NSW GOVERNMENT

Natural Resources Commission

Final report

Review of the Water Sharing Plan for the Murray Unregulated River Water Sources 2011

December 2021

Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to Aboriginal peoples, the Traditional Owners of NSW. The Commission recognises and acknowledges that Aboriginal peoples 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.

In the *Water Sharing Plan for the Murray Unregulated River Water Sources 2011*, the Commission pays its respects to the Bangerang, Barapa Barapa, Nyeri Nyeri, Tati Tati, Wadi Wadi, Weki Weki, Wemba Wemba, Wiradjuri and Yorta Yorta Traditional Owners past, present and future, as well as other Aboriginal peoples for whom these waterways are significant. The Commission hopes that the involvement of Aboriginal peoples, groups and Local Aboriginal Land Councils throughout the review process will help to shape collaborative water planning and sharing that is beneficial to Aboriginal peoples and their Country.

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Acronyms and units of measurement

Act	the *Water Management Act 2000* (NSW)
AWD	Available water determination
AWOP	Annual Water Operating Plans
Basin Plan	The *Basin Plan 2012*
Commission	the Natural Resources Commission
CTP	Cease to pump
DoI-Water	Former NSW Department of Industry – Water
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
DPI-Fisheries	Department of Primary Industries – Fisheries
DPIE-EES	Department of Planning, Industry and Environment – Environment, Energy and Science (the former Office of Environment and Heritage)
DPIE-Water	Department of Planning, Industry and Environment – Water
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GRP	Gross Regional Product
GSP	Gross State Product
HEVAE	High Ecological Values Aquatic Ecosystem
ILUA	Indigenous Land Use Agreement
IPA	Indigenous Protected Area
LALC	Local Aboriginal Land Council
LGA	Local government area
LTAAEL	Long-term average annual average extraction limit
LTWP	Long-Term Water Plan
MDBA	Murray-Darling Basin Authority
MLDRIN	Murray Lower Darling Indigenous Nations
MER	Monitoring, evaluation and reporting
ML	Megalitre (unit of volume equivalent to one million (1×10^6) litres
NARCliM	NSW and ACT Regional Climate Modelling Project

NBAN	Northern Basin Aboriginal Nations
NRAR	Natural Resource Access Regulator
NSW	New South Wales
The Plan	*Water Sharing Plan for the Murray Unregulated River Water Sources 2011*
R/ SA	Recommendation/ Suggested action
RMIF	River Murray Increased Flows
SMART	Specific, measurable, achievable, relevant and time-bound
SMRIF	Snowy Montane Rivers Increased Flows
Snowy Hydro	Snowy Hydro Limited
Snowy Scheme	Snowy Mountains Hydroelectric Scheme
SRIF	Snowy River Increased Flows
WRP	Water Resource Plan

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Executive summary

The Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Murray Unregulated River Water Sources 2011* (the Plan) in the NSW Murray region, as required under Section 43A of the *Water Management Act 2000* (the Act).

The Commission has assessed the extent to which provisions in the Plan have contributed to achieving environmental, social, cultural and economic outcomes, and identified where changes to provisions are warranted.

There is considerable new information available since the Plan was developed that should be incorporated into the Plan. The Plan was amended in 2020 to align it with the requirements of the Australian Government's Water Resource Plans (WRPs) under the *Basin Plan 2012* (the Basin Plan). As part of the development of the WRPs, a risk assessment was undertaken for the Plan area and a Long-Term Water Plan (LTWP) was developed. When amending the water sharing plans to meet the requirements of the WRPs, the Department of Planning, Industry and Environment – Water (DPIE-Water) adopted a policy of making the minimal changes necessary. This had several consequences including that the objectives were updated but the provisions have not yet been updated to support the new objectives, and latest available information such as DPIE's risk assessment updates and the LTWP were not considered.

While the Plan area contains a small percentage of the overall water volume within the Murray Valley, it contains substantial environmental assets. There is evidence that the current Plan rules do not adequately protect these assets. In addition, the Commission identified concerns over equitable sharing of water, protection of cultural values and management of connectivity.

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 two years to the existing Plan to allow time to undertake required analysis, development, and consultation on the replacement Plan (see **Table 1**)

A summary of key areas to improve the Plan are outlined in **Figure 1.** To ensure clarity, the Commission has developed a detailed set of 10 recommendations and three suggested actions (**Table 1**).

Figure 1: Key areas to improve Plan performance

Ensuring sustainable extraction limits

The Plan does not set sustainable and numeric long-term average annual extraction limits (LTAAELs). LTAAELs should be reviewed to ensure they are based on best available information including ecological requirements and an accurate estimate of all forms of extraction and interception. LTAAEL compliance assessments have not been undertaken, despite entitlement being considerably higher than the allowable licenced extraction within the Plan LTAAELs. Without assessment of LTAAEL compliance, Available Water Determinations (AWDs) have remained at 100 percent over the life of the Plan.

Supporting equitable sharing of water

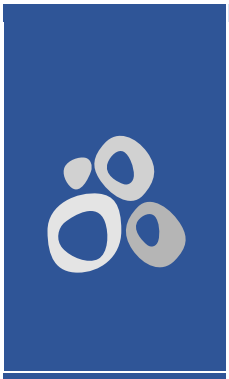
Plan provisions indicate that LTAAELs include floodplain harvesting and basic landholder rights. Floodplain harvesting has not been estimated for the unregulated plan area and extraction under basic landholder rights is considerable relative to the size of licenced extraction. It is important that all forms of water extraction and interception are accurately accounted for, to ensure compliance with the Plan's limits. There is a risk that once all forms of take are accurately accounted for, the LTAAELs may be exceeded, requiring a potentially significant reduction in annual water allocations for unregulated access licence holders. Plan rules should be reviewed and revised as necessary to ensure that any reductions in allocations required by growth in use are applied fairly, consistent with the priorities in the Act, and are transparent to users.

Post-augmentation rules for Snowy Valleys Council should be clarified. Rules should support local water utility access licences to continue to extract where environmental objectives and basic landholder rights are not compromised, before other licensed users.

Strengthening environmental protections

DPIE-Water has not yet updated the Plan to address identified issues in the WRP risk assessment or incorporated latest available information on threatened species, including from the LTWP and post-bushfire assessments. Latest available information indicates that the rules, including the cease to pump (CTP) provisions, do not adequately protect the ecological values and needs of identified environmental assets. For example, the last remaining population of the endangered Macquarie perch in the NSW Murray Valley region, which was severely impacted by the 2019-20 bushfires, is not adequately protected.

The Plan rules do not effectively protect held environmental water. In the absence of specific rules to protect these flows, DPIE-Water has relied on Section 324 Orders. There is also a disparity between the Plan rules and the gauge for the Mannus Upstream Water Management Zone. This allows access to low flows, which was unintended by the Plan, and expected end of system flows have not been achieved. Environmental flow rules for Mannus Dam sit outside of the Plan in the works approval, resulting in a lack of transparency.



Delivering outcomes for Aboriginal people

The Plan's objectives were updated in Plan amendments in 2020 as part of the WRP process, including generic objectives and indicators to protect cultural values across the basin. However, consultation was not undertaken with Aboriginal stakeholders in the Plan area to tailor these and there is not an adequate understanding of those values to protect and monitor them. There are also native title claims and a planned Indigenous Protected Area (IPA) that require appropriate consultation, consideration, and protection under the Plan.

Improving interactions and connectivity

Extraction from connected alluvial aquifers managed under separate water sharing plans and water releases from the (Snowy Mountains Hydroelectric Scheme) Snowy Scheme, which are subject to the provisions in the Snowy Water Licence, can impact on the availability of water and ecological values in the Plan area. Interactions and connectivity should be considered in the reviews of the *Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020* and other relevant water sharing plans. Provisions allowing for amendments to address potential impacts to connectivity, such as changes to the Snowy Water Licence, should also be included in the Plan.

Table 1: Recommendations

Overall recommendation	
Recommendation (R) 1	The Plan should be: a) extended for a further two years until 30 June 2024, to allow time to complete data collection and analysis b) replaced by 1 July 2024, supported by the completion of the recommendations of this review.
Sustainable extraction limits	
R 2	When remaking the Plan, to ensure all extraction under the Plan is managed to protect, preserve and maintain the water sources and dependent ecosystems and improve transparency, DPIE-Water should: a) establish and publish sustainable, numeric LTAAELs, ensuring they are based on best available information, including ecological requirements, an accurate estimate of extraction, interception and climate change impacts b) ensure the LTAAEL includes all forms of interception and extraction.
Suggested action (SA 1)	DPIE-Water should: a) undertake regular LTAAEL compliance assessments b) use AWDs to ensure extraction remains below LTAAELs as required by the Plan rules.
Improving equitable sharing of water consistent with the Act	
R 3	When remaking the Plan, to improve alignment with the priorities in the Act, DPIE-Water should: a) include economic dependence on town water supply when considering social and economic impacts of proposed changes to water sharing rules b) ensure that CTPs are established based on environmental sustainability and basic landholder needs c) specify what the post-augmentation CTPs for Snowy Valleys Council would be in the Plan d) ensure that the Plan rules encourage town water supply augmentation in line with the Plan's objectives.
R 4	When remaking the Plan, DPIE-Water should ensure the Plan facilitates equitable sharing of water by: a) determining the rate of growth in extraction and interception since timeframes set in the Plan rules and estimate growth into the future b) revising Plan provisions to clearly outline how allocations would be adjusted to respond to growth in various types of use where necessary to meet the LTAAELs, and ensuring these rules allocate reductions fairly.

	c) ensuring that any options for reducing allocations where necessary are consistent with the Act and Basin Plan.
Strengthening environmental protections	
R 5	By 2023, to improve environmental outcomes DPIE-Water should: a) ensure the replacement Plan reflects the latest information on environmental water needs, including from the NSW Murray and Lower Darling LTWP and associated fish and flows advice from the Department of Primary Industries (DPI) – Fisheries b) revise provisions to address identified concerns for medium- to high-risk water sources, including: i. a first flush rule for Tooma River ii. strategies within the scope of the Plan that can help mitigate the extreme flow variability and provide more stability around base flows to better mimic more natural rates of rise and fall in the Swampy Plains and Upper Murray water sources iii. opportunities to reduce extractive pressure in the Albury and Hume water sources iv. reviewing the current gauging network to identify where new gauges may be warranted to reduce reliance on no visible flow rules in medium- to high-risk water sources. c) in consultation with environmental water managers, determine the best mechanism for protection of held environmental water and include those arrangements in the Plan to avoid reliance on temporary water restrictions d) work with DPIE-Environment, Energy and Science (EES) and DPI-Fisheries to identify regionally significant wetlands/off-river pools where water access is currently permitted, assess the risks to these sites and the adequacy of current rules in protecting environmental values from extraction e) consider how plan provisions can help to ameliorate water quality issues, including those arising from the 2019-20 bushfires.
R 6	In remaking the Plan, revise the provisions to improve management of the Mannus Creek Water Source by: a) reviewing the environmental values for Manus Creek Water Source and ensuring the flow requirements of threatened species and other environmental values are considered b) reviewing the CTP rules for Mannus Creek and replacing the height rule with a flow condition that references the current Mannus Creek gauge c) ensuring the Plan reflects the changed location of the gauge and reviewing the location of water access licences to check they are in the appropriate water management zone

	d) including the Mannus Dam operating rules in the Plan and review environmental flow requirements in light of recent studies (including the five-yearly assessment of environmental impacts), the impact from bushfires and the needs of water users.
Aboriginal water rights, values and uses	
R 7	When remaking the Plan, DPIE-Water should take into consideration the native title claims, Indigenous Land Use Agreements (ILUAs), IPAs, and other Aboriginal land agreements in the Plan area – particularly the Bangerang Nation, Yorta Yorta Nation and the Werai IPA to identify cultural values and uses. Sufficient additional time should be allowed to undertake detailed engagement with Traditional Owners and other Aboriginal knowledge holders on options to support these values and uses and make any final amendments.
R 8	When remaking the Plan, to better achieve Aboriginal water outcomes, DPIE-Water should: a) identify and protect known high value cultural sites in the replacement Plan b) undertake further work with a range of Aboriginal Traditional Owners and knowledge holders, including Aboriginal women, to better understand water values and uses, identify the rules to protect them, and support water access and use c) ensure that where additional entitlement becomes available, that Aboriginal water needs are assessed as a priority d) undertake state-wide actions identified in Commission water sharing plan reviews to improve consideration and respect for native title and Aboriginal values in water sharing plans.[1]
Improving interactions and connectivity	
R 9	When remaking the Plan, to facilitate improved outcomes, DPIE-Water should include an amendment provision to allow the Plan to be modified as needed in response to changes in the Snowy Scheme program that impact transfers and releases of water into the Plan area.
SA 2	To facilitate improved environmental outcomes, DPIE-Water should work with Snowy Hydro Limited (Snowy Hydro) to assess and minimise the environmental impact of water release patterns from the Snowy Scheme on the Plan area's water sources.

1 A detailed list of minimum state-wide actions to support Aboriginal water rights, values and uses are outlined in the **Section 6.5**.

SA 3	When remaking the Plan, DPIE-Water should ensure that licences for miscellaneous alluvial aquifers are given daily access rules that align with any connected surface water sources managed under the Plan. This would involve: a) reviewing bore logs to determine if any licences in the water sharing plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources are extracting from an alluvial aquifer rather than porous rock b) assessing the potential volumes of alluvial extraction relative to surface water extraction c) publishing the results and, if extraction potential from alluvial aquifers is significant, outline and consult on steps to manage risks.
Monitoring, evaluation and reporting (MER)	
R 10	By June 2023, to improve Plan-based MER, DPIE-Water should: a) refine and implement the *NSW Murray and Lower Darling Surface Water WRP Monitoring, Evaluation and Reporting Plan* and ensure that monitoring programs not currently identified in this plan are incorporated, for example Macquarie perch monitoring, Mannus Dam environmental monitoring and monitoring of the use of held environmental water in unregulated rivers b) expedite the finalisation and publication of DPIE-Water's water sharing plan evaluation framework and methods manuals and ensure there is multi-agency support and oversight of their implementation c) identify feasible and appropriate resourcing to support ongoing MER activities d) specify timely reporting requirements of the results of MER activities to support transparency, public awareness and adaptive management e) identify and address critical knowledge gaps to support adaptive management f) use the recently developed prioritisation framework to prioritise MER activities based on values and risk. Clearly communicate how this framework interacts with monitoring plans and publicly report on where and why effort is being targeted.

1 Review background

1.1 Water sharing plans and the Commission's role

Water sharing plans are statutory instruments under the Act. They prescribe how water is managed to support sustainable environmental, social, cultural and economic outcomes. They intend to provide certainty regarding rules for water sharing for water users over the life of the water sharing plan, which is typically 10 years, unless it is extended.

The Plan commenced on 30 January 2012 and is due for extension or replacement on 1 July 2022.

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 the 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 a plan depending on its review findings. Section 43A(3A) of the Act requires the Commission to consider some potential compensation requirements resulting from recommended changes to a plan.[2] Under the Act, compensation is payable by the State to access licence holders only in certain circumstances[3] where water allocations under a water sharing plan are reduced.

The Commission must also consider the water management principles[4] – including the water sharing principles – of the Act when reviewing plans. 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.[5] 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).[6]

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2 If a Commission report recommends changes to a plan that will reduce water allocations in relation to which compensation might be payable under Section 87AA of the Act, the Commission is to state in the report if the purpose of the proposed changes is: (a) to restore water to the environment because of natural reductions in inflow to the relevant water source, including changes from climate change or drought or (b) to provide additional water to the environment because of more accurate scientific knowledge demonstrating the amount previously allocated to the environment is inadequate.

3 As set out in sections 87 and 87AA of the Act. Section 87 states that compensation applies for certain reductions in water allocations arising during the initial (10-year) period of a water sharing plan, only where amendments are not already contemplated in that plan. Section 87AA makes clear that compensation applies to amendments to the plan after its 10-year term. In addition, the Minister has an overriding discretion under Section 87 (but not under Section 87AA) to determine if compensation should be paid and, if so, the amount of any such compensation and the manner and timing of any payments.

4 Section 5 of the Act.

5 Section 9(1)(b) indicates that the principles set out in Section 5(4) are given priority in the order in which they are set out.

6 Section 5(3) of the Act.

Further, the water sharing principles should be prioritised in the order that they are set out above.[7] Water sharing plans must be based on evidence to achieve these outcomes.

For reference, the roles of the various NSW water management agencies are summarised in **Figure 2**.

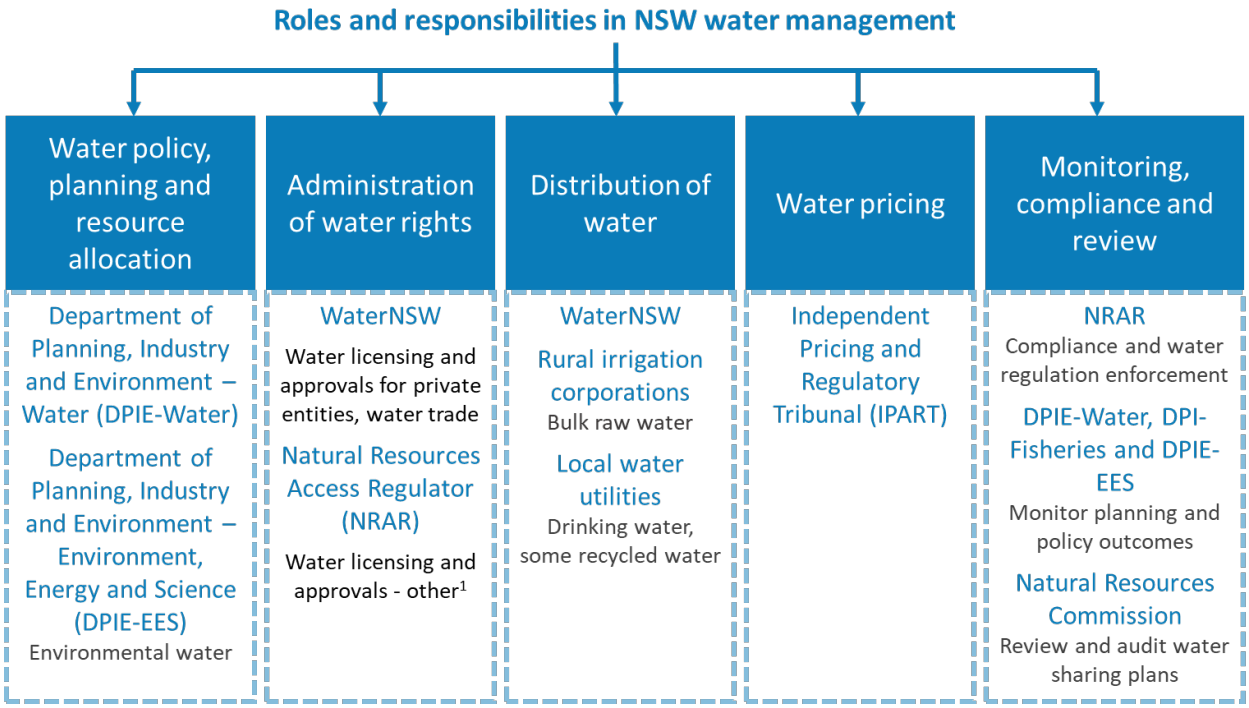

Figure 2: Roles and responsibilities in rural and regional water management[8]

Figure note (1): NRAR has several licencing and approval responsibilities, including for major and local utilities, state agencies, irrigation corporations, entities operating under the *Mining Act 1992* (NSW) and holders of specific purpose access licences with an Aboriginal subcategory.

1.2 Review approach

The Commission's review was informed by a range of evidence, including:

- **Consultation** – with government agencies, community and industry organisations.
- **Consultation with Aboriginal stakeholders** – the Commission provided the opportunity for input from Traditional Owner groups, Local Aboriginal Land Councils (LALCs) and relevant government agency staff in the Plan areas. The Commission undertakes ongoing consultation on Aboriginal water issues at a state level with NSW Aboriginal Land Council, Aboriginal Affairs NSW, Indigenous Land and Sea Corporation and Aboriginal staff in relevant NSW Government agencies.
- **Document review** – the Commission reviewed the Plan and its background document[9]. It also obtained publicly available information and reports from water management

7 Section 9(1) of the Act.

8 Revised from Department of Industry (DoI)-Water (2019) *NSW Regional Water Statement*. Available at: https://www.industry.nsw. gov.au/__data/assets/pdf_file/0019/218404/NSW-Regional-Water-Statement.pdf.

9 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.

agencies, including DPIE-Water, DPIE-EES, DPI-Fisheries and Snowy Valleys Council. As required, the Commission considered other relevant state-wide and regional government policies and agreements that apply to the Plan area.

- **Technical advice** – consultants provided expert analysis on key aspects of the Plan, including social and environmental objectives, the effectiveness of Plan provisions and opportunities for improvement.
- **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 four submissions. Non-confidential submissions are published on the Commission's website.[10]

The Commission evaluated the performance of the Plan against its stated objectives, strategies and performance indicators, which were linked to each of the broader outcome categories required as part of the review (environmental, social, cultural and economic outcomes). These are provided in **Appendix A**. The objectives changed over the period of the Plan. The Commission has assessed the Plan against the current objectives, strategies and indicators. The Commission recognises many of the objectives were not in place for the full period of the Plan.

