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Western – Attachment 2: Assessment of modelled options

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Cover image Image courtesy of Destination NSW. Menindee Lakes, Menindee.

More information water.dpie.nsw.gov.au/plans-and-programs/regional-water-strategies

Image courtesy of Destination NSW. Darling River, Bourke.

This attachment summarises the results of the hydrologic, economic and environmental assessment of options in the Final Western Regional Water Strategy that directly affected the behaviour of the river system.

The following options were analysed against a 130-year dataset:

- Reviewing B Class and C Class licence thresholds in the Barwon–Darling (Option 47 in the draft strategy)
- Deliver water down the Great Darling Anabranch (Option 50 in the draft strategy)
- Review how the Menindee Lakes are operated (Option 52 in the draft strategy)
- Review the environmental water allowance rule for the Lower Darling Water Source (Option 30 in the draft strategy)
- Regulate the Barwon–Darling River (Option 48 in the draft strategy)
- Provide 500 ML a day in the Barwon–Darling from the NSW tributaries to improve connectivity (new option proposed during consultation)
- Develop critical dry targets for the Barwon–Darling River (results located in attachment 3) (Government Commitment 6 in the draft strategy)
- Deliver replenishment flows from the Border Rivers, Gwydir, Namoi, and Macquarie valleys (results located in attachment 4) (Option 46 in the draft strategy)
- Restricting supplementary licences to meet algal suppression and fish migration targets in the Barwon–Darling River (results located in Attachment 5) (Government Commitment 5 in the draft strategy).

There were several key assumptions and processes used to undertake the modelling:

- Hydrologic assessment was undertaken by introducing each option into the department's river system models for NSW tributary (Border Rivers, Gwydir, Namoi and Macquarie–Castlereagh), Barwon–Darling and the Southern Connected System. The Southern Connected System model includes the Menindee Lakes and the Lower Darling. This was used to observe the changes that occurred to extraction of water and flows compared to the base case without the option being included.
- A rapid cost-benefit and hydrologic analysis (using historical data) was undertaken on all the options that could be modelled. The rapid economic analysis used high level cost estimates prepared for each option which were assessed against the economic value of water for towns and industries.[1]
- The rapid environmental assessment was undertaken by a professional assessment of scientists in the Department of Planning and Environment – Water and the Department of Primary Industries Fisheries.
- The detailed ecological assessment used hydrologically modelled results to assess whether changes to a set of flow parameters at several points were positive or negative relative to targets in the Barwon–Darling and Lower Darling Long-Term Water Plans. Table 1 describes the impact categories used in the environmental assessments and their associated changes in hydrology.

Based on the results of this analysis, more detailed hydrologic analysis using paleo-informed and climate change influenced long-term datasets will be undertaken in the coming months. This analysis will help assess how the options could perform under different future climate scenarios.

High-level results of the assessments are presented in Table 1 and in Attachments 3, 4, and 5.

1. Further information on how the economic estimated benefit of water to towns and industries was estimated is available in Marsden Jacobs Associates 2020, *Regional Water Value Function for all regions*. Available at, www.dpie.nsw.gov.au/water/plans-and-programs/regional-water-strategies/identifying-and-assessing

Table 1. Explanation of categories used in ecological assessment

Stage 1 category	Stage 2 category	Estimated percentage change in hydrology/ecology
Major/extreme impact	Extreme impact	More than 30% change in a negative direction (< -30%)
	Major impact	More than 20% change in a negative direction (< -20%)
Minor/moderate impact	Moderate impact	More than 10% change in a negative direction (< -10%)
	Minor impact	More than 3% change in negative direction (< -3%)
No/little change	Little impact	Less than 3% change in a negative direction (< 0%)
	No change	0%, rounded to the nearest whole percentage point
	Little improvement	Less than 3% change in a positive direction (> 0% and < 3%)
Minor/moderate improvement	Minor improvement	More than 3% change in a positive direction (> 3%)
	Moderate improvement	More than 10% change in a positive direction (> 10%)
Major/extreme improvement	Major improvement	More than 20% change in a positive direction (i.e. > 20%)
	Extreme improvement	More than 30% change in a positive direction (> 30%)

Image courtesy of Destination NSW. Barwon River, Brewarrina.

Reviewing B Class and C Class licence thresholds in the Barwon–Darling

Purpose	The Natural Resource Commission's review of the Barwon–Darling Water Sharing Plan recommended that the NSW Government review the access levels for B Class and C Class licences in the Barwon–Darling. This analysis undertook that review and assessed whether B Class and C Class licence thresholds are fit-for-purpose, and whether changing them could improve longevity of town water supply and improve environmental outcomes by aligning B Class and C Class licence access arrangements to environmental water needs. This was Option 47 in the Draft Western Regional Water Strategy.
Description	Hydrological modelling was undertaken to investigate aligning B and C flow classes with small and large fresh Environmental Water Requirements in the Barwon–Darling Long-Term Water Plan.
Results	Aligning B Class and C Class flow class thresholds with small fresh and large fresh environmental water requirements resulted in little to no change in the modelled flows in the Barwon–Darling River. This response may be because the pattern of water extraction under the adjusted thresholds remained essentially the same. There appears to be small benefits to the duration of small freshes and large freshes as a result of the increased thresholds. Overall, this option could decrease long-term average annual diversions in the Barwon–Darling by 0.7%. This impact is relatively low because Barwon–Darling water users are likely to be able to make up for the increased B and C Class thresholds by extracting water later in an event, or by taking more water in a subsequent event. An economic assessment of the implementation of new B Class and C Class thresholds, considering towns and agriculture, shows limited change from the current conditions. Implementing this option could decrease economic activities reliant on surface water by $3.7 million, (present value over 40 years) or 0.6% compared to the current conditions in the Barwon–Darling on average over a 40-year period. This analysis suggests that the option does not have merit in progressing on its own. However, considering amendments to B Class and C Class licence thresholds could be considered as part of a suite of measures to reduce impacts on licence holders from progressing any of the shortlisted connectivity actions in the Western Regional Water Strategy.
Limitations	The modelling is sufficient to demonstrate the effect of this option.

