen, M.S., Acworth, I., Edwards, N. and Azcurra. C. (2012) Spatially dense drip hydrological monitoring and infiltration behaviour at the Wellington Caves, South East Australia, *International Journal of Speleology*, 41(2): 283-296.
159 Keshavarzi, M., Baker, A., Kelly, B. F. and Anderson, M.S. (2017) River groundwater connectivity in a karst system, Wellington, New South Wales, *Hydrogeology Journal, Hydelberg,* 25: 557-574.
160 Wellington Super Science Groundwater Data Portal *National Research Infrastructure for Australia portal*

	a) review the current hydrometric network to identify where the Plan can reference operational gauges for establishing flow classes and flow-based access rules for water sources that currently have a 'no visible' flow rule b) ensure all high environmental value water sources at medium to high risk from extraction have flow-based access rules that support connectivity and adequately protect water sources and their dependent ecosystems c) review if conditions attached to current water access licences and works approvals are appropriate to protect high priority needs, and ensure any changes to access rules from (a) and (b) are reflected in water access licence/works approval conditions.
R 9	To protect surface-groundwater connectivity associated with the Bell River and the karst landscape of Wellington Caves, DPE-Water should investigate whether linked access rules would mitigate the risk of surface water extraction on the significant water dependent values associated with Wellington Caves.

5 Securing town water supply to meet future needs

Over half of the population in the Macquarie-Castlereagh area rely on water supplies from unregulated rivers and creeks. Most reside in the LGAs of Bathurst, Orange, Oberon and Cabonne, which are expected to grow significantly over the next two decades.[161] Outside the Plan area, Lithgow and smaller communities in the Blue Mountains area are also supplied with water governed by the Plan via the Fish River Water Supply Scheme. Interregional water supply pipelines also service communities in the upper Macquarie region and could provide emergency water supply during severe droughts.

Although local water utility licences and the concentration of town water supply infrastructure in the upper Macquarie region supported town water needs over the life of the Plan, communities faced severe water security risks during the most recent drought (2017-20) that need to be addressed (**Section 5.1**).

This chapter focuses on risks to town water supply for communities in the upper Macquarie region that rely on unregulated river local water utility access licences. The following sections discuss how:

- projected climate change places town water security at risk (**Section 5.2**)
- some access rules may not protect town water, which is inconsistent with the priorities of the Act (**Section 5.3**)
- changes to the Fish River Water Supply Scheme could better meet Plan outcomes (**Section 5.4**)
- existing interregional pipeline connections should be recognised in the Plan (**Section 5.5**)
- there is limited guidance on stormwater harvesting (**Section 5.6**).

5.1 Town water needs were met but there were risks from drought

When the Plan commenced, the share component for local water utility access licences was 40,327 ML per year (approximately 12 percent of the total share component[162]), distributed across 11 unregulated river water sources and four alluvial groundwater sources.[163] With the development of the inland water resource plans, four alluvial groundwater sources were removed from the Plan via amendments made in 2020. This resulted in the overall share component for local water utility access licences decreasing to 32,281 ML per year (approximately 11.3 percent of the total share component).[164]

The Plan also provides for a major utility access licence in the Fish River Water Source, with a share component of 15,876 ML per year.[165] This major utility access licence is critical to meet town water needs in the upper Macquarie region and beyond the Plan area, as it enables water to be supplied to Lithgow, Oberon and communities in the Blue Mountains area.[166] The Fish River Water Supply Scheme that is associated with this major utility access

161 According to the NSW Common Planning Assumption Population Projections, Bathurst and Orange are expected to grow 28 percent and 19 percent respectively by 2041 (DPE (2022) *Common Planning Assumption Population Projections*
162 Assuming maximum volume at 100 percent entitlement for all shares.
163 Section 23 of the Plan (2012).
164 Section 23 of the amended Plan (2020).
165 Part 5, Division 3, Section 27 of the Plan.
166 WaterNSW (n.d.) *Fish River Water Supply Scheme*

licence is unique as it is the only inter-catchment transfer water supply scheme in eastern Australia that transfers western flowing water eastwards of the Great Dividing Range, mostly by gravity.[167]

The share component dedicated to meeting town water needs in specific water sources in the upper Macquarie is significant and predominantly held by Bathurst Regional Council, Orange City Council, and WaterNSW (which supplies Oberon Council via the Fish River Supply Scheme). **Table 2** illustrates how towns and communities in the upper Macquarie area predominantly rely on unregulated water sources to meet their water needs.[168]

Table 2: Summary of town water demand and supply for local government areas in the upper Macquarie[169]

LGA	Population 2021	Water source(s)	Local Water Utility entitlements[170]
Oberon Council	5,421	Fish River Water Source	Water NSW holds major utility licence[171]
Bathurst Regional Council	44,370	**Unregulated** (Macquarie above Burrendong, Winburndale Rivulet)[172] Groundwater	18,500 (Macquarie above Burrendong) 17 (Winburndale Rivulet)
Orange City Council	42,976	**Unregulated** (Summerhill Creek) Stormwater harvesting Groundwater	9,143 (Summerhill Creek) ~1000 462
Cabonne Shire Council	13,783	**Unregulated** (Bell River, Little River, Molong Creek) Central Tablelands Water[173]	604

A unique feature of the upper Macquarie is the significant concentration of town water supply infrastructure, which expands into the Belubula[174] and Greater Sydney regions, and assists in meeting town water needs (**Figure 44**).

167 *Ibid.*
168 Bathurst and Orange have access to a small amount of groundwater in the Lachlan Fold Belt.
169 NSW Government (2021) *Common Planning Assumption Population Projection 2021*
170 Assuming maximum volume in ML at 100 percent allocations.
171 WaterNSW supplies customers of the Fish River Water Supply Scheme through supply agreement.
172 Ben Chifley Dam on the Campbell River is used to supply water to Bathurst's water treatment works via in-river releases.
173 Central Tablelands Water supplies parts of Cabonne Shire Council, including the towns of Canowindra, Cargo, Cudal, Eugowara and Manildra.
174 Central Tablelands Water is a water supply authority constituted under the NSW Local Government Legislation. It has an extensive water supply pipeline network which supplies communities across Blayney, Cabonne and Weddin Shire council areas. Central Tablelands Water can also supply water to Cowra Shire Council.

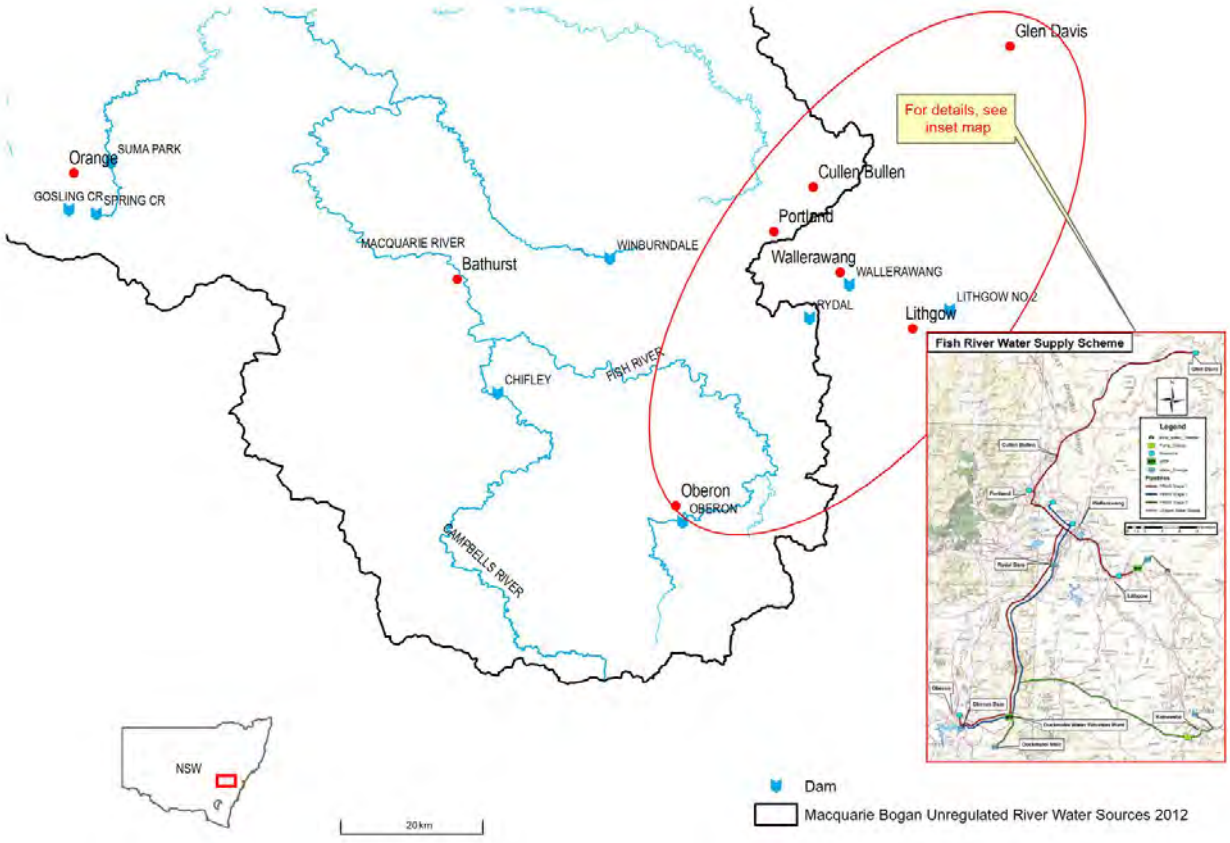

Figure 4: upper Macquarie region water supply infrastructure

It could be suggested that there are adequate water access entitlements available to meet town water needs in the upper Macquarie (assuming the 100 percent of the licenced entitlement is available to these towns during every year of the life of the Plan) based on the:

- local water utility share component in the Plan
- information available on historic town water demands
- concentration of town water infrastructure.

However, entitlement does not ensure water availability. The most recent drought (2017-2020) highlighted significant water security risks for towns in the upper Macquarie. Temporary water restrictions were imposed via s324 orders in the Campbells River downstream of Ben Chifley Dam and in the Macquarie River above Bathurst management zone.[175] These s324 orders restricted access by unregulated licence holders in order to protect critical town water supplies.[176] In addition, Bathurst Regional Council, Orange City Council and parts of Cabonne Shire Council imposed Level 5 water restrictions in mid-2019 due to very low town water storage levels and low expected inflows. Oberon experienced water quality incidents at Oberon Dam that impacted on town water supply (and increased treatment costs).

175 DPE-Water (2019) *Expired or temporary water restrictions – Macquarie-Bogan Unregulated and Alluvial Water Source*

176 In 2019, access to other licence holders in the Campbells River downstream and Macquarie River above Bathurst management zone were restricted via a Section 324 order. This occurred although Ben Chifley Dam did not yet reach the Plan's specified trigger level of 700.14 metres at the storage gauge at Ben Chifley Dam (site number 563008).

The timing and level of town water restrictions has not been consistent across LGAs during drought periods. These restrictions are the remit of the relevant local water utility servicing towns and communities within a particular area and depend on:

- allocations to local water utility entitlements and water availability
- the ability to access different sources of water, access to relevant town water supply infrastructure, including pipeline linkages between local water utilities within and across the upper Macquarie area.

The implementation of s324 orders to adequately protect town water supply indicates a need to review the Plan provisions to ensure town water supply is adequately protected and prioritised within the Plan.

There are significant potential economic costs associated with town water restrictions. Bathurst Regional Council analysed the loss in economic output associated with Level 5 and Level 6 restrictions and found that the costs associated with Level 6 restrictions can be up to $700,000 per year.[177]

5.2 Town water security is at risk from climate change

Since the Plan commenced, the upper Macquarie region has experienced several extreme events, including:

- wide-scale flooding in 2016, which caused water quality incidents and damage to water related infrastructure[178]
- severe drought between 2017 and 2020, which led to critically low town water storage levels and severe water restrictions.[179] The Plan's main regional centres of Bathurst and Orange were at risk of running out of water, with major town water storages reaching critically low levels:[180]
    - Ben Chiefly Dam fell below 30 percent in February 2020[181] (see **Section 5.3**)
    - Suma Park and Spring Creek Dam fell to 21.05 percent in February 2020
- consecutive La Niña events since mid-2019 have brought significant rainfall events that led to renewed flooding in the Macquarie-Bogan area between mid-2021 and 2022.

Each of these extreme events has provided new and valuable information about the region's climate and the risks to town water supplies.

As outlined in Central NSW Joint Organisation's submission, the Plan review should '*review the lessons from the drought of record' and consider the improved 'knowledge of the impacts of climate change where [...] there will be increasingly serious droughts and floods and water sharing needs [have] to be updated to optimise outcomes*'.[182] This same sentiment was expressed in Bathurst Regional Council's submission, which mentioned that '*the data for the Plan is quite aged and there is now much more data available to inform the plan review*'.[183]

177 Submission: Bathurst Regional Council, received 23 May 2022.
178 Bureau of Meteorology (2016) *Regular statement - New South Wales in 2016*
179 Bureau of Meteorology (2016) *Ibid.*
180 Molong Creek Dam ran out of water during the drought, but a pipeline from Orange could provide emergency water supply for the township.
181 The Commission notes that clause 58(15) of the Plan only prohibits extraction by unregulated water access licence holders downstream of Ben Chiefly Dam when dam storage levels fall below 22 percent.
182 Submission: Central NSW Joint Organisation, received 23 May 2022.
183 Submission: Bathurst Regional Council, received 23 May 2022.

Recent climate risk analysis completed by DPE-Water suggests that the Macquarie-Castlereagh region could experience more frequent and severe extreme events in the future,[184] which would heighten the water security risks to towns in the upper Macquarie.[185] In particular, the region could experience:

- a decrease in average annual rainfall by up to 12 percent coupled with less frequent but higher intensity rainfall events
- more frequent and prolonged droughts
- higher minimum and maximum temperatures, with maximum temperatures expected to increase by an average of 0.7 degrees Celsius by 2030 and 2.5 degrees Celsius by 2070
- 5 percent higher evapotranspiration compared to levels between 1990 and 2009, with the largest increases expected in autumn and winter
- lower inflows into the region's storages, with a potential decline in median annual inflow into Burrendong Dam by up to 50 percent by 2070.

DPE-Water's new climate risk analysis suggests that there is an increased probability that conditions similar to those during the 2017-2020 drought could re-occur in the Macquarie-Castlereagh region.[186] As illustrated in Table 3, Bathurst and Orange could experience more frequent severe water restrictions and potential system failure under a conservative long-term dry climate change scenario.[187]

184 DPE-Water has used the SRES A2 future climate change scenario for the development of the *Draft Macquarie-Castlereagh Regional Water Strategy*. This scenario assumes a 2 degrees Celsius warming by 2041 and represents a high carbon emission scenario.

185 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*; Intergovernmental Panel on Climate Change (2000) *Special Report on Emission Scenarios*

186 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*

187 This assumes no further demand management or supply augmentation to support town water security in Orange and Bathurst.

Table 3: Probability of Orange and Bathurst water supplies being restricted or experiencing a supply shortfall under different climate scenarios if there are no changes to policy, infrastructure or demand management[188]

Town	Historic climate	Long-term climate projection under a dry climate change scenario[189]
Percentage of time in severe water restrictions[190]		
Orange	3.3% (1 in 30 years)	14.7% (1 in 7 years)
Bathurst	1.8% (1 in 60 years)	7.6% (1 in 13 years)
Frequency of failure[191]		
Orange	1.9% (1 in 50 years)	11.8% (1 in 8 years)
Bathurst	1.7% (1 in 60 years)	6.3% (1 in 16 years)

DPE-Water should consider how to appropriately factor in climate change into the Plan provisions to ensure high priority needs, including town water needs, are effectively protected. This is particularly critical given the projected population growth in the upper Macquarie region. The Commission suggests several avenues in this respect, including amending access provisions or factoring in climate change and population growth in AWDs (see **Chapter 3**).

The Commission recognises DPE-Water Utilities is working closely with local councils to develop integrated water cycle management (IWCM) plans for drought management planning and to support future town water supply security. As stated in the DPE-Water *Water Utilities Best Practice Management Guidelines*:

> *'Local water utilities are responsible for undertaking long-term strategic town water services planning, including setting of service and investment priorities, revenue and pricing requirements. This planning includes the consideration of the local water utilities longer term and emerging risks to their water services.*
>
> *An Integrated Water Cycle Management Strategy is a 30-year plan developed by local water utilities that identifies an integrated water, sewerage and stormwater supply scenario that provides the best value for money on the basis of social, environmental and economic considerations. This encourages less reliance on limited natural water sources, less production of pollutant loads to the environment through stormwater and sewerage and involves efficient pricing and water management.'*[192]

188 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy – Consultation Paper*
189 Climate projections are based on 10,000-year data sets.
190 Severe restrictions are defined differently for each council and depends on their restriction regime and water supply sources: Orange: Level 5 restrictions, which represents 62 percent of unrestricted demand, or worse; Bathurst: Level 4 restrictions, which represents 60 percent of unrestricted demand, or worse.
191 Failure is defined differently for each council and depends on their restriction regime and water supply sources: Orange: where water demands cannot be met under Level 6 restrictions for Orange, which represents 60 percent of unrestricted demand; Bathurst: where water demands cannot be met under Level 5 restrictions for Bathurst, which represents 52 percent of unrestricted demand.
192 DPIE-Water (n.d.) *Water Utilities Best Practice Management – Integrated Water Cycle Management*.

The IWCM plans will provide important information on local water utility requirements for town water in the future and should be considered in the Plan remake. Adequate resourcing for DPE-Water and DPE-Water Utilities to collaborate in the development of IWCM and replacement water sharing plans will be critical going forward.

In addition, the Commission also notes DPE-Water manages the *Safe and Secure Water Program* which is a $1 billion regional infrastructure co-funding program established in 2017.[193] The program co-funds eligible water and sewerage projects in regional NSW based on risks.

While these programs are important for ensuring that town water needs are understood and necessary infrastructure is provided, the water sharing plans play an important role in ensuring that water meant for town water supply is protected consistent with the priorities under the Act.

5.3 Not all access rules protect high priority needs, including town water

The Act prioritises the protection of the water source and its dependent ecosystems over licensed water usage.[194] Within licensed usage, the Act prioritises local water utility access licences (which provide town water supply) over other licence classes.[195] It is important that these high priority licenced water needs are appropriately protected and prioritised in accordance with the Act.

In general, water access licences permit the licence holder to take a specified volume of water from a specified water source, under the conditions of the licence. These conditions should be consistent with the priorities, principles and objects in the Act, as well as the Plan objectives, including around social, cultural and economic outcomes.

In most water sharing plans, water users of the same category and water sources receive the same access conditions. Higher priority water users – such as towns – generally receive greater access in terms of when they can extract through less restrictive cease to pump rules. Access conditions should be set to ensure that adequate water is first provided for the environment and basic landholder rights as per the priorities of the Act.

With respect to protecting flows in unregulated water sources servicing town water needs in the upper Macquarie, Table 4 summarises the relevant Plan provisions. In some instances, these provisions are linked to relevant water infrastructure assets.