10 Natural Resources Commission (2021) *2019-2020 Water sharing plan reviews*. Available at: https://www.nrc.nsw.gov.au/2019-2020-wsp-reviews.

2 The Plan area

This chapter gives an overview of the Plan area and its water-dependent environmental, social and economic values.

2.1 The Plan area and water sources

The Plan's water sources are in the south-western region of NSW, covering an area of around 20,500 square kilometres, from the Murray River in the south, Billabong Creek catchment divide to the north, the Australian Alps to the east, and the confluence of the Murray and Murrumbidgee rivers to the west (**Figure 3**).[11]

The Plan includes 15 water sources that are grouped into two extraction management units:

- Unregulated Upper Murray Extraction Management Unit – covering 11 unregulated water sources above the Hume Dam.
- Unregulated Middle Murray Extraction Management Unit – covering four water sources downstream of Hume Dam to the confluence with the Murrumbidgee (see **Appendix B**).

Prior to 1 July 2020, the Plan also included the Murray Alluvial Groundwater Sources. However, the alluvial groundwater sources were separated into a separate water sharing plan (the *Water Sharing Plan for the Murray Alluvial Groundwater Sources Order 2020*) to align with the WRPs required under the Basin Plan.

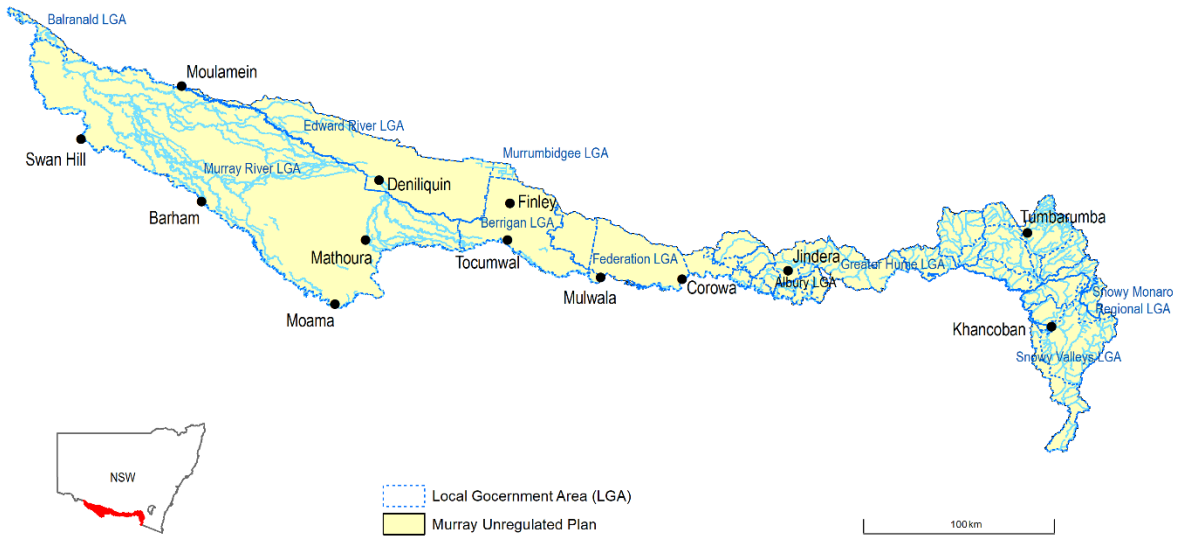

Figure 3: The Plan area including local government areas (LGAs)

11 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.

2.2 Water licences and entitlements

There are 312 water licences totalling 43,104 units of entitlement in the Plan area.
Table 2 shows the breakdown of licence entitlements for the Plan as at May 2021, totalling 43,104 megalitres (ML) per year.[12] Unregulated river access licences hold the largest entitlement at 41,840 ML, or 97 percent of the total entitlement. Local water utilities licences are the second highest entitlement at 639 ML per year.

Most of the unregulated river water licences are located in the Murray Below Mulwala Water Source (approximately 27,377 units), followed by the Upper Murray River Water Source (6,613 units). Most of the licences are licences are for irrigation purposes.[13]

Table 2: Breakdown of entitlement[14] by licence category for the Plan area

Licence category	Entitlement based on WaterNSW Water Licensing System[15]	Number of licences
Unregulated river access	41,840	235
Local water utility access	639	3
Domestic and stock access	625	74
Total licensed entitlement	**43,104**	**312**

2.3 Town water supply and water storages

The majority of town water supply for urban centres in the Plan area are provided for under the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*. Snowy Valleys Council holds the only local water utility access licences for the Plan, with a combined share component of 639 ML per year.[16]

Town water is extracted from the Swampy Plain and Tumbarumba water sources in the Plan area. Snowy Valleys Council also holds a local water utility licence for 59 ML in the Upper Murray Groundwater Source, which falls under the *Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020*.

The Council supplies the townships of Tumbarumba and Khancoban with these licences. Council advised that Burra Creek is the primary source of water to Tumbarumba township and Tumbarumba Creek is the secondary source.

12 Data provided by WaterNSW from its Water Licensing System, as at May 2021.
13 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.
14 Data provided by WaterNSW from its Water Licensing System, as at May 2021.
Entitlement is provided as ML for local water utility licences and domestic and stock access licences. For unregulated river licences, entitlement is issued as a unit share with the volume provided per unit share impacted by the available water determination.
15 The Commission noted some minor discrepancies with the entitlement data listed in the Plan and information available through the WaterNSW water licensing system. The WaterNSW figures have been presented in this report. Any discrepancies should be resolved in the remake of the Plan.
16 See Clause 24 of the Plan.

2.4 Water management not governed by the Plan provisions

Waterways within the Plan area are either fed by, or feed into, storages managed under the *NSW Murray and Lower Darling Regulated Rivers Water Sources 2017 Water Sharing Plan* and the Snowy Scheme.

For example, the Upper Murray River Water Source, which is managed under the Plan, extends from Khancoban Pondage to Hume Dam. Khancoban Pondage is a lake that forms part of the Snowy Scheme, and Hume Dam is a major water storage across the Murray River, about 11 kilometres east of Albury, which is managed as part of the regulated system. [17]

The inter-valley diversions and operations of the Snowy Scheme impact on the Plan's Upper Murray River Water Source. Water is diverted into Khancoban Pondage as a result of the operations of Murray 1 and Murray 2 Power Stations. Khancoban Pondage releases water into the lower reaches of the Swampy Plain River, which supplements the flows in the Upper Murray River, which are ultimately captured in Hume Dam for release into the regulated river.[18]

Most parts of the Murray River system downstream of Hume Dam are managed under the regulated system, except some effluents (outflowing waterways that leave the Murray River) that have been blocked off from the regulated river. These effluent waterways are part of the Murray Below Mulwala Water Source that is also managed under the Plan.

The Plan area includes anabranches, effluent streams, billabongs and lagoons that are on the floodplain of the regulated Murray River. While unregulated access licence holders cannot directly order regulated flows, some can receive water via irrigation channel networks that are supplied from the regulated river. Further, overbank flows and environmental water delivered from the regulated system may inundate the anabranches and other connected water bodies. It is important to recognise that connected surface water resources are addressed by rules in two separate water sharing plans.

2.5 Environmental context

The Plan's background document, which provides background to the development of the rules in the Plan, identifies threatened flora and fauna species in nine water sources, as well as Ramsar-listed wetlands and important heritage areas.[19] The water sources identified as having high instream values are listed at **Appendix B**.

Species present in certain locations and considered to be highly sensitive to extraction include the Murray hardyhead, trout cod, southern pygmy perch, silver perch, flathead galaxias, alpine tree frog, Booroolong frog, southern bell frog and spotted tree frog.[20]

17 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.
18 *Ibid.*
19 *Ibid.*
20 *Ibid.*

Some water sources, such as the Lower Wangamong, Albury and Majors water sources, were also identified as having the Lower Murray River aquatic ecological community, a listed endangered ecological community.[21] This ecological community includes 23 native fish species and over 400 native invertebrate species distributed across the natural creeks, rivers, billabongs and lakes of the Murray, Murrumbidgee and Tumut rivers, including their tributaries and branches.[22] Changes to natural river flows, competition from introduced aquatic species, and habitat degradation and loss have created threats to this ecological community.

The Plan area covers parts of the Australian Alps National Parks and Reserves, a unique natural environment, which is included in Australia's National Heritage List.[23] The Plan area also covers part of the NSW Central Murray Forests Ramsar Wetland. This site covers 83,992 hectares and consists of three forest subsites that depend on flows in the Murray River. Collectively, these sites contain Australia's largest area of river red gum forests, support eight threatened species and provide habitat for 11 species of migratory birds listed under internationals agreements.[24] The main threats to the site include altered water and fire regimes, as well as introduced species and climate change.[25]

There are also regionally significant wetlands in the Plan area that have important ecological values and wetlands that have been modified as water storage for agricultural production and flood mitigation.

Threatened species, communities and wetlands were considered when assessing the environmental values of water sources as part of the plan development processes. For these areas, rules were intended to provide greater levels of protection from extraction. These included rules to limit the trading to water entitlement into these water sources, and more conservative CTP limits.

While not considered explicitly in the development of the Plan, Mannus Water Source also supports a population of the Macquarie perch, which is listed as endangered under the NSW *Fisheries Management Act 1994* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (see **Chapter 5**). This threatened species occurs in waters with high levels of cover provided by aquatic vegetation, snags and overhanging banks, and is found in the Murray-Darling Basin, particularly the upstream reaches of the Lachlan, Murrumbidgee and Murray rivers.[26]

2.6 Cultural, social and economic context

2.6.1 Aboriginal peoples of the Murray

Aboriginal peoples have deep and ongoing connections with the rivers, aquifers, lakes and other water sources as custodian of the lands and waters in these areas.

21 *Ibid.*
22 *Ibid.*
23 Department of Agriculture, Water and the Environment (n.d.) *National Heritage Places – Australian Alps National Parks and Reserves*. Available at: http://www.environment.gov.au/heritage/places/national/australia-alps.
24 DPIE (2018) *NSW Central Murray Forests*. Available at: https://www.environment.nsw.gov.au/topics/water/wetlands/internationally-significant-wetlands/nsw-central-murray-forests.
25 *Ibid.*
26 DPI (n.d.) *Macquarie Perch*. Available at: https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current/endangered-species2/macquarie-perch.

Rivers of the region were a source of sustenance for Aboriginal peoples and had an important place in the Dreaming:

> *"The interconnectedness between humanity and the environment as a holistic entity is the essence of Indigenous peoples' culture, spirituality and life. The health and recovery of the rivers' ecosystems and Indigenous Nations' access to it is central to the spiritual, cultural, social and economic survival of the Indigenous Nations of the Murray."*[27]

The Traditional Owners of the area are peoples of the Bangerang, Barapa Barapa, Nyeri Nyeri, Tati Tati, Wadi Wadi, Weki Weki, Wemba Wemba, Wiradjuri and Yorta Yorta Nations. **Figure 4** shows there are 12 LALCs across the area. The Bangerang Nation and Yorta Yorta Nation are joint members of the Cummeragunja LALC.

While there are no native title areas determined to exist, there is the well-known Yorta Yorta native title claim that has previously been unsuccessful.[28] From 2004, the Victorian Government developed cooperative agreements with the Yorta Yorta people for land, rivers and lakes including the Yorta Yorta *Traditional Owner Land Management Agreement 2010* for Barmah National Park, which sits on the Victorian side of the Murray Valley National Park.[29] The Bangerang Nation and Yorta Yorta Nation are striving for formal 'heads of agreement' across Victoria and NSW to secure whole-of-Country recognition.[30]

In addition, there are a range of other examples of Aboriginal management of lands and waters in the Plan area, such as that of the IPA planned for the Werai Reserve[31] across Wamba Wamba and Perrepa Perrepa Nations.[32] Wamba Wamba and Perrepa Perrepa have the same language and their country is directly downstream from Bangerang and Yorta Yorta Country, where the Edward/Kolety River[33] starts (pronounced Kol-etch) and later meets the Wakool River (pronounced War-kool). Traditional knowledge contains a creation story relating to the formation of the Edward/Kolety and Murray (pronounced Milly) river systems by the creation snake, who was cut into pieces by the crow that was disturbed at Kyalite, where the rivers meet.[34]

In 2010, the Werai Reserve was vested with the NSW Minister for Environment and Climate Change for transfer to Aboriginal ownership (Schedule 6, National Park Estate (*Riverina Red Gum Reservations) Act 2010 (NSW*)).

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27 Morgan, M, Strelein, L, Weir J (2004) 'Indigenous Rights to Water in the Murray Darling Basin'. AIATSIS Research Discussion Paper No. 14, Native Title Research Unit, Australian Institute of Aboriginal and Torres Strait Islander Studies.

28 Yorta Yorta Traditional Owner Land Management Board (n.d.) *About*. Available at: https://yytolmb.com.au/about/.

29 Yorta Yorta Traditional Owner Land Management Board (n.d.) *Yorta Yorta Traditional Owner Land Management Agreement*. Available at: https://yytolmb.com.au/about/yyto-land-management-agreement.

30 Yorta Yorta Nation Aboriginal Corporation (2020) *Annual Report 2019-2020*. Available at: https://yynac.com.au/community/yynac-official-documents/yynac-annual-report-2019-2020/.

31 Werai Reserve includes forests situated on the floodplain of the Edward/Kolety and Niemur rivers between Yadabal lagoon and Morago and including the Barratta Creek Forest, the Banangalite Forest, Werai Forest, Morago Forest and Stevens Weir Forest. During the past 150 years this area has been referred to as individual state forests, the Werai Group of Forests and the Werai Forest Group.

32 Also known as the Barapa Barapa or Baraba Baraba Nation.

33 Kolety is now gazetted as a dual name for the Edward River (NSW Government Gazette 2006).

34 Weir, J.K., Ross, S.L., Crew, D.R.J. and Crew, J.L. (2013) *Cultural water and the Edward/Kolety and Wakool river system*. Research report for the Australian Institute of Aboriginal and Torres Strait Islander Studies Centre for Land and Water Research, Canberra.

This is part of a process of having Werai considered for declaration as an IPA, which was a key recommendation of the Commission's Riverina Regional Forest Agreement review in 2009.[35] It is also a product of ongoing advocacy work by local Traditional Owners, particularly Yarkuwa Indigenous Knowledge Centre. In 2009, Yarkuwa received funding from the IPA program to undertake a consultation project, supported by Forests NSW (now Forestry Corporation of NSW), to identify values and uses, and investigate joint-management options.

This process of values and uses mapping identified high cultural values and resources throughout the area; including burial grounds; oven mounds; scarred trees; story sites; stone artefacts; red gum trees; grasses and herbs – river mint, old man weed, flax lily, sedges for baskets, cumbungi for string; and food resource.[36] Yarkuwa has maintained a supporting process to enable the IPA transfer to take place, originally targeted for 2013. However, it has still not been declared an IPA (see further discussion in **Chapter 6**).

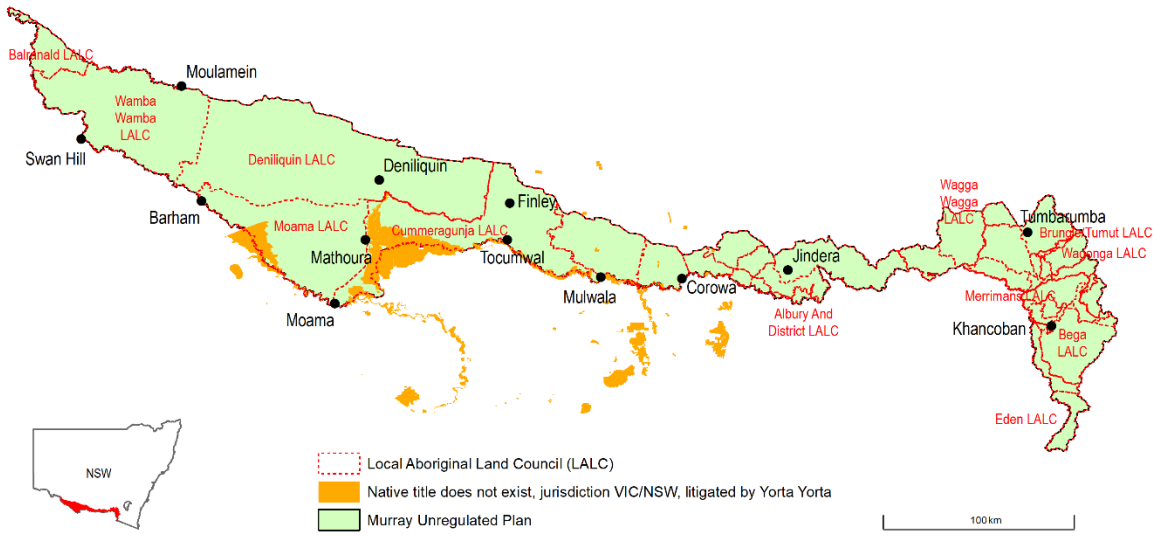

Figure 4: LALC and native title claim areas and determination areas for the Plan area

2.6.2 Socio-demographic context

There are nine LGAs across the Plan area. The bulk of entitlement allocated in the Plan area falls within the Snowy Valleys Council Shire. A large portion of the population live in the regional cities and towns of Albury, Corowa and Deniliquin.[37]

35 Natural Resources Commission (2009) *Riverina Bioregion regional forest assessment: river red gums and woodland forests, final assessment report*. Available at: https://www.environment.nsw.gov.au/research-and-publications/publications-search/riverina-bioregion-regional-forest-assignment-river-red-gums-and-woodland-forests.

36 Yarkuwa Indigenous Knowledge Centre and the Murray Country Project (2009) *Wamba Wamba collaborative assessment project*. Undertaken with Osler, D., McGregor, H. and the National Parks Association of NSW.

37 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.

These towns primarily rely on the regulated rivers covered by the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated River Water Sources 2016* for their town water supply.

Population and development patterns can have implications for the demand and supply of town water, basic landholder rights and future water sharing planning.

At Plan commencement, the Albury Water Source was considered highly likely to see an expansion of small-scale developments around the City of Albury.[38] Snowy Valleys Council is also an area of focus because it holds local water utility access licences under the Plan to supply town water to Tumbarumba and Khancoban (see **Section 4.1**).[39] Given this, population data of the two LGAs are outlined in terms of any potential growth or change to water needs in the areas.

The Snowy Valleys Council is in the Upper Murray Extraction Unit and its estimated resident population in 2020 was 14,412 with a population density of 0.02 persons per hectare.[40] The 'Tumbarumba-Khancoban and District' area had a population of 3,360 people[41] and, based on data from 2016, the town of Tumut in the northern region of the council area had a population of 6,293.[42] Since 2011, the council area has experienced population decline. Snowy Valleys Council predicts the population will further decline to 12,150 by 2041, thus experiencing a 15 percent negative growth (**Table 3**).[43]

The City of Albury LGA's estimated resident population for 2020 is 55,055, with a population density of 1.79 persons per hectare, which is above the regional NSW average.[44] The population is forecast to grow to 67,427 by 2036, a change of 20 percent.[45] Forecast dwelling and development in Albury City Shire is expected to grow from 23,690 in 2016 to 29,806 in 2036, an increase of 26 percent.[46]

38 NSW Government (2012) *Water Sharing Plan for the Murray Unregulated Alluvial Background Document* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf.

39 Note that parts of the Snowy Valley Council area are also governed by the Murrumbidgee regulated and unregulated water sharing plans.

40 Id Profiles (2021) *Snowy Valleys Council* Available at: https://profile.id.com.au/snowy-valleys/about?WebID=120.

41 *Ibid.*

42 *Ibid.*

43 Snowy Valleys Council (2021) *Snowy Valleys Council Local Strategic Planning Statement June 2020.* Available at: https://www.snowyvalleys.nsw.gov.au/Building-Planning/Planning/Local-Strategic-Planning-Statement-2020-2040.

44 Id Profiles (2021) *Albury City Community Profile.* Available at: https://profile.id.com.au/albury/population.

45 Id Profiles (2021) *Albury City Community Profile.* Available at: https://forecast.id.com.au/albury/about-forecast-areas.

46 Id Profiles (2021) *Albury City Council Community Profile.* Available at: https://forecast.id.com.au/albury/dwellings-development-map.

Table 3: Population snapshot for Snowy Valleys Council and City of Albury LGAs[47]

	Estimated Resident Population 2020 (no.)	Forecast population change (%)
Snowy Valleys Council	14,412	12,150 (-15% by 2041)[48]
City of Albury	55,055	67,427 (20% by 2036) [49]
Regional NSW	**2,777,654**	**22.3**

2.6.3 Economic context

A large portion of the Murray catchment is managed by private landowners for primary production.[50]

In the Snowy Valleys Council area, which covers both the Murray and Murrumbidgee unregulated water sharing plans and is important from a water entitlement perspective, the top three generators of value added by industry (an indicator of business productivity) are:

- Electricity, Gas, Water and Waste Services - $122 million
- Agriculture, Forestry and Fishing generating - $112 million
- Manufacturing generated - $108 million.[51]

However, since 2014/15, value added by Electricity, Gas, Water and Waste Services has increased by approximately 37 percent, whereas Agriculture, Forestry and Fishing has declined by around 87 percent. The value of agricultural production for 2015/16 is presented in **Table 4**. Livestock slaughtering generated $79 million accounting for 55 percent of all agricultural earnings for the Snowy Valleys Council area.