Table 2. Summary of hydrological model results using a modelled dataset from 1895 to 2020

	Bourke		Wilcannia	
Flow type	**Small freshes**	**Large freshes**	**Small freshes**	**Large freshes**
Change in number of events	-2	-1	-1	0
Increase in duration of events (days)	1.60%	0.50%	0.40%	0%
Decrease in average period between events (days)	0%	0.70%	0.50%	0%

Table 3. Summary of hydrological model results using a modelled dataset from 1895 to 2020

	A Class licences	B Class licences	C Class licences	Menindee Lakes median storage	Median flows into Menindee Lakes
Change (ML/year)	N/A	-833	-186	-6,657	1,666
% change	N/A	-0.89%	-0.58%	-0.74%	-0.2%

Image courtesy of Destination NSW. Murray and Darling Junction, Wentworth.

Table 4. Years in the historical record with licence holder impacts and benefits from the B and C Class option for each Barwon–Darling management zone

	Percentage of years there is reduced water availability for licence holders	Percentage of years there is increased water availability for licence holders
Zone 1: Mungindi-Boomi	57%	43%
Zone 2: Boomi-Mogil Mogil	0%	0%
Zone 3: Mogil Mogil Weir Pool	0%	0%
Zone 4: Mogil Mogil – Collarenebri	62%	35%
Zone 5: Collarenebri – Walgett	63%	37%
Zone 6: Walgett Weir Pool	25%	74%
Zone 7: Walgett Weir – Boorooma	50%	50%
Zone 8: Boorooma – Brewarrina	52%	48%
Zone 9: Brewarrina – Culgoa Junction	62%	37%
Zone 10: Culgoa Junction – Bourke	66%	33%
Zone 11: Bourke – Louth	48%	52%
Zone 12: Louth – Tilpa	54%	34%
Zone 13: Tilpa – Wilcannia	90%	5%
Zone 14: Wilcannia – Menindee Lakes	0%	0%
Total percentage of years	**63%**	**37%**

Table 5. Summary of economic analysis results

	Towns	Agriculture	Total
Present value ($, million) change from base case	~0	-3.7	-3.7
% change from base case	~0%	-0.6%	-0.6%

Table 6. Summary of ecological assessment results – modelled change in ecological flow metrics when B and C Class access thresholds are aligned against corresponding small fresh and large fresh environmental water requirements

Metric	Average effect across gauges	Range of effects across gauges
Years in record	No change	No change
Mean annual flow	No change	No change
Median annual flow	No change	Little impact to no change
Number of years with a cease-to-flow event	No change	No change
Number of cease-to-flow events	No change	No change
Mean duration of cease-to-flow events	No change	No change
Number of freshes	No change	No change
Mean duration of fresh events	No change	Minor impact to little improvement
Number of years with ≥ 1 fresh event	No change	Little impact to little improvement
95th percentile flow rate	No change	No change to little improvement
10th percentile flow rate	No change	Little impact to no change
Mean days below base case 90th percentile	No change	No change
Mean duration of base case 90th percentile or lower	No change	No change to little impact
Mean duration of base case 20th percentile or lower	No change	No change to little impact

Deliver water down the Great Darling Anabranch

Purpose	The purpose of this option is to maximise the use of water remaining in Lake Cawndilla for critical needs during dry periods by making releases to the Great Darling Anabranch. This option could also deliver environmental benefits by providing an avenue for fish to move out of the drying Lake Cawndilla and subsequently enhance fish populations across the southern Basin. This was Option 50 in the Draft Western Regional Water Strategy.
Description	When the lakes drop to the level where they are isolated from the Menindee Outlet, Lake Cawndilla becomes separated from Lake Menindee. This water becomes stranded in Lake Cawndilla. Unless the water in Lake Cawndilla is released to the Great Darling Anabranch, it is left to evaporate. Fish are at risk during these conditions and approximately 200 GL of water can be lost to evaporation when this occurs. This option would seek to formalise arrangements to deliver water from Lake Cawndilla to the Murray River via the Great Darling Anabranch. This would likely occur when storage levels in the lower lakes are dropping, and the Menindee Lakes storages are forecast to return to NSW control. The benefit of this option is that it will help prioritise releases of water from less efficient lakes and allow for more accessible water to remain in the upper Menindee Lakes to meet critical needs when the lakes return to NSW control. The modelling analysed how the option could impact on releases from Lake Cawndilla in situations when the lake separates from Lake Menindee. It is at these dry times when the water in Lake Cawndilla can be best used for Anabranch flows instead of being left to evaporate. Combining this option with an active 195 GL trigger could nearly halve the time Menindee Lakes are below critical levels.

Image courtesy of Carla Frankel. Menindee Lakes system, NSW.