193 DPE-Water (n.d.) *Safe and Secure Water Program*
194 Section 5(3) of the Act.
195 Section 58(1) of the Act.

Table 4: Plan provision to protect town water supply in the upper Macquarie

Local water utility	Plan provisions to protect flows
Oberon Council	**Fish River Supply Scheme** Division 2 Section 53(24): water must not be taken from the Duckmaloi River in the Fish River Water Source under a major utility access licence unless flow at the Duckmaloi Weir (421188) is 3 ML per day or more
Bathurst Regional Council	**Macquarie above Burrendong, Winburndale Rivulet** Division 2, Clause 53(15) – reference to volumes in Ben Chiefly Dam
Orange City Council	**Summer Hill Creek** Division 2, Clause 53(2) – no visible flow rule
Cabonne Shire Council	**Bell River, Little River, Molong Creek** Division 2, Clause 53(2) – no visible flow rule

Table 4 illustrates that the Plan provisions are not uniform in how flows are managed to protect town water needs in the upper Macquarie. In addition, Plan provisions, works approval conditions and water access licence conditions related to the Plan area contain a myriad of different conditions targeted at protecting town water supplies that are not transparent:

- **Standard default access rule of 'no visible flow'** – these rules do not effectively protect flows during periods of low flow and are difficult to enforce (see **Chapter 4**). Several water management zones are excluded from these 'no visible flow' rules and have tailored access rules that are sometimes linked to town water infrastructure.
- **Rules carried forward from previous water access licence conditions that were established under the *Water Act 1912*** – these rules are listed separately in Appendix 2 (Section 53(16) of the Plan).
- **Rules carried forward from water supply work approvals that were nominated by the access licence at the commencement of the Plan** – these works approval conditions are not explicitly referenced in the Plan (see Section 53(17) of the Plan).

The dispersed access provisions reduce clarity, increase regulatory uncertainty and could erode the protection of high priority needs over time. Existing conditions may also not be adequate to protect high priority needs, particularly in the context of a drying climate and forecast population growth.

The protection of flows in unregulated water sources servicing Bathurst are carved out as an exemption to the default no visible flow rules. Specifically, Bathurst's water security is managed through provision 53(15) of the Plan, which specifies that extraction must cease in the Campbells River Water Source and Macquarie River above Burrendong Water Source when the water level in Ben Chifley Dam is at or below 700.14 metres (which equates to 22 percent of capacity). Although this access condition is more specific than the standard no visible flow rule, the 2017-2020 drought highlighted that this provision may not be sufficient to protect Bathurst's town water supply and therefore warrants revision.[196]

In 2019, access to other licence holders in the Campbells River downstream and Macquarie River above Bathurst management zone was restricted via a s324 order,[197] despite Ben Chifley Dam not reaching the Plan's specified trigger level of 700.14 metres. The s324 order limited the take for other unregulated river access licence holders in this management zone to 20 percent,[198] as Ben Chifley Dam dropped to 44 percent of its capacity (instead of 22 percent as per provisions 53(15)).[199] In its submission, Bathurst Regional Council suggested there was a need for a more '*timely adaptive process*'[200] with respect to the Plan's access provisions.

In order to better protect Bathurst's town water supply, DPE-Water should review provision 53(15) of the Plan and determine appropriate trigger levels at which water access for licence holders in the Campbells River Water Source (e.g., Campbells River Downstream Management Zone) and the Macquarie River above Burrendong Water Source (e.g. the Macquarie River above Bathurst Management Zone) should be restricted. The review of provision 53(15) should also consider future town water infrastructure plans by Bathurst Regional Council, including any changes to the operations of Ben Chiefly Dam.

196 Submission: Bathurst Regional Council, received 23 May 2022.
197 DPE-Water (2019) *Expired or repealed temporary water restrictions – Macquarie Bogan Unregulated and Alluvial Water Source*
198 The Commission is unclear how long the s324 order continued and when it was repealed.
199 Access licence holders within the Campbells River Downstream and Macquarie River above Bathurst management zones have a combined estimated entitlement of 4,700 ML.
200 Submission: Bathurst Regional Council, received 23 May 2022.

A s324 order was also imposed on unregulated access licence holders within the Fish River Water Source downstream of Lake Oberon and to the confluence with the Macquarie/Wambuul River. Lake Oberon is part of the Fish River Water Supply Scheme and operated by Water NSW to meet water needs to customers of the Fish River Water Supply Scheme. During the 2017–2020 drought, water levels in Lake Oberon fell to critical low levels as water releases were made to meet downstream water needs. Oberon Council suggested that '*these restrictions were introduced too late and caused levels in Lake Oberon to drop to critically low levels, which also impacted water quality*.'[201]

Council stakeholders told the Commission that a '*lived experience with a multi-year drought highlighted several areas where permanent adjustments [to the Plan] are required. Specifically, [...] access rules around cease to pump [...] require significant change*'.[202]

To mitigate the need to impose future temporary water restrictions via a s324 order in the upper Macquarie, and to provide greater clarity around access restrictions linked to town water supply storages, DPE-Water should review existing access rules, town water storage release triggers and access licence dealings provisions in the upper Macquarie. This would ensure that environmental, basic landholder rights and town water needs are adequately protected. This review should factor in climate change. It will be critical that the review of these provisions consider recommendations made in **Chapter 3** and **Chapter 4**.

With respect to rules carried forward from the *Water Act 1912* and water supply work approvals, the Commission analysed a subset of water access licence conditions and associated works approvals across the Plan area and found considerable variations. These variations are likely the result of how the Plan has been constructed.

Instead of determining the environmental and basic landholder requirements, the Plan contains a mix of access licence and work approval conditions with no clear or specific outcomes. Also, conditions imposed on works approvals are frequently more comprehensive than those imposed on water access licences. However, these works approval conditions are not explicitly referenced in the Plan. It is unclear how the original risk assessment determined these access provisions and whether they remain effective in protecting high priority needs, including town water needs.

DPE-Water should consolidate and review existing unregulated water access licence conditions and works approval conditions. If appropriate, these combined conditions should be reflected in the Plan provisions, instead of the schedule and appendices to provide greater transparency (see **Recommendation 10**). The argument to consolidate and review the adequacy of access conditions is strengthened when reviewing some of the specific conditions in particular the unregulated water sources in the upper Macquarie.

In the Summerhill Creek Water Source, there are over 100 unregulated water access licences. Many of them have identical licence conditions, but significantly different works approval conditions. A review of the works approval conditions highlighted that some conditions would be challenging to regulate or may not be enforceable. In particular, references to locations, infrastructure or natural features used in the works approval conditions are insufficiently detailed to make these conditions enforceable. To ensure all conditions associated with the extraction and sharing of water are clear and can be regulated, these issues need to be resolved.[203]

201 Interview: Oberon Shire Council, 17 October 2022.
202 *Ibid.*
203 To do so, it is important that the Department ensures high priority needs, including flows for the environment, basic landholder rights and town water needs, can be effectively managed and protected.

5.4 Changes to the Fish River Water Supply Scheme could better meet Plan outcomes

WaterNSW holds a major utilities licence to operate and maintain the Fish River Water Supply Scheme. The licence authorises WaterNSW to take up to 15,876 ML per year from the Fish River Water Source to supply relevant local councils, Sydney Water customers and Energy Australia for its Mt Piper power station.[204] The Commission understands that over the life of the Plan, the major utility licence has not been fully utilised, and the maximum allowable extraction volume of 15,876 ML has not always been available due to climatic conditions.[205]

Energy Australia is the largest user of the Fish River Water Supply Scheme.[206] The Commission understands that Energy Australia intends to cease operating its power station over the life of the replacement Plan and may no longer require access to the Fish River Water Supply Scheme. This suggests that there may be capacity for the major utility licence to be utilised for other purposes – for example, to meet town water needs in the upper Macquarie or to improve environmental and cultural outcomes.[207] The Commission encourages DPE-Water to consult with WaterNSW and its customers about the future utilisation of this licence to meet the needs of basic landholders' rights, the environment, Aboriginal peoples, urban water supply by local water utilities and other water users, in accordance with the Act.[208]

In addition, the Commission understands that the original major utility licence held by WaterNSW contained a set of drought restriction conditions, which specified reduction in water delivery to different customer groups based on prevalent drought conditions.[209] WaterNSW raised concerns that these conditions were not reflected in the Plan and not carried across when the major utility licence was reissued. DPE-Water should review these original drought restriction conditions in consultation with WaterNSW and assess the merit of including a table in the replacement Plan that specifies these conditions. This would provide transparency to users reliant on the Fish River Water Supply Scheme. DPE-Water should also consider adding these drought restriction conditions on WaterNSW's water access licence.

The Commission also heard that actions are needed to better manage water quality in the Fish River Water Supply Scheme. The Central NSW Joint Organisation in its submission mentioned that:

> '*Over the past two droughts the dam levels have dropped to as low as 12 and 8 percent, respectively. This has a substantial impact on the Oberon community socially,*

Access rules should consider the environmental flow requirements (see **Chapter 4**), and the volumes needed to fulfill basic landholder rights. Assisting this process would be the initiation of Action 1.6 of the *NSW Water Strategy* which seeks to review the regulation of domestic and stock basic landholder rights. A better understanding the volume of water taken under domestic and stock basic landholder rights will help identify risks in particular Plan areas and assist in better managing extractions against the LTAAEL (see **Chapter 3**).

204 WaterNSW (n.d.) *Fish River Water Supply Scheme*

205 Interview: WaterNSW, 26 October 2022.

206 Energy Australia holds a Special Purpose Licence to take water from the Fish River Water Supply Scheme and a licence to take water from the Cox Water Supply Scheme.

207 Work undertaken for the *Draft Macquarie-Castlereagh Regional Water Strategy* indicates that using a portion of the underutilised major utilities licence from the Fish River Scheme could support town water security to Bathurst. In particular, there could be a significant reduction in risk of water supply shortfall.

208 Any review of the major utility licence held by WaterNSW should consider the security of supply customers of the Fish River Water Supply Scheme.

209 Interview: WaterNSW, 26 October 2022.

> *environmentally and politically. The need to provide appropriate quality (and quantity) of water to meet the critical needs of the community is paramount.'*[210]

Associated with the significant fluctuations in the dam levels, Oberon has experienced a range of water quality incidents.[211] High levels of minerals in the water, along with infrastructure limitations, have contributed to water security challenges for Oberon. This has also resulted in very high water treatment costs for the council.

The Commission encourages DPE-Water to work with Oberon Council and WaterNSW to better understand the secure yield of the Fish River Supply Scheme and work on options to improve water quality outcomes at Lake Oberon. This may also require a review of the operation of the Fish River Water Supply Scheme against the water management principles.

The Commission also suggests the publication of a summary guide that outlines the current operational principles of the Fish River Water Supply Scheme. Such a guide would provide greater transparency about the operation of the Scheme, its history of use, the conditions of extractions and basis for sharing available water and any risk associated with 'growth in use' by existing Fish River Water Supply Scheme customers, basic landholder rights and the environment.

5.5 Interregional pipeline connections should be recognised in the Plan

There are several interregional town water supply pipelines connecting towns and communities in the upper Macquarie-Bogan and Lachlan/Belubula regions. For example, Central Tablelands Water supplies water from Lake Rowlands in the upper Belubula catchment to parts of the Cabonne Shire Council areas, including the towns of Canowindra, Cargo, Cudal, Eugowra and Manildra, which are located in the upper Lachlan catchment area. In addition, water can be transferred during drought emergencies between Central Tablelands Water's operating area and Orange City Council, which is located in the Macquarie-Bogan Plan area.[212]

Despite the importance of these existing interregional connections during extreme events, these town water supply pipelines' operations and related water supply arrangements are not referenced in the relevant water sharing plans for the Macquarie-Bogan unregulated water sources or the Lachlan unregulated water sources.

Orange City Council suggested that interregional connections should be recognised in the Plan:

> '*The Water Sharing Plans should recognise the potential for urban communities to share water including through existing and planned infrastructure. Mechanisms should be in place, particularly when this sharing occurs across catchment divides*'.[213]

Considering the existing water security risks during the recent drought (2017-2020), capturing minimum supply arrangements and relevant triggers associated with interregional pipelines in the Plan[214] would provide greater clarity and certainty for towns

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210 Submission: Central NSW Joint Organisation, received 23 May 2022.
211 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy – Consultation Paper*
212 Central Tablelands Water (n.d.) *Who We Are* The Commission notes that the existing pipeline between Central Tablelands Water and Orange City Council allows for bi-directional transfer of water.
213 Submission: Orange City Council, received 20 May 2022.
214 These arrangements should also be reflected in other relevant documents, for example the Lachlan and Macquarie-Castlereagh regional water strategies.

and communities reliant on interregional water sources. The Commission is of the view that these interregional water supply arrangements should be captured in the Plan if water is transferred between water sources governed by different water sharing plans.[215]

There are also two projects under development that could add to the existing town water supply pipeline linkages:

- **Sub-regional town water strategy:**[216] Orange City Council, Cabonne Shire Council and Central Tablelands Water are developing a sub-regional town water strategy to enhance water security for these LGAs. The strategy will consider existing and potentially new pipeline linkages between the towns of Manildra, Orange, Molong and adjacent areas.
- **Belubula Water Security Project:**[217] Central Tablelands Water is working with DPE-Water to undertake the Belubula Water Security Project. This project will assess a range of potential options to improve the efficiency and resilience of water management in the Belubula catchment.[218] Given the existing linkages with the upper Macquarie region, this project is also of relevance for the review of the Plan, as augmentations of Lake Rowlands could enhance the water security benefits for upper Macquarie towns and communities (particularly Orange) and therefore may interact with other existing recommendations in this report.

Where relevant, the Commission recommends that DPE-Water references existing interregional water supply pipelines between local water utilities in the Plan area to provide guidance on their operational arrangements and better protect town water security during future extreme events. In addition, DPE-Water should also consider these interregional supply arrangements in instances where other Plan provisions are reviewed to better protect town water supply.

5.6 There is limited guidance on stormwater harvesting

Some local councils in the Plan area have developed, or are considering, stormwater harvesting schemes to enhance town water security. Orange City Council has an established stormwater harvesting scheme and is seeking to expand this scheme in coming years.[219] Bathurst Regional Council is also investigating the feasibility of a stormwater harvesting scheme.[220]

Work undertaken for the *Macquarie-Castlereagh Regional Water Strategy* suggests that expanding stormwater harvesting for Orange and Bathurst could reduce the percentage of time residents in these communities would experience water restrictions.[221] This is important in the context of the most recent severe drought conditions (**Table 5**).

215 The Commission notes that the transfer of water via local water utilities' reticulation systems would not necessarily need to be captured in plan provisions.
216 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy – Consultation Paper*
217 DPE-Water (2022) *Belubula Water Security Project*
218 The Belubula Water Security project will investigate a pipeline linkage between Central Tablelands Water owned Lake Rowlands and WaterNSW owned Carcaor Dam, as well as the augmentation of Lake Rowlands.
219 Submission: Central NSW Joint Organisation, received 23 May 2022.
220 Submission: Bathurst City Council, received 23 May 2022.
221 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy – Consultation Paper*

Table 5: Impact on town water security from expanding stormwater harvesting in Orange and Bathurst

	% time in severe water restrictions[222]		% time of failure[223]	
	Base case	**Stormwater harvesting scheme**	**Base case**	**Stormwater harvesting scheme**
Orange	3.3% (1 in 30 years)	2.1% (1 in 50 years)	1.9%	0.7% (1 in 140 years)
Bathurst	1.8% (1 in 60 years)	1.4% (1 in 70 years)	1.7%	0.4% (1 in 250 years)

The Central NSW Joint Organisation raised concerns that Plan provisions limit the ability of local councils to develop stormwater harvesting schemes (clauses 57(2) and 57(3)). Through a recent Plan amendment,[224] this constraint has been removed but landholders downstream of Orange's existing stormwater harvesting scheme have raised concerns that the Plan amendments were made without adequate consultation.

These stakeholders also raised concerns that expansion of the stormwater harvesting scheme could further impact the environment,[225] basic landholder rights and licenced entitlement holders who rely on the Summerhill Creek Water Source:

> '*Stormwater runoff in this last feeder creek is the last remaining uncontrolled water source for my creek. My riparian rights to access water for stock and domestic use is being severely eroded by actions of Orange City Council upstream. There needs to be other alternatives for Orange City Council to secure its urban water supply other than to continue to bleed every last drop of water from Summer Hill Creek through increased stormwater harvesting …*'[226]

Similar to all streams in the upper Macquarie,[227] Summerhill Creek is classified as an unregulated water source, despite the existing town water infrastructure in the upper part of the catchment areas. This town water infrastructure can significantly regulate flows downstream. The impact of the existing infrastructure and the potential expansion of town water infrastructure in the upper catchment was also raised by local landholders:

> '*Whenever Orange City Council's urban storage dams in the upper catchment are less than 100 per cent, [this] has largely progressed to an almost fully regulated system controlled by Orange City Council. Orange City Council's latest works proposal currently under assessment will significantly increase this degree of regulation and control*.'[228]

222 Severe restrictions are defined differently for each council and depends on their restriction regime and water supply sources: Orange: Level 5 restrictions, which represents 62 percent of unrestricted demand, or worse; Bathurst: Level 4 restrictions, which represents 60 percent of unrestricted demand, or worse.

223 Failure is defined differently for each council and depends on their restriction regime and water supply sources: Orange: where water demands cannot be met under Level 6 restrictions, which represents 60 percent of unrestricted demand; Bathurst: where water demands cannot be met under Level 5 restrictions, which represents 52 percent of unrestricted demand.

224 DPE-Water (2022) *Water Sharing Plan status – Macquarie-Castlereagh regions*

225 DPE-Water, DPE-EHG and DPI-Water Science also raised concerns that the recent Plan amendments could have potential flow on impacts on the environment and water-dependent species.

226 Submission: Individual, received 14 November 2022.

227 The Commission considers the upper Macquarie to be the area above Burrendong dam and Windamere dam.

228 Submission: Individual, received 14 November 2022.

In terms of water entitlements and basic landholder rights, Summerhill Creek Water Source has one of the highest levels of entitlements in the Plan area and has experienced significant growth in basic landholder rights since the Plan was made (**Table 6**).

Table 6: Water entitlements and basic landholder rights in the Summerhill Creek Water Source

Summerhill Creek Water Source	Number of licences	Total water access entitlements	Unregulated river water access licence	Stock and domestic	Local water utility	Basic landholder rights
2020 Plan	96	12,251	4,320	131	7,800	151
Licence register	107	11,577	3634	143	7,800	496.81

Compared to other unregulated water sources in the Plan area, more than half of the water access licences are held by Orange City Council. In the context of the growing town water demand and the intention from Orange City Council to expand the existing storm water harvesting scheme, there is increased likelihood that there will be further flow changes in Summerhill Creek, which increases the risks to downstream environments, basic landholder rights and other licence holders.

According to the risk assessment developed for the Macquarie-Castlereagh Water Resource Plan, the Summerhill Creek Water Source has a medium risk of insufficient water being available for the environment during low and zero flow periods.[229] Flows in Summerhill Creek are also likely affected as treated effluent from Orange City Council is not returned to the unregulated creeks in the Plan area but provided to other uses.