The Snowy Valleys Council highlights prospective industries going forward for the area, including hydroelectricity generation, biomass energy using plantation timber residues, aged care and tourism, premium cool climate wine, cool climate horticulture (such as chestnuts and blueberries) and apple cider.[52]

Based on an economic assessment undertaken to support the development of the Plan, two water sources were classified as being of high economic dependence on commercial water extraction – the Upper Murray River and Manus water sources (see **Appendix B**).

47 Id Profiles (2021) *Snowy Valleys Council* Available at: https://profile.id.com.au/snowy-valleys/about?WebID=120.

48 Snowy Valleys Council (2021) *Snowy Valleys Council Local Strategic Planning Statement June 2020.* Available at: https://www.snowyvalleys.nsw.gov.au/Building-Planning/Planning/Local-Strategic-Planning-Statement-2020-2040.

49 Id Profiles (2021) *Albury City Community Profile.* Available at: https://forecast.id.com.au/albury/about-forecast-areas.

50 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.

51 Id Profiles (2021) *Snowy Valleys Council economic profile.* Available at: https://economy.id.com.au/snowy-valleys.

52 Snowy Valleys Council (2018) *Snowy Valleys Regional Economic Development Strategy.* Available at: https://www.snowyvalleys.nsw.gov.au/files/assets/public/reports-amp-strategies/snowy-valleys-council-economic-development-strategy-2018-2020.pdf

The Upper Murray River sub-catchment is not densely settled, largely consisting of national park, but includes Murray River townships. The Manus Water Source includes the localities of Mannus, Rosewood and Glenroy, and has agriculture areas with wine grapes, fruit, seed production and grazing. [53]

Table 4: Value of agricultural production for Snowy Valleys Council area for 2015/16[54]

Commodity	Total ($)	% of total for Snowy Valleys Council	Snowy Valleys Council as a % of NSW
Livestock slaughtering	79,139,396	55.3	1.8
Other fruit	37,697,389	26.3	13.7
Milk	13,413,091	9.4	2.3
Wool	6,361,711	4.4	0.7
Crops for hay	2,564,737	1.8	0.8
Cereal Crops	1,427,512	1	0
Nurseries & cut flowers	1,179,537	0.8	0.4
Grapes (wine and table)	514,536	0.4	0.2
Other broadacre crops	418,414	0.2	0
Nuts	324,504	3.9	0.2
Eggs	56,166	0	0
Citrus fruit	-	-	-

The Commission also acknowledges that local communities in the Snowy Valleys Council area experienced widespread economic and social impacts in the 2019/20 bushfires. Documented impacts for these communities include:

- up to 50 percent of plantation forests were burnt, limiting future available fibre for the processing and manufacturing industry
- horticulture industry lost approximately 20 percent of fruit trees
- viticulture and blueberry harvests were impacted by smoke taint
- tourism industry impacted by evacuations and damage to key assets.[55]

53 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.

54 Id Profiles (2021) Id Profiles (2021) *Snowy Valleys Council economic profile*. Available at: https://economy.id.com.au/snowy-valleys/value-of-agriculture.

55 NSW Government (2020) *Snowy Valleys REDS fire impact addendum*. Available at: https://www.nsw.gov.au/regional-nsw/regional-economic-development-strategies/reds-bushfire-addenda.

3 Establishing sustainable extraction limits

A central role of a water sharing plan is to specify the amount of water available for the environment and for extraction both by licensed users and under basic rights. Water sharing plans do this by establishing LTAAELs.

Setting appropriate LTAAELs is important for the proper functioning of water sharing plans. Limits that are too high will reduce the amount of water remaining for the environment and downstream water users, while limits that are too low reduce economic, social and cultural opportunities from water use.

Once LTAAELs have been established, compliance assessments of actual extractions against LTAAELs can be undertaken. The Plan provides that, in cases where the average annual extraction over the preceding three years exceeds the LTAAEL by five percent or more, future extraction can be managed through reductions in AWDs.

3.1 Establish numeric extraction limits

The Plan establishes LTAAELs for its two extraction management units – the Unregulated Upper Murray and Unregulated Middle Murray extraction management units. However, as with many water sharing plans, these limits are not specified numerically (in ML per year) in the Plan but are described as the sum of the estimated historic extractions, outlined in **Table 5**.

Establishing numeric LTAAELs is a recurring recommendation in the Commission's water sharing plan review reports. Establishing these limits is important to provide clarity and transparency to stakeholders. It would also support more efficient compliance with extraction limits and allow remedial action to be taken, as well as supporting an effective water market and the valuing of water as a limited resource.

In addition to LTAAELs, the Basin Plan also sets sustainable extraction limits – called the Sustainable Diversion Limits (SDLs) – which apply to various geographic areas.[56] The SDLs are based on estimates of the amount of extraction prior to the Basin Plan – called the Baseline Diversion Limit (BDL) – less water savings achieved by water purchase programs and other works and measures set out in the Basin Plan.[57,58] While the BDL incorporates more water sources than the Plan (as it includes the regulated river system), parts of the BDL apply to the unregulated portion of the system.

56 MDBA (2020) *Sustainable diversion limit (SDL) accounting framework improvement strategy 2020 – 2025*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/Sustainable%20diversion%20limit%20accounting%20framework%20improvement%20strategy%202020-2025.pdf.

57 Turner, G., Vanderbyl, T. and Kumar, S. (2019) *Final Report of the Independent Panel's Review of the Sustainable Diversion Limit (SDL) Water Accounting Framework*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/Final-Report-Independent-Panels-Sustainable-Diversion-Limit_0.pdf.

58 MDBA (2020) *Sustainable diversion limit (SDL) accounting framework improvement strategy 2020 – 2025*. Available at: https://www.mdba.gov.au/sites/default/files/pubs/Sustainable%20diversion%20limit%20accounting%20framework%20improvement%20strategy%202020-2025.pdf.

Table 5: LTAAEL and BDL extraction components

LTAAEL extraction components[59]	BDL extraction components[60]
Estimated average annual extraction from 1 July 1993 to 30 June 1999 under entitlements issued under Part 2 of the *Water Act 1912*[61]	Long-term annual average take of water, from July 1993 to June 1999, from watercourses other than from regulated rivers (excluding take under basic rights)
Estimated average annual extraction from 1 July 1993 to 30 June 1999 by floodplain harvesting activities for which floodplain harvesting (unregulated river) access licences may be issued	Long-term annual average limit on the quantity of water that can be taken by runoff dams (excluding take under basic rights) calculated on the basis of the quantity of water that could be taken under State water management law as at 30 June 2009
Estimated annual water requirements pursuant to basic landholder rights at the commencement of the Plan	Long-term annual average take of water from watercourses under basic rights calculated on the basis of the take under the level of development that existed on 30 June 2009 Long-term annual average take of water by runoff dams under basic rights calculated on the basis of the take under the level of development that existed on 30 June 2009
Estimated annual take of water by plantation forestry that existed on 30 June 2009	Long-term annual average net take of water by commercial plantations calculated on the basis of the take under the level of development that existed on 30 June 2009

The components of historic extraction used to estimate the BDL for the NSW Murray region are presented against the corresponding LTAAEL components in **Table 5**. While the region covered by the BDL includes both regulated and unregulated rivers, the Commission considers there are key differences between what is included in the BDL and the LTAAEL that may create uncertainty for water users in the Plan area:

- The BDL and the LTAAEL account for floodplain harvesting and other forms of interception of overland flow differently, using different time frames. The LTAAEL is meant to include floodplain harvesting, for which a licence may be issued based on estimated annual extraction from June 1993-1999. The BDL is meant to include all take by runoff dams based on development as of 30 June 2009.
- In a note to Schedule 3 of the Basin Plan, the Murray-Darling Basin Authority (MDBA) estimates the portion of BDL defined as the long-term annual average take of water over the period from July 1993 to June 1999 from watercourses other than regulated rivers (excluding take under basic rights) to be 28,000 ML per year. This is equivalent (based on identical definitions) to the LTAAEL component for licensed extractive use. The Plan states that there are 42,077 unit shares of unregulated access licences and 639 ML per year of local water utility licences. Therefore, there is significantly more entitlement in the Plan area than the LTAAEL. The basis for the 28,000 ML per year BDL should be made publicly available as part of DPIE's calculation of a numeric LTAAELs for the Plan. Any

59 Clause 28 of the Plan.
60 Schedule 3 of the Basin Plan.
61 As part of a volumetric conversion process, irrigation licence holders were surveyed as to the area and types of crops that they had irrigated over the six-year period from 1993-1999, and conversion rates were developed to establish licensed entitlements and derive average levels of water use based on crop water requirements.

implications for water users, including the possibility of future reductions in allocations based on the LTAAEL, or the likelihood of future changes to the current BDL estimate, should be also be made publicly available.

3.2 Floodplain harvesting and other interception should be accounted for

There is potentially interception, including floodplain harvesting, within the Plan area that is not accounted for or adequately quantified in the Plan,[62] which has implications for the environment and other users.

Under the Act, overland flow is defined as water (including floodwater, rainfall run-off and urban stormwater) that is flowing over or lying on the ground because of rain or other forms of precipitation, that rises to the surface from underground, or as prescribed by the regulations.[63] The interception of overland flows can occur via several means, including capture in a dam, pumping from low lying land, or through diversion embankments that direct the flow into a storage structure or directly onto a parcel of land, such as where a crop is intended to grow. The interception of overland flow is also not classified as harvestable rights, which only includes capture of rainfall runoff. There is a need to clarify the legal status of this water and quantify the volume being taken.

Floodplain harvesting is one form of interception of overland flow. Floodplain harvesting is generally described as the capture and storage of flow across a floodplain. However, in NSW this definition is restricted to floodplains that have been designated a floodplain under the Water Management (General) Regulation 2018. The Plan area contains designated floodplains and the LTAAEL includes average extraction from floodplain harvesting from July 1993 through June 1999. Where interception meets the definition of floodplain harvesting, this should be managed consistent with the current Plan rules.

The MDBA does not currently recognise floodplain harvesting as occurring in the Plan area as it was not reported as occurring in establishment of the BDL. This does not mean that it is not occurring. Stakeholders have indicated there is known floodplain harvesting in the Plan area, and DPIE-Water has acknowledged that floodplain harvesting has not been assessed in the Plan area.

Floodplain harvesting in the Plan area should be assessed and volumes of take should be incorporated into the LTAAEL as required by the Plan rules. Any increase in floodplain harvesting since 1999 should be assessed and managed in accordance with Plan rules, as this is not currently allowed within the LTAAEL.

All other forms of interception should be accounted for within the Plan rules and included in the definition of the LTAAEL. To mitigate the risk from interception, DPIE-Water needs a comprehensive policy for any areas not defined as a designated floodplain that covers:

- how to quantify the extent of interception of overland flows that is occurring
- how it will account for reduction in flow through interception in LTAAELs

62 For the Murray and Lower Darling, Schedule 3 of the Basin Plan estimated licenced and unlicenced dams to be 80,000 ML per year.

63 Section 4A(1) of the Act.

- threshold for licencing interception activities
- how to manage interception to remain within sustainable LTAAELs and equitably distribute any risks.

Once the extent of interception is quantified, the material risk of this historical interception should be assessed along with the future environmental, economic and social risks from further development. Plan rules should be revised as necessary to adequately manage these risks now and into the future, and equitably distribute risk of allocation reductions (see **Chapter 5**). Once historical interception is assessed, the NSW Government should apply to amend the BDL to accurately reflect this usage based on improved information.

3.3 Establish sustainable extraction limits

The Commission considers that the intent of the Act is to require the establishment of sustainable extraction limits to protect water sources, their dependent ecosystems and landholder rights. The Commission recognises that the Basin Plan establishes SDLs for water resource areas. However, these cover both the unregulated and regulated plans. Water sharing plans are responsible for ensuring ecologically sustainable levels of extraction at appropriate scales for protecting water sources, their dependent ecosystems and landholder rights. This includes establishing LTAAELs at the sub-catchment scale and the establishment of a bulk access regime to manage water sources within the Plan. In practice, these requirements should be met through the establishment of numeric LTAAELs based on consideration of environmental needs and all forms of extraction, and supported by other tools such as access rules.

The LTAAELs established by the Plan are largely based on codifying estimated historic levels of extraction and floodplain harvesting, and they do not explicitly factor in environmental sustainability considerations. The LTAAEL should be based on an assessment of environmental sustainability consistent with the priorities under the Act. As outlined in **Sections 3.1** and **3.2**, there is potentially considerable water take that is not currently accounted for within the LTAAEL. In addition, the entitlement is considerably higher than the LTAAEL estimate. Once a sustainable LTAAEL is established, this must be compared to the total actual take. This may result in the need to reduce take for various types of users.

Chapter 4 discusses how Plan rules should be revised to ensure any such reduction are made fairly. The Commission recognises that review of the LTAAEL would need to be undertaken taking into consideration any requirements of the Basin Plan, and any revisions to historical estimates should be used to update the BDL.

In making these findings, the Commission acknowledges that the Plan includes other tools and measures to support environmental sustainability, such as CTP limits and trade rules, which complement the LTAAELs. However, the role of the LTAAEL is to provide long-term balance between environmental needs and other forms of use to manage long-term impacts of overall extraction and interception. Other mechanisms, such as CTP rules, are in place to manage impacts of water scarcity in shorter time periods and/or to address more localised concerns.

The Commission also acknowledges that, within the Murray Valley, the entitlement in the Plan's unregulated river water sources (43,607 units based on data provided by WaterNSW) is small by comparison with the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources 2016* (2,497,102 units). Nevertheless, having clarity around

LTAAELs, how floodplain harvesting will be managed with LTAAELs, and how any necessary reductions to maintain the LTAAEL in the future will be allocated is important for the individual licence holders in the Plan area, and for protecting the ecosystems within the Plan area.

3.4 LTAAEL compliance should be assessed

Compliance assessments that involve comparing the actual average annual extractions for each extraction management unit against their LTAAELs have not been undertaken.[64]

The Plan requires the total annual extraction for each extraction management unit to be calculated at the end of each water year (Clause 29). The average annual extraction over the preceding three years is to be compared against the respective LTAAEL (Clause 30). There is a non-compliance if this average extraction exceeds the LTAAEL by 5 percent or more.

An assessment of LTAAEL requires the establishment of numeric LTAAELs, which are not available, and comprehensive annual extraction data. The volume of water taken from unregulated surface water sources cannot be calculated because of a lack of water use data and broadscale metering,[65] although some metering has been rolled out through NSW Government-supported programs, and some further metering will be rolled out under the 2018 metering regulations.[66]

AWDs are meant to be used under the Plan rules to ensure compliance with LTAAELs. If water use exceeds the LTAAEL for an extraction management unit, AWDs can be reduced in the subsequent years to retrospectively address this exceedance. As assessments of actual extractions against LTAAELs have not been undertaken, all categories of access licence have received AWDs of 1 ML per unit share or 100 percent per year, regardless of the past usage and actual availability of water in the river system.

DPIE-Water should ensure that the LTAAEL calculations are undertaken as required and that adjustments to the AWD are implemented as per the Plan rules. This is critical for ensuring the protections intended by the Plan are realised.

64 Alluvium (2019) *Audit Report: Audit of the Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources 2011.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289487/Murray-Unregulated-and-Alluvial-Water-Sources-2011.pdf.

65 *Ibid.*

66 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf.

3.5 Recommendations

R 2	When remaking the Plan, to ensure all extraction under the Plan is managed to protect, preserve and maintain the water sources and dependant ecosystems and improve transparency, DPIE-Water should: a) establish and publish sustainable, numeric LTAAELs, ensuring they are based on best available information, including ecological requirements, an accurate estimate of extraction, interception and climate change impacts b) ensure the LTAAEL includes all forms of interception and extraction.
Suggested action (SA 1)	DPIE-Water should: a) undertake regular LTAAEL compliance assessments b) use AWDs to ensure extraction remains below LTAAELs as required by the Plan rules.

4 Improving equitable sharing of water consistent with the Act

The Act prioritises the protection of the water source and its dependent ecosystems over licensed water usage.[67] Within licensed usage, the Act prioritises local water utility access licences (which provide town water supply) over other licence classes.

The Commission identified several areas in which the Plan could be more consistent with the priorities of the Act. Regarding prioritisation of water for the environment, the CTP rules in the current Plan are not based on an adequate assessment of ecosystem needs and, in some cases, do not appear to be adequate to provide for the environment and basic landholder rights (see **Chapter 5**). Regarding prioritisation of town water supply over other licensed use, some of the current Plan rules may not provide priority access for local water utilities over other licensed access (**Section 4.1**). This is significant as current estimates indicate a shortfall in secure yield for town water supply over the life of the next Plan.

Plans are also required by the Act to provide orderly, efficient and equitable sharing between users.[68,69] What equitable sharing means and how it is managed between users is not clearly defined in the Plan. The Plan includes objectives related to achieving equitable sharing of water, but how the provisions support this objective is not clear.

The Commission has identified opportunities to improve the way Plan provisions equitably manage risks of potential reductions in allocations for licence holders that may be required to meet the LTAAELs. These opportunities require that extraction is first quantified, as required by the Plan, so that risks can be properly understood (**Section 4.2**).

4.1 Securing urban water supply

The majority of town water supply for urban centers in the Plan area is provided for under the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*. The Snowy Valleys Council holds all of the local water utility access licences in the Plan, with a combined share component of 639 ML per year.[70] Water is extracted from the Swampy Plain and Tumbarumba water sources in the Plan area. The Council also holds a local water utility licence for 59 ML per year in the Upper Murray Groundwater Source, which falls under the *Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020.* The Council supplies the townships of Tumbarumba and Khancoban with these licences. The Council advised that Burra Creek is the primary source of water to Tumbarumba township and Tumbarumba Creek is the secondary source.[71]

Tumbarumba's current town water demand is 306 ML per year.[72] The Plan provides for adequate entitlement to meet the town's water needs now and into the future, when water is available to access that full entitlement.

67 Section 5(3) of the Act.
68 Section 3(e) of the Act.
69 Clause 2(d) of Section 5 of the Act.
70 Clause 24 of the Plan.
71 Interview: Snowy Valleys Council, 25 May 2021.
72 Interview: Snowy Valleys Council, 25 May 2021.

However, the Council advised that it has faced challenges in providing for the town's water supply under the current Plan provisions in times of drought.[73] During the millennium drought, Snowy Valleys Council had to place level 4 water restrictions on urban users to maintain adequate town water supply.[74] The Tumbarumba secure yield is sensitive to the water sharing rules in the Plan.

The Council has commissioned several investigations which found:

- without additional bore supply the secure yield is reduced to about 140 ML per year
- even at a lower level of service and without considering increases in temperature from climate change, the secure yield is well short of requirements
- secure yield would be expected to reduce by about 15 percent based on climate change projections from 2013 to 2030
- continued extraction from Burra Creek would require about 500 ML of off-river storage to enhance the security of town water supply for times of drought
- without augmentation there is a risk to security of urban water supply.[75]

The Council is currently considering a range of options to augment its water supply system, including extraction from Mannus Lake, which has a 2,300 ML storage.[76] The Council does not currently hold a licence to extract from the Mannus Water Source. This augmentation would potentially shift extraction to a water source with significant environmental issues. The lake has several water quality issues and cyanobacterial blooms, a recognised problem for Mannus Lake,[77] that already impact on environmental and recreational values. Recreational uses would also need to be considered given boating is currently permitted on the lake. In addition, any impacts on flows downstream of the dam would need to be considered given the last known self-sustaining population of the endangered Macquarie perch in the NSW Murray occurs in Mannus Creek and this population has already been heavily impacted by the 2019/20 bushfires (see **Chapter 5**).

A further constraint in these considerations is the Basin Plan, which states a WRP must ensure that there is no net reduction in protection of planned environmental water from that was provided under state water management law at the start of the Basin Plan in 2012.[78] The Plan predates the Basin Plan and therefore cannot be changed to decrease the net protection of planned environmental water.

The Plan currently includes a CTP threshold of 5 ML per day at the Tumbarumba gauge in the Tumbarumba Water Source for the Council.[79] The Council is concerned that, once the town water supply is augmented, the CTP for the Tumbarumba water source will rise to 14 ML per day consistent with other licence holders. The background document recommended including

73 Interview: Snowy Valleys Council, 25 May 2021.
74 Snowy Valleys Council (2021) Information supplied by Council, unpublished.
75 Snowy Valleys Council (2013) *Tumbarumba Water Supply Yield Study.*
76 Submission: Snowy Valleys Council, received 18 December 2020.
77 Mitrovic, S., Hitchcock, J. and Vasey, J. (2019) *Mannus Lake – investigations into the contributing factors for the 2018 blue-green algal bloom and management recommendations.* Report prepared by Freshwater and Estuarine Research Group, University of Technology, Sydney.
78 DPIE (n.d.) *NSW MDB Porous Rock WRP Frequently Asked Questions*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/236599/faqs-fact-sheet.pdf.
79 Clause 12 (12) Schedule 2 (2) of the Plan.

an amendment provision to allow a new CTP rule to apply at the Minister's discretion post augmentation.[80] However, there is no provision in the Plan stating this will occur.[81]
In developing the Plan, the relative environmental and economic values were not fully considered. Mannus Creek Water Source needs to reflect its high environmental significance and Tumbarumba Water Source needs to reflect its higher economic dependency to avoid perverse outcomes:

- The macro planning approach[82] was used to set the current CTP rules in the Plan. This approach sets rules across the whole Plan area with an aim to maximise environmental protection while minimising economic impact. However, the background document indicates that the analysis only considered the economic dependence of irrigation, not town water supply. Not considering the economic value of the town distorts the analysis. The Act requires local water utilities to be prioritised above other water users with a licensed entitlement.[83]
- The 14 ML per day CTP for the Tumbarumba Water Source corresponds to the 95th percentile flow as recommended by the macro planning approach. The 95th percentile is based on expert opinion and detailed studies in other water sources being extrapolated from across NSW. In situations where there are significant ecological risks from increased extraction (as in the case of Mannus) or economic risks from limitations on extraction (as in the case of Tumbarumba) further site-specific studies are warranted.
- The Council is seeking to potentially augment supply from Mannus Creek Water Source, which is already under considerable hydrologic stress and has high ecological values.