Results	Using the modelled dataset from 1895 to 2020, hydrological modelling found that, compared to the base case, the option resulted in minor changes (less than 1% decrease) in average general security supply in the Lower Darling and NSW Murray rivers, and negligible difference in flows to South Australia (insignificant overall increase). While there may be some years where flows into South Australia or general security allocations to the NSW Murray reduce slightly, these years are few and the changes are small (see Figure 1 and Figure 2). The total delivery volume to the Murray River did not change. This result is likely to be because increased delivery losses associated with using the Anabranch are offset by reduced Lake Cawndilla storage losses resulting in no net difference in flows entering the Murray River. There was approximately 18 GL/year less water delivered from the Lower Darling River, and 18 GL more water per year delivered from the Great Darling Anabranch. The analysis particularly focused on whether there was any change to the flow events down the Great Darling Anabranch from Lake Cawndilla. The results indicated: • benefits to Lake Cawndilla discharges down the Anabranch, including 20% more water volume down the anabranch on average (Figure 3) • a reduction in the average time between flows down the Great Darling Anabranch from 4.8 months to 3.9 months • a reduction in the maximum time between flows down the Great Darling Anabranch from 40 months to 34 months • an increase in the proportion of time with a flow in the Great Darling Anabranch from 54% to 59%. Combining this action with actions to restrict lower priority licences upstream when Menindee Lakes is below 195 GL of accessible storage could reduce the time that Menindee Lakes are at critically low levels. For example, it could reduce the time Menindee Lakes (Wetherell, Pamamaroo and Tandure) are below 5% of active storage from 0.7% of the time to 0.5% of the time (see Table 8). This option has been shortlisted in the Final Western Regional Water Strategy under Action 3.4.
Limitations	No economic modelling was undertaken on this option. The modelling is sufficient to demonstrate the effect of this option and proceed to further investigation through collaborative processes with other states and the Murray–Darling Basin Authority. NSW would need to seek approval for an operational protocol through the River Murray Operations Committee.

Table 7. Summary of hydrologic model results using a modelled dataset from 1895 to 2020 with and without the option of delivering water from Lake Cawndilla down the Great Darling Anabranch

Metrics	Baseline	With option of releasing water from Lake Cawndilla down the Great Darling Anabranch	% change
Changes in water availability for general security licences (ML/year)			
Lower Darling – supplied general security	33,146	32,983	-0.5%
Lower Darling – held environmental water general security	31,506	31,340	-0.5%
Murray – supplied NSW general security (ML/year)	1,399,000	1,391,000	-0.6%
Lake Cawndilla total (active + inactive) storage volume (ML/year)			
Mean storage volume	339,337	330,036	-2.7%
Median storage volume	315,814	306,603	-2.9%
Volume-percentage of time less than 25% of full supply volume	36.7%	37.2%	0.5%
Volume-percentage of time less than 5% of full supply volume	9.3%	12.8%	3.5%

Table 8. Modelled results of the time Menindee Lakes active storage capacity across Lakes Wetherell, Pamamaroo and Tandure are below critical levels

Metrics	Baseline	Combined option of: • releasing water from Lake Cawndilla down the Great Darling Anabranch • restricting lower priority licences when there is less than 195 GL active storage in Menindee Lakes
Time Menindee Lakes is below 5% active storage	0.7%	0.5%
Time Menindee Lakes is below 10% of active storage	1.5%	1.3%

Figure 1. Modelled NSW Murray General Security Allocations with and without the option of releasing water from Lake Cawndilla down the Great Darling Anabranch based on data from 1998 to 2019