There is a need to review the existing Plan provisions in this water source to ensure that environmental and basic landholder rights needs are adequately protected in accordance with the provisions of the Act.[230] In particular, the Commission considers it important to maintain the prohibition on instream dams on third order and greater streams, consistent with the Act and the latest HEVAE mapping of instream values.[231] The Commission also considers it important to ensure that future instream dam proposals are subject to rigorous and transparent environmental and downstream impact assessments. The publication of explicit guidelines explaining how new instream dam proposals are assessed for downstream impacts, including on basic landholder rights, would help provide greater transparency.

DPE-Water should also consider concerns of downstream landholders and environmental impacts when reviewing the application for town water supply related stormwater harvesting schemes. In particular, DPE-Water should ensure that additional stormwater harvesting schemes do not erode the conditions imposed on the original stormwater harvesting scheme or lead to greater cumulative impacts on the environment and downstream users. In addition, DPE-Water should codify environmental release requirements from existing town water storages and instream dams in the upper Macquarie to protect the needs of the environment and basic landholder rights.

229 The risk assessment also highlights that there is a medium risk of further growth in basic landholder rights which may create risks to water available for other uses.

230 A review is required given the extent of river regulation through Orange City Council's existing town water infrastructure, the level of water access licences, the reduction in effluent discharge and the risks identified through the water resource planning process.

231 DPE-Water (n.d.) *Environmental value of NSW rivers: HEVAE*

5.7 Recommendations

R 10	As part of the Plan replacement process, DPE-Water should: a) review, and if necessary, revise existing access rules, town water storage release triggers and access licence dealings provisions in the Upper Macquarie to protect environmental, basic landholder rights and town water needs, including consideration of climate change, consistent with the principles and priorities of the Act b) review whether additional Plan provisions are needed to guide releases from existing and future town water storages (including stormwater harvesting schemes) to adequately protect environmental and basic landholder rights c) review and consolidate existing unregulated access licence conditions and works approval conditions and reflect these in the Plan provisions (instead of the schedules and appendices) d) ensure there are no further exemptions that enable the construction of in-stream dams on third-order or greater streams consistent with the principles and objects of the Act e) ensure any further in-stream dam proposals for town water supply purposes are subject to rigorous and transparent environmental and downstream impact assessment, supported by clear guidelines.
R 11	To better protect and prioritise town water during extreme events, DPE-Water should in the next 2 years: a) include explicit drought conditions (e.g., including appropriate release rules for Lake Oberon) for the major utility access licences held by WaterNSW in the Fish River Water Source. When developing these drought conditions, DPE-Water should consider the experiences of the 2017 – 2020 drought, including the introduction of section 324 orders in the Fish River Water Source; consult with WaterNSW on an appropriate set of drought conditions and then reflect these conditions on WaterNSW's major water utility licence b) in cases where water is transferred from one water source to another water source via town water supply system, ensure these inter-regional transfer arrangements are referenced in the Plan, and any necessary operational arrangements of the transfer infrastructure are accounted for in Plan provisions.

6 Improving outcomes in the Bulbodney Grahway Creek Water Source

There are close hydrologic connections between the regulated and unregulated river systems in the Macquarie-Castlereagh catchment downstream of Warren. The first main – and most critical – connection point is the regulated Gunningbar Creek, which branches off from the main trunk of the mid-Macquarie/Wambuul River and enables regulated water to be transferred to the unregulated Albert Priest Channel and onto the Nyngan weir pools, which are part of the Bulbodney Grahway Creek Water Source. The upper Nyngan weir pool can also receive flows from the unregulated Bogan River if there are sufficient flows in the river (**Figure 55**).

The Plan manages the interactions between the regulated and unregulated river systems via three management zones in the Bulbodney Grahway Creek Water Source.[232]

The upper and lower Nyngan weir pools meet town water needs of Nyngan and Cobar, provide habitat and a drought refuge for water-dependent aquatic species, and provide water supply to several agricultural and mining operations in the mid-Macquarie/Bogan area. Local councils, DPI-Fisheries and local irrigator groups have stressed the importance of maintaining the levels in the Nyngan weir pools for critical human, environmental, social, and economic needs.[233]

The Plan recognises the complex hydrologic connections in the Bulbodney Grahway Creek Water Source via several Plan provisions,[234] including:

- individual access and trade rules for each of the three management zones
- dedicated access licences called Unregulated River (Regulated Supply – Local Water Utility) and Unregulated River (Regulated Supply), which enable the take and transfer of water from the regulated system to the unregulated system.

There are several issues with the management of the Bulbodney Grahway Creek Water Source:

- the Plan does not effectively account for, or equitably distribute, transmission losses along the Albert Priest Channel (**Section 6.1**)
- the access rules for the Bulbodney Grahway management zone do not effectively protect weir pool inflows (**Section 6.2**)
- the Nyngan weir pool pump threshold are not aligned (**Section 6.3**).

Trade in the Bulbodney Grahway Creek Water Source is also highly restrictive, an issue that is addressed in **Section 8.3**.

232 The Bulbodney Grahway Management Zone (the Bogan River and its tributaries between Bulbodney Creek to the confluence with Withbarrow Creek), the upper Nyngan weir pool and the lower Nyngan weir pool.

233 Interviews: Orana Water Alliance, 18 October 2022; DPI-Fisheries, 9 November 2022; Nyngan Irrigators Association, 8 November 2022.

234 Part 1, Section 5; Part 8, Division 2 and Part 10 of the Plan.

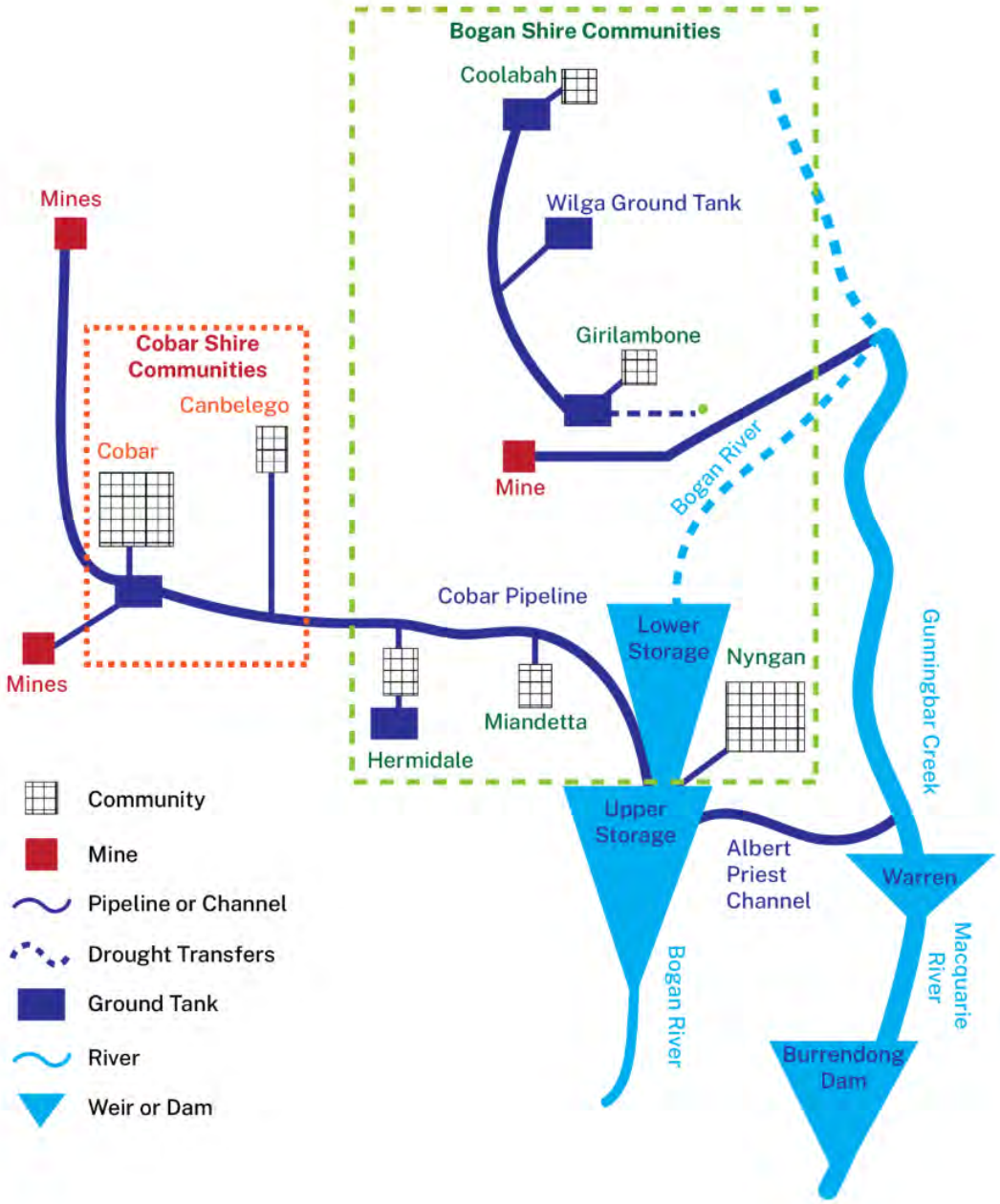

Figure 5: Snapshot of Bulbodney Grahway Creek Water Source

6.1 Albert Priest Channel losses not accounted for or equitably distributed

The upper Nyngan weir pool can receive water via the unregulated Bogan River if there are sufficient flows. However, extended low flow periods in the upper Bogan River have resulted in an increased reliance on the regulated Macquarie/Wambuul river system and the Albert Priest Channel to supply water to the upper Nyngan weir pool over the life of the Plan.[235]

235 The Albert Priest Channel flows approximately 60 kilometres along an open unlined channel to the upper Nyngan Weir Pool. Along its way it crosses Belaringar Creek.

To transfer water to the upper Nyngan weir pool via the regulated Macquarie/Wambuul river system, water needs to be released from Burrendong Dam and travel approximately 500 kilometres along the regulated Macquarie/Wambuul River to Warren weir.[236] At Warren weir, water is transferred to Gunningbar Creek and then subsequently transferred to the 60-kilometre Albert Priest Channel, which terminates in the upper Nyngan weir pool. Both the Albert Priest Channel and upper Nyngan weir pool are managed under the unregulated Macquarie-Bogan Plan.

Transmission requirements associated with water releases from Burrendong Dam along the Macquarie/Wambuul River are managed by WaterNSW,[237] while losses along the Albert Priest Channel to the upper Nyngan weir pool are managed by Bogan Shire Council[238] after receiving its water orders from the regulated system at the Albert Priest Channel intake.[239]

The transmission requirements associated with the transfer of regulated river water to the Nyngan weir pools can be significant, particularly during dry periods.[240] For example, to account for the transfer of water[241] along the regulated Macquarie/Wambuul River, Gunningbar Creek, Albert Priest Channel and Nyngan weir pools, WaterNSW suggested roughly 43,000 ML is required to deliver 9,000 ML at the Albert Priest Channel offtake during drought periods.[242]

A disproportionate amount of the transmission losses occur along the Albert Priest Channel, which is an open unlined channel. Analysis conducted for the draft *Macquarie-Castlereagh Regional Water Strategy* indicated that, during the most recent drought (2017-2020), approximately 15,000 ML of additional water were needed to cover transmission of regulated orders from Burrendong Dam to Warren weir, and another 12,000 ML to deliver water along Albert Priest Channel,[243] despite it covering less than one-fifth of the distance of the river.

WaterNSW does not explicitly account for losses along the Albert Priest Channel, as it is outside the regulated system, but suggested that between 40 and 50 percent of the water transferred from the Gunningbar Creek offtake to the upper Nyngan weir pool could be lost during dry times.[244]

Despite these significant transmission losses along the Albert Priest Channel, the unregulated Macquarie-Bogan Plan provisions[245] do not factor in these losses uniformly across the different licence categories. For example, Clause 53(11) of the Plan effectively factors in a minimum 20 percent loss factor for water ordered from the regulated Macquarie/Wambuul river system for unregulated licence holders, while Clause 53(12)(a)

236 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
237 WaterNSW (2022) *Ordering Water*
238 Cobar Shire Council takes water from the Nyngan Weir Pool via a pipeline. Orders from the regulated system are managed by Bogan Shire Council.
239 There are also licence holders and stock and domestic licence holders who extract water from the Albert Priest Channel. Clause 53(13) of the Plan manages extractions from these licence holders, but the loss factor is unspecified.
240 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
241 This is frequently referred to as transmission/conveyance losses from a river operators' point of view. Amongst other things, the transmission/conveyance losses are required to meet water orders along the regulated Macquarie/Wambuul River system and from local councils, licence holders and basic landholder rights in the Unregulated Macquarie-Bogan Plan area who rely on the Albert Priest Channel.
242 Interview: WaterNSW, 16 October 2023. The Commission notes that other water orders along the river systems are met with the transmission//distribution water requirements in this example.
243 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy*
244 Interview: WaterNSW, 16 November 2022.
245 Clauses 53(11), 53(12) and 53(13) of the Plan.

factors in a minimum 30 percent loss factor for local water utility licences.[246] The rationale for the different minimum loss factors is not clear or transparent.[247]

Further, Clause 53(13)(b) does not specify any loss factor associated with water orders from the regulated system if the water is extracted in another unregulated stream in the Bulbodney Grahway Creek Water Source.

Although the Plan acknowledges that there are losses associated with the transfer of regulated water to the unregulated system via the Albert Priest Channel, the Commission suggests that setting these factors at a minimum of 20 percent and 30 percent respectively may not be sufficient to account for the full transmission requirements along the Albert Priest Channel. As suggested earlier, WaterNSW and local council representatives suggested that losses along the Albert Priest Channel can be very high, particularly during dry times.

Currently, the Plan provides too much ambiguity to ensure that extractions at the Nyngan weir pool appropriately account for the actual transmission requirements and extractions from other licence holders along the Albert Priest Channel.[248] For example, if Bogan Shire Council assumes a lower loss factor than the actual losses along the Albert Priest Channel, there is a considerable risk that extractions in the weir pools exceed the amount of water that was ordered from the regulated system.

The Commission is of the view that DPE-Water should, in conjunction with Bogan and Cobar Shire councils, the Cobar Water Board and WaterNSW, undertake further analysis of the transmission requirements associated with the transfer of water from the regulated system along the Albert Priest Channel and other relevant unregulated streams in this part of the Plan area. This analysis should then be used to update and align the loss assumptions in clauses 53(11)-53(13).

The Commission acknowledges that Bogan Shire Council did not feel that changes to the existing cease to pump provisions and associated loss factors are required:

> '*Bogan Shire Council supports the rules regarding commence to pump, cease to pump and drawdown which have provided security and certainty for the residents of Bogan Shire Council and protected the town water supply during times of low inflows (...). There have been no recorded breaches of these rules since the Water Sharing Plan was declared and no actions by weir irrigators endangered town water supply even during the record drought of 2017 – 2020.*'[249]

The Nyngan Weir Pool Irrigators shared the same view about the existing provisions and expressed their support for maintaining Clauses 53(10) – 53(13) without change:

> *'[the provisions] recognise, in some small way, the historic right of Nyngan Weir Irrigators to access Macquarie River water ... Water licences were issued to weir irrigators from as early as 1953 that specifically reference Macquarie River flows and our licences were conjunctive Macquarie/Bogan licences ...*'[250]

246 This effectively gives greater access to unregulated water licence holders than to town water licence holders, which is not consistent with the priorities under the Act.
247 The Commission heard that the difference in minimum loss factors may be a consequence of when different licence holders must take water from the Nyngan weir pools.
248 There are stock and domestic users along the Albert Priest Channel.
249 Submission: Bogan Shire Council, received 30 April 2022.
250 Submission: Nyngan Weir Pool Irrigators, 1 May 2022.

The Commission understands that the loss factors in the Plan are not necessarily the losses that the local council imposes on other licence holders.[251] The Commission considers that it would be more appropriate for the Plan to reflect consistent and accurate transmission requirements to provide clarity to towns and licence holders and better account for take in the unregulated system. This latter point is particularly important as DPE-Water currently does not undertake LTAAEL compliance in the unregulated system (see **Chapter 3**).

The Commission also notes that the Orana Water Alliance raised concerns about the impact of losses along the Albert Priest Channel on town water security.[252] In response to its concerns, Cobar Shire Council suggested that the metering point for Cobar Water Board users' and Nyngan's town water offtake should be moved from Warren weir to the Nyngan weir pools.[253] The Commission agrees that the arrangements to have an offtake point 60 kilometres away from the town's extraction point is unusual. However, transferring the offtake point to Warren weir could create other issues, including how to account for transmission requirements along the Albert Priest Channel. In other catchments, similar situations exist but, in these instances, the town water is supplied by a private irrigation corporation, which holds a conveyance licence to account for losses across the entire scheme. In other instances (such as Broken Hill), the water can be piped to the offtake point.

When reviewing transmission requirements associated with Albert Priest Channel, DPE-Water should consider whether there are other suitable mechanisms that could better account for losses associated with the transfer of water from the regulated to the unregulated system, including individual licence holders' water accounts or the issue of a separate conveyance licence for the Albert Priest Channel.[254]

In addition, the Commission notes that the Plan does not contain a comprehensive set of access or management rules guiding extractions along the Albert Priest Channel. The Orana Water Alliance indicated that councils were not aware of the extraction management arrangements along the Albert Priest Channel and whether water take occurs within the existing rules and licence provisions.[255] Although this is a compliance matter outside of the remit of the water sharing plan reviews, the Commission notes that the Plan makes specific reference to access arrangements for members of the Albert Priest Channel Association (Clause 53(11)(b)). The Commission considers that providing access to water based on the affiliation with a particular representative body is inappropriate and inequitable in the context of a water sharing plan. The Commission recommends Clause 53(11)(b) is removed.

6.2 Access rules for the Bulbodney Grahway management zone do not protect weir pool inflows

Clause 53(2) of the Plan specifies that water must not be taken under an access licence when there is 'no visible flow' where water is proposed to be taken. Although this standard 'no visible flow' rule does not apply to the Lower Nyngan Weir Pool Management Zone[256] or

251 Interview: Orana Water Alliance, 18 October 2022.
252 *Ibid.*
253 Submission: Bogan Shire Council, received 30 April 2022.
254 The Commission recognises that the issue of a conveyance licence would simplify the accounting for conveyance and transmission losses across the Albert Priest Channel but may not provide the flexibility needed to account for large variations in losses.
255 Interview: Orana Water Alliance, 18 October 2022.
256 Access rules for the Lower Nyngan Weir Pool Management Zone are specified in Clause 53(8).

the Upper Nyngan Weir Pool Management Zone,[257] it does apply to the Bulbodney Grahway Management Zone,[258] which includes the Bogan River upstream of the Nyngan weir pools.

As noted in **Chapter 4** and **Chapter 5**, the Commission considers that the standard 'no visible flow' rule does not effectively protect flows during dry periods and is difficult to enforce. It also compromises the Plan's connectivity and environmental objectives and does not build resilience in the system. In the replacement Plan, DPE-Water should review and revise this provision to ensure low flows are protected into the Nyngan weir pools (see **Recommendation 7**).