If the Council is required to move to the 14 ML per day CTP that applies to other licence holders, it could disincentivise Council from augmenting its supply. However, the current CTP limit of 5 ML per day is well below other licence holders. The appropriate CTP rule for the Council post-augmentation needs to be included in the replacement Plan to remove ambiguity and avoid perverse outcomes.

Appropriate CTPs should be established based on an assessment of environmental flow needs (see **Chapter 5**) and volumes needed to fulfill basic landholder rights. Subsequent economic analysis should consider the full range of other uses for water, including town water supply and town water should be given priority over other licensed use in establishing CTP rules, consistent with the priorities under the Act. Once a sustainable set of water sharing rules are established, an assessment of any necessary augmentation should be undertaken, and CTP rules should be assessed based on environmental impacts and ability to provide adequate town water. Rules should support local water utility access licences to continue to extract where environmental outcomes are not compromised, and before other licensed water users.

The *Murray Regional Water Strategy* should consider the risks to security of town water supply as part of its process, including a changing climate and the further pressure this may place on meeting town water supply needs.

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80 See Appendix 9 of the background document (DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf).

81 Interview: Snowy Valleys Council, 25 May 2021.

82 NSW Office of Water (2010) *Macro water sharing plans - the approach for unregulated rivers. A report to assist community consultation.* Available at https://silo.tips/download/macro-water-sharing-plans-the-approach-for-unregulated-rivers.

83 See Part 3: Principles of the Act.

4.2 All basic landholder rights extraction must be accounted for

The Plan provides for basic landholder rights, which are given priority under the Act and do not require water licences:[84]

- **domestic and stock rights** – owners or occupiers of land that has river or lake frontage can take water without a licence for domestic (household) purposes or to water stock
- **harvestable rights – dams** – landholders in most rural areas can collect a proportion of the runoff on their property and store it in one or more farm dams up to a certain size
- **native title rights** – native title holders (as determined under the *Native Title Act 1993* (Cwth)) can take and use water for a range of domestic and traditional purposes.

The Plan recognises all basic landholder rights extraction. However, it only includes an estimate of domestic and stock rights water usage, and not the other types of basic landholder rights usage. DPIE-Water has indicated that there is an estimated 11,000 ML per year of basic landholder rights usage. This is a large percentage of the estimated LTAAEL. Therefore, any growth in basic landholder rights could have a substantial impact on the LTAAEL and result in the need to reduce licensed usage. This should be made transparent to the users, by including accurate estimates of basic landholder rights in the remake of the Plan.

Some stakeholders are concerned the Plan does not provide adequate protection of basic landholder rights with regards to daily access during low flows because water sharing favours economic use:

> "*The WSP has failed to protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values or to protect basic landholder rights. The key intent of the WSP was to have negligible impacts on history of use. This has contributed to economic outcomes at the expense of balanced water sharing. The long-term outcome of poor water management will have economic implications.*"[85]

While there are CTP rules that protect some water from licensed extraction, it is not clear whether the CTPs provide adequate water for the environment or basic landholder rights.

Stock and domestic use is not measured or monitored making it difficult to determine if basic landholder requirements have been met over the life of the Plan, or if there has been growth in this type of usage. Surveillance of harvestable rights dams is part of NRAR's compliance activities and there is no active monitoring by DPIE-Water. The MDBA is concerned that without monitoring there are material risks for areas to stay within sustainable diversion limits:

> '*There is no meaningful tool to monitor growth. Where there is potentially increased take we see the need for an improvement program. This is a program of work to improve the way basic landholder rights are measured in the future.*'[86]

The Commission supports the MDBA's suggestion that growth in high-risk extraction management units should be determined and a program for monitoring growth in basic landholder rights is required.

84 Sections 52-55 of the Act.
85 Submission: Inland Rivers Network, received 18 December 2020.
86 Interview: MDBA, May 25 2021.

Population and development patterns can provide an indication of potential growth in demand for water, which may impact on the demand for basic landholder rights. The Commission's analysis indicates there is unlikely to be significant growth in the Upper Murray Extraction Management Unit because the Snowy Valleys Shire population has declined since 2011[87] and is expected to continue to decline 15 percent by 2041.[88] Population density is half the regional NSW average and building approvals are a small percentage of NSW regional growth. The Snowy Valleys Council advised there are no large subdivisions anticipated in the area that would impact on basic landholder rights.[89]

Conversely, there has been significant population growth in the City of Albury, which is situated in the Mid Murray Extraction Management Unit. Albury City Shire population growth is estimated at 20 percent by 2036[90] and dwelling and development growth is estimated at 26 percent.[91] Population density has been well above the NSW regional average since 2011 and is currently at 1.79. Medium-to-high density dwellings are 21.4 percent, 4.5 percent higher compared to regional NSW. The background document noted that Albury was highly likely to expand small-scale developments and the Albury Water Source was classified as having high in stream value (see **Appendix B**).[92] Given this, growth in basic landholder rights in the Mid Murray Extraction Management Unit warrants consideration in the replacement Plan.

Further, as discussed in **Chapter 3**, LTAAEL compliance is not currently assessed. Given the possibility of growth in basic landholder rights, assessment of LTAAEL compliance is particularly important to ensure that the allocations for licenced extractions are appropriately reduced as necessary to comply with the LTAAEL and ensure basic landholder rights needs are met. Accurate estimates of basic landholder rights should be made for the life of the current Plan and projected into the future in making the new Plan to provide more transparent information for licence holders to manage their risk.

4.3 Significant risk of reduction in allocations

The Plan includes objectives around managing equitable sharing between users. To meet these objectives, Plan provisions should equitably manage any impacts of reductions in allocations necessary to remain within the LTAAELs. However, under current rules there are potential inequities if reductions in allocations are necessary, and a considerable risk that reductions will be necessary.

Unregulated access licence users are exposed to a risk of reduced allocation if there is growth in basic landholder rights and/or significant floodplain harvesting. This is because the Plan requires that all extraction must be contained within the LTAAEL for each extraction management unit.

87 Id Profiles (2021) *Snowy Valleys Council.* Available at: https://profile.id.com.au/snowy-valleys/about?WebID=120.

88 Snowy Valleys Council (2021) *Snowy Valleys Council Local Strategic Planning Statement June 2020.* Available at: https://www.snowyvalleys.nsw.gov.au/Building-Planning/Planning/Local-Strategic-Planning-Statement-2020-2040.

89 Interview: Snowy Valleys Council, 25 May 2021.

90 Id Profiles (2021) *Albury City Council Community Profile.* Available at: https://forecast.id.com.au/albury/about-forecast-areas.

91 Id Profiles (2021) *Albury City Council Community Profile.* Available at: https://forecast.id.com.au/albury/dwellings-development-map.

92 NSW Government (2012) *Water Sharing Plan for the Murray Unregulated Alluvial Background Document.* Available at:

When extraction is above the LTAAEL, reductions in allocations for unregulated access licences are required by the Plan rules to bring extraction to below the LTAAEL.

As outlined in **Sections 3.1** and **3.2**, there is considerable water take within the Plan area that has not yet been accurately quantified, and some of which is not currently covered clearly by the Plan. Once a sustainable LTAAEL is established, and all forms of take are accounted for, there may be a need to reduce water usage in the Plan area.

Reductions in licensed allocation to accommodate growth in floodplain harvesting or other forms of interception would potentially have negative socioeconomic impacts on unregulated access licence users and would be inequitable. The socioeconomic impact of these reductions will depend on the extent to which the long-term average annual extraction rate is found to be exceeded. Floodplain harvesting should be accurately quantified prior to the Plan remake. Accurate estimates should be made for the life of the current Plan and projected into the future in making the new Plan, so that provisions can be appropriately designed and assessed to ensure they are managed equitably and consistent with the Act priorities.

Under current Plan rules, the only method of reducing take to achieve LTAAEL compliance is for unregulated access licence users to have their AWD reduced. The rules should be revised to explicitly state how water allocation will be reduced across the range of users, including any future licensed floodplain harvesting and licensed extraction. DPIE-Water should ensure that risks of future reductions are fairly distributed to all users as much as possible, while maintaining consistency with the Act requirements.

4.3.1 Inequitable distribution of risks across management units

The impact of any growth could be greater in one extraction management unit if this growth was not uniform across the Plan's two extraction management units. Without accurate numbers for these rights there could be unintended consequences.

Because the two extraction management units have separate LTAAELs (see **Chapter 3**), any reduction required to offset growth has the potential to have more significant social or economic consequences on the Middle Murray Extraction Management Unit. Growth in basic landholder rights or floodplain harvesting is most likely to occur in the Middle Murray Extraction Management Unit because topographically floodplain harvesting can only occur in this unit. Population growth in Albury may potentially drive growth in basic landholder rights (see **Section 2.6.2**), which is also situated in this unit. Under current Plan rules, social and economic risk to licence holders are greatest for those in this unit who would bear the impact of any reductions necessary to accommodate such growth. This risk continues to increase as long as there is no measurement or accurate estimates of total extraction and interception, and these continue to grow.

Once extraction is adequately estimated, DPIE-Water should assess the impacts and equity of various options for mitigating the risk of reduced allocations. For example, if the Plan were revised to have one LTAAEL across both extraction management units, growth in basic landholder rights and floodplain harvesting would be shared across the entire Plan area, spreading the risk (and potential reductions) across more licence holders. The Commission recognises that this option would likely require some compensation to users outside the Middle Murray Extraction Management Unit (see **Chapter 9**).
Following assessment of options, the Plan rules should be revised to ensure equitable sharing of any necessary reductions, consistent with the priorities under the Act.

4.4 Recommendations

R 3	When remaking the Plan, to improve alignment with the priorities in the Act, DPIE-Water should: a) include economic dependence on town water supply when considering social and economic impacts of proposed changes to water sharing rules b) ensure that CTPs are established based on environmental sustainability and basic landholder rights needs c) specify what the post-augmentation CTPs for Snowy Valley Council would be in the Plan d) ensure that the Plan rules encourage town water supply augmentation in line with the Plan's objectives.
R 4	When remaking the Plan, DPIE-Water should ensure the Plan facilitates equitable sharing of water by: a) determining the rate of growth in extraction and interception since timeframes set in the Plan rules and estimate growth into the future b) revising Plan provisions to clearly outline how allocations would be adjusted to respond to growth in various types of use where necessary to meet the LTAAELs, and ensuring these rules allocate reductions fairly c) ensuring that any options for reducing allocations where necessary are consistent with the Act and Basin Plan.

5 Strengthening environmental protections

The Plan aims to protect the needs of the environment by setting and managing extraction against LTAAELs, trade restrictions and access rules. However, there is limited evidence to indicate how effective these Plan provisions have been in supporting environmental outcomes. Risk assessments undertaken as part of the development of the *Murray and Lower Darling Surface Water Resource Plan* indicate that more can be done to protect key components of the flow regime across some of the Plan's water sources.

Since the Plan was developed, work has been undertaken to better understand environmental water requirements. This includes the development of LTWPs by DPIE-EES and DPI-Fisheries' Fish and Flows Framework for identifying significant flow components to support the life stages of native fish. These developments are commended and provide an important evidence base for refining plan provisions to deliver better environmental outcomes. However, further work is required to recognise and better understand the interaction between regulated and unregulated water sources and their respective water sharing plans, and risks to environmental values posed by extraction from regionally significant wetlands and off-river pools.

While the Plan was amended in 2020 to improve consistency with the Basin Plan, the principle adopted by the NSW Government of minimal change to plans within their 10-year term means that there are several opportunities identified during the development of the WRPs still to be addressed to improve environmental outcomes. In addition, the Commission has identified opportunities to improve water quality outcomes and better protect held environmental water. Key issues and areas for improvement are discussed below.

5.1 Improved understanding of ecological values and flow needs

When the Plan was developed, information was available on the threatened species within the Plan area, including those that are highly sensitive to extraction and there was some understanding of their water requirements.[93] Based on this information, nine unregulated water sources were identified as having high instream values. In addition, three water sources in the Plan area were identified as having an endangered ecological community – the Lower Murray River aquatic ecological community, including Albury, Lake Wangamong and Majors Creek. The listing of this aquatic ecological community gives all native aquatic species within its boundaries the status of endangered species. Flow alteration is a key factor threatening the endangered ecological community.

Despite this information, not all Plan rules appear to be commensurate with the values and needs of identified environmental assets. Further, the original Plan and its background document did not recognise the presence of the last known population of the endangered Macquarie perch in the NSW Murray (see **Section 6.2**). This is now reflected to some extent through the updated objectives in the amended Plan, including the targeted environmental objective to '*protect, and contribute to the enhancement of the recorded distribution or extent, and population structure, of target ecological populations including Macquarie perch, Murray cod, trout cod,*

93 NSW Office of Water (2012) *Water sharing plan for the Murray unregulated and alluvial water sources 2012 - background document*, DPI – NSW Office of Water, Sydney, p. 22. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf.

flathead galaxias and southern pygmy perch.'[94] However, there were no major changes made to access rules to ensure that the objectives could be met.

Plan rules were also constrained by the limited gauging within the Plan area. In the absence of gauges, visible flow rules were adopted for most rivers and streams. However, they do not necessarily provide for connectivity and may not provide adequate flows to protect high-risk water sources and their water dependent ecosystems. This is inconsistent with the updated environmental objectives in the Plan, which aim to provide for longitudinal connectivity.[95] Further, visible flow rules may not provide adequate flows to protect the water source and its ecosystems.

During the term of the Plan, DPIE-EES in collaboration with other agencies, developed the Murray-Lower Darling LTWP.[96] The LTWP provides the latest information on environmental assets and their water requirements and should inform provisions in the replacement water sharing plan.[97] It sets out this information by planning units, which generally align with the water sources included in the water sharing plan. It is therefore an important information source for improving environmental outcomes. The LTWP highlights the need to focus on delivering connecting flows, which would include between regulated and unregulated water sources in the Murray Valley:

> *"The future ecological condition of the Murray and Lower Darling water-dependent environmental assets will be largely driven by our ability to deliver flows that connect rivers with cut-off channels, anabranches, floodplains and wetlands."*[98]

A key input to the LTWP was the risk assessment undertaken by DPIE-Water as part of the WRP process.[99] This assessment examined the risk of insufficient water for the environment and capacity to meet environmental water requirements. It currently represents the best available science and knowledge. Several water sources in the Plan area were assessed as having medium or high-risk components of the flow regime (see **Table 6**). Mannus and Tooma water sources were identified as having a high risk associated with an increase in zero flow periods. Swampy Plains and the Upper Murray were identified as having high risks associated with altered base flows and freshes, and Swampy Plains has a medium risk for larger flows (high and infrequent flows).

As part of its risk assessment process, DPIE-Water applied the High Ecological Value Aquatic Ecosystems (HEVAE) framework to assess risks to instream values based on the sensitivity of ecological functions and assets to changes in flow. The process generated consequence scores for regulated and unregulated river reaches.

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94 Clause 10(2)(a) of the amended Plan.

95 Clause 10(2)(b) of the amended Plan: the targeted environmental objective of this Plan is to protect, and contribute to the enhancement of longitudinal and lateral connectivity within and between water sources to support target ecological processes.

96 DPIE-EES (2020) *Murray–Lower Darling Long Term Water Plan, Part A and B*. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-b-planning-units-200081.pdf.

97 The Commission has drawn on the Lower Murray-Darling LTWP to inform its advice. This is considered best available information on environmental water requirements for environmental assets in the Plan area.

98 DPIE-EES (2020) *Murray–Lower Darling Long Term Water Plan, Part A: Murray-Lower darling catchment,* p. 2. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-a-catchment-200080.pdf.

99 DPIE (2019) *NSW Murray and Lower Darling Surface Water Resource Plan Risk Assessment (SW8).*

The unregulated water sources of Dora Dora, Hume, Jingellic, Mannus, Swampy Plains, Tooma and Upper Murray were found to have medium HEVAE consequence scores. Murray below Mulwala was found to have a high consequence score meaning it has high ecological values. However, the overall risk rating did not indicate that this water source is at significant risk of meeting environmental needs. Tumbarumba was found to have the lowest HEVAE consequence score suggesting the water source has low ecological value according to the assessment. Nonetheless, cease to flow periods do appear to be highly altered in this water source.

Table 6: Water sources identified as having medium and/or high-risk flow components[100]

Water source	Zero flow periods	Base flow or low flow	Fresh flows	High and infrequent flows (overbank flow		
				Over bank 1.5 years average recurrence interval	Over bank 2.5 years average recurrence interval	Over bank 5 years average recurrence interval
Albury	L^{0}	M^{-}	L^{-}	L^{0}	L^{0}	L^{0}
Hume	L^{0}	M^{-}	L^{-}	L^{0}	L^{0}	L^{0}
Mannus**	H^{+}	L^{-}	L^{-}	L^{-}	L^{0}	L^{0}
Swampy Plains	L^{0}	H^{+}	H^{+}	M^{-}	M^{-}	M^{-}
Tooma	H^{+}	L^{-}	L^{-}	L^{0}	L^{0}	L^{0}
Upper Murray	L^{0}	H^{+}	H^{+}	L^{-}	L^{-}	L^{-}

Key
L = low risk M = medium risk H = high risk
+ increase near-natural condition; - decrease near-natural condition; 0 no change from near-natural condition
** Mannus was modelled with CTP implemented

Albury Water Source

While the Plan includes visible flow rules and rules to protect natural in-river and off-river pools, the risk assessment indicates extraction is posing a medium risk to low flows and base flows. In addition, there has been significant population growth in Albury Shire (see **Section 2.6.2**). This is potentially leading to a growth in domestic and stock use (see **Section 4.2**). The LTWP identifies five opportunities to reduce extractive pressure on the water source, which the Commission supports. These are largely targeted at installing gauges to better manage extraction based on real-time flow data, introducing commence-to-pump thresholds higher than CTP threshold and rostering access to reduce pressure on low flows.

It is acknowledged that changes to access rules could potentially have socio-economic implications that would need to be further explored. The Commission understands that DPIE-Water recently completed a review of hydrometric gauges in NSW.

100 DPIE (2019) *NSW Murray and Lower Darling Surface Water Resource Plan Risk Assessment (SW8).*

The NSW Government should ensure that there is adequate funding to install gauges necessary to properly manage water sources.

Hume Water Source

For the Hume Water Source, the risk assessment determined low flows and base flows to be at medium risk due to a decrease in flows. Plan rules, including CTP when there is no visible flow, do not necessarily protect base or low flows. The LTWP identifies five opportunities to reduce extractive pressure on the water source which the Commission supports. They are similar to the options identified for the Albury Water Source.

Mannus Water Source

Plan rules do not appear to be addressing the increased frequency in cease to flow periods in Mannus Creek. CTP rules need to be reviewed to ensure that visible flow is maintained downstream of extraction points to provide for connectivity and ensure that the correct gauge is referenced. See **Section 5.2** for further discussion on environmental flow studies and opportunities to improve environmental outcomes for Mannus Creek Water Source.

In addition, there is a need as identified in the LTWP to review the licence conditions for Mannus Dam to ensure that environmental flow rules are appropriate to achieve intended environmental outcomes, including supporting the last population of Macquarie perch in the NSW Murray and its recovery from the 2019-20 bushfires. These requirements should also be codified in the Plan.

Swampy Plains and Upper Murray Water Sources

The high risk ratings across the flow regime (base flows/low flows, freshes and larger flows) in the Swampy Plains and Upper Murray water sources are predominantly attributed to intervalley transfers and hydropower operations as part of the Snowy Scheme, which result in significant daily and hourly flow variations.[101] Plan rules do not effectively manage these risks and arrangements for managing these operations and environmental impacts sit outside of the Plan (see **Chapter 7**).

There are also several unregulated river water access licences (downstream of Khancoban Pondage) that are likely contributing to an altered flow regime. Changed flows pose significant risks to environmental values in the Upper Murray, including Murray cod nesting. The LTWP indicates that strategies are needed to mitigate the extreme flow variability and provide more stability around base flows.[102] Mimicking more natural rates of rise and fall would deliver a range of environmental benefits.

101 DPIE-EES (2020) *Murray–Lower Darling Long Term Water Plan, Part B,* p. 97. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-b-planning-units-200081.pdf.

102 *Ibid.*

Tooma Water Source

Flows in the Tooma Water Source are highly altered as a result of transfers for the Snowy Scheme and extractive use in the Lower Tooma. Of most concern, according to the WRP Risk Assessment, the Tooma River has experienced a significant alteration in cease-to-flow periods – more than a 50 percent departure from base case – with cease to flow periods occurring more frequently.[103] There has also been a decline in low flows, base flows and freshes.

These changes are attributed to diversions from Tooma River to the Tumut River under the Snowy Scheme (see **Section 2.4**). Surface water extraction in the lower Tooma River and its tributaries could also be contributing to the significant increase in the occurrence of cease-to-flow periods, which have implications for water quality and the protection of aquatic species.