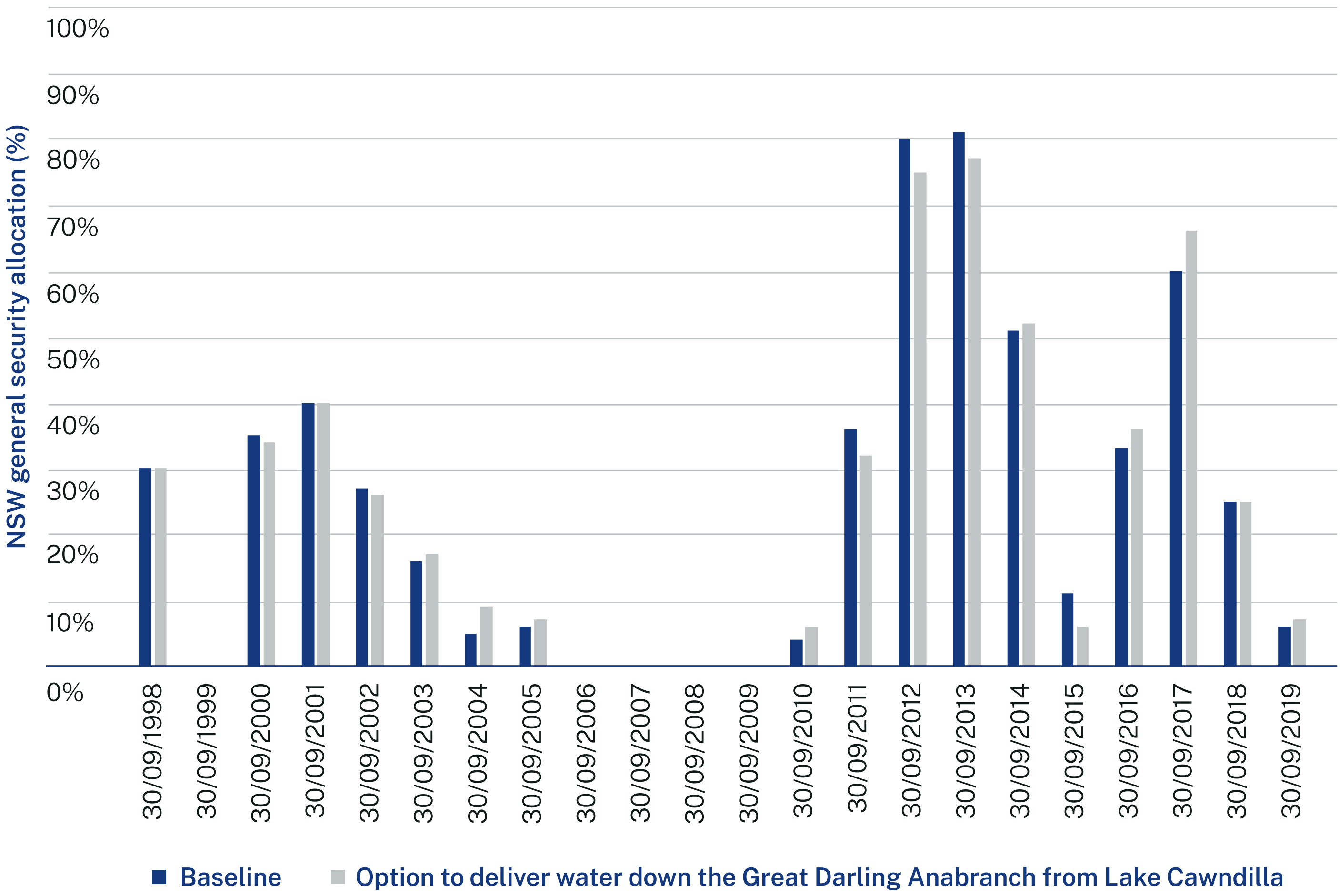


Image courtesy of Destination NSW. Menindee Lakes, Menindee.

Figure 2. Flow to South Australia with and without the option of releasing water from Lake Cawndilla down the Great Darling Anabranch based on data from 1998 to 2019

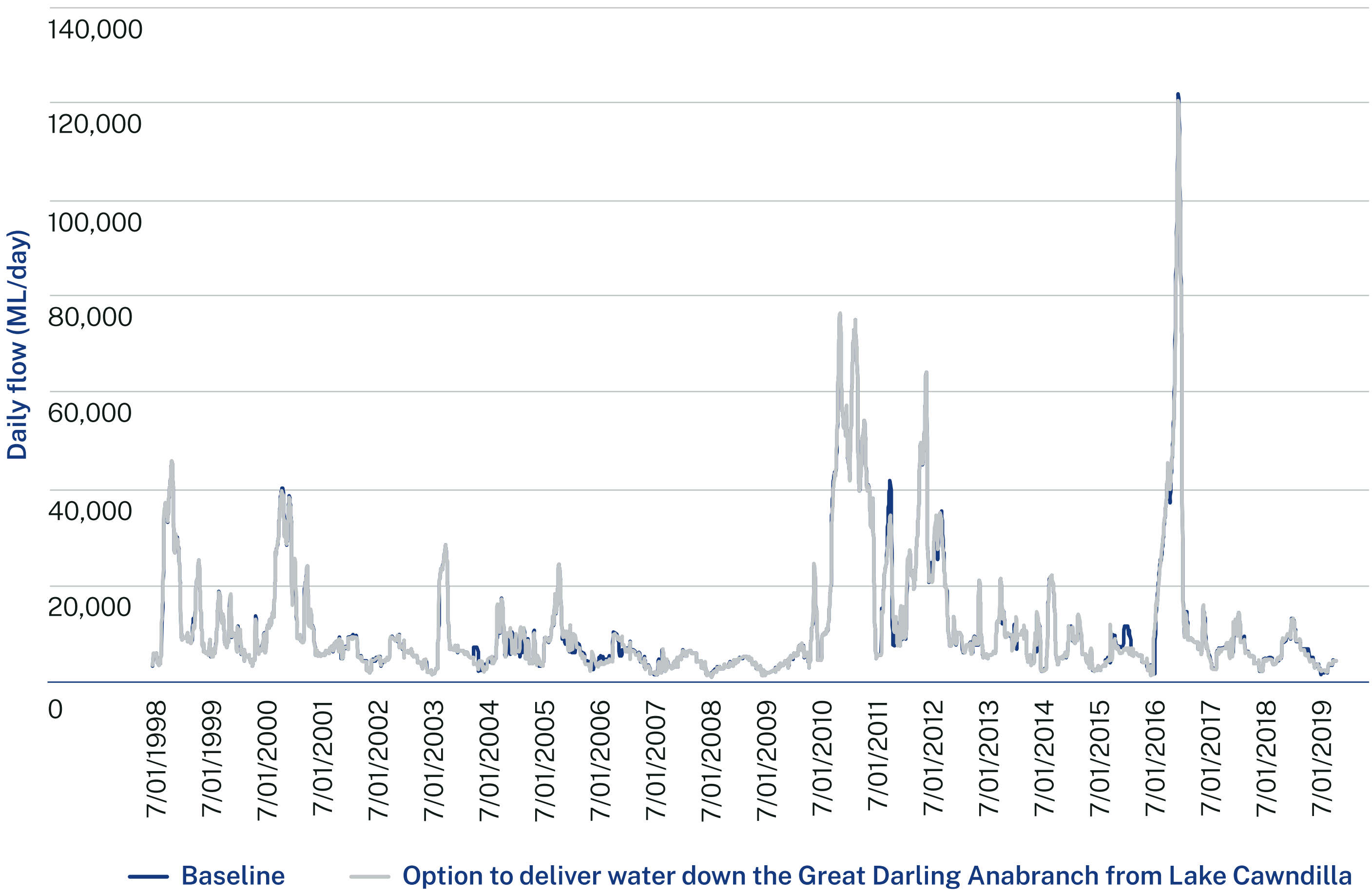
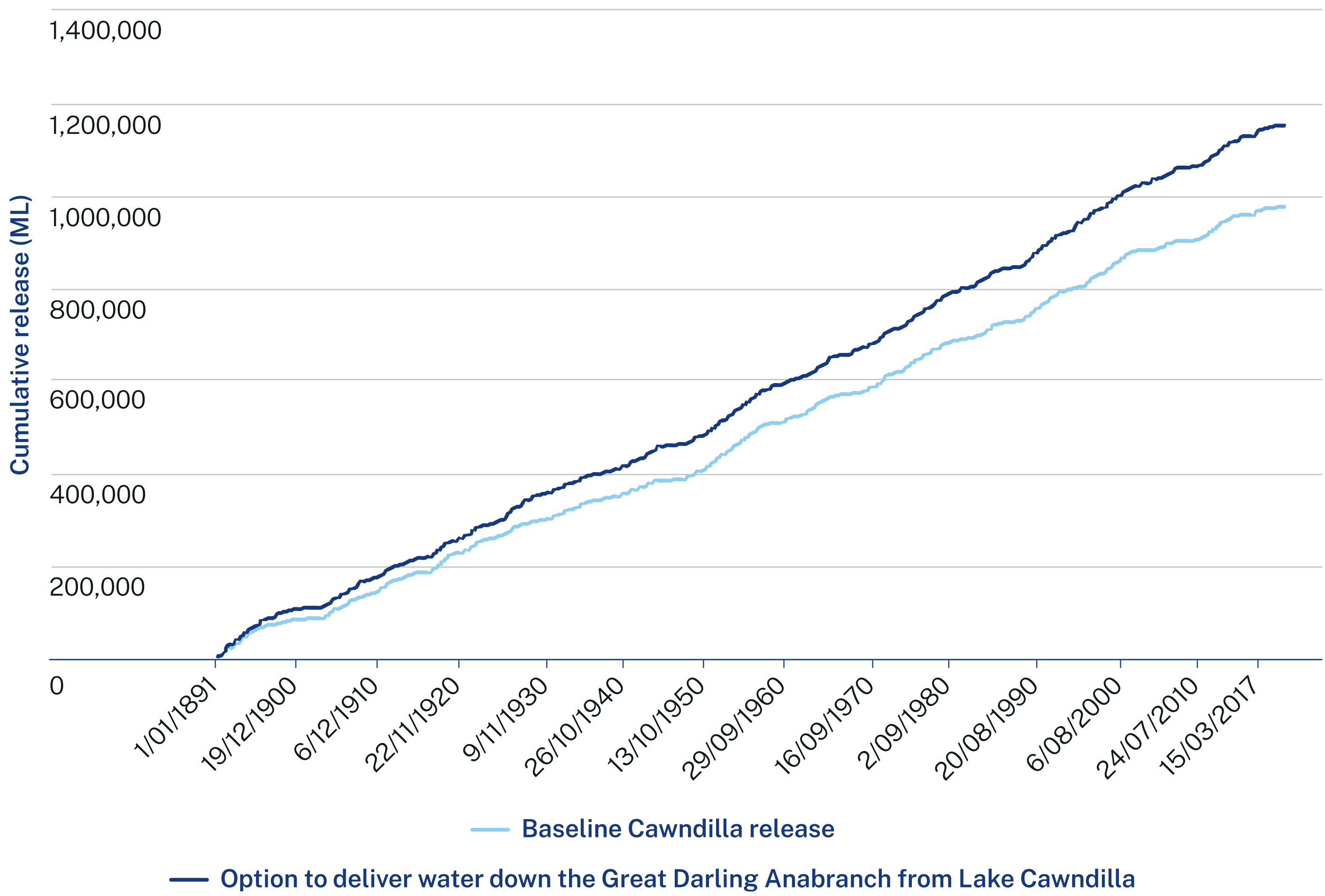