Bogan Shire Council supports an amendment to the 'no visible flow' rule in the Bulbodney Grahway Management Zone, stating that it '*would like to see further protection of local flows to ensure they reach the upper weir pool via consideration of additional 'commence to pump' rules on Bulbodney Grahway Management Zone licences within 50kms upstream of the weir pool (..)*'.[259]

Clause 53(10) of the Plan also includes a reference to the 'no visible' flow rule. This provision places limits on accessing water from the Nyngan weir pool unless there is a visible flow in the Bogan River at Neurie Plains gauge (421039), provided water has spilled over lower Nyngan weir. Although the joint restriction provides some additional protection for town water supply, the Commission considers that the provision should also be revised to account for the environmental requirements more explicitly along the Bogan River.

6.3 Nyngan weir pool pump thresholds are not aligned

The Plan has specific access provisions for the upper and lower Nyngan weir pools to protect water levels to meet the region's environmental, town water, social and economic needs. The reference points at which licence holders must cease to pump from each weir pool are different:

- **lower Nyngan weir pool:** cease to pump when water level is at or below 50 percent of the full capacity[260]
- **upper Nyngan weir pool**: cease to pump when water level is 70 centimetres or more below the concrete sill of the weir.[261]

The Commission understands that the upper Nyngan weir pool threshold was established to ensure town water supplies in the upper weir pool were protected, because stakeholders considered existing water licence conditions were not adequate to protect town water supply.[262] The threshold for the lower Nyngan weir pool was intended to protect the pool's recreational, social and tourism value.

During Plan development, it was proposed that commence to pump rules for both the upper and lower Nyngan weir pool should be set at 56 ML per day at Neurie Plains gauge and visible flow downstream of the lower weir pool.[263] However, this proposal was rejected by

257 Access rules for the Upper Nyngan Weir Pool Zone are specified in Clause 53(9).
258 The Bulbodney Grahway Creek Water Source – Bulbodney Grahway Management Zone applies from the confluence of the Bogan River with Bulbodney Creek to the confluence with Whitbarrow Creek and all its tributaries.
259 Submission: Bogan Shire Council, 1 May 2022.
260 Clause 53(8) of the Plan.
261 Clause 53(9) of the Plan.
262 The existing conditions did not restrict access to the weir pool when regulated water has been diverted for town water supply purposes.
263 DPI-Water (2012) *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources – Background document*

water users due to the perceived impacts on local irrigators. Following further consultation, two different thresholds were established (as per the current Plan).[264]

Although Bogan Shire Council and the Nyngan Weir Pool Irrigators Association expressed support for both cease to pump thresholds, the Commission feels the inconsistency in the provisions could lead to regulatory uncertainty.

The 2019 audit of the Plan found that DPE-Water had not surveyed the lower Nyngan weir pool to determine the level that represents 50 percent of the full capacity to ensure water is not extracted below this point.[265] The Commission understands that no further work has progressed on this. It is therefore unclear if a reference to a percentage of full capacity is most appropriate and consistent with other Plan provisions. The Commission suggests DPE-Water conduct a survey determining the level of the lower Nyngan weir pool that represents 50 percent of the full capacity at the earliest opportunity to enable appropriate implementation and compliance assessments of the Plan provisions.

The Commission also notes that the drawdown provisions for the lower Nyngan weir pool posed a potential risk to water for the environment during the most recent drought (see **Chapter 4**). In 2019, environmental water managers ordered approximately 300 ML of environmental water to be delivered to the lower Nyngan weir pool to support drought refuge for water-dependent species, primarily native fish. Given the uncertainty around the 50 percent capacity, the environmental water managers tried to ensure that the level in the weir pool remained below the commence to pump threshold to avoid the risk of water for the environment being extracted by other users.[266] Given the uncertainties around the 50 percent capacity threshold, the management of the environmental water in the weir pool was significantly challenged.

As part of the replacement Plan process, the references to the cease to pump conditions in Clauses 53(8) and 53(9) should be reviewed to ensure they are adequate to protect environmental values and town water supply needs. In its review, DPE-Water should reassess whether there is benefit in having a joint trigger level for both weir pools given that both towns and other licence holders have access to both weir pools.[267] Equipment should be installed to provide for continuous water level monitoring in both weir pools in real-time.

6.4 Recommendations

R 12	As part of the replacement Plan, to improve accounting for water take in the Bulbodney Grahway Water Source, DPE-Water should: a) work with Bogan and Cobar Shire councils, Cobar Shire Council/Cobar Water Board and WaterNSW to analyse the transmission requirements associated with the transfer of water along Gunningbar Creek, the Albert Priest Channel and any relevant transfer pipelines, and revise the loss factors in clauses 53(11)(c), 53(12)(b) and 53(13)(b) b) review and revise the existing cease to pump conditions associated with the upper and lower Nyngan weir pools (clause 53(8) and 53(9)). This review should:

264 DPI-Water (2012) *Ibid.*
265 Alluvium and Vista (2019) *Audit of the Water Sharing Plan for the Gwydir Unregulated and Alluvial Water Sources 2012*
266 Interview: DPE-EHG, 10 November 2022.
267 The Commission understands that a joint trigger level for the upper and lower Nyngan weir pools could have implications on current licence provisions and/or works approval of individual licence holders.

	▪ be accompanied by a survey that determines the level in the lower Nyngan weir pool that represents 50 percent of the full capacity, ▪ consider the environmental values associated with the weir pools and town water needs, and ▪ assess whether a joint trigger level for both the upper and lower Nyngan weir pool should be established. c) remove Clause 53(11)(b)[268].

[268] Clause 53(11)(b) states that 'Subclause (1) does not apply to the taking of water under an access licence where the licence holder is a member of the Albert Priest Channel Association'.

7 Delivering outcomes for Aboriginal people

The Commission acknowledges that the Plan area includes Traditional Owners representing several Aboriginal nations, three Native Title groups and 20 Local Aboriginal Land Councils. These nations have longstanding and continuing ties to Country and hold the rivers, wetlands and waterways, including many billabongs, in the Plan area in high regard.

The landscape and its waters provide First Nations people with important links to their history and help them maintain and practice their traditional culture and lifestyle.

The Commission acknowledges that extensive flooding in the Plan area has limited engagement with Aboriginal people for this review. The Commission recognises the importance of engaging with Native Title claimants and Aboriginal people for the Plan reviews and supports DPE-Water undertaking further detailed engagement with Aboriginal communities as part of any Plan replacement process.

The Commission continues to identify critical state-wide issues in water sharing plans relating to Native Title, Aboriginal water rights, and the protection of cultural values. This review highlights several specific issues in the Plan area, including that:

- there are inconsistencies with the *NSW Water Strategy* (**Section 7.1**)
- there is limited recognition of Native Title and Aboriginal land in the Plan area (**Section 7.2**)
- the Plan does not identify and protect Aboriginal water values and uses (**Section 7.3**) or provide for tangible access to water (**Section 7.4**)
- additional shares have been offered under controlled allocations without evidence that Aboriginal water rights were considered before this took place (**Section 7.5**).

7.1 Commitments under the *NSW Water Strategy* must be met

The Commission's recent water sharing plan reviews have acknowledged DPE-Water's commitments to improve stakeholder engagement with Aboriginal peoples and to progress under the *NSW Water Strategy* to address inequality in Aboriginal water rights and access. The *NSW Water Strategy* sets out actions to 'recognise First Nations / Aboriginal people's rights and values and increase access to, and ownership of, water for cultural and economic purposes', including:[269]

- strengthening the role of Aboriginal peoples in water planning and management
- developing a state-wide Aboriginal water strategy and a separate groundwater strategy
- providing Aboriginal ownership of and access to water for cultural and economic purposes
- working with Aboriginal peoples to improve shared water knowledge
- working with Aboriginal peoples to maintain and preserve water-related cultural sites and landscapes.

269 DPIE-Water (2021) *NSW State Water Strategy*

If implemented in a culturally appropriate manner, these commitments will lead to better outcomes for Aboriginal peoples, be consistent with commitments Australia has made as a signatory to the *United Nations Declaration on the Rights of Indigenous People*,[270] and contribute to Closing the Gap targets.[271]

Details on the timelines and processes for implementing an Aboriginal water strategy and its associated actions are now required – this needs to be co-designed with key Aboriginal stakeholders and with increased Aboriginal staff involvement and leadership. The Commission acknowledges that DPE-Water has recently initiated a Cultural Watering Plans pilot project to inform the Department's review of existing policy frameworks and identify opportunities for greater Aboriginal access and ownership of water.[272] It is now critical that DPE-Water establishes meaningful, appropriate, and integrated processes for Aboriginal peoples with relevant knowledge of water management to have input at all levels and stages of water planning, management, and monitoring.

As highlighted by the Productivity Commission inquiry on national water reform, there is still much work to do to secure Aboriginal peoples' interests in water.[273] Collaborations between agencies and First Nations/Aboriginal Peoples to explore ways to integrate cultural flows into contemporary water management, or providing funding to help First Nations communities invest in water for cultural and economic activities are some of the steps to deliver outcomes for Aboriginal peoples.[274] The challenge now is to embed these commitments and actions in the NSW water planning and water licensing framework so that Aboriginal rights and interest in water can be recognised, quantified and actioned in ways that support cultural and economic needs. A simple first step would be to ensure the dual naming of the Macquarie/Wambuul is recognised throughout the replacement Plan.

The first draft *Macquarie-Castlereagh Regional Water Strategy* proposed several actions to recognise and protect local Aboriginal water rights, interests and ensure greater involvement of Aboriginal people in water management. In the second iteration of the draft *Macquarie-Castlereagh Regional Water Strategy*, DPE-Water has outlined explicit actions to address barriers to Aboriginal water rights in the catchment,[275] including:

- **developing ongoing arrangements for participation of local Aboriginal people in water management** – this would include investigating ways to improve the participation of Aboriginal peoples in water management through new approaches, programs, partnerships and funding
- **supporting place-based initiatives to deliver cultural outcomes for Aboriginal people** – this would support the continued development of tailored, placed-based initiatives to improve water and other outcomes for Aboriginal people in the Macquarie-Castlereagh region
- **supporting the development of new water-related Aboriginal business opportunities in the Macquarie-Castlereagh region** – this would include investing in Aboriginal run businesses and initiatives that address water needs or identify new water-related business opportunities.

270 See for example, '*Article 25 Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations in this regard.*' In: United Nations (2007) *United Nations Declaration on the Rights of Indigenous Peoples*
271 Closing the Gap Target (n.d.) *National Agreement on Closing the Gap*
272 DPE-Water (n.d.) *About Cultural Watering Plans*
273 Productivity Commission (2021) *National Water Reform 2020, Productivity Commission Inquiry Report No. 96*
274 MDBA (2022) *Water for First Nations*
275 DPE-Water (2022) *Draft Macquarie-Castlereagh Regional Water Strategy – Consultation Paper*

DPE-Water should ensure the replacement Plan aligns with and supports these actions and the objectives proposed in the *Macquarie-Castlereagh Regional Water Strategy*.

The Commission notes that key barriers to progressing these actions, as well as supporting Aboriginal water rights and interests, are systemic and institutional. They require state-wide legislative, policy and practice change, and significant increases in Aboriginal staff and resourcing – as acknowledged in the *NSW Water Strategy*. The Aboriginal Water Strategy, the *Macquarie-Castlereagh Regional Water Strategy* and the Cultural Water Plan pilot project will be a key step in addressing these issues.

The Commission acknowledges that DPE-Water has been working with key Aboriginal stakeholders to identify and guide actions to recognise Aboriginal peoples' rights and values associated with water for cultural purposes. There has also been increased resourcing for Aboriginal liaison staff in DPE-Water to support a range of planning activities.[276] While these steps are positive, there is still much to be done in this area and the Commission considers improved engagement and focus on co-design of measures to improve outcomes for Aboriginal people a high priority. This is critical to ensure that:

- the needs of Aboriginal stakeholders are met
- critical barriers to water use and access are addressed
- Aboriginal peoples are empowered and valued as knowledge holders and leaders for implementing actions to restore Aboriginal water rights and interests in NSW.

7.2 Native Title and Aboriginal land are not proactively recognised

A significant part of the Plan area is covered by three registered Native Title claims and an Indigenous Land Use Agreement (ILUA). It is important that DPE-Water engages with the Gomeroi, Ngemba, Ngiyampaa, Wangaapuwan, Wayilwan, Warrabinga-Wiradjury and the Tubba-Gah peoples as a priority in the Plan replacement process.

In line with other updated inland water sharing plans, the Plan includes a requirement to provide water to satisfy Native Title rights where a determination or ILUA is made.[277] The Plan also includes a relevant objective, strategy and performance indicator to monitor the extent to which Native Title requirements have been met and a provision to support amendments where Native Title rights may change under the Commonwealth *Native Title Act 1993.*[278]

The Commission recommends that any Native Title claimants are engaged as a priority to identify water-dependent cultural values and how Plan provisions can better support and protect these values as part of the Plan remake and ongoing Plan improvement. The Commission continues to raise concerns regarding the limitations of the extent to which Native Title determinations and established ILUAs are reflected in water sharing plan provisions.

In the development of any new water sharing plan, DPE-Water should draw on information from Native Title claims to help identify cultural assets and plan provisions as they are often the best available information for a plan area and can support the achievement of a plan's cultural objectives. Under the claim registration test, registered Native Title

276 This included funding for representative groups MLDRIN and NBAN as part of developing water resource plans and regional water strategies. Source: Interview conducted during recent reviews of water sharing plans for the Intersection Streams and Lower Murray-Darling unregulated water sources.
277 Clause 20 of the Plan.
278 Clauses 12 and 12A of the Plan.

claimants have proven their connection to Country to an extent where government departments must consult with them.

The Commission also recommends that DPE-Water appropriately consult with the Tubba-Gah people as part of the Plan replacement process to ensure there are provisions in any new Plan to satisfy watering needs under the ILUA. Engagement should then continue through Plan development and implementation in line with actions under Priority 2 of the *NSW Water Strategy*.

7.3 Aboriginal water values and uses are not identified and protected

The Plan aligns with the updated inland (Murray-Darling Basin) plans and includes common objectives, vision, strategies and performance indicators to maintain and improve values and uses of water by Aboriginal people. However, the Plan's background document provides very limited information on Aboriginal values and does not identify any Aboriginal assets in the region. The Commission notes that the draft *Macquarie-Castlereagh Regional Water Strategy* acknowledges the significant importance of the Macquarie Marshes to Aboriginal peoples.

Box 2: The Wayilwan Creation story[279]

The Wayilwan creation story of the Macquarie Marshes and the Macquarie, Bogan, Castlereagh and Barwon-Darling rivers highlights the importance of connectivity of the river system. In this story, a giant tree on the Barwon-Darling River was formed by a range of plants, including the river red gum, coolibah and black box. It looked over the red plains where the Wayilwan people and animals lived. Whenever they left the safety of the three main peaks known as Mt Foster, Mt Harris and Little Mount, which had natural waterholes and waterways, they were attacked by the giant wedge-tailed eagle, Mulliyan, who lived in the tree. To protect themselves while out hunting and gathering, the people and animals decided to get rid of Mulliyan and the giant tree. After many attempts to climb the tree by men and the sand goanna, the water rat got to the top and put a fire stick into the eagle's nest. As the tree burned down it crashed to the south where it created the imprint of the Macquarie Marshes and the Macquarie, Bogan and Castlereagh rivers.

This creation story, and others like it, determine many of the environmental indicators for river connectivity and plant and animal health that the Wayilwan community want to see improve.

There is also a provision common to many water sharing plans that allows for amendments to protect any identified water-dependent Aboriginal cultural assets after Year 5 of the Plan.[280] Plan provisions have not been updated over the life of the Plan to recognise Aboriginal cultural assets or appropriate water sharing rules to maintain these assets. As a matter of priority, DPE-Water should review best available information regarding cultural assets and ensure that water sharing rules maintain these assets as provided for by the amendment provision.

In general, the Commission considers that timed provisions to include cultural assets after a set period are unnecessary, inequitable and could result in harm or desecration of Aboriginal cultural assets. Plan provisions should be updated as a matter of priority

279 MDBA (2017) *Aboriginal environmental outcomes in the Macquarie Marshes*
280 Clause 87 of the Plan.

whenever new information about Aboriginal cultural values becomes available. To support this, DPE-Water should establish systems and procedures that regularly check key sources for cultural and Native Title information updates.

7.4 There is limited tangible water access and uses

Following the identification and protection of Aboriginal water values, the Plan needs to include rules that provide for these values, in ways that are supported by Aboriginal peoples in the Plan area.

As with many other water sharing plans, this Plan only provides for an 'Aboriginal cultural' specific purpose access licence to provide access to water. This can only be used for traditional cultural purposes (not commercial or trading activities) and allocations are capped at up to 10 ML per licence per year. The Commission has not seen evidence of the issue of this licence category in the unregulated river water sources covered by the Plan.

The Commission's reviews consistently find that Aboriginal-specific water licences available in NSW are highly restrictive, inequitable, subject to significant limitations in use and awareness. They are unable to be easily accessed and applied for, or monitored – as noted in a submission to the Castlereagh Unregulated Plan review:

> *'We note that Water Sharing Plans may provide for Aboriginal Cultural Access Licences, Aboriginal Community Development Water Access Licences, and Aboriginal commercial licences however with a range of constraining parameters. We ask that the NSW Government remove constraints on these licences and provide support to Aboriginal communities and Aboriginal Land Councils to access these licences. These provisions must be improved to better meet the needs of Aboriginal water users, ensure the health of communities, and protect our cultural sites.'*[281]

There is limited guidance available to help Aboriginal people apply for licences, or information on the process. Moreover, Aboriginal people are often constrained in using these licences due to limited resources and the infrastructure required to access water. The Commission understand that DPE-Water has factsheets available (previously the responsibility of NRAR) for applying for special purpose access licences for Aboriginal cultural purposes.[282]

In addition, these licences are inherently limiting by excluding economic uses. This is despite the objectives of the Plan clearly stating that Aboriginal economic values are to be maintained and, where possible, improved. This issue was raised as part of the *Macquarie-Castlereagh Regional Water Strategy* consultation process:

> *'We also heard that Aboriginal people want ownership of cultural water entitlements that allow for economic benefit. While there are Aboriginal businesses, groups and Aboriginal Land Councils that own water access licences (which are available on the market for trading), generally the cost involved means that Aboriginal people cannot afford to buy these entitlements and allocations.'*[283]

The Commission notes that Aboriginal peoples and representative groups have put forward a range of mechanisms that could better provide for Aboriginal water values as part of the water sharing plans. The most appropriate way to identify the mechanisms needed to provide for Aboriginal water values is to work closely with Traditional Owners, relevant Native Title holders and claimants, Local Aboriginal Land Councils and local Aboriginal

281 Submission: NSW Aboriginal Land Council, received 16 July 2021.
282 DPIE (2019) *How to apply for a water access licence*
283 DPIE (2020) *Draft Regional Water Strategy: Macquarie-Castlereagh Strategy*

groups, and knowledge holders as part of a well-resourced engagement effort in the Plan area.

To acknowledge this diversity of Aboriginal water interests, the Commission continues to recommend state-wide initiatives for DPE-Water to:

- adopt a common principle across all water sharing plans to ensure that, where additional allocations become available, Aboriginal water needs – including Aboriginal water allocations and/or licences – are assessed and provided for as a priority
- co-design licences or other water custodianship options (volumetric, non-volumetric and non-licensed solutions) with Aboriginal stakeholders that meet a range of identified needs (cultural, environmental, social and economic uses).