The background document indicates at the time of plan development, "*no water sources, management zones or pools within the plan area were identified as requiring a first flush rule*".[104] However, for Tooma River, the NSW Murray and Lower Darling LTWP suggests implementing 'first flush provisions' to protect initial increases in flows following cease to flow/very low flow periods. This could provide a range of benefits for aquatic ecosystems including to water quality.

5.2 Improving environmental outcomes for Mannus Water Source

As discussed above in **Section 5.1**, Mannus Water Source was one of two water sources identified as having a high risk associated with an increase in zero flow periods.[105] This water source is split into two management zones – Upper and Lower, with the identified boundary at a (now decommissioned) Glenroy Gauge. Mannus Creek is known to support the last remaining populations of Macquarie perch in the NSW Murray catchment. This species is listed as endangered under the NSW *Fisheries Management Act 1994* and the EPBC Act. However, this population was impacted by the 2019-20 bushfires.[106] The Mannus Water Source also supports a population of the booroolong frog which is listed as endangered under NSW and Commonwealth legislation (EPBC Act).

It is important to ensure provisions of the Plan are adequate to protect the Mannus Water Source, its population of Macquarie perch and other native aquatic biota, as well as appropriately manage water for other users. The Commission has identified two key areas of concern to be addressed when remaking the Plan: operation and release rules for Mannus Dam and the correct specification of a river gauging station in the Mannus Upstream Management Zone. These are addressed in the following two subsections.

The Plan was amended in 2020 to include more targeted environmental objectives to protect and contribute to the enhancement of, among other considerations, native fish including Macquarie perch.

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103 DPIE-Water (2019) *NSW Murray and Lower Darling Surface Water Resource Plan Risk Assessment (SW8)*.

104 NSW Office of Water (2012) *Water sharing plan for the Murray unregulated and alluvial water sources 2012 - background document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf.

105 DPIE-Water (2019) *NSW Murray and Lower Darling Surface Water Resource Plan Risk Assessment (SW8)*.

106 Doyle K., Pearce L., Ning N., McGregor C., Duffy D., Weatherman K., and Baumgartner L. (2021) *Reassessing Macquarie Perch Populations and Habitat in Mannus Creek - Final Report*. Institute for Land, Water and Society, Charles Sturt University, Albury.

However, Plan rules have not yet been amended to facilitate meeting those objectives. There are still several issues with how this water source is managed under the Plan. Most notably:

- the requirements of Macquarie perch were not considered in setting Plan rules
- the impact of Mannus Dam on downstream users and the environment is not considered or included in the Plan and the release requirements were not exhibited when the Plan was amended in 2020
- the gauging station for the Upper Mannus Management Zone is not correctly referenced posing a risk to the protection of low flows.

5.2.1 Mannus Dam operation and release rules are not in the Plan

Mannus Lake is a 2,300 ML storage that was originally constructed on Mannus Creek. In 2010, a large flood event caused the failure of the dam. A new dam wall was constructed four years later with the ability to regulate environmental flow releases to deliver beneficial effects on the creek's water quality and biotic communities.

The operating requirements included in the works approval for Mannus Dam have not been codified in the Plan. This should be amended as part of the Plan remake, along with updating the conditions in the works approval to reflect best available information and the newly codified water sharing plan system operation rules. In developing conditions, DPIE-Water should consider the needs of the environment (such as fish passage and ecological objectives downstream), basic landholder rights and other downstream water users (such as unregulated licence holders). Environmental considerations are of particular importance given the impacts of the 2019-20 bushfires on the population of Macquarie perch in Mannus Creek (downstream of the dam). The fires burnt the 9-kilometre reach of river the threatened species was known to inhabit, posing a serious risk to this population.[107]

Prior to the 2019-20 bushfires, Mannus Creek supported the last remaining populations of Macquarie perch in the NSW Murray catchment. This species is listed as endangered under the NSW *Fisheries Management Act 1994* and Commonwealth EPBC Act. The Mannus Creek population – one of four known Macquarie perch populations left in NSW – was severely impacted when heavy rainfall caused a postfire blackwater event in Mannus Creek in January 2020. The Plan does not appear to contain specific provisions to protect this population of the threatened native fish species.

The presence of this population was also not recognised in the original Plan's background document. A study commissioned by Murray Local Land Services and undertaken by Charles Sturt University to reassess Macquarie perch populations and habitat in Mannus Creek post bushfires is nearing completion. This study should be considered as part of Plan remake to ensure that plan provisions, in conjunction with other complementary measures, adequately support the recovery of Macquarie perch and other fire affected native aquatic species.[108]

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107 Doyle K., Pearce L., Ning N., McGregor C., Duffy D., Weatherman K., and Baumgartner L. (2021) *Reassessing Macquarie Perch Populations and Habitat in Mannus Creek - Final Report*. Institute for Land, Water and Society, Charles Sturt University, Albury.

108 Doyle, K., Ning, N., McGregor, C., Weatherman, K. and Baumgartner, L. (2021) *Reassessing Macquarie perch populations and habitats in Mannus Creek: progress report*. Unpublished research paper. Available at: https://researchoutput.csu.edu.au/en/publications/reassessing-macquarie-perch-populations-and-habitat-in-mannus-cre.

While there is currently no extraction from the dam, this may change depending on which town water supply augmentation options Snowy Valleys Council pursues to secure supply for Tumbarumba (see **Section 4.1**). Therefore, in reviewing the dam's operation and release rules, DPIE-Water should also consider the potential for Mannus Dam to augment the water supply for Tumbarumba.

Other considerations include the findings from an environmental flow study that was intended to inform the environmental flow requirements included in the new Mannus Dam works approval issued in 2014.[109] The Mannus Dam works approval also requires Snowy Valleys Council (the approval holder) to report on the environmental impacts of dam operations every five years. This report is currently being prepared by NSW Public Works[110] and should also be used to inform this review.

5.2.2 Mannus Upstream Management Zone gauging station needs to be correctly referenced

Plan rules do not appear to be addressing the increased frequency in cease to flow periods in the Mannus Water Source. This is attributed in part to issues with the gauge in the Upper Management Zone, which need to be rectified as a priority. CTP rules also need to be reviewed to ensure that visible flow is maintained downstream of extraction points to provide for connectivity.[111]

Incorrect referencing of the gauging station has allowed access to very low flows, which was not intended, resulting in the river level going below CTP at a critical point in time. The original (2011) Plan stated that the Very Low Flow Class for the Mannus Upstream Management Zone is less than or equal to 0.2 metres or less at Mannus Creek at Glenroy gauge (40110008). The gauge referred to in this Plan was installed in 2001 but was decommissioned prior to the commencement of the Plan on 30 January 2012.

Division 2 of Part 8 (a) of the original Plan stated that the reference point could be amended to specify a newly installed gauge in the Mannus Upstream Management Zone in the Mannus Water Source, such that the top of the Very Low Flow Class would be equivalent to the current Very Low Flow Class as measured at the Glenroy gauge (40110008). However, this was not undertaken, and the amendment provision was removed in 2020.

The amended (2020) version of the Plan attempted to rectify this issue, but incorrectly referred to 0.2 metres or less at gauge 4010291. There is no gauge station numbered 4010291, and this is most likely referring to gauge number 401029, which was installed on the 16 June 2011. Accordingly, since the original Plan came into effect on 30 January 2012, the CTP rule for the upstream management zone of Mannus Creek has never been able to take effect.

Even if the station number had been correctly referred to in the amended version of the Plan, the height specification for the CTP would need to be adjusted, as 0.2 metres does not equate to the same flow at the new gauge site.

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109 NSW Water Solutions (2013) *Mannus Lake environmental flow assessment.* Final paper prepared by NSW Water Solutions, NSW Public Works for Tumbarumba Shire Council.

110 Personal communications.

111 DPIE-EES (2020) *Murray–Lower Darling Long Term Water Plan, Part B,* p. 169. Available at : https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/long-term-water-plans/murray-lower-darling-long-term-water-plan-part-b-planning-units-200081.pdf.

According to the WaterNSW real time data website (**Figure 5**), the cease to flow limit at gauge 401029 is at 0.53 metres. This means if the CTP level of 0.2 metres was to be applied to gauge 401029, the CTP is well below the cease to flow. Since a flow class has been established, this would override the visible flow condition[112] allowing pumping to draw down in-river pools.

Height records at gauge station 401029 show that the river did drop below the cease to flow during the recent drought (**Figure 5**) and, unfortunately, this coincided with the bushfires (see **Section 2.6**). It seems likely that the CTP set in the original Plan was meant to be for a depth of flow of 0.2 metres, but the Commission has been unable to confirm this.

As per **Sections 6.3** and **Section 4,** CTPs should be reassessed to ensure that they adequately protect the necessary environmental flows and provide for basic landholder rights. Gauging information should be revised accordingly. Further, Plan provisions should provide for a specified flow, rather than a height at a gauge to ensure that flows can be maintained through any adjustments to gauges in the future.

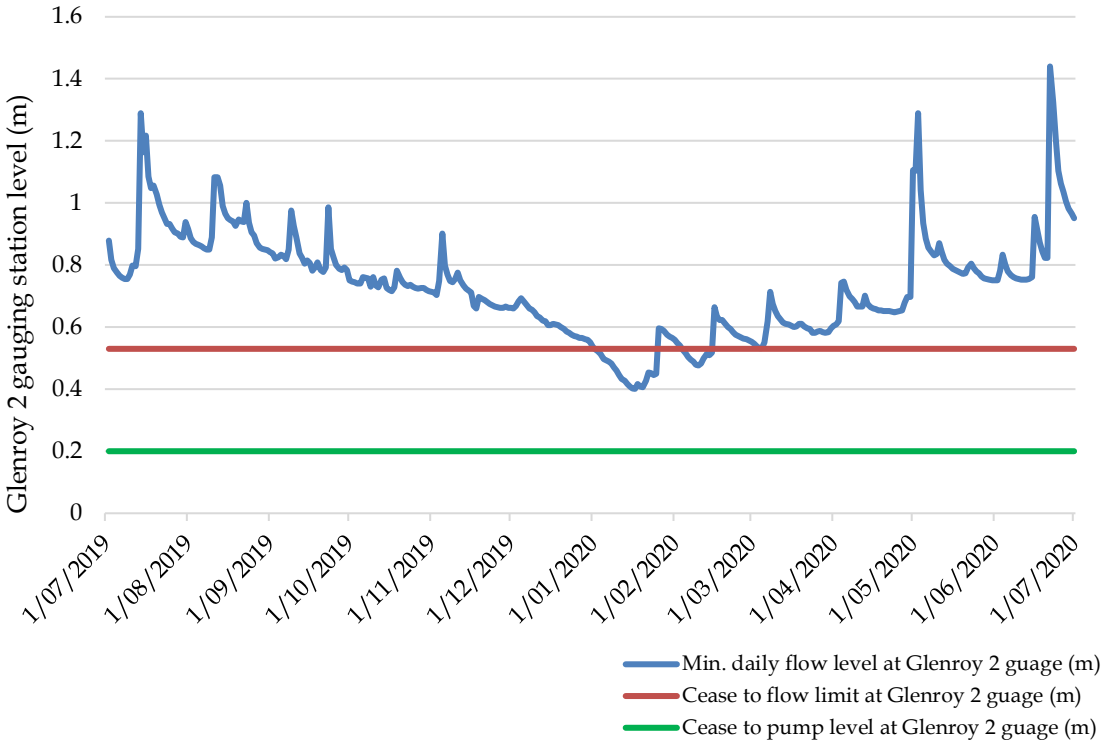

Figure 5: Water level at Mannus at Glenroy 2 gauging station compared to cease to flow and CTP

Changing the location of a CTP without amending the specified flow height at the new gauge could constitute a reduction in planned environmental water and would be inconsistent with the requirements of the Basin Plan. In addition, the Plan notes that the Mannus Upstream Management Zone is defined as upstream of the Glenroy Gauge[113] (40110008).

112 Section 44(8) states that "*Subject to subclause (12), water must not be taken from natural pools, lagoons or lakes within rivers in water sources or management zones where flow classes have not been established, when the water level in that pool, lagoon or lake is less than 100% of the full containment volume of the respective pool, lagoon or lake*".

113 Part 5 of the Plan states that "*The Mannus Upstream Management Zone is the area of the Mannus Water Source upstream of the Glenroy Gauge.*"

Moving the location of a gauging station also requires an assessment of the location of access licences since this can move extraction from above to below the gauging station, altering which management zone they are in.

The Commission examined the conditions placed on access licences for the Mannus Upstream Management Zone. These refer to a CTP of 0.2 metres, but at gauge 40110008 (the old non-existent site). These conditions cannot be complied with or enforced and are inconsistent with the current Plan.

5.3 Protection of held environmental water

Although Commonwealth environmental water holdings in the Murray date from the 2008-09 water year, the Plan currently lacks the provisions to effectively protect held environmental water originating from the regulated river. However, provisions for protection of held environmental water have been agreed for the regulated Murray River in the form of prerequisite policy measures. Provisions to give effect to prerequisite policy measures were included in the *Water Sharing Plan for the Murray and Lower Darling Regulated Rivers Water Sources 2016*.[114] Protection of held environmental from extraction, including from connected water sources should be an objective of the unregulated Plan and relates to the achievement of the Plan's connectivity objective.[115]

Lack of Plan rules for the protection of held environmental water from the regulated river water source into the unregulated water sources was evident in the use of temporary water restrictions from September 2020 to June 2021 to restrict access of unregulated river access licences to held environmental water in Buccaneit and Cunninyeuk creeks,[116] Tuppal Creek[117] and Thule Creek.[118] While Section 324 of the Act allows the Minister or their delegate to order temporary water restrictions within a water source(s) for a specified period, these orders sit outside of the Plan. Held environmental water protections should be specified inside the plan for transparency and certainty.

As an example, Tuppal Creek is an ephemeral creek that once connected the Murray and Edward rivers. It was disconnected through the construction of a levee across the mouth of the creek in 1956 to mitigate flooding of Tocumwal village. This impacted the hydrology and ecology of the creek. Community concerns over the declining health of the creek led to the signing of an environmental water delivery agreement between the NSW Government and Murray Irrigation.[119] Since then, held environmental water (NSW and Commonwealth) has been delivered to the creek via Murray Irrigation's delivery network.

114 DPIE-Water (2019) *Pre-requisite Policy Measures in the Murray-Lower Darling.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/234366/ppm-fact-sheet-murray-and-lower-darling.pdf.

115 Clause 10(2)(b) of the Plan.

116 *Temporary Water Restriction (Buccaneit and Cunninyeuk Creeks) (No 2) Order 2020.*

117 *Temporary Water Restriction (Tuppal Creek) Order 2020.*

118 *Ibid.*

119 NSW Office of Environment and Heritage (2014) *Tuppal Creek: Environmental watering event, Spring 2013 – Community summary*. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/tuppal-creek-environmental-watering-event-spring-2013-140655.pdf.

The community-led Tuppal Creek Restoration Project, which was established to improve the health of Tuppal Creek through improved flows via the Murray irrigation network and escapes, resulted in infrastructure upgrades to allow for remote controlled access of flows into Tuppal Creek. This project and the collaboration of the community, Murray Irrigation and government agencies is highly commended, but the Plan has not been updated to support the restoration objectives. This means the flows into Tuppal Creek require a Section 324 order to give effect to temporary water restrictions.

The Commission understands that DPIE-Water intends to investigate the most effective options for protecting held environmental water in the southern Basin, specifically between the regulated and unregulated rivers.

Active management could be a suitable strategy for protecting flows through unregulated rivers such as Tuppal Creek and providing certainty for water users and environmental water managers. The Plan includes an amendment provision for the shepherding of water[120] but does not appear to have an amendment provision for active management, unlike other plans in the northern Basin, for example the *Water Sharing Plan for the Intersecting Streams Unregulated River Water Sources 2011*. Rules for protecting held environmental water should be codified into the revised Plan to provide certainty of its protection.

5.4 Assess and manage risks to regionally significant wetlands

The Plan area contains several regionally significant wetlands and lagoons, including some that are subject to water extraction via unregulated river access licences. Unlike other plans, such as the *Water Sharing Plan for the Lower Murray-Darling Unregulated Water Sources 2012*, these areas are not listed in the Plan. An example raised by DPIE-EES is Lake Tooim, which is located off Merran Creek.[121] These areas hold a range of environmental values, including as native fish nurseries.

The Plan restricts the take of water from natural in-river pools when below the full containment volume, helping to protect environmental values associated with these features. However, off-river pools, lagoons and lakes have less protection. Under Clause 44(7) of the Plan, extraction from these pools is to cease when the water level falls below 80 percent of the full containment volume.

The risks associated with these provisions are unclear and require further assessment to ensure that pools, lagoons and lakes are adequately protected. To ensure these risks are considered the Commission recommends that DPIE-Water works with DPIE-EES and DPI-Fisheries as part of Plan replacement to:

- identify regionally significant wetlands and off-river pools where water access is currently permitted
- assess the risks to these sites and the adequacy of current rules in protecting environmental values from extraction.

120 Clause 74 Other (1) states that '*This Plan may be amended to provide rules for the following:(c) the shepherding of water*'

121 Personal communications, DPIE-EES, 11 July 2021.

5.5 Management of water quality issues should be enhanced

DPIE-Water developed a Water Quality Management Plan for the NSW Murray and Lower Darling WRP area as required under the Basin Plan.[122] The purpose of the Water Quality Management Plan is to provide a framework to protect, improve and restore water quality and manage salinity. It defines water quality target ranges for the water sources covered by the WRP, including Murray unregulated river water sources covered by the Plan.

The amended Plan includes updated environmental and economic objectives that seek to align with the target ranges set out in the Water Quality Management Plan.[123] The Commission considers this an improvement on the original water sharing plan given the updated objectives are meaningful and measurable. However, they are only relevant if there is adequate ongoing data collection, analysis and reporting, and there is recognition that a range of interventions are required to improve water quality.

The water quality condition of the Murray and Lower Darling was assessed to inform the development of the Water Quality Management Plan.[124] This analysis appears to have been finalised before the 2019-20 bushfires, which significantly impacted the Upper Murray catchment, as there is no mention of the impacts of the bushfires in DPIE-Water's technical paper. More information on the impacts of the fires is presented below.

The technical paper examined water quality data from a range of sites across the Murray and Lower Darling WRP area. A water quality index score for each parameter and an overall score for each site was determined based on a 2010 to 2015 water quality data set. The analysis found that a range of factors had contributed to a decline in water quality, such as alteration to the natural flow regime (particularly through Hume Dam) and land use change.[125]

There are four monitoring sites in the Plan area (see **Table 7**). The overall water quality rating for Tooma River at Warbrook was poor, while ratings for sites along the Murray River at Jingellic, Indi and Albury were good. Of note, Tooma River at Warbrook and Murray River at Jingellic were respectively rated as high and medium risk to the health of water dependent ecosystems from turbidity. Tooma River at Warbrook was also rated medium risk to the health of water-dependent ecosystems from nitrogen and phosphorus.

122 Chapter 10, Part 7 of the Basin Plan.

123 Environmental objective: Clause 8(20)(c) - *water quality within target ranges for the water source to support water-dependent ecosystems and ecosystem functions.* Economic objective: Clause 9(2)(c) - *to contribute to maintaining water quality within target ranges for agriculture, surface water dependent businesses and landholders.*

124 DPIE-Water (2020) *Water quality technical report for Murray Lower Darling surface water resource plan area.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/305757/Water-quality-technical-report-for-the-Murray-Lower-Darling-surface-water-resource-plan-area-SW8.pdf.

125 *Ibid.*

Table 7: Water quality index scores for sites in the Plan area[126]

Station name	Rating	Overall score	Total Nitrogen	Total Phosphorus	Turbidity	pH	Dissolved oxygen
Murray River at Indi Bridge	Good	88	93	86	67	100	100
Tooma River at Warbrook	Poor	54	55	35	21	96	80
Murray River at Jingellic	Good	80	89	74	46	100	96
Murray River at Albury (Union Bridge)	Good	85	91	90	93	87	66

Water quality rating key: **Poor:** 1 – 59; **Fair:** 60 – 79; **Good:** 80 – 94; **Excellent:** 95 - 100

The risk profiles of unregulated rivers in the Upper Murray would likely be higher following the 2019/20 bushfires. Around one third of the catchment that drains into Lake Hume was burnt – 5,210 square kilometres in NSW and 10,140 square kilometres in Victoria. CSIRO modelled the post-fire rainfall-induced water quality impacts in the Upper Murray Catchment, including Lake Hume.[127] While the modelled impacts have some uncertainties, the high sediment deposition in Lake Hume is predicted to exacerbate the risk of harmful cyanobacteria blooms in the storage. A red alert warning was issued for Hume Dam in February 2020, shortly after the fires in the upper Murray catchment.[128] However, the magnitude of sedimentation and long-term impacts on aquatic ecosystems across the fire impacted area is unknown.[129]

A post-fire rainfall-induced decline in water quality has significantly impacted aquatic environments in the Upper Murray, including the Mannus Creek system. Increased sedimentation rates and post-fire rainfall-induced blackwater events have contributed to localised fish kills, likely resulted in mortality of other aquatic species and disruption to the life cycles of invertebrates.[130] See **Section 6.1** for discussion of impacts on Macquarie perch.