Figure 3. Cumulative downstream flow from Lake Cawndilla (gauge 425014 near the Cawndilla outlet regulator) under a base case and with changes to the release arrangements at Lake Cawndilla



Review how the Menindee Lakes are operated

Purpose	Investigating whether management decisions at Menindee Lakes should be based on active storage or total storage volumes. Operating the lakes based on active storage could provide more flexibility in supporting critical human and environmental needs in the Lower Darling. This was Option 52 in the Draft Western Regional Water Strategy.
Description	The Menindee Lakes storage is owned and operated by NSW with an arrangement under the Murray–Darling Basin Agreement. This agreement requires the Murray–Darling Basin Authority to include the water held within the lakes as part of the shared resource of the River Murray System, and use the water in the lakes when the volume is above 640 GL until it next falls below 480 GL. The volumes are based on total storage volumes and include a level of 'inactive' storage that cannot be used or delivered down the rivers. The location of where water is stored in the Menindee Lakes, and when it falls below 480 GL, has a significant impact on NSW and its ability to access water, including how long this critical drought reserve can meet the demands of the community and environment. The triggers to move management of the lakes between NSW and Murray–Darling Basin Authority control are based on an assessment of NSW drought reserves required to meet Lower Darling needs for 2 years. This option examines the impacts of changing the operation of this rule so that it applies to active storage, rather than total storage, where active storage is water that is able to be physically diverted or extracted from the lakes. Inactive storage was modelled as 20,282 ML across the 7 lakes. However, Lake Cawndilla has an additional 157,000 ML that can be used to release water down the Great Darling Anabranch, but not the Lower Darling. This option assumes the active storage does not include the additional 157,000 ML available only to the Great Darling Anabranch.
Results	The results indicate that under this option the lakes would be under NSW control approximately 8.7% of the time more often than the base case. Having the lakes under NSW control more often and excluding inactive storage means that NSW is better able to manage flows in the Lower Darling and the Great Darling Anabranch for critical human and environmental needs during dry periods. This issue is expected to be exacerbated under climate change. Long term climate change modelling indicates that under a worst-case climate scenario the Menindee Lakes may be under NSW control 18% more often. Other results include: • 1.4% increase in general security and 13% increase in high security supplied to the Lower Darling • 2.3% to 5.6% increase in held environmental water supplied to the Lower Darling • minor changes to NSW General Security Murray entitlements. Figure 4 indicates that while there are individual years where the option increases or decreases NSW Murray General Security allocations, there are minimal changes on average over the long-term • negligible changes to South Australian flows (see Figure 5). As a result of the analysis this option has been shortlisted under Action 3.4 in the strategy. Progressing this option will need to be done in collaboration with other basin states and would require a change to the Murray–Darling Basin Agreement which may occur through a review of the Murray–Darling Basin Plan in 2026.