7.5 Aboriginal water rights should be prioritised when delivering controlled allocations

Controlled allocations can occur where a water source is not fully committed and there is unassigned water.[284] The Commission understands that this can occur in circumstances where a licence holder surrenders their licence or entitlement to the Minister for Water, such as where they no longer intend to use the water for irrigation. The licence or entitlement may be cancelled or held by the Minister. Licences that are retained can be reissued to other licence holders via controlled allocation. However, before this occurs, risks associated with this action and a prioritisation of needs must be considered, consistent with the objects and principles of the Act.[285]

In previous reviews the Commission has recommended that DPE-Water considers Aboriginal peoples' needs before announcing controlled allocations.[286] However, in March 2022 the NSW Government published controlled allocations in six of the unregulated river water sources that form part of the Plan area.[287]

It is unclear if and how Aboriginal water rights and values were considered when making this controlled allocation order. DPE-Water is encouraged to codify this process and ensure there is greater transparency around what is considered as part of the risk assessment and any assessment of high priority needs before making any future controlled allocations during the term of the replacement Plan. This is particularly important given benefits for Aboriginal people have not been realised in the Plan area and current provisions to improve Aboriginal outcomes have significant limitations.

The process for making controlled allocations needs to be brought into line with the *Water Management Act 2000,* where Native Title is prioritised.

284 NSW DPE (2022) *Controlled allocations*
285 Section 5 of the Act.
286 NSW Natural Resources Commission (2021) *Review of water sharing plans for the Bega and Brogo Rivers Area, Murrah-Wallaga Area, and Towamba River water sources*
287 NSW Government (2022) *Government Gazette of the State of NSW, Number 83 - Electricity and Water*

7.6 Recommendations

R 13	As part of the replacement Plan, to deliver better outcomes for Aboriginal peoples through water management, DPE-Water should: a) include registered Native Title claims and ILUAs and allow sufficient time to undertake detailed engagement with the Traditional Owners and other Aboriginal knowledge holders to identify cultural values and provisions to protect and support these values b) reflect the dual naming of the Macquarie/Wambuul in the Plan c) identify and protect known high value cultural sites and undertake further work with a range of Traditional Owners and knowledge holders to better understand water values and uses, identify the rules to protect them, and support water access and use d) update amendment provisions to state that the Plan can be amended to protect cultural values based on best available information. Any future amendments that occur due to new information should occur in a timely manner. e) undertake state-wide actions identified in the Commission's water sharing plan reviews to improve consideration and respect for Native Title and Aboriginal values in water sharing plans f) ensure Plan objectives and corresponding provisions are consistent with the NSW Water Strategy relating to Aboriginal peoples' rights and values and increase access to, and ownership of, water for cultural and economic purposes g) prioritise Aboriginal cultural rights and interest when making controlled allocations, and codify this process in relevant guidelines and policies, consistent with the objectives and principles of the Act.

8 Improving outcomes through trade

Trade is an important tool for water licence holders, including primary producers, urban water suppliers, and environmental water managers to achieve economic, social and environmental outcomes. In addition, trade can be an important and cost-effective part of a suite of adaptation strategies for climate change.[288] This is critical given climate change may cause a significant shift in the region's climate, potential long-term declines in water availability, and more frequent and intense extreme events.

The Plan includes an objective to '*maintain, and where possible improve, access to water to optimise economic benefits for agriculture, surface water-dependent industries and local economies*', and a targeted objective to '*maintain, and where possible improve, water trading opportunities for surface water-dependent businesses'.*[289] These objectives illustrate that the Plan has a clear intent to adapt and support socioeconomic outcomes, and recognise a need to optimise water use (potentially through the use of trading) given constantly changing water needs in the Plan area.

Although the NSW Government supports an open, fair, efficient and sustainable water market that is characterised by integrity, transparency and accountability,[290] the Commission notes that the Plan currently prohibits most forms of water trades. In particular, the Plan prohibits:[291]

- licence conversions (dealings under section 710 of the Act)
- licence/entitlement trades ('permanent trades') in most water sources (dealings under 71Q of the Act)[292]
- allocation trades ('temporary trades') in most water sources (dealings under section 71T of the Act)[293]
- amendments to share components and extraction component dealings[294] for unregulated river (special additional high flow) access licences and other licences in most of the Plan's water sources (dealings under 71R and 71S of the Act)
- nomination of water supply works dealings[295] in most water sources (dealings under section 71W of the Act).

These trade restrictions are based on DPE-Water's assessment of instream values for each unregulated water source conducted when the Plan was developed. This assessment concluded that 26 of the Plan's 30 water sources had 'high' instream values.[296] Thus, DPE-Water adopted a precautionary approach to trade in the Plan area:

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288 Trade provides an opportunity to reallocate scarce resources during climate extremes, including droughts, which can benefit the environment, social and economic outcomes.
289 Provision 11 of the Plan.
290 DPE-Water (2020) *High Level Submission*
291 Part 10 of the Plan.
292 This includes the sale of all or part of a water access licence.
293 This includes the sale or transfer of all or part of the water held in a licence holder's annual account under a trade agreement.
294 This includes the change in location where a water access licence can be used and the movement of the licence to another water source or part of the water source.
295 This includes the amendment of the licence for delivery of water from an alternative water supply work or group of works.
296 The only water sources that were not classified as having a high instream value were the Coolbaggie Creek, Upper Bogan River, Wambangalong Whylandra Creek and Ewenmar Creek. DPI-Office of Water (2012) *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*, page 10.

> '*High instream value water sources are, by default, protected by the plan by not allowing any trades in. Trades are allowed into some water sources with lower value in order to encourage the movement of extraction from high to lower environmental values.*'[297]

The Commission acknowledges that trade limits remain an important mechanism to protect environmental and basic landholder rights outcomes. In addition, expanding trade opportunities could enhance the risk of LTAAEL exceedance (see **Chapter 3**), especially if current access rules do not provide sufficient protection. The Commission considers that DPE-Water should prioritise the development of appropriate access rules instead of applying a blanket prohibition on trade in all circumstances.

Given the Plan area's close and complex connectivity to the regulated Macquarie/Wambuul river system (see **Section 6.1**) and the location of the Macquarie Marshes, the trade provisions of the Plan are complex and opaque, which may hinder licence holders from taking full advantage of existing trade opportunities.

A review of past trade data has highlighted that there have been 22 permanent trades (71Q trades)[298] and 46 temporary trades (71T trades)[299] over the life of the Plan.[300] Compared to the large number and volume of trades in the regulated inland river systems, the Commission notes the limited market depth in the unregulated water source in the Plan area, which is likely due to the complex trade restrictions.

A comprehensive review of Part 10 of the Plan could expand further economic and social opportunities in the Plan area. A review could also improve alignment with the Plan's economic objectives, strategies and performance indicators, and better align with the *National Water Initiative* objective to progressively remove trade barriers to facilitate a deepening of the water market.[301] This review and any revision to the existing trade provisions should ensure that environmental, basic landholder rights, Aboriginal cultural, and other instream values remain protected, consistent with the objects and principles of the Act.

Some stakeholders have expressed an interest in removing trade restrictions in the Plan area,[302] while others highlighted that expanding trade opportunities could lead to impacts on environmental and basic landholder rights.[303] The Commission considers that DPE-Water should review existing trade rules to determine whether there are opportunities to further relax trade constraints in the Plan area, while maintaining protections for the needs of the environment and basic landholder rights. However, the Commission notes that any change to trade should only be undertaken when there is an effective compliance regime.

As a starting point, improvements to the Plan's trade provisions can be facilitated by:

- using latest information to expand trade in low-risk areas (**Section 8.1**)
- investigating if trade between the regulated and unregulated Macquarie/Wambuul river system could further support connectivity (**Section 8.2**)

297 DPI-Office of Water (2012) *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*, page 10.
298 There have been 42 additional dealings over the life of the Plan. These include trades in accordance with clauses 71R, 71S, 71W and 71P of the Act.
299 The majority of trades occur in the Lower Macquarie.
300 The Commission notes that trade reporting by WaterNSW lacks transparency as trades are grouped into categories. This makes it difficult to report on trades under specific Plan provisions.
301 Department of Climate Change, Energy, the Environment and Water (2022) *Intergovernmental Agreement on National Water Initiative*, Clause 23.
302 Submission: Orange City Council, received 23 May 2022.
303 Interviews: DPE-EHG, 10 November 2022; DPI-Fisheries, 9 November 2022.

- assessing if trade could be expanded in the Bulbodney Grahway Water Source (**Section 8.3**)
- assessing if trade in the upper Macquarie could further support town water security (**Section 8.4**).

8.1 New information could expand trade in low-risk settings

New data and research undertaken since the Plan was developed provide a better understanding of the ecological values and hydrologic needs across the Plan area,[304] which could support a more granular assessment of the likely risks and benefits associated with trading activities. This information should be used to review the existing trade rules and expand opportunities where trade should be permitted at the appropriate scale in low-risk settings, while still protecting environmental, Aboriginal cultural and other instream values.

The *Water Resource Plan Risk Assessment* provides comprehensive information on the hydrologic stress of each water source and ranks them according to a consequence score. These scores provide an indication of the potential impacts to ecological functions and assets using the HEVAE values and the extraction pressures within each water source. The risk assessment for the Macquarie-Castlereagh catchment assigned the following unregulated water sources with very high or high consequence scores:[305]

- **Fish River**[306] – due to the presence of several species of threatened frogs
- **Wambangalang Whylandra system and the Coolbaggie Creek** – due to the presence of EECs and threatened fish
- **Upper and Lower Bogan River, the Bulbodney Grahway Creek, Backwater-Boggy Cowel, Ewenmar Creek, Marra Creek, Lower Macquarie River and Marthaguy Creek** – due to the presence of EECs and threatened fish. The Lower Macquarie River also rates very high due to its proximity to the Ramsar wetlands.

All other remaining water sources in the Plan area have been assigned a medium or low risk, which suggests that an expansion of trading opportunities could be explored. DPE-Water should review whether trade in and between these lower risk water sources could be expanded.

The *Macquarie-Castlereagh Long-Term Water Plan* also provides information on key water-dependent values and stresses, water source or planning unit hydrology (including connectivity) and recommended management strategies, HEVAE mapping and some cultural values, which should be considered by DPE-Water in developing the replacement Plan.[307] DPE-Water should also consider the newly developed climate datasets and updated hydrologic models developed for the regional water strategies when reviewing the Plan's trade provisions. This information will be important to better understand the risks and

304 DPIE-Water (2020) *Macquarie-Castlereagh Long-Term Water Plan*
305 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
306 Despite the consequence score, the Commission notes that Clause 83(b) of the Plan allows for amendments to the Plan's access licence dealings provisions if WaterNSW can demonstrate to the Minister's satisfaction that such rules will have no more than minimal impacts on, but not limited to: Bathurst City Council's water supply and inflows into Burrendong Dam, the water source, nothing high-instream environmental values in Duckmaloi Creek, and other unregulated access licence holders in these water sources from any growth-in-use response that could result from dealings into the water source.
307 DPIE-Water (2020) *Macquarie-Castlereagh Long-Term Water Plan*. The Commission acknowledges that there are some data and modelling limitations.

consequences of future climate variability and climate change on the region's water sources and trade opportunities.

Recognising that many issues associated with trade are state-wide, DPE-Water advised that it is currently reviewing trade rules for unregulated rivers (coastal and inland). In developing the replacement Plan, DPE-Water should draw on the findings in other plans to determine the most appropriate dealing rules and trading zones for the Plan area and explore opportunities to reduce restrictions on trade. Provisions should be designed at the appropriate geographic scale and clearly stated in the Plan to support trade within environmental and system constraints. The Commission supports the inclusion of updated trade rules where it can be demonstrated that environmental needs are protected and economic and social outcomes can be improved.

While trade rules should be reviewed as soon as possible, and no later than in the replacement Plan, the Commission does not support interim case-by-case trade arrangements. These interim case-by-case trade arrangements would require the suspension of the Plan's dealing provisions and the development of individual assessment criteria, which would take the focus away from developing revised Plan rules.

In addition, DPE-Water should consider preparing an accompanying explanatory plain English document on the Plan's access licence dealings provisions to provide greater clarity and transparency to licence holders and WaterNSW on where trades are permissible.

8.2 Trade may be used to manage connectivity

The *Access Licence Dealing Principles 2004* currently prohibits trade from an unregulated river water source to a regulated water source but does not prohibit trade from regulated to unregulated water sources.

In this context, several stakeholders raised concerns and frustration about the Plan's limited trade opportunities in the lower Macquarie-Bogan area and the existing trade restrictions between the regulated Macquarie/Wambuul river system and unregulated water sources in the Plan area:

> *'The Macquarie unregulated river system has no opportunities to trade water. There are only 3 active irrigators that all have sufficient water licences for a river system that yields less than 3 years in 10. That is both unfair and unique.'*[308]

Licence holders have asked that DPE-Water consider opening up trading opportunities with the regulated Macquarie/Wambuul and Barwon-Darling river systems to promote economic opportunities.

The Commission notes that the *Macquarie-Castlereagh Water Resource Plan Risk Assessment* has categorised the Lower Macquarie River Water Source as having a very high consequence score due to the presence of EECs and threatened fish, as well as its close proximity to the Macquarie Marshes.[309] In addition, cease to flow, low flows and baseflow freshes have all decreased compared to modelled near-natural conditions according to the *Macquarie-Castlereagh Long-Term Water Plan*.[310]

308 Interview: Landholder, 20 October 2022.
309 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
310 DPIE-Water (2020) *Macquarie-Castlereagh Long-Term Water Plan* – Part B.

As noted in **Chapter 4**, there are gaps in the application of the active management rules that need to be resolved as a priority to ensure the active management rules meet their intended outcomes. However, despite these gaps, the Commission encourages DPE-Water to review the benefits and risks of increasing trade opportunities between the regulated Macquarie/Wambuul river system and downstream unregulated river systems. In considering such expanded trade opportunities, DPE-Water needs to address the existing issues with active management (see **Chapter 4**) and demonstrate that environmental, basic landholder rights and Aboriginal cultural needs can be effectively protected. Such a review would promote the principles of the National Water Initiative and be in in line with the intent of the Basin Plan trading rules.[311]

The Commission also notes the recommendations made in DPE-Water's *2020-21 Active Management Annual Evaluation and Review Report*, [312] which acknowledged ambiguities around cease to pump conditions if water is traded from the Marthaguy Water Source to an existing work on the Lower Macquarie Downstream Management Zone.[313] The Commission supports DPE-Water implementing the review report's recommendations, particularly revising the trade rules between management zones and notifying landholders (see **Section 4.1**).

Stakeholders also raised concerns about practically working with the existing active management rules:

'Contrary to the feedback provided from water users, the existing Active water management rules are complex, disregard historical practices and are unworkable. For example daily extraction limits fluctuate from 0-200megs/day – On farm level a pump can take 2 hours to start: how do you communicate with a manager today you can't pump, tomorrow for 3.5 hrs and the following 12 hours even though the river is a constant height). Particularly if we don't know our daily limit until 8pm the day before. We have asked for If the Department could forecast flows and provide an indication of the volumes that can be pumped during a week-long period then this leaves irrigators more options to design an appropriate schedule.'[314]

The Commission suggests that DPE-Water considers the feasibility of providing greater clarity around volumes that could likely be extracted in advance, as well as greater flexibility to licence holders, especially if it can be built into the active management protocol.

8.3 Trade in the Bulbodney Grahway Water Source is highly restrictive

Stakeholders have raised concerns that trade in the Bulbodney Grahway Creek Water Source is very restrictive and suggested it should be relaxed to enable more entitlements to be traded into the Nyngan weir pools to allow for more high value irrigation in the area.[315]

The Plan restricts trade into the Nyngan weir pools via Clauses 67-70. In particular, Clause 67(c) sets out that dealings under Section 71Q of the Act are prohibited if the dealing involves an assignment of rights from an access licence in the Bulbodney Grahway Management Zone to an access licence in the Upper Nyngan Weir Pool Management Zone or the Lower Nyngan Weir Pool Management Zone.

311 MDBA Basin Plan Trading Rules
312 DPIE (2022) *2022-21 Active Management Annual Evaluation and Review – Full Report*
313 DPIE (2022) *Ibid.*
314 Interview: Landholder, 20 October 2022.
315 Interview: Nyngan Weir Pool Irrigators, 8 November 2022.

The Nyngan Weir Pool Irrigators Association suggested that there is limited rationale for the existing restriction[316] while continuing to have access provisions that rely on 'no visible flows' in the Bogan River (clauses 53(2) and 53(10)).

In addition, licence holders told the Commission that existing weir pool users did not want to see a complete ban on trade into the Nyngan weir pools when the Plan was made, instead wanting existing licence holders to have exclusive rights to the draw down from the weir pools.

DPE-Water's *Macquarie-Castlereagh Water Resource Plan Risk Assessmen*t assigned the Bulbodney Grahway Creek Water Source a 'high' consequence score but identified that there are low risks to zero flow, freshes, and high and infrequent flows in the Bogan River and a high-risk to base flow or low flows.[317] Further, DPE-Water identifies that the current critical mechanisms in place to manage the existing risks in the Bogan River include:[318]

- cease/commence to pump rules for streams
- cease/commence to pump rules for instream and off-stream pools
- restrictions on the construction of in-river dams on 3rd order or higher streams and
- trade limits or prohibition between surface water plan areas, water sources and management zones to manage entitlement growth.

The Commission acknowledges these mechanisms but continues to stress that the establishment of more adequate access rules in the Bulbodney Grahway Management Zone may be more appropriate to protect base flows and low flows, rather than prohibiting trade in all circumstances.

With adequate access rules and appropriate LTAAEL accounting and compliance assessment (see **Chapter 3**), there is merit in DPE-Water exploring opportunities to expand trade in the Bulbodney Grahway Creek Water Source for any licence holders and revising trade restrictions under Clauses 67-70. This should also consider the adequacy of access provisions in Clauses 53(8)-(13). Any review needs to ensure that amendments to Clauses 67-70 do not lead to negative impacts on the environment, basic landholder rights and town water supply arrangements, consistent with the water management principles of the Act.

8.4 Trade in the upper Macquarie could support town water security

As outlined in **Chapter 5**, the upper Macquarie has seen significant population growth over the life of the Plan. The area also has a high concentration of town water infrastructure. Existing access rules linked to dam levels are inadequate (see **Section 5.3**), which needs to be addressed. However, councils also raised concerns that Plan provisions limit entitlements being traded between different water sources. In particular, Orange City Council mentioned that if it wanted to transfer parts of their entitlement from the Summerhill Creek Water Source to the Macquarie River extraction point to support operation in any one year, it could not transfer water back again.[319] The Council suggested

316 Submission: Nyngan Weir Pool Irrigators, received 1 May 2022.
317 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
318 NSW Department of Industry Water (2018) *Ibid.*
319 Submission: Orange City Council, received 23 May 2022.

that the trade rules should be relaxed to allow an entitlement to be moved back to the water source it originally came from.

According to the Plan, temporary or permanent trade into the Summerhill Creek Water Source are not permitted under clauses 70(2)(c)(xvii) and 67(1)(i).