126 *Ibid.*

127 Joehnk K, Biswas TK, Karim F, Kumar A, Guerschman J, Wilkinson S, Rees G, McInerney P, Zampatti B, Sullivan A and Nyman P (2020) *Water quality responses for post 2019-20 bushfires floods in south eastern Australia – a catchment scale analysis.* A technical report for the CSIRO strategic bushfire project 2020. CSIRO, Canberra.

128 WaterNSW (2020) *Blue green algae red alert issued for Hume Dam, 24 February 2020.* Available at: https://www.waternsw.com.au/about/newsroom/2020/blue-green-algae-red-alert-issued-for-hume-dam.

129 Joehnk K, Biswas TK, Karim F, Kumar A, Guerschman J, Wilkinson S, Rees G, McInerney P, Zampatti B, Sullivan A and Nyman P (2020) *Water quality responses for post 2019-20 bushfires floods in south eastern Australia – a catchment scale analysis.* A technical report for the CSIRO strategic bushfire project 2020. CSIRO, Canberra.

130 Verkaik, I., Prat, N., Rieradevall. M., Reich P. and Lake, B, S. (2014) 'Effects of bushfire on macroinvertebrate communities in south-east Australian streams affected by a megadrought'. *Marine and Freshwater Research,* 65(4):359-369.

The NSW Murray and Lower Darling Water Quality Management Plan indicates that in the unregulated catchments "*there are very limited opportunities to manage water quality through flow management*".[131] While this may be the case to some extent, there are still opportunities to consider how the protection of low flows and flushing flows can provide water quality benefits. It will also be important to investigate how flow management can aid the recovery of fire affected native aquatic species when considered in conjunction with other interventions.

It should also be noted that, while the surface waters covered by the Plan are categorised as unregulated, there are still some that are significantly influenced by regulated flows. There are also water sources in the Plan area that form part of the Snowy Scheme, for example Tooma River (see **Chapter 7**). The Commission will further examine opportunities to better manage water quality impacts from flows originating in the regulated Plan when it undertakes the review of that Plan.

5.6 Recommendations

R 5	By 2023, to improve environmental outcomes DPIE-Water should: a) ensure the replacement Plan reflects the latest information on environmental water needs, including from the NSW Murray and Lower Darling LTWP and associated fish and flows advice from DPI-Fisheries b) revise provisions to address identified concerns for medium- to high-risk water sources, including: i. a first flush rule for Tooma River ii. strategies within the scope of the Plan that can help mitigate the extreme flow variability and provide more stability around base flows to better mimic more natural rates of rise and fall in the Swampy Plains and Upper Murray water sources iii. opportunities to reduce extractive pressure in the Albury and Hume water sources iv. reviewing the current gauging network to identify where new gauges may be warranted to reduce reliance on no visible flow rules in medium- to high-risk water sources. c) In consultation with environmental water managers, determine the best mechanism for protection of held environmental water and include those arrangements in the Plan to avoid reliance on temporary water restrictions d) work with DPIE-EES and DPI-Fisheries to identify regionally significant wetlands/off-river pools where water access is currently permitted, assess the risks to these sites and the adequacy of current rules in protecting environmental values from extraction e) consider how plan provisions can help to ameliorate water quality issues, including those arising from the 2019-20 bushfires.

131 DPIE-Water (2020) NSW *Murray and Lower Darling Surface Water Resource Plan - Water Quality and Salinity Management Plan*, p. 19. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/272738/schedule-h-mld-wqmp.pdf.

R 6	In remaking the Plan, revise the provisions to improve management of the Mannus Creek water source by: a) reviewing the environmental values for Manus Creek Water Source and ensuring the flow requirements of threatened species and other environmental values are considered b) reviewing the CTP rules for Maunus Creek and replacing the height rule with a flow condition that references the current Mannus Creek gauge c) ensuring the Plan reflects the changed location of the gauge and reviewing the location of water access licences to check they are in the appropriate water management zone d) including the Mannus Dam operating rules in the Plan and review environmental flow requirements in light of recent studies (including the five-yearly assessment of environmental impacts), the impact from bushfires and the needs of water users.

6 Aboriginal water rights, values, and uses

The Commission continues to identify critical issues in water sharing plans relating to both native title and Aboriginal water rights, and protection of cultural values generally across all its reviews in the 2019-21 period:[132]

- provisions have failed to protect and allocate water for native title for registered claims and determinations, and do not proactively consider native title and other Aboriginal land ownership and management as they relate to water resources
- Aboriginal water cultural values are not adequately identified and protected, and watering needs are not provided for under current water sharing plan provisions or licences
- native title and Aboriginal water provisions limit uses to traditional cultural applications only, thereby not supporting a range of Aboriginal water values, including economic uses as defined in objectives and visions and the Act[133]
- Aboriginal engagement in water planning has been inconsistent and inadequate, thereby limiting knowledge and support of Aboriginal water values and uses
- key barriers to Aboriginal water rights and interests are systemic and institutional and require state-wide legislative, policy and practice change, and significant increases in Aboriginal staff, resourcing, and support.

There are number of specific examples of these critical issues for Aboriginal water within this Plan area that are highlighted in the sections below.

The Commission notes that DPIE-Water has released the final *NSW Water Strategy*, which includes several actions including state-wide commitments under an Aboriginal Water Strategy.[134] Implementing these actions going forward is fundamental to improving NSW water sharing to address ongoing injustices in Aboriginal water rights and interests.

The Commission also notes that DPIE-Water had initially been working with key Aboriginal stakeholders as part of a state-wide Aboriginal Water Coalition to develop the Aboriginal Water Strategy and to improve engagement across NSW.

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132 Natural Resources Commission (2021) *Final report – Review of the water sharing plans for the Greater Metropolitan region.* Available at: https://www.nrc.nsw.gov.au/Greater%20Metropolitan%20-%20Final%20report.pdf?downloadable=1; Natural Resources Commission (2021) *Final Report – Review of the water sharing plans for the Richmond and Tweed unregulated and alluvial water sources.* Available at: https://www.nrc.nsw.gov.au/Richmond%20and%20Tweed%20-%20Final%20report.pdf?downloadable=1.

133 Section 3(c)(iv) of the Act.

134 Priority 2 under the *NSW Water Strategy 2021* sets out several actions to "*Recognise First Nations/Aboriginal People's rights and values and increase access to and ownership of water for cultural and economic purposes*", to:

- Strengthen the role of First Nations/Aboriginal People in water planning and management
- Develop a state-wide Aboriginal water strategy
- Provide Aboriginal ownership of and access to water for cultural and economic purposes
- Work with First Nations/Aboriginal People to improve shared water knowledge
- Work with First Nations/Aboriginal People to maintain and preserve water-related cultural sites and landscapes.

However, feedback provided as part of this review suggests there have been several delays, significant barriers and the group is currently inactive.[135] The NSW Government must establish a meaningful, appropriate, and integrated process for Aboriginal peoples with relevant knowledge of water management to have input at all levels and stages of the planning process.

6.1 Proactively recognise native title and Aboriginal land

The Plan includes a requirement to provide water to satisfy native title rights, where a determination or ILUA is made.[136] 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 *Native Title Act 1993*.[137]

These provisions are detailed when compared with other water sharing plans. However, limiting consideration of cultural values to determined native title claims and established ILUAs does not proactively support Aboriginal water needs and management arrangements as is recommended in reviews by the Commission.[138]

As noted in **Section 2.6.1**, there are a range of Aboriginal Nations that have undertaken native title claims or engaged in land use and ownership agreements, not just ILUAs. For example, the long-running Yorta Yorta native title claim and determination represents a significant opportunity to extend on the native title process. This proactive approach has been undertaken by the Victorian Government and is being actively sought by the Yorta Yorta peoples with the NSW Government to overcome key challenges of border river communities.[139]

The Bangerang Nation are also currently seeking stronger co-management arrangements with the NSW Government for Millewa Forest. In addition, the IPA planned for the Werai Reserve of the Barapa Barapa and Wemba Wemba Nations will also require active support to ensure water needs are delivered in various ways once the land ownership is transferred (see **Section 2.6.1**).[140]

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135 Input from stakeholders provided for this review suggests that the Aboriginal Water Coalition has not met during 2021 and has not had consistent input from members or members have withdrawn. The reasons for this suspension of the Coalition are multiple, including a formal partnership agreement put forward by DPIE-Water that was not seen as an appropriate model for engagement by some prospective members *'our argument is that we need to start with our position…what our members think…not what DPIE think. They need to come to the table early enough to ask what we want, not come to the table with their points and ask us to sign up'* (Murray Lower Darling Indigenous Nations (MLDRIN), 28 May 2021). This breakdown in the Coalition means that guidance on the Aboriginal Water Strategy have not progressed from the Commission's last review. Source: Interviews: DPIE-Water, Aboriginal Policy and Legislation Officer, 7 May 2021; MLDRIN Executive Officer and Board Member, 28 May 2021.

136 Division 2, Section 20 of the Plan.

137 Part 2, Section 12(2), (3), (4) of the Plan.

138 Natural Resources Commission (2021) *Final report – Review of the water sharing plans for the Greater Metropolitan region*. Available at: https://www.nrc.nsw.gov.au/Greater%20Metropolitan%20-%20Final%20report.pdf?downloadable=1; Natural Resources Commission (2021) *Final Report – Review of the water sharing plans for the Richmond and Tweed unregulated and alluvial water sources*. Available at: https://www.nrc.nsw.gov.au/Richmond%20and%20Tweed%20-%20Final%20report.pdf?downloadable=1.

139 The disconnection between NSW and Victorian government responses and engagement processes creates significant barriers and challenges for border communities. This has resulted in duplication of government effort and resourcing and engagement fatigue for many Aboriginal communities.

140 Werai Reserve is planned for transfer to an IPA later in 2021 and will have a range of watering needs. Firstly, it has had environmental water allocations for the Ramsar-listed wetlands but the delivery of this is hampered

Relying only on final native title determinations and ILUAs fails to address the many documented limitations of relying on the *Native Title Act 1993*[141] and does not acknowledge the variety of Aboriginal land ownership, custodianship and management arrangements that are used in NSW. This leaves a large gap in equity for Aboriginal people in a water plan area.[142]

Stakeholder feedback received as part of this review confirmed many of these concerns. Firstly, one key stakeholder group noted the lack of practical application and support of native title rights in water sharing plans even where these rights have been determined in NSW:

> *'[Plans] never seem to define volumes and have these circular definitions that are not practical … it makes you unsure how this would work in practice.'*[143]

For another stakeholder, provisions only for native title rights were seen as limiting and not reflective of the reality of Aboriginal custodianship:

> *'The way our country speaks – the idea that this is Aboriginal country and whoever is on their country is responsible for looking after it and the people on it – this is more than recognising Traditional Owners. That doesn't cut it for us. We are reaching for something far more substantial … It's not just native title entitlement. You are a community even if you don't have native title.'*[144]

There are a range of Aboriginal landowners and managers beyond native title, and they need to be considered equitably as part of water sharing provisions.[145]
The Commission recommends that the Plan is updated to reflect the full range of information available regarding Aboriginal cultural values, including the considerable information available in native title claims, as well as determinations and to include reference to IPAs and any other Aboriginal land ownership, co-management and management agreements. Following this

by inadequate and outdated infrastructure – the infrastructure is owned by the MDBA but operated by NSW so will need a joint arrangement. Secondly, it will require water licences to support water delivery to all sites beyond the wetland. Licences are seen as a way for Aboriginal owners to manage the land so they can have control over the water the same way other users have. Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.

141 Relying on basic landholder rights or the *Native Title Act 1993* to provide for Aboriginal water rights in NSW water sharing plans is inherently problematic. Firstly, basic landholder rights notionally mean that native title water requirements must be met first with domestic and stock rights; prior to any other consumptive water uses. However, for this to be effective, DPIE-Water acknowledges that basic landholder rights need to be identified, allocated and monitored within plans so that water needs can be protected from other consumptive uses. However, there are no extraction estimates used in plans to date to protect native title rights. Secondly, although the *Native Title Act 1993* makes specific provisions in relation to rights to water, the law of native title has not, to date, recognised exclusive rights in relation to water for native title parties. The rights most commonly recognised are non-exclusive (in that native title holders cannot stop other people from exercising their rights and interests over the same water) and usually comprise traditional uses only.

142 See: Behrendt, J. and Thompson, P. (2003) 'The Recognition and Protection of Aboriginal Interests in NSW Rivers', *Journal of Indigenous Policy*, Issue 3; Jackson, S. and Langton, M. (2012) 'Trends in the recognition of indigenous water needs in Australian water reform: the limitations of 'cultural' entitlements in achieving water equity'. J. *Water Law 22* (2/3), 109–123; Tan, P.L.; and Jackson, S. (2013) 'Impossible dreaming—Does Australia's water law and policy fulfil Indigenous aspirations? Environment and Planning Law Journal', 30: 132–49; Duff, N. (2017) 'Fluid Mechanics: The Practical Use of native title for Freshwater Outcomes'. AIATSIS Research Publications, Canberra; Hartwig, L., Jackson, S. and Osborne, N. (2020) 'Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession', *Land Use Policy*, 99 https://doi.org/10.1016/j.landusepol.2020.104869.

143 Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.

144 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.

145 Native title can also be a complicating factor for projects on Crown lands where native title may need to be proven to be extinguished in order to gain approvals for other forms of Aboriginal land and water management. Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.

recognition in the Plan, DPIE-Water need to address the Commission's ongoing state-wide recommendation to take a proactive approach to native title and Aboriginal land management. This approach must commit the time and resourcing to undertake detailed, ongoing engagement with Traditional Owners and a range of Aboriginal groups and knowledge holders to identify the provisions required to adequately support Aboriginal rights and values within individual Plans.

6.2 Identify and understand Aboriginal values and uses of water

The Plan includes specific objectives,[146] vision,[147] strategies[148] and performance indicators[149] to maintain and improve values and uses of water by Aboriginal people. These are comparatively detailed and specific when contrasted with other water sharing plans in NSW. The Commission understands that these provisions were included in the recent Plan updates, as a result of the WRP process.

Despite these more detailed provisions, Aboriginal Nations and groups in the Plan area feel they have not been sufficiently consulted to inform these provisions. While there has been Nation-specific consultation reports prepared as part of the WRP process, these have only been completed for some Nations in the area.[150] There are also reported issues, as part of the WRP independent assessment process, regarding a lack of consistent and adequate Aboriginal engagement, and a lack of transparency regarding how consultation report findings are translated into plans.[151] Indeed, most of these independent assessments of NSW WRPs have been completed and no plans have been determined to meet the assessment criteria and therefore have not been recommended for approval.[152]
The key issue is that the Plan objectives, vision, strategies and indicators were apparently updated to reflect the WRP engagement and findings on Aboriginal water values. However, the new provisions have been generically applied across other updated inland water sharing plans. It is therefore unclear how they were developed, and how they will be applied in practice – as described below:

146 Part 2, Section 12(2) of the Plan.
147 Part 2, Section 9 of the Plan.
148 Part 2, Section 12(3) of the Plan.
149 Part 2, Section 12(4) of the Plan.
150 Nation consultation reports are not finalised for Tati Tati, Weki Weki and Yorta Yorta Nations in the Plan area.
151 The Basin Plan requires that Basin state governments involve Traditional Owners in identifying Aboriginal objectives and outcomes based on Aboriginal values and uses. A series of WRP tools were developed to assist Basin state governments in developing their WRPs. The 14A Position Statement sets out the requirements of the *Basin Plan 2012 Chapter 10, Part 14* – Aboriginal values and uses. The MDBA assesses submitted WRPs against Part 14 and also commissioned MLDRIN and Northern Basin Aboriginal Nations (NBAN) to undertake independent assessments of WRPs in relevant parts of NSW to ensure all WRPs are meeting the requirements. MLDRIN and NBAN bring together Traditional Owners from each nation for each plan in their respective areas of NSW – together they work through three criteria (MDBA criteria, Chapter 10 Part 14, Awke: Kon Guidelines) to assess the plans, using a scale of 'absent, partial, satisfactory, good, excellent'. They then provide assessment reports to the MDBA. See: https://www.mdba.gov.au/about-us/partnerships-engagement/aboriginal-partnerships-programs.
152 The key issues noted during the Commission's consultation for this review include:

- significant delays in starting Aboriginal consultation meant that groups were consulted very late in process – for example, most Aboriginal Nations were only consulted after the plans were put on public exhibition
- inconsistency in consultation efforts due to the use of different contractors to undertake engagement with little involvement from departmental staff
- no consideration of Aboriginal Nations in the risk assessment process (Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021).

> *'[The] glaring issue is the alignment between WSPs and WRPs. DPIE-Water claimed that consultation for WRPs had directly informed WSP amendments. However, this was not the case…The WSP amendments are all generic objectives, strategic etc across all inland plans. Nations have had no input … there has been no actual consultation that we are aware of and certainly none at a plan level.'*[153]

> *'The objectives and strategies are very broad, aspirational and vague – how will they be evaluated and monitored? We don't believe they intend to do these things, they are not very operational, not practical, not quantifiable…It appears on the surface that there is substantial change, but in detail it's not practical and not reflective of Nation needs.'*[154]

While the provisions to protect Aboriginal values and uses of water are more detailed compared with other plans outside of the Basin, they do not appropriately present the views of Aboriginal peoples in the Plan area, they are impractical to implement and monitor, and they are not defined in the Schedule of the Plan. As a result, Aboriginal water values are not well understood or integrated in the Plan, nor are they adequately protected and monitored – as was also noted in several public submissions.[155]

There is much evidence and research on the significant Aboriginal values throughout the Plan areas that could have been effectively drawn on in the recent Plan updates. These include the vast records of the Yorta Yorta documented as part of their native title claim process (see **Section 6.1**). In addition, there is extensive research of the Barapa Barapa and Wemba Wemba Nations undertaken as part of the process for transferring the Werai Reserve to an IPA. This included 'occupancy and use mapping' in 2009,[156] which had extensive involvement from a range of community members and has been described as having many beneficial outcomes for local Aboriginal peoples:

> *'Rather than ask about values of water or forests, they were asked to tell their story and what they knew. They each had an individual map and shared memories of that land, fishing, hunting, community. This was powerful…The value of involving younger people as well was so important, they had their own maps showing places important to them. This helps continue and renew this connection … not always a focus on loss. This demonstrates the importance of articulating appropriately, what you want to hear. The mapping process was a way of showing the meaning of water.'*[157]

Despite this process occurring over 10 years ago, it has not been acknowledged or supported in any meaningful way by government agencies – *'all the mapping work we did of our stories and activities was not allowed on national park tenure. Nothing meaningful has been delivered under the River Red Gum Act yet despite the recommendations and provisions.'*[158]
The Commission recommends the Plan is updated to include all known values, through a process ensuring the free, prior and informed consent of relevant Aboriginal Nations.

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153 Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.
154 Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.
155 Submissions: *"The WSP has failed to protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values or to protect basic landholder rights."* (Inland Rivers Network, 18 December 2020); *"The WSP has failed to protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values or to protect basic landholder rights."* (Charles Sturt University, 18 December 2020).
156 The 'occupancy and use' mapping process is built on a Canadian model in response to the challenges confronted by the Yorta Yorta peoples to prove that oral evidence of connection is legitimate in their native title claim.
157 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
158 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.

Further state-wide work is also needed to identify and link Aboriginal values and uses, objectives, outcomes and performance indicators in all plan areas through extensive engagement with local Aboriginal knowledge holders. The outsourced and targeted model of engagement used as part of the WRP process has proved unsuccessful. Resourcing for adequate employment and training of Aboriginal water staff is required to lead meaningful engagement and build ongoing relationships.

6.3 Protect and improve Aboriginal water values and uses

Following the identification of Aboriginal water values, water sharing plans need to then protect these values through rules in the plans, in ways that are supported by the local Aboriginal peoples in the Plan area.

The Commission notes that protection of Aboriginal values and rights means different things to different people. For some, this protection involves a cultural water allocation:

> *'Actually having an allocation for communities is key – an amount of water that can be used for whatever purposes we want to use it; cultural, women's' business, economic, trading as well. The river is a highway for us …these are paths for flows, for nutrients, for monetary and non-monetary trade and business.'*[159]

For other Aboriginal peoples, licences are seen as an important mechanism:

> *'We need licences as a way of allocating water for Aboriginal communities. These put all land managers at the same table … so that Aboriginal communities have control over the water the same way other users have … that their input could and should be heard. Cultural water isn't seen the same way.'*[160]

In this Plan, only an 'Aboriginal cultural' specific purpose access licence is available and this can only be used for traditional cultural purposes (not commercial or trading activities)[161], only in certain water sources, and allocations are capped at up to 10 ML per licence per year.[162] This review has not identified any instances where these licences have been issued under the Plan.

The Commission's water sharing plan reviews continually state that Aboriginal-specific water licences available in NSW are highly restrictive, inequitable, subject to significant limitations in use and awareness, and unable to be easily accessed and applied for, or monitored – as noted below:[163]

> *"Cultural Access Licence provisions are the only water access option outside of native title. Most Nations in the NSW-MDB do not have native title determinations. Issues with this framework are well known; they do not allow for economic or commercial uses."*[164]

159 Interview: Executive Officer and Board Member, Murray Lower Darling Indigenous Nations, 28 May 2021.
160 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
161 Water must be used only for any personal, domestic or communal purpose, including drinking, food preparation, washing, manufacturing traditional artefacts, watering domestic gardens, cultural teaching, hunting, fishing, gathering and for recreational, cultural and ceremonial purposes.
162 See Part 8, Clause 54(5); Part 7, Clause 35(3); Clause 36(4).
163 For example, updated WSPs include performance indicators such as: "*the water made available for Aboriginal cultural values and uses during the term of this Plan through available water determinations and the granting of new access licences*". Part 2, Section 12(4) of the Plan.
164 Written advice: MLDRIN, email received 28 May 2021.