Limitations	While no economic or ecohydrology modelling has been conducted on this option the hydrological modelling is sufficient to demonstrate the effect of this option. Any reconsideration of reviewing the 480 GL trigger, including accounting for inactive storage, would require changes to the Murray–Darling Basin Agreement and negotiation with Victoria, South Australia, and the Australian Government at the Murray–Darling Basin Ministerial Council.

Table 9. Summary of hydrologic model results using a modelled dataset from 1895 to 2020

Metrics	Baseline	Option 52 results	% change
Lower Darling related outputs (ML/year)			
Supplied general security	33,146	33,603	1.4%
Supplied high security	4,001	4,521	13%
Supplied held environmental water in the Lower Darling/general security	31,506	32,219	2.3%
Supplied held environmental water in the Lower Darling/high security	699	738	5.6%
Combined total Menindee Lakes storage volume (ML) when the lakes come under NSW control			
Mean storage volume	308,532	477,342	54.7%
Median storage volume	301,678	477,798	58.4%
Murray related outputs (ML/year)			
Supplied NSW general security	1,399,000	1,395,000	-0.3%
Supplied NSW high security	150,834	150,256	-0.4%
Supplied held environmental water/general security	355,616	355,742	No change
Supplied held environmental water/high security	17,487	17,457	-0.2%

Figure 4. Modelled NSW Murray General Security Allocations with and without the option of changing the operation of Menindee Lakes based on active storage for the period 1998 to 2019

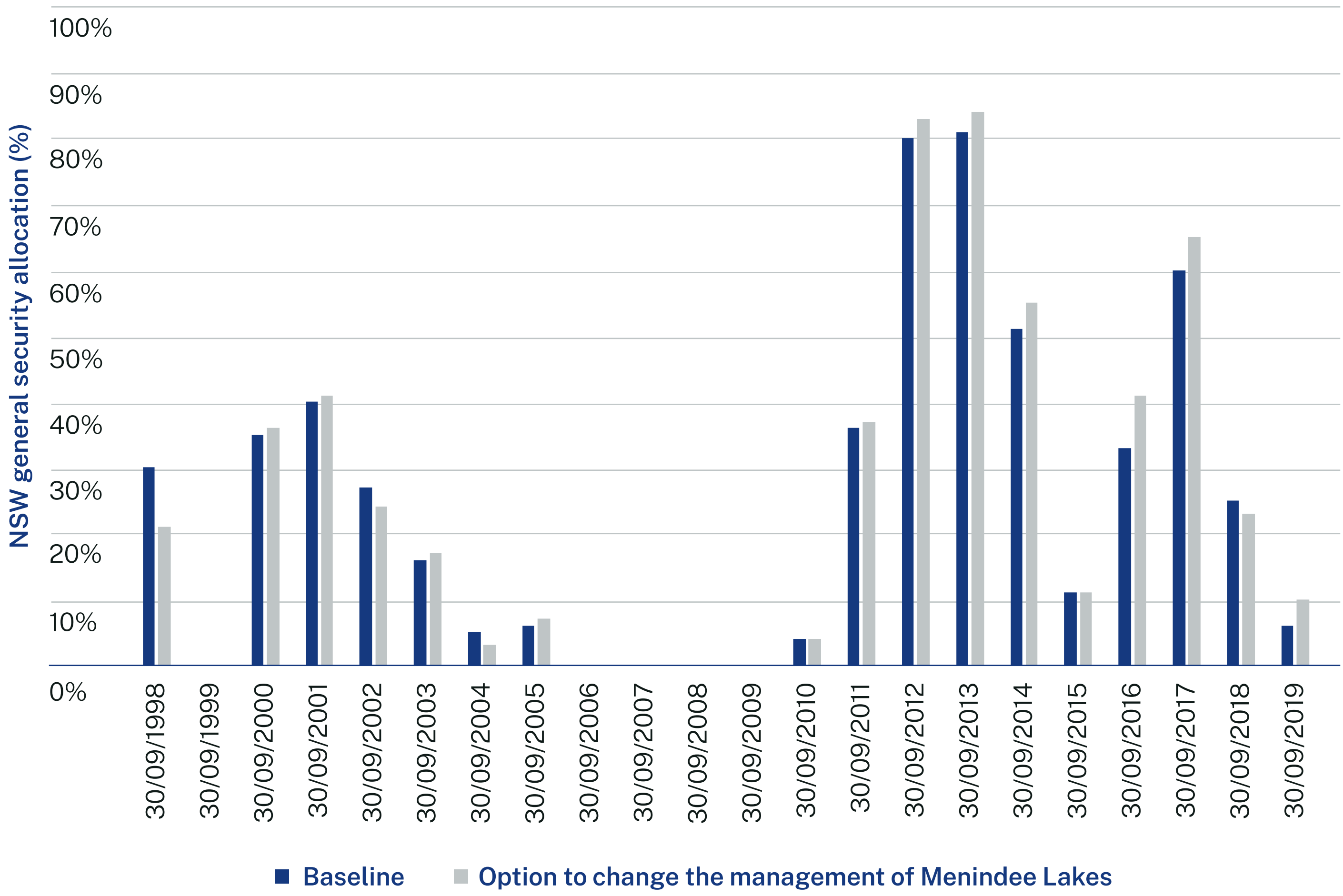
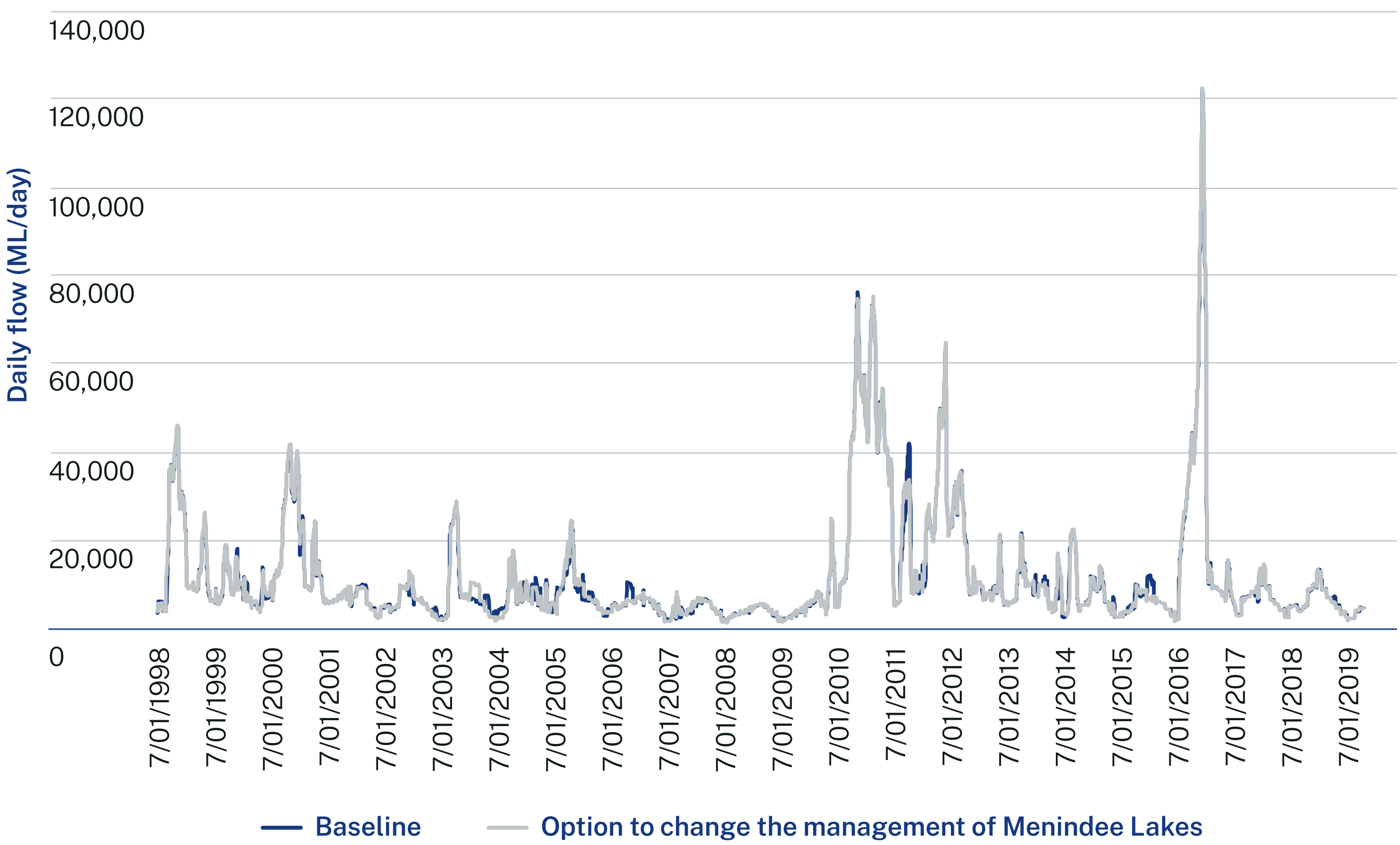