Contrary to the original instream value assessment, which categorised Summerhill Creek Water Source as having a 'high' instream value, the *Water Resource Plan Risk Assessment* assigns the water source a 'low' consequence score.[320] However, the Long-Term Water Plan indicates that cease to flow periods and low flows in the water sources are highly altered (more than 50 percent departure from base case), and freshes are moderately altered (20-50 percent departure from base case). Cease to flow periods currently occur more frequently, and low flows and freshes occur less frequently compared to the 'without development' model scenario.[321] DPE-Water should consider whether the Plan should permit trade back into a water source if the entitlement originates from this water source in order to improve town water security without undue impacts on the environment and basic landholder rights.

8.5 Recommendations

R 14	To improve outcomes through trade, in the next two years, DPE-Water should: a) review and revise existing water access licence dealing provisions at an appropriate scale. This review should be based on the latest information on hydrologic stress, entitlement volumes, connectivity, HEVAE mapping and cultural assets and values, supported by an accompanying plain English explanatory document. In addition, this review should consider the interrelationships between the unregulated and regulated water sharing plans and the impacts on all flow categories (including high flow dependent environmental values). b) implement the Plan-specific recommendations from the *2020-21 Active Management Annual Evaluation and Review – Full Report* to: i. revise the trading rules between management zones in the Macquarie-Bogan to manage the impact of trading in and out of entitlements with different access provisions ii. notify licence holders of current trading rules between zones with different access thresholds.

320 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*

321 DPIE-Water (2020) *Macquarie-Castlereagh Long-Term Water Plan* – Part B.

9 Improving the management of floodplain harvesting impacts

Work to licence floodplain harvesting extraction in NSW has focused on northern NSW valleys where floodplain harvesting is considered more prevalent. In contrast to other northern NSW valleys, including the Gwydir or Border Rivers catchment, DPE-Water has stated its intent to issue floodplain harvesting licences only in the regulated Macquarie-Cudgegong water sharing plan area, and not the unregulated Macquarie-Bogan or Castlereagh plan areas.[322] Thus, DPE-Water is not intending to make any amendments to the unregulated plans in the Macquarie-Castlereagh catchment to account for the management of floodplain interception activities in unregulated Macquarie-Bogan or Castlereagh water sharing plan areas.[323]

The Commission considers that the narrow consideration of licensing and managing floodplain harvesting via the regulated Macquarie-Cudgegong Plan does not address the complex interactions between the regulated and unregulated water sharing plan areas or the impact of floodplain harvesting on unregulated water sources (**Figure 6**). It also does not aid the understanding of, or adequately address, the cumulative impacts of different types of extractions across multiple water sharing plan areas and floodplain management plans. This is inconsistent with the principles of the Act[324] which include that "*the cumulative impacts of water management licences and approvals and other activities on water sources and their dependent ecosystems, should be considered and minimised*."

Floodplain harvesting concerns the take of overbank flows. Flows that spill out onto the floodplain are important for maintaining floodplain vegetation communities and floodplain wetlands (see **Chapter 4**), which provide critical habitat for a range of species and support the overall productivity of river floodplain systems.[325] Floodplain harvesting poses a risk to downstream water users and environmental values, including the Ramsar-listed Macquarie Marshes, which is the largest flood-dependent ecological asset in the catchment.[326]

The NSW Government has administered floodplain management in the Macquarie valley since the late 1970s, in response to the construction of flood works that directed flood waters in the catchment to deliver water to crops or protect high value crops from flood damage.[327] Most of the government's early efforts were focused on areas with intensive irrigation development and where major flood events showed changes to flooding behaviour that were caused by flood works – particularly channels and levee banks built between Narromine and Oxley Station.[328]

322 DPE-Water (n.d.) *Floodplain Harvesting licence rules in the water sharing plan for the Macquarie valley*
323 This is despite Clause 87(1)(a) allowing for the Plan to be amended to manage floodplain harvesting in the Plan area.
324 Section 5(2)(d) of the Act.
325 DPIE-Water (2021) *Background document to the Macquarie Valley Floodplain Management Plan 2021*
326 The ecological significance of the Macquarie Marshes is recognised at local, state and national levels of government and internationally through the Ramsar Convention. When inundated for extended periods, the Marshes are an important breeding and refuge area for a variety of waterbirds, including egrets, ibis, herons, spoonbills and cormorants, in additional to other wetland fauna. The Marshes can support more than 500,000 waterbirds in large floods. Native floodplain vegetation including extensive communities of river red gum, common reed beds and water couch areas are distinctive features of the Marshes.
327 DPIE-Water (2021) *Background document to the Macquarie Valley Floodplain Management Plan 2021*
328 Flood works have redistributed flows and increased flow velocities on the Macquarie Valley Floodplain during historic flood events, in some cases resulting in bank failure and substantial flood damage.

In August 2022, DPE-Water published[329] its intent to issue 52,547 unit shares of floodplain harvesting (regulated river) access licences.[330] Subsequently, the licensing of floodplain harvesting in the Macquarie and Cudgegong Regulated River Water Source commenced on 1 March 2023. The share volume is comparatively small when considered against the 632,000 unit shares of regulated river (general security) licences and 50,000 unit shares of supplementary licences on issue in the regulated Plan area. However, this volume is significant when compared against the share components in the water sources of the unregulated Macquarie-Bogan Plan area,[331] which overlaps with the designated Macquarie Valley floodplain (**Table 7**).

Table 7: Share component in the Plan's water sources overlaying the Macquarie Valley Floodplain

Water source	Unregulated river share component	Unregulated river (regulated supply)	Unregulated river (special additional high flow)
Lower Macquarie River Water Source	48,720.5 unit shares		3,078 unit shares
Marra Creek Water Source	307 unit shares		
Marthaguy Creek Water Source	4,312 unit shares		
Ewenmar Creek Water Source	1,248.5 unit shares	63,836 ML per year	
Backwater Boggy Cowal and Lower Bogan River Water source*	4,409 and 3,669 unit shares	915 ML per year	39,029 unit shares (Lower Bogan)

* DPE-Water's factsheet is unclear how the Department's floodplain management zones align with the Plan's water sources and the associated licenced entitlement volumes. The Commission has considered the Backwater Boggy Cowal Water Source and the Lower Bogan River for this comparison.

DPE-Water has indicated that eight management zones will be created to manage floodplain harvesting (regulated river) access licences and to facilitate active management and dealing rules in the Macquarie valley.[332] These management zones align (to a large extent) with existing water source or management zones in the unregulated Macquarie-Bogan Plan area. However, parts of the floodplain in the Macquarie catchment that overlay the unregulated Plan area are captured in the declared Barwon-Darling Floodplain (**Figure 6**). This complicates the management of floodplain harvesting activities and makes the accounting of water take and diversions less transparent.

329 DPE-Water (2022) *Rule summary sheet*
330 These regulated floodplain harvesting licences would be issued to eligible landholders in the designated Macquarie Valley Floodplain or, more specifically, eight (clipped) management zones that are based on existing water source or management zone boundaries in the Macquarie Bogan unregulated river water sources.
331 Part 5, Division 3 of the Plan.
332 DPE-Water (2022) *Rule summary sheet*

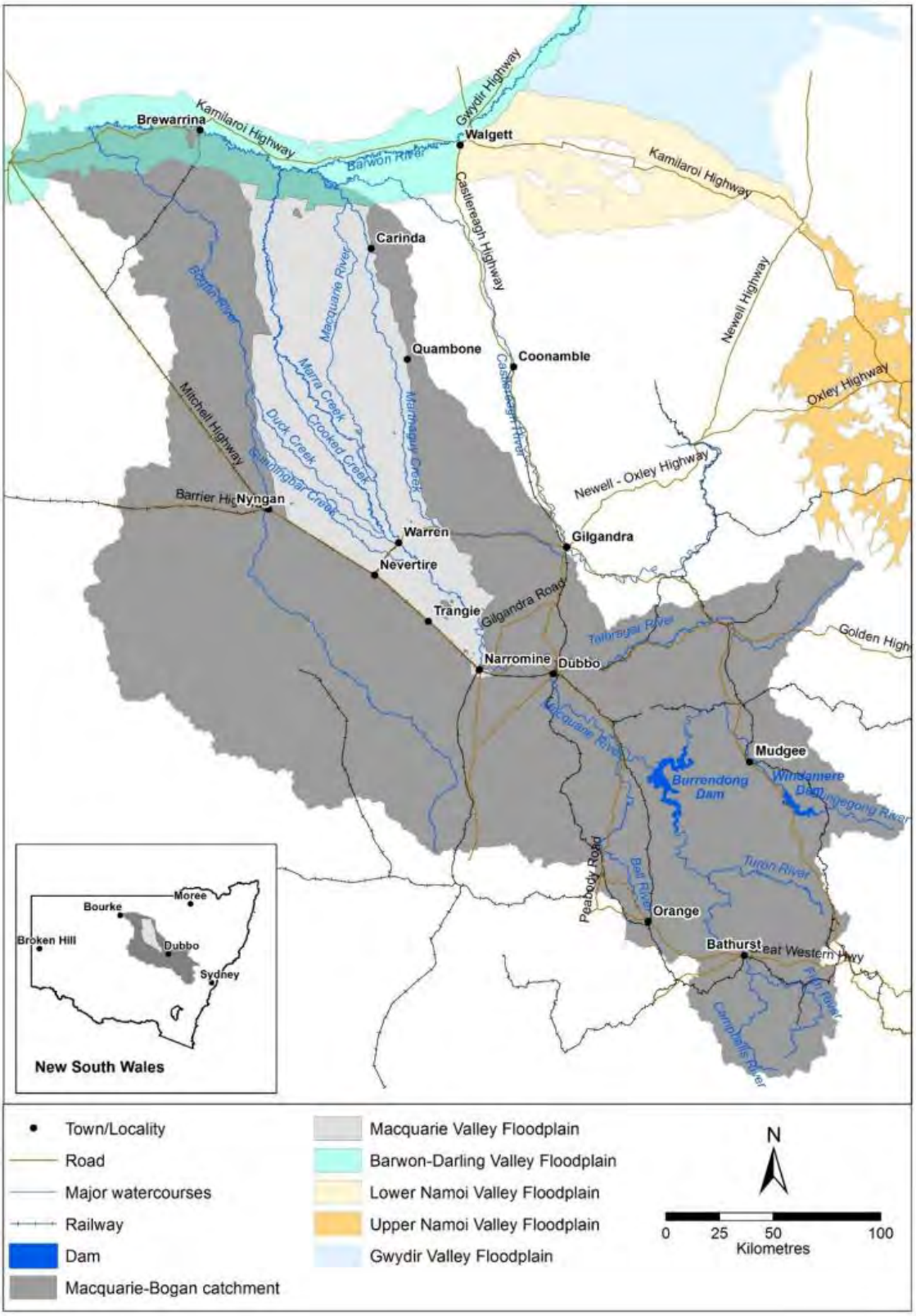

Figure 6: Designated floodplain and water sharing plan areas in the Macquarie-Bogan catchment[333]

333 DPIE-Water (2021) *Background document to the Macquarie Valley Floodplain Management Plan 2021*

Although floodplain harvesting licences were issued in Macquarie and Cudgegong Regulated River Water Source in March 2023, the Commission considers there are still opportunities to refine the Plan provisions to better manage floodplain harvesting across multiple plan areas and address potential cumulative impacts of floodplain harvesting. In addition, there are opportunities to address risks to the protection of the environment and improve the implementation of active management (see **Chapter 4**).

To better manage the impacts of floodplain harvesting in the Macquarie-Castlereagh catchment, there are several issues DPE-Water should consider, including:

- multiple plan boundaries complicate the management of floodplain harvesting (**Section 9.1**)
- cumulative impacts on unregulated rivers have not been assessed (**Section 9.2**)
- some floodplain structures may not have been assessed or approved (**Section 9.3**).

9.1 Multiple plan boundaries complicate the management of floodplain harvesting

The Macquarie Valley foodplain[334] (**Figure 7**) begins at Narromine and includes a system of effluent creeks flowing towards the Bogan River at its western extent, and Marthaguy Creek at its eastern extent.[335] The northern extent of the floodplain is marked by the confluence of the Macquarie River[336] and Marthaguy Creek.[337]

Major effluent streams in this region at the western extent of the Macquarie Valley Floodplain include the Beleringar, Gunningbar, Crooked, Duck and Marra creeks, which carry flows from the Macquarie River to the lower Bogan River and Barwon River. Downstream of Warren, between Marebone Weir and Carinda, the Macquarie River flows for 120 kilometres through a network of effluent channels and anabranches, including the internationally and nationally significant Macquarie Marshes wetlands (**Figure 7)**. The Macquarie River exits the Macquarie Marshes as a single channel and flows for 80 kilometres to the Barwon River, upstream of Brewarrina. In this reach, known as the lower Macquarie, the Macquarie River is joined by the Marthaguy Creek, followed by the Castlereagh River.[338]

The majority of floodwater within the Macquarie Valley Floodplain originates from the Macquarie River upstream of Narromine and several locations along the length of the river. However, there are several ungauged tributaries that can contribute significant volumes of water to floods within the Macquarie Valley. These tributaries flow into the Macquarie

334 Approximately 648,100 hectares (52% of the Macquarie Valley floodplain) is outside the inundation extent of the small and large design floods and/or an urban area where there is FS, FRMS, FRMP, or an area that is protected by a flood mitigation work, such as a town levee. These floodplain areas are not part of the floodway network and the floodway network is the hydraulic basis for the management zones, rules and assessment criteria of the Macquarie Valley FMP 2021.

335 The original floodplain areas designed under Part 8 of the Water Act 1912 were the Lower Macquarie Floodplain (designated in 1985) and the Macquarie River Floodplain (designated in 2008 as part of the Macquarie River floodplain management plan 2008). The floodplain was extended from the Macquarie River floodplain for the Macquarie River floodplain management plan 2008 to include the Macquarie Marshes and the effluent creek system. Part of the floodplain of the Marthaguy Creek, a tributary of the Macquarie River, was also included because of significant flooding during the December 2010 flood and the contribution of substantial inflows to the Macquarie River.

336 The channel capacity of the Macquarie River decreases progressively downstream of Narromine as it enters the flat alluvial plains near Warren, which are characterised by a complex system of anabranches and effluent creeks connecting the Macquarie, Bogan and Barwon-Darling rivers.

337 DPIE-Water (2021) *Background document to the Macquarie Valley Floodplain Management Plan 2021*

338 DPIE-Water (2021) *Ibid.*

Valley Floodplain from its eastern boundary, generally flowing in a north-westerly direction and having several links and interactions with flow from the Macquarie River. Notable ungauged tributaries are Marthaguy and Ewenmar creeks, which are both unregulated streams governed by the unregulated Plan. Flows from these tributary systems can interact with floodplain flows from the Macquarie and are therefore important to consider in the context of water take and management of floodplain harvesting in the catchment.[339]

In addition to the Macquarie Valley Floodplain, the Barwon Darling Valley Floodplain also overlays parts of the Macquarie catchment and the unregulated Plan area.[340] Water sources that fall under the Barwon-Darling Valley Floodplain include the Lower Macquarie, Lower Bogan and Lower Marra Creek water sources. Thus, works used for floodplain harvesting in the Macquarie catchment will be managed under two different floodplain management plans, while the access licences are managed under the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016*. Each of these plans have different management boundaries:

- the *Floodplain Management Plan for the Macquarie Valley Floodplain 2021*
- the *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017*
- the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016* (the Macquarie-Cudgegong Plan).

Although the Macquarie Valley Floodplain is fully contained within the boundaries of unregulated Macquarie-Bogan Plan area (**Figure 7**), access rules designed to manage floodplain harvesting in the Macquarie Valley will only be contained in the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016.* The Commission has not seen evidence of how DPE-Water has considered the potential interaction between the proposed access rules for regulated floodplain harvesting licences and the access rules for existing unregulated river water access licences. This could be problematic as floodplain harvesting licences will be issued adjacent to unregulated water sources in the Macquarie-Bogan Plan area. Without understanding the impacts between the access rules for regulated and unregulated licences, this could lead to inequitable take conditions amongst different licence holders and lead to impacts on the environment.

339 DPIE-Water (2021) *Background document to the Macquarie Valley Floodplain Management Plan 2021*
340 DPE-Water (n.d.) *Barwon-Darling valley floodplain*

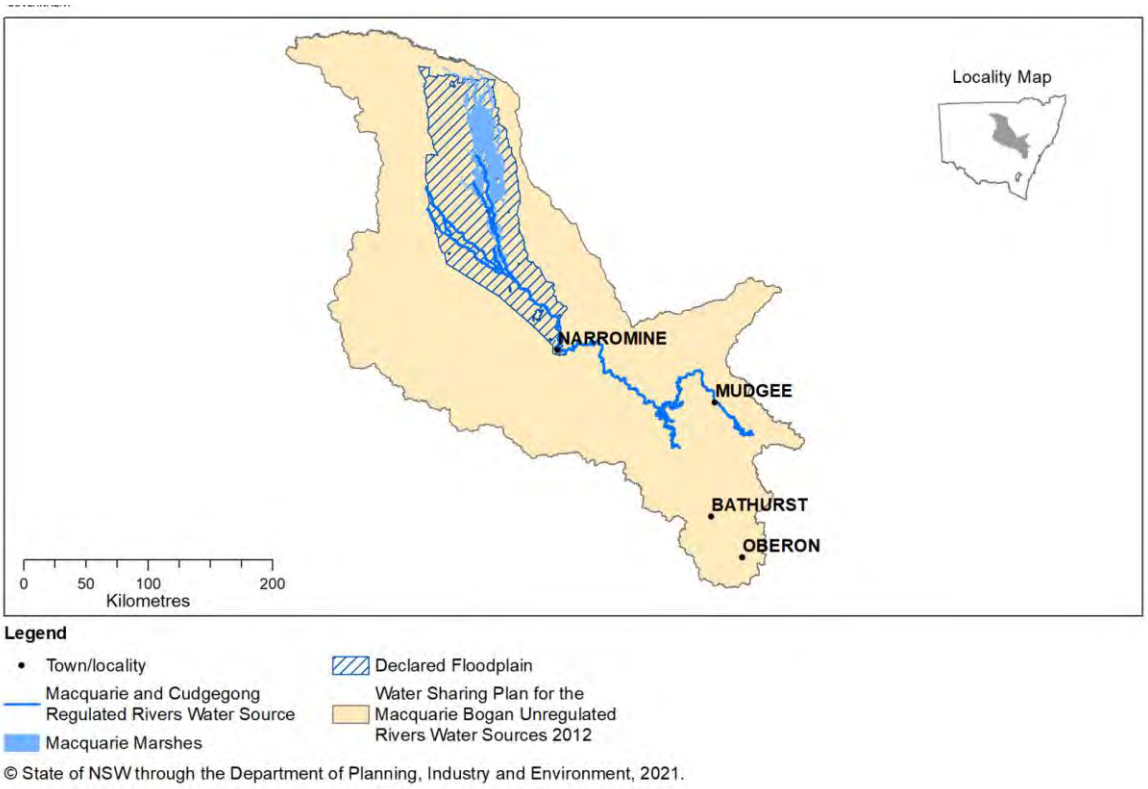

Figure 7: Macquarie Valley declared floodplain[341]

Further, areas downstream of the designated Macquarie Valley Floodplain that could be impacted on by the issue of regulated floodplain harvesting licences, like the lower Bogan or Castlereagh floodplains, are not included or considered in the Macquarie Valley Floodplain because they were not considered as being influenced by the hydrology of the Macquarie Valley.[342] As noted in **Chapter 6**, there are multiple significant hydrologic connections between the regulated and unregulated Plan areas, particularly downstream of Warren. The assumptions that the lower Bogan is not influenced by the hydrology of the Macquarie River should be reconsidered in the context of the most recent floods. The close connectivity between water sources in the Macquarie catchment is also raised in the background document to the *Macquarie Valley Floodplain Management Plan 2021*, which states that *'flooding can be influenced by floodwaters from the Bogan, Castlereagh and Barwon rivers at the fringes of the Macquarie Valley Floodplain'.*[343]

The existence of multiple water sharing plans and floodplain plan boundaries makes it difficult to assess the impacts of extractions and water diversion on the catchment. It also makes it difficult to understand whether the introduction of a new licence class in the regulated Macquarie-Cudgegong Plan will cause any equity issues in other plan areas. As part of the replacement process, DPE-Water should consider utilising clause 87(1)(a) to develop appropriate Plan provisions to effectively manage the impacts of floodplain harvesting in the Plan area. These provisions should align and complement provisions relating to floodplain harvesting in the regulated Macquarie-Cudgegong Plan (see **Recommendation 15**).