There is no clear guidance available to guide Aboriginal people in applying for these licences, or advice that there is an exemption from fees for cultural access licences and works approvals.[165] Often, the resources required to enable use of these licences is limiting for Aboriginal people. In addition, the range of uses of these licences are inherently limiting by excluding economic uses. This is despite the cultural objectives of the Plan clearly stating that "*economic values are to be maintained, and where possible improved*".

There are also barriers to Aboriginal peoples' access to general stock and domestic licences and general water entitlements. These limitations are well-known and relate to a lack of land ownership with water attached.[166] Anecdotal evidence received during this review confirms this limited uptake: *'we only know of 7 applied for, and only 3 operational we think in our area. It's hard to know, there's no visibility. But most people and groups don't have any infrastructure to access the water anyway.'*[167] *'Cummeragunja Aboriginal Land Council has land with water … but they don't use this water and trade it to put money back into housing.'*[168]

Ideally, the solution may be a combination of mechanisms to support Aboriginal water values and uses '*the aim is for a mix of both licences and allocations and environmental watering*'.[169] However, this can only be determined through working with local Aboriginal groups, Nations and knowledge holders as part of a well-resourced engagement effort in the Plan area.

To acknowledge this diversity, the Commission continues to recommend state-wide initiatives for DPIE-Water to:

- adopt a common principle across all water sharing plans to ensure that where additional allocations become available within Plans, 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).

6.4 Address known barriers and issues to Aboriginal water rights and uses

The Commission continues to identify common barriers to Aboriginal water rights and uses across its reviews that need to be addressed if water sharing plans are to deliver on their stated Aboriginal objectives – examples in this Plan area are illustrated below:

- **Separation of land and water does not fit with Aboriginal values and is an ongoing source of inequity:** *'the separation of water and land has been a real challenge for Aboriginal people – they do not understand water like this. It is hard to have a conversation about it.'*[170]

  '*At the end of the day access to land is critical … there's no point of owning land without water.'*[171]

165 This exemption was provided for under an Independent Pricing and Regulatory Tribunal determination in 2014 (not applicable to water usage charges).
166 Hartwig, L., Jackson, S. and Osborne, N. (2020) 'Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession', *Land Use Policy*, 99 https://doi.org/10.1016/j.landusepol.2020.104869
167 Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.
168 Interview: Senior Land Services Officer, Murray Local Land Services, 4 May 2021.
169 Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.
170 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
171 Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.

- **Distinction of cultural, environmental and economic water is limiting Aboriginal water rights and uses:** *'Often it is said cultural water cannot be used for economic gain. We want to change that. For example, collecting watergrasses for basket weaving and then selling these. We have never had a good answer from government on if we can use water for productive uses. Being a part of the economic development in the region is often left out of the plans, we are only seen as the cultural part of water.'*[172]

  "Although 'economic values and uses' are included in the broad Aboriginal objectives of the revised WSPs (and the Water Management Act's objects), there are no economic targeted objectives, strategies or performance measures in the revised WSPs. [WRP assessment workshop] Participants stressed that economic objectives and strategies should be addressed in the WSPs."[173]

- **Water policy, management and sharing is complex:** *'we have 4-5 agencies involved in managing water and this is confusing. If you are not in the business of needing to manage water, you don't get a lot of feedback and it's very complex.'*[174]

  "WSPs are confusing. Intentional effort is needed to communicate to First Nations what these Plans are, what effects they have, and what provisions they offer that are of benefit."[175]

- **Aboriginal peoples are not engaged in water appropriately or equitably:** *'A lot of the issue is that most negotiations are mainly to support people who make a living out of it … irrigators … the Aboriginal voice is cultural heritage. This voice is not as strong and takes the backseat… Because we are not going to a meeting with hydrological modelling and evidence of how much income we will or won't get if we do or don't get a share, we are not recognised … Engaging people on these complex issues means you end up with the dominant voices or a regional voice that is not challenged. This has happened with regional type bodies which government like because these bodies are like them. But these groups don't represent the community. [They] are important but there are opinions in the local community that are missed in that model.'*[176]

- **Questions to Aboriginal people are not appropriate and capacity and water literacy in Aboriginal communities is still low:** *'Direct questions asked by agencies about water don't get to the source of the problems faced by Aboriginal people. It's about what you want to hear…When community were asked no one would come to water quality discussions, but when they framed it as 'where do you like to fish and the memories and stories associated with that, then they do.'*[177]

- **Participation in engagement is demanding on Aboriginal peoples:** *'There are not enough Aboriginal voices in the space … We have to allocate our time to this. We don't have an economic reason to be in the room like others.'* [178]

- **There are barriers to accessing waterways:** *'Access through private property is a key issue. Some places especially in town there are old titles that go to the middle of the river which creates problems. So people that want to go down there are accosted by people that own titles down to the river.'*[179]

- **Adequate resourcing of Aboriginal water rights and uses is required to support uses:** *'gaining access is a problem for what we need because they changed the whole (water) model to servicing industry rather than community.'*[180]

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172 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
173 Written advice: MLDRIN, email received 28 May 2021.
174 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
175 Written advice: MLDRIN, email received 28 May 2021.
176 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
177 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
178 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
179 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.
180 Interview: Manager and Chairperson, Yarkuwa Indigenous Knowledge Centre, 4 May 2021.

'Securing benefits from the committed $40 million [from the Department of Agriculture, Water and the Environment] is a priority. Still no word yet on progress – still stating a "delay" despite more than 3 years since the announcement and continual talks about the money and how it will be spent. We are advocating it must be primarily used to acquire water as intended and for it to be administered through a trust-based process as the most equitable way to distribute the funds.'[181]

- **Other economic and social challenges for Aboriginal peoples need to be recognised:** *'We go in as an organisation thinking that caring for Country is the priority, when in reality there are a range of other outcomes they are seeking to achieve … e.g. employment is a priority, housing is a priority…need to keep this at the back of your mind.'*[182]
- **Water quality and flows are key concerns for Aboriginal peoples in the area:** *'We have a big concern about the quality of water in the system. We are looking at the process of how water flows through the region. The change in quality of water for aquatic species and wetlands is compromised due to competition from water users. We get a whole lot of sediment movement. Volume of water being pumped down the river is having impacts including on the sediment issue.'*

6.5 Recommendations

The Plan-specific recommendations for DPIE-Water are listed below in **Table 8**
In addition, research continues to show that Aboriginal water holdings are suffering disproportionately under NSW legislation, creating issues of inequity and further dispossession that need to be addressed at a state-wide scale[183] – in line with new Closing the Gap targets[184] and the recent Productivity Commission review of national water reform.[185] To support this, the Commission's state-wide recommendations for Aboriginal water are referenced in **Recommendation 8(d)** (**Table 8**).

Table 8: Plan-specific recommendations for DPIE-Water

R 7	When remaking the Plan, DPIE-Water should take into consideration the native title claims, ILUAs, IPAs, and other Aboriginal land agreements in the Plan area – particularly the Bangerang Nation, Yorta Yorta Nation and the Werai IPA to identify cultural values and uses. Sufficient additional time should be allowed to undertake detailed engagement with Traditional Owners and other Aboriginal knowledge holders on options to support these values and uses and make any final amendments.

181 Interview: Executive Officer and Board Member, MLDRIN, 28 May 2021.
182 Interview: Local Land Services Senior Land Services Officer, Murray Local Land Services, 4 May 2021
183 A recent study of empirical water entitlement data in the NSW portion of the Murray-Darling Basin showed that while Aboriginal people in this area constitute nearly 10 percent of the population, their organisations hold only 0.2 percent of the available surface water. In addition, 17.2 percent of Aboriginal water holdings by volume were lost from 2009−18. See: Hartwig, L., Jackson, S., Osborne, N. (2020) 'Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession', *Land Use Policy* 99.
184 The National Agreement on Closing the Gap (July 2020) includes an additional outcome area "Aboriginal and Torres Strait Islander people maintain a distinctive cultural, spiritual, physical and economic relationship with their land and waters" and two associated targets for land and water: a) *Target 15a:* By 2030, a 15 percent increase in Australia's landmass subject to Aboriginal and Torres Strait Islander people's legal rights or interests; b) *Target 15b:* By 2030, a 15 percent increase in areas covered by Aboriginal and Torres Strait Islander people's legal rights or interests in the sea. See www.closingthegap.gov.au/sites/default/files/files/national-agreement-ctg.pdf.
185 Productivity Commission (2021) *National Water Reform 2020*, Draft Report, Canberra.

R 8	When remaking the Plan, to better achieve Aboriginal water outcomes, DPIE-Water should: a) identify and protect known high value cultural sites in the replacement Plan b) undertake further work with a range of Aboriginal Traditional Owners and knowledge holders, including Aboriginal women, to better understand water values and uses, identify the rules to protect them, and support water access and use c) ensure that where additional entitlement becomes available, that Aboriginal water needs are assessed as a priority d) undertake state-wide actions identified in Commission water sharing plan reviews to improve consideration and respect for native title and Aboriginal values in water sharing plans.[186]

186 At a minimum, state-wide actions to support Aboriginal water rights, values and uses include to:
- hire and train Aboriginal staff to undertake culturally appropriate water planning, management and engagement
- proactively consider native title claims, ILUAs or other Aboriginal land and water agreements wherever possible as part of the planning, drafting and engagement process for plans
- establish common provisions to undertake preliminary amendments to a plan within six months of a registered native title claim or determination. Allow for additional time to undertake detailed engagement with Traditional Owners to make any specific water allocations and final amendments to the plan required.
- work to identify Aboriginal values and uses, objectives and outcomes in all plan areas through extensive engagement with local Aboriginal knowledge holders including Aboriginal women – include linked strategies, indicators and monitoring plans to ensure these are met
- use well-evidenced cultural flow and Country-based principles and processes for identifying, protecting, and monitoring Aboriginal water values and outcomes
- co-design options to support a wide range of cultural, environmental, social and economic water values and uses – for example, volumetric allocations from unallocated flows; water purchase or transfer of licences; improved licensing; other water custodianship that is non-volumetric/non-licensed; commercial and trading options
- identify and support the appropriate infrastructure, resources and education needed to support Aboriginal water access and use
- co-design and deliver awareness-raising, capability-building and education measures on water sharing, planning and management in NSW
- support Aboriginal ownership, management and leadership in water and ensure this is well-resourced – to help meet Closing the Gap targets
- consider, prioritise and commit to changes to legislation and policy that are needed to support these actions.

7 Improving interactions and connectivity

The water sources covered by this Plan sit within the broader NSW Murray Valley water management system. The way they are physically connected to water sources managed under other water sharing plans, as well as the administrative interactions between plans, are critical in understanding the Plan's ability to deliver outcomes for the environment and water users.

In the NSW Murray Valley, water flows from the Snowy Mountains through systems of hydroelectric dams and storages. From these locations, it flows along an unregulated river covered by the Plan into the Murray regulated river at Hume Dam. After leaving Hume Dam, it flows along the regulated river, where it can enter unregulated effluent creeks, anabranches, billabongs, and lagoons covered by the Plan.[187]
The water flowing along these surface water sources is also connected to alluvial groundwater deposits[188] and the fractures and faults within the rock mass of the NSW Murray Darling Basin.[189] Overland flow that is captured as floodplain harvesting may be included in the unregulated or regulated plans. Further, floodplain flow and effluent creeks, anabranches, billabongs and lagoons in the unregulated Plan may then re-enter the regulated river.

The water in the NSW Murray Valley is managed through six water sharing plans. These plans cover unregulated and regulated river water sources, as well as alluvial, fractured rock and porous rock groundwater sources.[190] The Snowy Scheme also operates in the Murray Valley under the Snowy Water Licence and *Snowy Hydro Corporatisation Act 1997*, that sits outside the water sharing plans.

While the water is managed under different water sharing plans and, in the case of the Snowy Scheme, a different regulatory and licensing arrangements, the water in the system is physically connected. The interactions between the various plans and licences, and the physical movement of water to and from adjacent plans, determines the volume and timing of water in many of the unregulated water sources covered by the Plan.

The Commission has also identified several issues relating to the management of connected regulated and unregulated water sources that are currently managed under separate water sharing plans. Specifically, the management of environmental water between this Plan and the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources 2016*. These issues are discussed in **Section 5.3**

7.1 Management of connected surface and groundwater

At the state scale, the Act does not explicitly identify the consideration of connectivity between water sources within its objects or water management principles. However, the National Water Initiative's Water Planning Guidelines state that 'surface and groundwater should be managed

187 DPIE (n.d.) *NSW Murray and Lower Darling Surface Water Resource Plan - Status*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/drafts/nsw-murray-lower-darling.

188 DPIE (n.d.) *Murray Alluvium Water Resource Plan - Status*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/drafts/murray-alluvium.

189 DPIE (n.d.) *NSW Murray Darling Basin Porous Rock Water Resource Plan - Status*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/drafts/nsw-mdb-porous-rock.

190 DPIE (2021) *Water sharing plan status – Murray region*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.

in an integrated manner' and, according to these guidelines, connected systems should ideally be managed as a single resource under a single plan, or at least through integrated plans that refer to each other.[191] The Basin Plan also aims to manage the rivers as a connected system and, in developing water resource plans, the Basin Plan requires states to consider connections between groundwater and surface water.[192]

Groundwater in the Murray Valley is managed under three water sharing plans:

- the *NSW Murray-Darling Basin Porous Rock Groundwater Sources 2020*
- the *NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020*
- the *Murray Alluvial Groundwater Sources 2020*.

The mapped boundaries of the alluvium defined by the *Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020* do not include alluvial sediments along the minor tributaries of the Murry unregulated surface water sources. These miscellaneous unmapped alluvial water sources are included in the *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Water Sources*. As such, any bores in alluvial aquifers on these tributaries have been assigned to this porous rock groundwater plan, even though they are adjacent to rivers and extraction from these water sources may impact surface water flows.

As licences have different conditions across the different plans, the current mapping of alluvial water sources reduces the ability to manage the impact of extraction from the miscellaneous alluvial on unregulated rivers. The Commission recommends that these licences be given daily access rules that align with any connected surface water sources.

The annual average recharge of the Upper Murray Groundwater Source managed under the *Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020* has been estimated to be 15,300 ML per year. This is within approximately 8 percent of its annual average extraction limit of 14,108 ML per year.[193] Given there is some degree of connectivity between the surface water managed under the Plan and this alluvial groundwater, the Commission expects that some level of surface water is being lost out of the rivers and into the alluvial groundwater system.

This risk should be monitored by DPIE-Water and will be assessed further by the Commission in its future review of the *Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020*.

7.2 Interactions with the Snowy Scheme

The significant inter-valley diversions of the Snowy Scheme impact two water sources in the Plan: the Upper Murray River and Swampy Plain water sources. The timing of transfers and releases can impact these water sources, as well as 16 other water sources in adjacent water sharing plans.

The Snowy-Tumut Development diverts 295,000 ML per year of water from the Murray River Catchment to the Murrumbidgee River Catchment, whereas the Snowy-Murray Development

191 Council of Australian Governments (2010) *National Water Initiative Policy Guidelines for Water Planning and Management*. Available at: https://www.agriculture.gov.au/water/policy/nwi/guidelines-water.

192 MDBA (2020) *Common challenges across resource plans*. Available at: https://www.mdba.gov.au/basin-plan/water-resource-plans/common-challenges-across-water-resource-plans.

193 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/166865/murray-unreg-alluvial-background.pdf.

diverts an additional 875,000 ML per year from the Upper Snowy River Valley to the Murray River Catchment. The net average increase in water is 580,000 ML per year. This additional water is released down the upper Murray River until it reaches Hume Dam storage, which is managed under the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*.

The transfers and releases under the Snowy Scheme are not included in the Plan but are subject to provisions under Part 5 of the *Snowy Hydro Corporatisation Act 1997 No 99*. Under that act, Snowy Hydro was entitled, on the corporatisation date, to a licence issued by the Water Administration Ministerial Corporation under this Part (called the Snowy Water Licence). That licence was issued on 30 May 2002 and defines Snowy Hydro's water rights and obligations. The licence allows Snowy Hydro to collect, divert, store, and release water by and from the works of the Snowy Mountains Scheme for the 75-year term of the licence.

The licence also defines the rules for releases into the Murray and Murrumbidgee rivers and imposes environmental flow release obligations on Snowy Hydro for the benefit of the Snowy River and other montane rivers (the rivers of the Snowy Mountains).[194]
The Snowy Water Licence requires the licensee to:

- publicly report annually on its compliance with the licence (licence clause 4.3)
- publicly report on compliance with its Snowy River, Snowy Montane and Annual increased water release requirements (licence clause 4.4)
- prepare and comply with Annual Water Operating Plans (AWOP) (licence clause 8.1)
- make the AWOP publicly available on its website (licence clause 8.13(b))
- maintain water accounts, develop analytical models, and provide data (various licence clauses).

The *Water Act 2007* (Cwth) specifically:

- excludes a work that is under the control of the body that is entitled, under the *Snowy Hydro Corporatisation Act 1997*, to the Snowy Water Licence[195]
- requires that the Basin Plan must not be inconsistent with the provisions of the licence issued under Section 22 of the *Snowy Hydro Corporatisation Act 1997*.[196]

Since 2011, Snowy Hydro has conducted three increased water release programs, providing first flush and increased flows to the Snowy-Genoa, Murrumbidgee and Murray unregulated water sharing plan areas. However, the AWOP and information on operational details of the water release programs have not been made publicly available.

The Licence and AWOP sit outside the Plan with no corresponding provisions or interaction with the Plan. DPIE-Water released its final report on the 10-year review of the Snowy Water Licence in 2018. It identified 23 actions to improve Snowy Scheme water management.[197] Thirteen of these actions remain outstanding but exactly which 13 of the 23 that are outstanding is not publicly available.

194 DPIE-Water (n.d.) *Snowy Water Licence*. Available at: https://www.industry.nsw.gov.au/water/basins-catchments/snowy-river/corporate-licence.
195 Clause 8(2)a.
196 Clause 21(6).
197 DoI (2018) *Ten-year review of the Snowy water licence – final report*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/335622/review-implementaton.pdf.

There are currently three programs to improve the environmental outcomes from the operation of the Snowy Scheme. These include the Snowy River Increased Flows (SRIF), Snowy Montane Rivers Increased Flows (SMRIF) and River Murray Increased Flows (RMIF). However, the Commission understands that the water sources in the Plan area do not materially benefit from the RMIF.

The *Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012* has a specific provision to amend the Plan in response to the SMRIF programs.[198] The Plan does not include an equivalent amendment provision to incorporate improvements in environmental outcomes from any changes to the Snowy Scheme licence or environmental watering initiatives. While the Plan cannot mandate any changes to the Snowy Water Licence, the Plan can be revised to recognise the impacts of the licence and include provisions, including potential amendment provisions to allow the Plan to adjust to any changes in the Snowy Water Licence where necessary to achieve desired outcomes. Further, DPIE-Water has a role in negotiating the Snowy Water Licence and should advocate for any changes deemed necessary to achieve outcomes in the Murray unregulated or other water sharing plans.

7.3 Recommendations

R 9	When remaking the Plan, to facilitate improved outcomes, DPIE-Water should include an amendment provision to allow the Plan to be modified as needed in response to changes in the Snowy Scheme program that impact transfers and releases of water into the Plan area.
SA 2	To facilitate improved environmental outcomes, DPIE-Water should work with Snowy Hydro to assess and minimise the environmental impact of water release patterns from the Snowy Scheme on the Plan area's water sources.
SA 3	When remaking the Plan, DPIE-Water should ensure that licences for miscellaneous alluvial aquifers are given daily access rules that align with any connected surface water sources managed under the Plan. This would involve: a) reviewing bore logs to determine if any licences in the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources* are extracting from an alluvial aquifer rather than porous rock b) assessing the potential volumes of alluvial extraction relative to surface water extraction c) publishing the results and, if extraction potential from alluvial aquifers is significant, outline and consult on steps to manage risks.

198 Clause 88 (Part 8): "*Division 2 of Part 8 of this Plan may be amended to do any of the following -… "(d) establish a variable cease to pump access rule in the Murrumbidgee I Water Source, the Murrumbidgee II Water Source or the Goodradigbee Water Source that – (i) reflects seasonal variations, (ii) protects Snowy Montane Rivers Increased Flow releases as established in the Snowy Water Inquiry Outcomes Implementation Deed 2002, and (iii) protects releases made from Tantangara Dam for the ACT.*"

8 Monitoring, evaluation and reporting

Evidence of limited MER is a consistent theme raised in the Commission's reviews of water sharing plans. The lack of MER is largely due to a lack of plan-specific MER programs, but also limited resources dedicated to undertaking MER activities. This is despite the importance of MER for assessing achievement of plan outcomes, effectively reviewing plans, and supporting adaptive management to improve Plan provisions and associated outcomes.

While the Commission has observed the same limitations for this Plan area (i.e. lack of plan-specific MER over the life of the Plan), the Commission recognises there are a range of other existing or historical monitoring programs in place that support an understanding of the condition of water sources, and how environmental assets respond to changes in flow (**Section 8.1**). There is also evidence that steps are being taken by DPIE-Water and other agencies to improve MER, in part driven by the need to meet Basin Plan reporting requirements (**Section 8.2**).