Figure 5. Modelled flows to South Australia with and without the option of changing the operation of Menindee Lakes based on active storage for the period 1998 to 2019



Review the environmental water allowance rule for the Lower Darling Water Source

Purpose	There is a 30 GL environmental water allowance in the Menindee Lakes to manage water quality issues in the Lower Darling, which is triggered by high alert for blue-green algae. Currently, the Lower Darling allowance can only be used when conditions are relatively wet and the operation of Menindee Lakes is under the control of the Murray–Darling Basin Authority. However, water quality issues usually arise in drier conditions when the lakes are under NSW control. Consequently, this allowance has not been used since the start of the water sharing plan in 2004, mainly due to the allowance not being required when it is permitted to be used. The purpose of this option was to understand whether amendments should be made to water sharing plan rules to allow the environmental water allowance to be used when Menindee Lakes are at low levels and under NSW control. This was Option 30 in the Draft Western Regional Water Strategy.
Description	This option explored the potential to use the allowance when the lakes were under NSW control, including consideration of different crediting arrangements so the allowance is available in a range of circumstances to potentially mitigate a broader range of water quality issues and prevent critical water quality incidents in the Lower Darling River. Modelling was undertaken to represent a scenario of low flow where river pools could begin to stratify – periods when flows at Burtundy or Weir 32 were less than 1,000 ML/day on average over a 7-day period during October to April. This flow threshold was used as a proxy for times when the conditions for algal blooms may be present.

Image courtesy of John Spencer, Department of Planning and Environment. Darling River, Kinchega National Park.