As discussed in **Chapter 3**, extractions could potentially be more equitably managed if the Plan included more than one EMU and LTAAEL. As part of the work investigating this change, DPE-Water should consider the most appropriate boundary between EMUs and if

341 ..... DPIE-Water (2021) *Background document to the Macquarie Valley Floodplain Management Plan 2021*
342 DPIE-Water (2021) *Background document to the Macquarie Valley Floodplain Management Plan 2021*
343 DPIE-Water (2021) *Ibid.*

one should align with the gazetted floodplain. This would recognise that floodplain harvesting has a unique extraction profile compared to river extraction, and allow appropriate access and account management provisions to be applied across the Plan area.

9.2 Cumulative impacts on unregulated rivers have not been assessed

The Act's principles require the consideration and minimisation of the cumulative impacts of water management licences and approvals and other activities on water sources and their dependent ecosystems. As part of this, understanding the impacts of extraction under each licence type on water sources is important to define daily access provisions and trade rules.

Floodplain harvesting (regulated river) licences – as a new licence type in the Macquarie catchment – will likely have an impact on the region's unregulated river water sources that adjoin the regulated river. The Commission considers that the risk of this new share component on unregulated water sources is not well understood or clearly discussed in any published reports.[344] Modelling for regulated rivers also does not adequately address the potential risks of floodplain harvesting on unregulated rivers in the Plan area.[345]

For example, DPI-Water published a risk assessment to inform the development of the *Macquarie-Castlereagh Surface Water Resource Plan* in 2018. Although the risk assessment is meant to provide a comprehensive assessment of the risks to the Macquarie Valley's water sources (including unregulated water sources), it has omitted to assess and discuss the impact of floodplain harvesting on the Plan's water sources and environmental values.[346]

In addition, there is little evidence that the proposed access rules for regulated floodplain harvesting licences fully consider existing access rules in the unregulated Plan area. According to the DPE-Water factsheet, which summarises the proposed access rules for future floodplain harvesting licences:

> *'Take [is] not permitted under a floodplain harvesting (regulated river) access licence when there is less than 195 GL in the Menindee Lakes system (as defined in the Murray Darling Basin Agreement). Rules cease to apply during periods when there is a combined flow forecast to occur that is at least 3,400 ML/d at Marebone Break d/s regulator gauge (421088) and Marebone Weir gauge (421090).'*[347]

Although the Commission acknowledges the consideration of downstream catchment conditions, these rules do not adequately consider the interplay between the access provisions for floodplain harvesting licences and other unregulated water access licences[348] in the Plan area (see **Recommendation 15**). For example, the Plan area includes several different licence types (unregulated water access licences, unregulated (regulated) water access licences and unregulated (special additional high flow water access licences)) in the Ewenmar, Lower Macquarie and Lower Bogan water sources, which

344 DPE-Water (n.d.) *Floodplain harvesting licence rules in the water sharing plan for Macquarie valley*
345 DPE-Water (2022) *Modelling reports*
346 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*
347 DPE-Water (2022) *Rule summary sheet*
348 As noted in Chapter 3, access conditions for the Plan's water access licences are dispersed across water access licence conditions and works approval conditions thus it is not straight forward to compare these access conditions with a set of proposed draft access conditions for regulated floodplain harvesting licences.

are located adjacent to the designated Macquarie Valley Floodplain. The share component and access conditions for these types of licences are summarised below:[349]

- **Ewenmar Creek Water Source**: the share component of unregulated (regulated) water access licences is 63,836 ML. These licences allow the take of water if there is a visible flow in Ewenmar Creek at the Oxley Highway Bridge.
- **Lower Macquarie Water Source**: the share component of unregulated water access licences is 33,282 ML. These licences have complex access conditions, including specific flow access conditions for each individual licence. These licences are also subject to active management and replenishment flow announcement conditions that restrict the access of water at certain times.
- **Lower Bogan Water source**: the share component of unregulated river (special additional high flow) water access licences is 37,802 ML. These licences have standard visible flow conditions associated with the location the water is taken. Although the Lower Bogan Water Source is outside the designated Macquarie Valley Floodplain, it is adjacent to the designated floodplain, and access rules and extraction in these water sources should be considered in the context of access conditions for future regulated floodplain harvesting licences.

Considering existing access conditions for licences in the unregulated Plan area will be important when designing appropriate access conditions for regulated floodplain harvesting licences. The access conditions should ensure the issue of these new licences will not lead to unintended consequences for high priority environmental and basic landholder rights as well as other existing licence holders in the unregulated Plan area.

Further, the proposed account limits for floodplain harvesting (regulated river) access licences are more generous than for other existing unregulated river entitlements. According to DPE-Water's factsheet,[350] the proposed account limit for regulated floodplain harvesting licences will be 5 ML per unit share at any time and any unused allocation can be carried over from one water year to the next, subject to the account limit not being exceeded. This compares to 1 ML per unit share for any other unregulated river access entitlements in the Plan area.[351] Water allocations remaining in the water allocation accounts for an unregulated river (special additional high flow) access licence also cannot be carried over from one year to the next.[352]

These differences in water accounting could create equity issues for licences holders in the unregulated Plan area. This is particularly the case when considering the distribution of unregulated river access entitlements (**Figure 8**) and the overlap between the area and the gazetted floodplain management area, where DPE-Water proposes to issue regulated floodplain harvesting licences in the Macquarie catchment. The Commission considers there are significant risks that misaligned account and access management rules could have unintended consequences and risk perverse outcomes, limiting achievement of the Act's priorities and Plan objectives.

349 Parts 5 and 8 of the Plan.
350 DPE-Water (2022) *Rule summary sheet*
351 Part 8, Clause 50 of the Plan.
352 Part 8 clause 50 of the Plan.

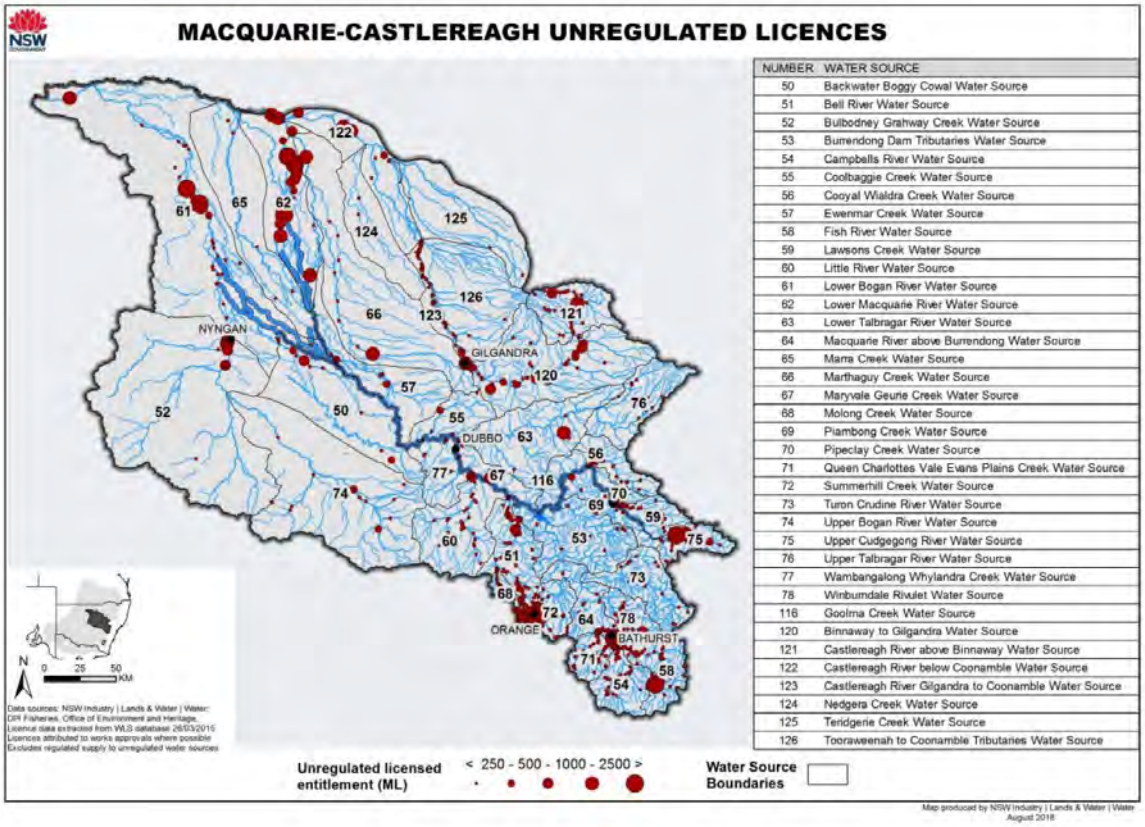

Figure 8: Unregulated water sources and distribution of entitlements in the Macquarie-Castlereagh Water Resource Plan area (SW11)[353]

To assess the risk associated with water extraction across the Macquarie catchment, DPE-Water should consider the access and account rules for all types of water licences in the catchment, including those proposed for new regulated floodplain harvesting licences. As discussed in **Chapter 3**, a comprehensive understanding of all forms of take will be critical to ensure LTAAEL compliance, particularly given the large entitlement volume across the Macquarie catchment.

DPE-Water should assess the cumulative impacts of introducing new regulated floodplain harvesting licences in the Macquarie catchment and develop appropriate access rules in regulated and unregulated water sharing plans to adequately protect water sources, their dependent ecosystems and downstream outcomes, and not negatively impact on other licence holders in the unregulated Plan area. The *Macquarie-Castlereagh Long Term Water Plan* provides guidance on environmental flow requirements to support floodplain environmental assets.[354]

In addition, DPE-Water should consider the impacts of issuing regulated floodplain harvesting licences on specific water sources in the unregulated Plan area. This should include, for example, assessment of flows at the end of the Lower Macquarie, Marra Creek or Lower Bogan River where it meets the Barwon River, particularly given that these areas and water sources are covered by the *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017*.

353 NSW Department of Industry Water (2018) *Risk assessment for the Macquarie–Castlereagh water resource plan area (SW11)*

354 DPIE (2020) *Macquarie-Castlereagh Long-Term Water Plan*

As outlined in **Chapter 4**, existing issues associated with active management should also be addressed before issuing new regulated floodplain harvesting licences. Only licences with an extraction component that specifies the Gum Cowal or Lower Macquarie River Upstream Management Zones are subject to active management provisions, leaving other water sources without adequate protection via active management.

Finally, DPE-Water should ensure that restrictions put in place in the Barwon-Darling Plan area, are also placed on those sections of other plan areas connected or potentially connected with the Barwon-Darling. This would avoid unintended consequences of environmental water backing into the Macquarie-Bogan and being extracted by other licence holders, including newly issued floodplain harvesting licences.[355]

9.3 Some floodplain structures may not have been assessed

Floodplain harvesting requires works[356] that allow for the take of overland flows. Under the *NSW Floodplain Harvesting Policy*, only works constructed on a gazetted floodplain and that meet certain criteria[357] are eligible for floodplain harvesting licences.[358]

As part of this review, stakeholders raised concerns that existing works capable of floodplain harvesting interception in the Macquarie Valley will not be reviewed, assessed or authorised for floodplain harvesting interception activities, despite being located on the Macquarie Valley Floodplain.[359] These stakeholders have pointed to the discrepancies between the works shown in the *Draft Floodplain Management Plan for the Macquarie Valley Floodplain 2018* and the *Management Plan for the Macquarie Valley Floodplain 2021*.[360] In the former, Figure 9 shows that there are works on around 106,200 hectares of the Macquarie Valley Floodplain, while the latter only shows works on around 32,600 hectares. It is unclear why the remaining 73,400 hectares were removed from consideration (**Figure 9**).

Stakeholders pointed out that the budget estimates hearing records (dated 5 November 2021),[361] indicated that eighty unauthorised on-farm storages were being assessed for floodplain harvesting licences in the Macquarie Valley.[362] Of these, sixty-nine were being considered eligible (for work approvals) under the *NSW Floodplain Harvesting Policy,* although it was unclear if these works had been assessed for environmental impacts. In addition, six of the sixty-nine works were identified as being in an identified 'hotspot'.[363] These six works had the potential to impede critical flood flow paths.

355 The Commission acknowledges that DPE-Water has indicated its intent that floodplain harvesting in the Barwon-Darling River Floodplain will be accounted for under the *Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012*. This plan is intended to be amended to include floodplain harvesting provisions to enable the licencing and regulation of floodplain harvesting. When amending the Barwon-Darling Plan, connected water sources would also need to be considered.

356 The Act provides for Flood Works Approvals and for Water Supply Works Approvals. Many floodplain harvesting arrangements require both categories of work and frequently a combined works approval is issued. Given the intent to issue floodplain harvesting licences in the regulated system only, the flood work or water supply works approvals as well as the access licence would be covered under the regulated Macquarie Cudgegong Plan.

357 Only works constructed on or before 3 July 2008 in accordance with an approval or that did not require an approval, or for which a valid application under Part 2 or Part 8 of the *Water Act 1912* or the *Water Management Act 2000* was made on or before that date, are eligible for assessment under the NSW Floodplain Harvesting Policy.

358 DPE-Water (n.d.) *NSW Floodplain Harvesting Policy*

359 Submission: Inland Rivers Network, received 30 April 2022.

360 NSW Government (2019) *Floodplain Management Plan for the Macquarie Valley Floodplain 2018*; NSW Government (2021) *Floodplain Management Plan for the Macquarie Valley Floodplain Order 2021*

361 NSW Legislative Council (November 2021) *Budget Estimates 2021-22 Supplementary Questions*

362 Applications existed for many of these storages, which were being assessed by WaterNSW against the rules and criteria in the Floodplain Management Plan.

363 NSW Legislative Council (November 2021) *Budget Estimates 2021-22 Supplementary Questions*

Assessing works and issuing appropriate work approvals for floodplain harvesting infrastructure is of equal importance to setting appropriate access rules for floodplain harvesting licences. This is because floodplain structures not only have the capacity to take water[364] but they can also redirect water away from (or towards) a location without any extraction occurring. This reduction of flows could impact on flows in other downstream water sources, including unregulated water sources. It is therefore important that all works in the Macquarie Valley are uniformly assessed to understand potential downstream impacts on the region's water sources.

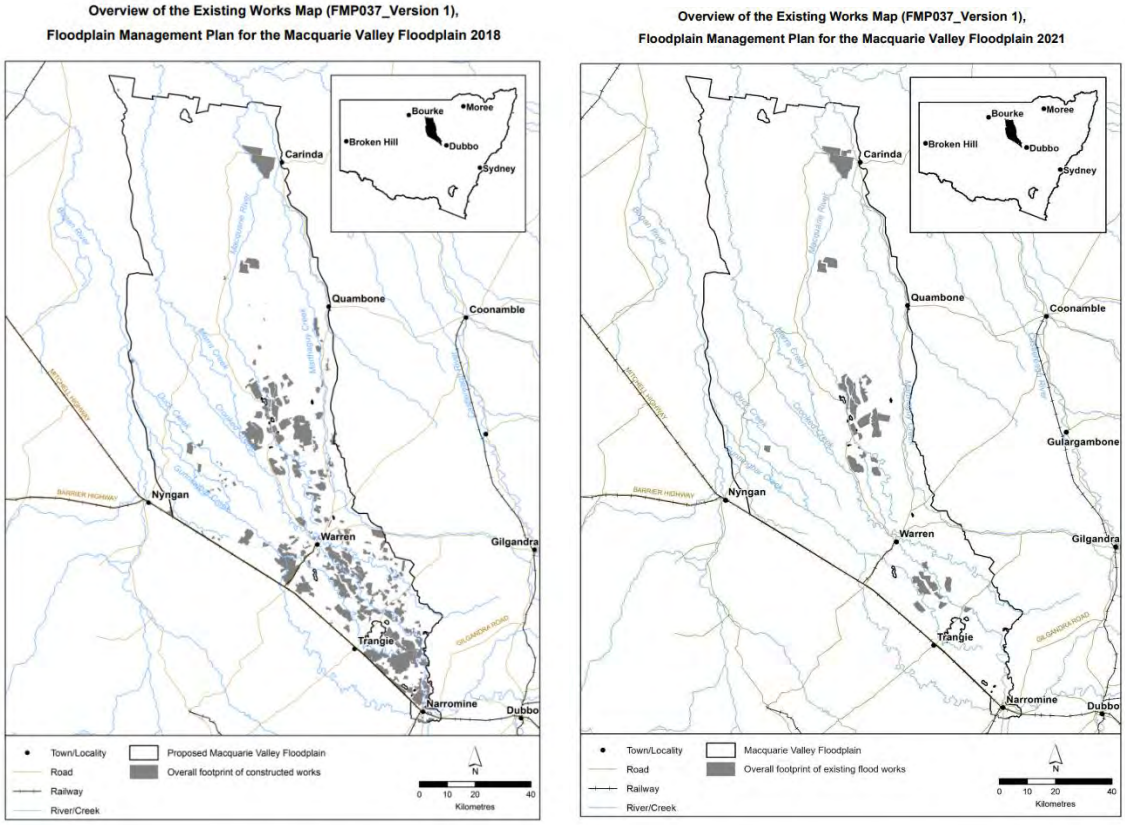

Figure 9: Identified works on designated floodplain as per *Draft Floodplain Management Plan for the Macquarie Valley 2018* and *Floodplain Management Plan for the Macquarie Valley 2021*[365]

The Commission notes that the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012* includes rules for water supply works approvals.[366] However, these rules do not necessarily capture works that fall outside of the designated floodplain or outside the regulated Macquarie-Cudgegong Plan. Part 12 includes an amendment provision (Clause 87(1)(a)) which should be utilised to allow DPE-Water to better manage floodplain harvesting, including works outside of the designated floodplain.