8.1 Existing monitoring programs in the Upper Murray

There are existing hydrological and water quality monitoring sites in the Plan area. Water quality monitoring is important for determining whether water quality targets are being met. Data from these sites were examined as part of the development of the NSW Murray and Lower Darling Water Resource Plan and key findings relevant to the water sharing plan area are reported in **Chapter 5** of this report. Updated Plan objectives mean that water quality will be assessed to determine if it is in target ranges for ecological, recreational, and economic purposes.

Perhaps the longest running monitoring program that includes sites in the Plan area and provides an understanding of the health of the Upper Murray is the River Murray Biological Monitoring Program, which ran from 1980 to 2018. This program provides more than 30 years of biological data (macroinvertebrate assemblages) at sites along the Murray, including the Upper Murray at Jingellic (site 801) that falls in the Plan area.[199]

Combined with hydrological and water quality data, the program identified that water temperature at this montane site increased by around 2.5 degrees Celsius.[200] Increasing water temperature is attributed to drought and local factors including reduced water levels and groundwater inputs.[201] Temperature increases correspond with a shift in the geographic range of macroinvertebrate taxa found in the mid Murray reaches into the upper Murray and a reduction in the abundance of taxa typically associated with cool water, notably *Coloburiscoides* sp. and *Atalophlebia* spp. (Ephemeroptera), *Leoptoperla* spp. (Plectoptera), and *Cheumatopsyche* spp. (Trichoptera).

199 Shackleton, M., Suter, P. and Hawking, J. (2014) *Investigating the distribution and tolerance of macroinvertebrate taxa over 30 years in the River Murray*. Final report to the Murray Darling Basin Authority. Prepared by the Murray-Darling Freshwater Research Centre. Available at: https://www.mdba.gov.au/sites/default/files/pubs/Murray-Monitoring-dist-and-tolerances-of-macroinvertebrate.pdf.

200 Warren, L.P. Paul, W.L, Cook, R.A, Suter, P.J., Clarke, R.K., Shackleton, ME., McInerney, P. J and Hawking, J.H. (2018) 'Long-term monitoring of macroinvertebrate communities over 2,300 kilometres of the Murray River releases ecological signs of salinity mitigation against a backdrop of climate variability'. *Water Resources Research*, 54, 7004–7028. https://doi.org/10.1029/ 2018WR022976.

201 *Ibid*.

There has also been targeted monitoring of Macquarie perch commissioned by Murray Local Land Services and DPI-Fisheries in Mannus Creek to determine if the threatened species persists, examine their abundance and distribution, and identify major threats.[202] While this species was not recognised in the original Plan, it is listed in the amended Plan objectives.

Further monitoring was undertaken after the 2019/20 bushfires to compare pre- and post-fire habitat extent, and survey Macquarie perch and other fish species post-fire.[203] This information is critical in understanding the impacts of fire and recovery efforts and should be considered in the refinement of Plan provisions and MER activities going forward. This information should also be considered in refining the operating arrangements for Mannus Dam.

In addition, to the Macquarie perch monitoring, the Mannus Dam works approval sets out monitoring conditions for determining the environmental impacts of Mannus Dam.[204] A 5-yearly report is currently being drafted by NSW Public Works on behalf of Snowy Valleys Council, which could be used to support adaptive management and improve environmental outcomes for the Plan.[205] The report is required to cover hydrology and flooding, water quality, fluvial geomorphology based on four agreed cross-sections, terrestrial ecology and aquatic ecology.

Event-based monitoring of the effectiveness of held environmental water in Tuppal Creek and Thule Creek[206] has also occurred. For Tuppal Creek, the environmental flows program has also looked at stakeholder involvement and participatory decision making for informing adaptive management.[207] This water is not currently protected under the Plan, but will likely be included soon, ideally as part of the Plan replacement. This monitoring will be important for assessing the effectiveness of provisions to protect environmental water and associated environmental outcomes.

Although the above projects may currently be disparate, there is an opportunity to better coordinate these programs and link them back to Plan objectives and monitoring themes as part of an integrated MER plan (**Section 8.2**).

8.2 Pathway towards improved MER

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

- updates to water sharing plan objectives to make them measurable and more meaningful

202 Silva, L., Pearce, L., Mabo, S., Horta, A., Duffy, D., Kopf, S., Ning, L. and Baumgartner. L. (2018) *Maccas in the Mannus, Macquarie perch refuge in the Upper Murray*. Institute of Land and Water Science, Charles Sturt University, 67 pp. volume, ILWS Report No 114.

203 Doyle K., Peace L., Ning N., McGregor C., Duffy D., Weatherman K., and Baumgartner L. (2021) *Reassessing Macquarie Perch Populations and Habitat in Mannus Creek - Final Report*. Institute for Land, Water and Society, Charles Sturt University, Albury.

204 Water supply works approval 50WA512896 issued 25 February 2014.

205 Personal communications: Snowy Valleys Council, 22 June 2021.

206 Watts, R and Liu, X. (2020) *Monitoring an environmental water action in Thule Creek to evaluate the contribution of flow via Thule Creek to the productivity of the Wakool River*. Research report prepared by the Institute for Land, Water and Society (Charles Sturt University) for the Forestry Corporation of NSW.

207 Conallin, J., Wilson, E. and Campbell, J. (2018) 'Implementation of environmental flows for intermittent river systems; adaptive management and stakeholder participation facilitates implementation', *Environmental Management,* 61: 497 – 505.

- the development of a NSW MER Framework and customised environmental MER plans
- investment in projects to strengthen MER and help target resources, including development of a framework for prioritising water sources for MER activities.

The MER framework and MER plans seek to integrate MER activities across agencies and map out monitoring effort by research theme. The intent was to then develop theme-based methods manuals which set out monitoring sites, arrangements for cooperative research, sampling methods and data management and analysis techniques.

The Commission has seen a copy of the Murray and Lower Darling Surface Water WRP MER plan, designed to meet Basin Plan reporting requirements.[208] The environmental MER plan, which applies to the Murray and Lower Darling valleys, is based on program logic developed for the water sharing plan objectives, but also objectives from the LTWP and Water Quality and Salinity Management Plan. The program logic is intended to guide monitoring activities, while risk assessments undertaken as part of the WRP process are intended to inform areas for further research.[209] The MER plan also maps out existing monitoring programs across the Murray and Lower Darling by research theme.

However, there is room for improvement:

- while the amended Plan includes clearer, measurable objectives, 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
- monitoring identified Aboriginal values can be improved
- compliance monitoring can be improved
- several the existing monitoring programs listed above in **Section 8.1** are not included in the MER plan
- the MER plan does not explicitly identify areas for further research based on risk and value
- there does 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 for DPIE-Water to continue to identify efficiencies, focus on the most critical MER and continue to work collaboratively with other government agencies and academic institutions to coordinate monitoring activities that support the evaluation of the Plan. MER activities should be prioritised based on value and risk, and public reporting of MER findings should be prioritised to improve transparency and public awareness around Plan outcomes. Water source prioritisation and transferability studies currently underway by DPIE-Water will help to target effort and resources.

208 DPIE (2019) *NSW Murray and Lower Darling Surface Water Resource Plan Monitoring, Evaluation and Reporting Plan: Schedule* J. Provided to the Commission by DPIE.
209 *Ibid.*

8.3 Recommendations

To improve monitoring, evaluation and reporting, the Commission makes the following recommendations.

R 10	By June 2023, to improve Plan-based MER, DPIE-Water should: a) refine and implement the *NSW Murray and Lower Darling Surface Water WRP Monitoring, Evaluation and Reporting Plan* and ensure that monitoring programs not currently identified in this plan are incorporated, for example Macquarie perch monitoring, Mannus Dam environmental monitoring and monitoring of the use of held environmental water in unregulated rivers b) expedite the finalisation and publication of DPIE-Water's water sharing plan evaluation framework and methods manuals and ensure there is multi-agency support and oversight of their implementation. c) identify feasible and appropriate resourcing to support ongoing MER activities d) specify timely reporting requirements of the results of MER activities to support transparency, public awareness and adaptive management e) identify and address critical knowledge gaps to support adaptive management f) use the recently developed prioritisation framework to prioritise MER activities based on values and risk. Clearly communicate how this framework interacts with monitoring plans and publicly report on where and why effort is being targeted.

9 Compensation

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 changes 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. However, the Commission considers that compensation might be payable under Section 87AA in relation to some recommendations listed in **Table 10**.

Table 9: Recommendations that may trigger compensation

R 4	When remaking the Plan, DPIE-Water should ensure the Plan facilitates equitable sharing of water by: a) determining the rate of growth in extraction and interception since timeframes set in the Plan rules and estimate growth into the future b) revising Plan provisions to clearly outline how allocations would be adjusted to respond to growth in various types of use where necessary to meet the LTAAELs, and ensuring these rules allocate reductions fairly. c) ensuring that any options are consistent with the Act and Basin Plan.
R 8	When remaking the Plan, to better achieve Aboriginal water outcomes, DPIE-Water should: a) identify and protect known high value cultural sites in the replacement Plans b) undertake further work with a range of Aboriginal Traditional Owners and knowledge holders including Aboriginal women, to better understand water values and uses, identify the rules to protect them, and support water access and use c) ensure that where additional entitlement becomes available, that Aboriginal water needs are assessed as a priority

	d) undertake state-wide actions identified in Commission water sharing plan reviews to improve consideration and respect for native title and Aboriginal values in water sharing plans.
SA 3	When remaking the Plan, DPIE-Water should ensure that licences for miscellaneous alluvial aquifers are given daily access rules that align with any connected surface water sources managed under the Plan. This would involve: a) reviewing bore logs to determine if any licences in the Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources are extracting from an alluvial aquifer rather than porous rock b) assessing the potential volumes of alluvial extraction relative to surface water extraction c) publishing the results and, if extraction potential from alluvial aquifers is significant, outline and consult on steps to manage risks.

Recommendation 4 could require compensation, depending upon how the rules are adjusted to respond to growth in various types of take and the extent of any exceedance of the LTAAELs. Whether compensation is necessary will depend upon the option for mitigating risks selected by DPIE-Water and would be due to improved information regarding actual extraction. For example, if the LTAAELs for the two extraction management units were combined to spread risks of exceedances more widely, this could require compensation to those licence holders in the management unit where there is currently little risk of LTAAEL exceedance.

Recommendation 8 could require compensation if allocations are reduced to provide for additional water for protection of cultural values. Such a change would be made based on new information about impacts on cultural values. However, the Commission notes that the Plan includes an amendment provision that allows for the Plan to be amended to protect Aboriginal cultural assets and it is likely that protections could be implemented without requiring compensation.

Suggested Action 3 may require compensation if allocation needs to be reduced to mitigate any excess extraction identified once the connectivity between the groundwater and surface water extraction is better understood. This would be based on improved information about connectivity and impacts of extraction from alluvial sources.

The Commission recognises that aspects of **Recommendations 2, 3, 5** and **6** may lead to impacts on water allocation. However, the changes proposed, which may lead to these reductions are allowed (or required) under the current plan rules and therefore would not require compensation.

Appendix A – Plan objectives, strategies and indicators

Table A1: Objectives, strategies and indicators in the Murray Unregulated Plan

Plan Vision

9 The vision for this Plan is to provide for the following:

(a) the health and enhancement of these water sources and their water dependent ecosystems,

(b) the productive and economically efficient use of water resources,

(c) the social and cultural benefits to urban and rural communities that result from the sustainable and efficient use of water,

(d) the spiritual, social, customary and economic benefits to Aboriginal communities that result from the sustainable and efficient use of water.

10 Environmental Objectives

10 (1) The broad environmental objective of this Plan is to protect and, where possible, enhance the ecological condition of these water sources and their water dependent ecosystems (instream, riparian and floodplain ecosystems) over the term of this Plan.

Objectives	Strategies
(2) The targeted environmental objectives of this Plan are as follows: (a) to protect and, where possible, enhance the following over the term of this Plan: (i) the recorded distribution or extent, and population structure of, target ecological populations, (ii) the longitudinal and lateral connectivity within and between water sources to support target ecological processes, (iii) water quality within target ranges for these water sources to support water dependent ecosystems and ecosystem functions.	a) reserve all water volume in excess of the long-term average annual extraction limit and long-term average sustainable diversion limit for the environment, Note. Part 4 reserves all water remaining above the long-term average annual extraction limit and long-term average sustainable diversion limit for the environment. (b) reserve a portion of natural flows to partially mitigate alterations to natural flow regimes in these water sources, (c) restrict the take of water from in-river and off-river pools, (d) restrict or prevent water supply work approvals on third order or higher streams (e) reserve a portion of natural flows to maintain hydrological connectivity between and within these water sources and other connected water sources.

Environmental Performance Indicators

10 (4) The performance indicator used to measure success in reaching the broad environmental objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success in achieving the targeted environmental objectives in subclause (2) are changes or trends in the ecological condition during the term of this Plan including the following:

(a) the recorded range or extent of target ecological populations,

(b) the recorded condition of target ecological populations,

(c) measurements of fish movements through priority fish passage areas,

(d) the recorded values of water quality measurements including salinity, turbidity, total nitrogen, total phosphorous, pH, water temperature and dissolved oxygen,

(e) the extent to which the strategies in subclause (3) have provided flow conditions of sufficient magnitude, frequency, timing and water quality to achieve the targeted environmental objectives.

6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this Plan,

(b) the extent to which the strategies in subclause (3) and provisions in this Plan have been effectively implemented and complied with,

(c) the extent to which external influences on these water sources have affected progress toward achieving the environmental objectives.

11 Economic Objectives

(1) The broad economic objective of this Plan is to maintain access to water to optimise economic benefits for irrigation, water-dependent industries and local economies over the term of this Plan.

Objectives	Plan strategy
(2) The targeted economic objectives of this Plan are as follows: (a) maintain, and where possible improve, water trading opportunities for water-dependent economic activities, Note. Trading is a generic term referring to dealings under Division 4 of Part 2 of Chapter 3 of the Act. (b) maintain access to water, up to the extraction and diversion limits, for water-dependent economic activities, (c) maintain water quality within target ranges for water-dependent economic activities.	(3) The strategies for reaching the targeted economic objectives of this Plan are as follows: (a) provide a stable and predictable framework for sharing water among water users, (b) provide flexibility of access to water, (c) manage extractions to the long-term extraction limit and long-term average sustainable diversion limit and provide for managing extractions within that extraction or diversion limit that recognises different climatic conditions in different years, including during drought, (d) provide for trade of water allocations and entitlements within and between water sources, subject to environmental constraints.

Economic Performance Indicators

(4) The performance indicator used to measure success in reaching the broad economic objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted economic objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure success in achieving the targeted economic objectives in subclause (2) are changes or trends in economic benefits, including the following:

(a) the economic benefits of water extraction and use, including the movement of water to higher value uses,

(b) the economic benefits of water trading, including changes or trends in the following:

(i) the unit price of water that is subject to a dealing,

(ii) the annual total volume of access licence share component that is subject to a dealing,

(iii) the annual weighted average price of water traded within these water sources,

(c) the recorded values of water quality measurements including salinity, sodium adsorption ratio, harmful algal blooms, total nitrogen, total phosphorus, pH and dissolved oxygen.

(6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which stakeholders have considered the operation of this Plan to be clearly explained and predictable,

(b) water made available during the term of this Plan through available water determinations and granting of new licences,

(c) the extent to which changes in the economic benefits of water extraction and use can be attributed to the strategies in subclause (3) and provisions in this Plan,

(d) the extent to which the strategies in subclause (3) and provisions in this Plan have been effectively implemented and complied with,

(e) the extent to which external influences on these water sources have affected progress toward achieving the economic objectives.

12 Aboriginal Objectives

(1) The broad Aboriginal cultural objective of this Plan is to maintain and, where possible, enhance the spiritual, social, customary and economic values and uses of water by Aboriginal peoples.

Objectives	Strategies
(2) The targeted Aboriginal cultural objectives of this Plan are as follows: (a) provide access to water in the exercise of native title rights, (b) provide access to water for Aboriginal cultural use, including fishing, (c) protect identified water-dependent cultural areas, including culturally important riparian vegetation communities, (d) maintain and, where possible, enhance water quality within target ranges to ensure suitability of water for Aboriginal cultural use.	(3) The strategies for reaching the targeted Aboriginal cultural objectives of this Plan are as follows: (a) manage access to water consistently with the exercise of native title rights, (b) provide for water associated with Aboriginal cultural values and uses, (c) reserve a portion of natural flows to partially mitigate alterations to natural flow regimes in these water sources, (d) restrict the take of water from in-river and off-river pools when the volume of that water is less than full capacity, (e) reserve a portion of natural flows to maintain hydrological connectivity within and between water sources, including with culturally important riparian zones, wetlands and floodplains located within these water sources, and with other water sources.

Aboriginal Performance Indicators

(4) The performance indicator used to measure success in reaching the broad Aboriginal cultural objectives in subclause (1) is an evaluation of the extent to which the combined outcomes of the strategies in subclause (3) have contributed to achieving the broad objective.

(a) use of water by Aboriginal people during the term of this Plan by measuring factors including:

(i) the extent to which native title rights are able to be exercised, consistently with any determination of native title,

(ii) the extent to which access to water has achieved Aboriginal cultural outcomes,

(b) the recorded range or extent of target populations of native fish,

(c) the recorded range or condition of target populations of riparian vegetation,

(d) the recorded values of water quality measurements including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, water temperature and dissolved oxygen.

(6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which Aboriginal people have considered the operation of this Plan to be clearly explained and predictable,

(b) water made available for Aboriginal cultural values and uses during the term of this Plan through available water determinations and granting of new access licences,

(c) the extent to which changes in the use of water by Aboriginal people can be attributed to the strategies in subclause (3) and provisions in this Plan,

(d) the extent to which the protection of identified cultural assets can be attributed to the strategies in subclause (3) and provisions in this Plan,

(e) the extent to which Aboriginal people have considered the operation of this Plan to be beneficial to meeting their needs for water-dependent cultural uses and values, and

(e) the extent to which external influences on these water sources have affected progress toward achieving the Aboriginal cultural objectives.

13 Social and Cultural Objectives

(1) The broad social and cultural objective of this Plan is to maintain and, where possible, enhance the efficient and sustainable access to water to support critical human water needs, and water dependant values, culture, heritage and recreational uses.

Objectives	Plan strategy
(2) The targeted social and cultural objectives of this Plan are to maintain and, where possible, improve: (a) access to water for critical human water needs, town water supply and domestic and stock purposes, and (b) access to water for water-dependent cultural, heritage and recreational uses, including recreational fishing, and (c) water quality within target ranges for critical human water needs, town water supply, domestic and stock purposes and water-dependent cultural, heritage and recreational uses, including recreational fishing.	(3) The strategies for reaching the social and cultural objectives of this Plan are as follows: (a) provide water access for critical human needs, town water supply, and for domestic and stock purposes, (b) reserve a portion of natural flows to partially mitigate alterations to natural flow regimes in these water sources, (c) restrict the take of water from in-river and off-river pools, (d) reserve a portion of natural flows to maintain hydrological connectivity between these water sources and other water sources, riparian zones, wetlands and floodplains connected to these water sources.

13 Social and Cultural Indicators

(4) The performance indicator used to measure success in reaching the broad social and cultural objectives in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted social and cultural objectives in subclause (2) have contributed to achieving the broad objectives.

(5) The performance indicators used to measure success in reaching the targeted social and cultural objectives in subclause (2) will be evaluated as follows:

(a) by comparing changes or trends in the social and cultural uses of water during the term of this Plan by measuring factors including:

(i) the extent to which basic landholder rights have been met,

(ii) the extent to which major utility access licence and local water utility access licence requirements have been met,

(b) by comparing changes or trends in the recorded range or extent of target populations of native fish that are important for recreational fishing,

(c) by comparing changes or trends in the recorded takes of native fish that are important for recreational fishing within legal age and size classes,

(d) by comparing changes or trends in the recorded values of water quality measurements, including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, water temperature and dissolved oxygen.

(6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which stakeholders have considered the operation of this Plan to be clearly explained and predictable,

(b) water made available during the term of this Plan through available water determinations and granting of new access licences,

(c) the extent to which changes in the social and cultural use of water can be attributed to the strategies in subclause (3) and provisions in this Plan,

(d) the extent to which external influences on these water sources have affected progress toward achieving the social and cultural objectives.

Appendix B – Water sources

Table A2: Plan water sources

Plan area water sources	
Unregulated Upper Murray Extraction Management Unit	▪ Dora Dora Water Source (I) ▪ Hume Water Source (I) ▪ Indi Water Source ▪ Jingellic Water Source (I) ▪ Mannus Water Source (E) ▪ Maragle Water Source ▪ Ournie Welaregang Water Source (I) ▪ Swampy Plain Water Source (I) ▪ Tooma Water Source (I) ▪ Tumbarumba Water Source ▪ Upper Murray River Water Source (I) (E)
Unregulated Middle Murray Extraction Management Unit	▪ Albury Water Source (I) ▪ Lower Wangamong Water Source ▪ Majors Water Source ▪ Murray Below Mulwala Water Source (I)

Note: (I) denotes high in-stream value; (E) denotes high level of economic significance[210]

210 DPI (2012) *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources – Background document*. Available at: https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/murray-region.