The Commission also notes that *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016* provides opportunities for DPE-Water to consider works on the Macquarie and Barwon-Darling River floodplains. As stated in Clause 99(1), the Macquarie-Cudgegong Plan may be amended to add, modify or remove provisions

364 The work approval issued to the relevant landholder would allow for the construction and use of the work to take water.
365 NSW Government (2019) *Floodplain Management Plan for the Macquarie Valley Floodplain 2018*; NSW Government (2021) *Floodplain Management Plan for the Macquarie Valley Floodplain Order 2021*
366 Part 9 of the Plan.

relating to floodplain harvesting (regulated river) access licences in response to the following:

- the need to protect overland flows for environmental purposes (clause 99(1)(a))
- the need for monitoring, evaluation and reporting outcomes (clause 99(1)(b))
- an improved understanding of the influence of floodplain harvesting on downstream flows (clause 99(1)(c)
- a review that assesses the potential benefits and impacts of new access provisions for floodplain harvesting (regulated river) access licences (clause 99(1)(d).

DPE-Water should utilise these amendment provisions to assess the impacts of works in the unregulated water sharing plan area, particularly those that are located in the Macquarie Valley and Barwon-Darling River floodplains, and which are not captured by the regulated Macquarie-Cudgegong Plan.

To enhance confidence in water extraction in the Plan area, DPE-Water should take a broader approach to the assessment of works in the Macquarie catchment. The expanded assessment should ensure that all take and diversions are appropriately accounted for and works do not impede on high priority environment and basic landholder right needs or constrain connectivity to the Barwon River. This assessment should result in all works in the Macquarie Valley being subject to the same rules, irrespective of whether they are governed by the regulated Macquarie-Cudgegong Plan or the unregulated plans.

9.4 Recommendations

R 15	As part of the replacement Plan, DPE-Water should expand its assessment of works in the Plan area (e.g., works not covered by the regulated Macquarie-Cudgegong Plan and on the designated floodplain). The expanded assessment should ensure the take and diversion of these works is appropriately accounted for and these works do not impact high priority environment and basic landholder rights or constrain connectivity. This assessment should result in all works in the Macquarie catchment being subject to the same rules, irrespective of whether they are governed by the regulated Macquarie-Cudgegong Plan or the unregulated Macquarie-Bogan Plan and be consistent with the principles and objects of the Act.

10 Monitoring, evaluation and reporting

A lack of monitoring, evaluation and reporting (MER) is a consistent theme raised in the Commission's reviews of water sharing plans. This is largely due to a lack of plan-specific MER programs, as well as limited resources dedicated to MER. This review has found a similar lack of plan-specific MER over the life of the Plan.

The Commission acknowledges that DPE-Water is working to improve MER arrangements for water sharing plans and water resource plans. It has prepared the *Macquarie-Castlereagh Surface Water Monitoring, Evaluation and Reporting Plan* as part of the *Macquarie-Castlereagh Surface Water Resource Plan*. In addition, the Commission welcomes DPE-Water's work on a draft NSW Water Sharing Plan Evaluation Framework, including the development of method statements and pilots for the *Water Sharing Plan for the Macquarie and Cudgegong Regulated River Water Source 2016*[367] and the *Water Sharing Plan for the Clarence River Unregulated and Alluvial Water Sources 2016*. The Commission understands that DPE-Water will extend these pilots to eight additional water sharing plans by mid-2023.

There are several existing or historical monitoring programs in place (led by DPE-Water, DPE-EHG and DPI-Fisheries in particular) that support an understanding of the conditions of water sources in the Plan area, and how environmental assets respond to changes in flow. Despite their value, these historic monitoring programs are often focused on the regulated Macquarie-Cudgegong river system and tailored to specific site investigations (**Section 10.1**).

The *NSW Water Strategy* includes an action under Priority 3 to '*invest in long term and effective monitoring, evaluation, reporting and research*'.[368] The Commission welcomes this commitment, despite the lack of clarity around long-term future funding that will be available for MER activities, including water sharing plan monitoring and evaluation actions.

The Commission considers it critical that DPE-Water receives (or re-allocates) adequate funding to undertake appropriate monitoring and evaluation as a priority.[369] Funding should be commensurate with the importance of MER for assessing water sharing plan effectiveness and supporting adaptive management, and be consistent with the water management principles of the Act.

Section 10.2 describes pathways towards improved MER, while **Section 10.3** outlines key knowledge gaps that should be addressed. The Chapter concludes with recommendations about future stakeholder engagement as part of the Plan replacement process.

367 The Commission understands that DPE-Water will not consider the unregulated water sources in the Plan area for the development of the method statement and pilot for the Macquarie and Cudgegong Regulated River Water Source 2016 despite the close hydrologic connectivity between the regulated and unregulated river system in the catchment.

368 DPIE-Water (2021) *NSW Water Strategy*

369 The Commission understands that funding for water sharing plan MER activities is predominantly allocated from the Independent Pricing and Regulatory Tribunal NSW final determination of charges that the Water Administration Ministerial Corporation can levy on licence holders for its water management services over the period of 4 years. The current determination was handed down in 2021 and expires on 30 June 2025.

10.1 Existing monitoring programs in the Plan area

Although there is a lack of monitoring and reporting against the Plan's performance indicators, other existing monitoring programs provide some insight into environmental condition and outcomes being achieved in the Macquarie-Bogan catchment.

Unfortunately, these programs can often not be directly attributed to the Plan or Plan provisions given they are largely associated with the use of environmental water holdings and planned environmental water allocations from the regulated Macquarie-Cudgegong River. Nonetheless, the Commission recognises that provisions that are intended to protect these environmental water holdings and planned environmental water releases can contribute to realising intended outcomes in the catchment (and by extension in the Plan area).

Much of the monitoring and evaluation of environmental values and outcomes in the catchment that has occurred to date has focused on the regulated Macquarie/Wambuul river system as well as sites that are the recipients of environmental water releases from the regulated river, including the Macquarie Marshes. For example, the CEWO also undertakes limited short-term environmental monitoring projects in the Macquarie-Castlereagh catchment to evaluate the environmental responses of selected watering actions.[370] Data and information gathered through this work and others across the catchment is valuable to further improve river and wetland health in the catchment. Relevant programs include:

- *Water for the Environment Monitoring, Evaluating and Reporting* (MER) program led by DPE-Environment and Heritage Group
- various fisheries monitoring projects and programs led by DPI-Fisheries,[371] including the *Basin Plan Environmental Objectives Monitoring – Fish Project*

There are also existing hydrologic and water quality monitoring sites in the catchment, including in unregulated river water sources that were considered as part of this review. As part of the development of the *Macquarie-Castlereagh Surface Water Resource Plan*, DPE-Water prepared a water quality technical report based on data from these sites. In addition, DPE-Water completed a review of its stream, storage, groundwater and water quality monitoring network in 2021. This work has progressed upgrades to existing gauges and to install new gauges in northern NSW, including in the Plan area.[372]

The Commission understands that DPE-Water will draw upon existing programs and link them back to Plan objectives and monitoring themes as part of an integrated MER plan.

10.2 Pathways towards improved MER

DPE-Water is taking steps to improve MER and support an efficient and effective use of available resources. This includes:

- updating water sharing plan objectives as part of Plan amendments in 2020 to make them measurable and more meaningful
- developing a *Water Resource Plan MER Framework* and customised environmental MER plans, as part of the development of water resource plans that seek to integrate MER activities across agencies and map out monitoring efforts by research theme

370 Department of Climate Change, Energy and the Environment (n.d.) *Monitoring - Macquarie*
371 The primary program is the Basin Plan Environmental Objectives Monitoring project, which assesses the status of native fish population against related Basin Plan objectives and targets.
372 Department of Planning and Environment (n.d.) *Hydrometric Gauging Stations Installations and Upgrades*

- establishing the DPE-Water Water Planning Implementation Unit, including the Water Evaluation and Reporting Team that is focused on improving MER through the development of DPE-Water's *Water Sharing Plan Evaluation Framework*, which intends to inform future water sharing plan reviews
- establishing a *NSW Water Sharing Plan Implementation Program* that will track and report on progress of implementation of water sharing plan MER activities
- investing in projects to strengthen MER and help target resources, including the development of a framework to prioritise water sources for MER activities and development of a transferability model.

The Commission has considered the *Macquarie-Castlereagh Surface Water Resource Plan*'s MER plan, which was designed to meet Basin Plan reporting requirements.[373] The environmental MER plan is based on program logic developed for the water sharing plan objectives, but also objectives from the *Macquarie Castlereagh Long-Term Water Plan* and *Water Quality and Salinity Management Plan*. The program logic is intended to guide monitoring activities, while risk assessments undertaken as part of the water resource planning process are intended to inform areas for further research. The MER plan also maps out existing monitoring programs by research theme.

Despite these efforts, there are areas that are currently not included in the MER plans developed for the NSW water resource plans:

- while the amended Plan includes clearer, measurable objectives, the Plan provisions have not been updated to support the achievement of the revised objectives, meaning that in some respects, these objectives risk not being met
- the Plan lacks equity[374] objectives and corresponding performance indicators – without these, there is a lack of transparency and it is difficult to assess the Plan's effectiveness and alignment with the Act[375] with respect to how it manages equitable sharing of water between and within licence categories, and the Plan's treatment of different users
- the MER plan does not explicitly identify areas for further research based on risk and value
- the MER plan does not specify where real-time gauging or water level monitoring is required to support MER
- there do not appear to be clear roles and responsibilities or adequate resources for overseeing and implementing the MER plan, which generates risks to implementation
- methods manuals referred to in the MER plan do not appear to have been finalised.

Given limited resources, it will be critical that DPE-Water continue to identify efficiencies, focus on the most critical MER needs, and continue to work collaboratively with other

373 DoI (2019) *Macquarie Castlereagh Surface Water Resource Plan Monitoring, Evaluation and Reporting Plan*

374 Equitable sharing of water is required by the *NSW Water Management Act 2000* and is a critical component for water sharing plans to support community trust and cohesion, effective water market operation and the fair distribution of benefits and cost from water sharing rules. Equitable sharing does not mean equal amounts of water supplied for all users, rather:
- a fair distribution of available water consistent with the priorities under the Act
- consistent application of access rules for licences in the same licence category and the same water source or management zone
- fair and transparent consideration of relative reductions to meet extraction limits.

375 Section 3 of the Act set a clear expectation that water sharing plans should 'provide for the orderly, efficient and equitable sharing of water, and seek to minimise cumulative impacts on water sources.

government agencies and academic institutions to coordinate monitoring activities that support water sharing plan evaluation. MER activities should be prioritised based on value and risk. Water source prioritisation and transferability studies currently underway by DPE-Water will help to target efforts and resources.

Public reporting of MER priorities, findings and how they were considered in Plan amendments is needed to improve transparency and public awareness around Plan outcomes. It is preferable that public reporting of available MER occur at regular intervals and in line with the *NSW Water Sharing Plan Evaluation Framework,* which is currently in development.

While MER may be limited by resources, public reporting outcomes of MER that is available should be consistent with best practice and with various NSW commitments to increased transparency in water management. It should also be comparable with the MDBA and states' publication of reports and other matters required by the Basin Plan.

There is also a need to report on extreme events that occur during the term of a water sharing plan. These extreme events have already been observed during the term of the current Plan. Specifically, there should be greater visibility regarding water management arrangements during extreme events and how they influence Plan outcomes.

10.3 Knowledge gaps

As noted above, much of the focus for existing monitoring programs has been in the regulated Macquarie/Wambuul and Cudgegong river systems as well as the Macquarie Marshes. Further monitoring and evaluation of the unregulated river water sources is required to improve system knowledge, refine Plan provisions and support whole of catchment planning, including:

- assessing and quantifying historic levels of extraction and estimating current levels of extraction (where not metered) and interception activities. This should include LTAAEL compliance assessment in unregulated rivers in the catchment.
- identifying cultural flow needs for water-dependent Aboriginal cultural assets
- locating high-quality drought refugia, and impacts of climate change and extended droughts on waterhole persistence, as well as their connectivity to, and dependence on, regulated river flows[376]
- identifying regionally significant wetlands and lagoons dependent on unregulated river water sources. This includes their current condition, impacts associated with extraction and an altered flow regime, and their resilience to extended droughts and effectiveness of rules to protect them, as well as their connectivity to, and dependence on, regulated river flows
- expanding habitat mapping to refine environmental water requirements to inform future water sharing plan updates
- improving the understanding of the native fish habitat needs and functional flow requirements, as well as better understanding barriers to fish movement and how they impact on connectivity to help prioritise where investment is most needed to improve connectivity

[376] The Commission acknowledges that DPI-Fisheries has progressed work to better understand the suite of fish specific EWRs necessary to protect and recover native fish in the Macquarie Valley and greater Northern Connected Basin as part of its *Fish and Flow* research.

- assessing whether basic landholder rights and local water utility needs are being met (after environmental needs), consistent with the water management principles (section 5 and 9) of the Act
- determining the degree of connectivity between regulated rivers and unregulated water sources, as well as degree of surface-groundwater connectivity and condition of groundwater dependent ecosystems, and options for Plan rules to reflect and protect connectivity, in accordance with the water management principles of the Act and the objectives of the Plan.

10.4 Increase stakeholder engagement and communication

It is important that stakeholder engagement mechanisms support the review and remake of the Plan. Since the dismantling of DPE-Water's stakeholder advisory panel, the Commission has heard that engagement and communication between DPE-Water and regional stakeholders, about recent Plan amendments or the process for future review and Plan replacement, has been limited.[377]

For the replacement of the Plan, the Commission considers it critical that any engagement occurs with a broad cross-section of stakeholders, including Aboriginal people, local councils, licence holders, environmental water managers, industry stakeholders and landholders in the Plan area. This will enable DPE-Water to gain a broad range of perspectives and local insights regarding potential impacts of changes to Plan provisions.

The Commission acknowledges that DPE-Water has limited resources to undertake active and sustained engagement across all Plan areas. However, the Commission is of the view that there are benefits of communicating and engaging with stakeholders about planned and proposed amendments to the Plan to ensure stakeholders' perspective can be heard and future Plan amendments are understood and complied with.

10.5 Recommendations

R 16	To inform the replacement of the Plan and improve Plan specific MER, DPE-Water should, in consultation with other agencies: a) identify and address critical knowledge gaps b) specify what MER activities will be undertaken to address critical knowledge gaps, support transparency and adaptive management of the Plan in line with the NSW Water Sharing Plan Evaluation Framework and Prioritisation Tool (prioritise MER activities based on value and risk) c) strengthen stakeholder engagement in the lead up to and during the plan replacement process.
R 17	DPE-Water should also ensure that the replacement Plan: a) includes equity objectives and co-designed Aboriginal objectives and corresponding performance indicators b) specifies timely reporting requirements of the results of MER activities to support transparency and adaptive management. This should include but is not limited to reporting on: I. water management during extreme events that occur in the Plan area II. benefits for Aboriginal people arising from Plan provisions

377 Interview: Stakeholder, 19 October 2022.

11 Compensation implications of recommendations

Under the Act, compensation may be payable by the NSW Government to access licence holders – only in some circumstances where water allocations under a water sharing plan are reduced. Section 43A(3A) of the Act requires the Commission to consider some potential compensation requirements resulting from recommended changes to water sharing plans.

Specifically, the Act states:

> '*(3A) If a report of the Natural Resources Commission under subsection (3) recommends changes to a management plan that will result in a reduction of water allocations in relation to which compensation might be payable under section 87AA, the Commission is to state in the report whether the purpose of the proposed change is:*
> *(a) to restore water to the environment because of natural reductions in inflow to the relevant water source, including but not limited to changes resulting from climate change, drought or bushfires, or*
> *(b) to provide additional water to the environment because of more accurate scientific knowledge that demonstrates that the amount previously allocated to the environment is inadequate.*'

Many of the recommendations can be advanced without triggering compensation. The Commission notes that Section 87AA indicates for instance that compensation is not payable due to a reduction in water allocation if *'the reduction in water allocations is for the purpose of restoring water to the environment because of natural reductions in inflow to the water source, including but not limited to changes resulting from climate change, drought or bushfires.*' However, the Commission considers that compensation might be payable under Section 87AA in relation to some recommendations listed in **Table 8**.

Table 8: Recommendations that may trigger compensation

Establishing sustainable extraction	
R 5	To support adaptive management during the term of the replacement Plan, the Plan should include a provision requiring DPE-Water to determine the sustainable level of extraction by Year 5 based on best available ecological requirements, hydrological and climate information. This information should be used to define the Plan's LTAAEL for each EMU.
Strengthening environmental protections	
R 8	As part of Plan replacement, to address issues with current access rules, DPE-Water should: a) review the current hydrometric network to identify where the Plan can reference operational gauges for establishing flow classes and flow-based access rules for water sources that currently have a 'no visible' flow rule b) ensure all high environmental value water sources at medium to high risk from extraction have flow-based access rules that support connectivity and adequately protect water sources and their dependent ecosystems c) review if conditions attached to current water access licences and works approvals are appropriate to protect high priority needs and

	ensure any changes to access rules from (a) and (b) are reflected in water access licence/works approval conditions.
R 9	To protect surface-groundwater connectivity associated with the Bell River, the Bell River alluvial aquifer and the karst landscape of Wellington Caves, the replacement Plan should include linked access rules that mitigate the risk of surface water extraction on the significant water dependent values associated with Wellington Caves.
Securing town water supply to meet future needs	
R 10 (a) and (b)	As part of the replacement Plan, DPE-Water should: a) review, and if necessary, revise existing access rules, town water storage release triggers and access licence dealings provisions in the upper Macquarie to protect environmental, basic landholder rights and town water needs, including consideration of climate change, consistent with the principles and priorities of the Act. b) review whether additional Plan provisions are needed to guide releases from existing and future town water storages (including stormwater harvesting schemes) to adequately protect environmental and basic landholder rights.
Improving outcomes through trade	
R 14 (b)(i)	To improve outcomes through trade, in the next two years, DPE-Water should: b) implement the Plan-specific recommendations from the *2020-21 Active Management Annual Evaluation and Review – Full Report* to: I. revise the trading rules between management zones in the Macquarie-Bogan to manage the impact of trading in and out of entitlements with different access provisions.

Recommendation 5 could require compensation if the analysis determines that the current LTAAELs based on historic extraction are too high to adequately protect the water sources and their ecosystems. In this case the potential change in allocation may be due to new scientific information about ecological requirements as well as a natural reduction in inflows that may be associated with climate change, which may result in a lower availability of water into the future.

Recommendations 8, 9 and 10 (a) and (b) and 14 (b)(i) may require compensation if changes to access rules, dealing rules or other restrictions materially affect overall long-term allocations available to users. Changes made under these recommendations could be necessary to provide additional water to high priority needs, including the environment, because of more accurate knowledge.

The Commission acknowledges that there are other recommendations that may affect water allocations. However, these changes are allowed through amendment provisions provided for in the Plan or in the Commission's view would not affect long-term allocation. In particular, the Commission acknowledges that **Recommendation 3** may well lead to a reduction to current AWDs. However, the Commission notes that the Act allows the Minister to set the AWD at their discretion. Further, this clause would only ensure that a precautionary approach is taken to setting the AWD to ensure the current LTAAEL is adhered to. As such, the Commission does not anticipate that the compensation Clause

87AA would be triggered. However, DPE-Water should seek their own legal advice on this matter.

In considering these requirements, the Commission has not made any determination in relation to entitlements to or amount of compensation and does not provide legal advice in this report. DPE-Water should seek legal advice regarding any potential compensation implications of implementing the recommendations in this report.