Results	The analysis looked at the times over the historical record when the Menindee Lakes were under NSW control (under current operating procedures) and there was a requirement for an environmental water release in the Lower Darling. In more than 50% of years there was no need for an additional environmental water release due to the presence of flows in the Lower Darling River. When there was an environmental water allowance requirement, in 29% of these events (low-flow sequences could run up to 3.4 years), there was not enough available water in the lakes to meet this requirement. This means that the lake levels were not high enough to provide an environmental water release to satisfy the proposed threshold at Burtundy. Typically, periods with the greatest environmental water allowance requirement were also the years with the least available water. The median environmental water allowance requirement was 9,500 ML (targeting 1,000 ML/day in the Lower Darling) and the allowance was often required multiple times when the lakes were under NSW control. This meant that maintaining the environmental water allowance resulted in heavy drawdowns from the lakes. The average annual volume required for the environmental water allowance was 26.6 GL, with 58.4 GL required in at least 25% of years, and 79.3 GL required in at least 10% of years. For those times when there was multiple or successive environmental water allowance requirements, there was generally not enough storage available in the lakes to meet this requirement. The analysis shows that during long periods when multiple de-stratifying flows were likely to be required, there would be insufficient stored water available under current operating provisions once the critical human water needs are set aside along with existing committed allocations. The active storage volumes in the lakes would not be able to support the proposed environmental water allowance for the duration that the lakes are under NSW control. This analysis did not consider how the water needs of consumptive users in the Lower Darling would be affected; however, there are likely to be impacts on these users as a result of this option. As a result of this analysis, this option was not shortlisted in the Final Western Regional Water Strategy. However, this analysis may be used to contribute to broader discussions about how the Menindee Lakes are operated and managed.
Limitations	• No detailed economic or environmental assessment has been undertaken. • The analysis does not consider additional losses caused by storing the environmental water requirements provision. • In practice, the design of the pulse would need to be adaptively managed to adjust for real-time attenuation and losses.

Regulating the Barwon–Darling River

Purpose	Improve the ability to deliver water to Barwon–Darling water users by constructing a headwater storage at the top of the Barwon–Darling to regulate the system. The objective of this option was to improve water security for towns and industry during extended droughts. This was Option 48 in the Draft Western Regional Water Strategy.
Description	For a system to be considered regulated, it requires a large storage – enough to give multiple years of deliverable water during droughts. This analysis considered the feasibility of constructing a headwater storage for the Barwon–Darling. The Barwon–Darling Valley is generally very flat and there are no existing locations that are well suited to construct a large storage. For the purposes of this analysis, it was proposed to site a new storage at the Banarway Weir site on the Barwon River at the top of the system. Because the topography is so flat, the proposed storage wall was approximately 30 km long across the floodplain. Spatial analysis techniques were used to represent a dam wall across the river and floodplain to calculate the resulting storage volume and area inundated at full supply. Similar techniques are used to measure the size of on farm storages with remote-sensed data.

Image courtesy of Michael Scotland. Barwon River, Collarenebri.

Results	The analysis explored the effect of building an embankment across the Banarway Weir site at Mogil Mogil. It explored a range of embankment heights from a maximum dam elevation of 148 m to 154 m. The analysis revealed that this type of dam would hold a volume of 31 GL to 1,823 GL with average water depths of 1.3 m to 2.3 m respectively. The assessment results indicated: • **High storage losses:** Due to the flat topography of the land in the Barwon–Darling Valley, the storage was large and shallow with inundated areas spread out across the floodplain. The result being large storage losses due to high evaporation. Due to average drawdown demands and evaporation rates this storage would only be able to hold water for maximum of 1–2 years if there were no inflows. • **High costs:** The estimated cost of establishing a storage at this location is estimated to be over $2 billion which includes construction of the storage wall, land acquisition and estimation of environmental and cultural heritage offsets and operating costs. A high-level economic analysis completed with favourable assumptions was undertaken and found that even under perfect operating conditions, which would not be able to be achieved, the costs of the option significantly outweighed it's benefits. The analysis assumed that due to the regulation of the Barwon–Darling River, towns downstream within the Barwon–Darling catchment could maintain full supply and experience no shortfalls, and all current agricultural licence classes in the region were consistently met each year. With these upper-bound assumptions a very low benefit-cost ratio of less than 0.1 was achieved. The results are preliminary but sufficient to demonstrate it does not merit further investigation. The required headwater storage may not be physically feasible, it would be large and expensive with insufficient benefit to users for the cost. There is also no real likelihood of further investigations to identify other feasible locations for a regulating dam in the Barwon–Darling Valley due to the prevailing low topography and rainfall. There was also significant opposition to this option during consultation on the Draft Western Regional Water Strategy. As a result, this option did not progress to the detailed assessment. Analysis on the prospect of diverting flows from the Clarence Valley to the Border Rivers to understand how it could improve flows to the Barwon–Darling was undertaken for the Final Border Rivers Regional Water Strategy. The results and the outcome of this analysis can be found at: water.dpie.nsw.gov.au/__data/assets/pdf_file/0006/544029/additional-analysis-on-inland-diversion-schemes.pdf
Limitations	Although detailed hydrological assessment was not undertaken for this option, the analysis is sufficient to demonstrate that the option is not feasible.

Provide 500 ML a day to the Barwon–Darling River from the NSW tributaries to improve connectivity

Purpose	This option was intended to test the benefits and impacts of establishing daily minimum flow releases from the NSW tributary storages to the Barwon–Darling River. This is a new option considered as a result of stakeholder feedback during the development of the Draft Western Regional Water Strategy designed to help improve water flowing across connected systems and improve connectivity.
Description	The hydrological modelling for this option consisted of providing a constant daily release from the Border Rivers, Gwydir and Namoi rivers of 233 ML/day whenever the flows at Bourke fell below 500 ML/day. The daily order was selected to be able to provide 500 ML/day flows at Bourke for most of the record. To meet the minimum flow requirement, water from storages in the Border Rivers, Gwydir and Namoi valleys was drawn down. No restrictions were applied to water users in the tributary valleys or the Barwon–Darling.
Results	The modelling scenario resulted in a 20% increase in flows at Bourke greater than 500 ML/day (from 71% to 91% of the time). The impacts to water users in the northern NSW valleys ranged from an 8% reduction in diversions to a 22% reduction in diversions over the long-term. Virtually all of the impacts were on general security licence holders as the releases draw down the tributary storages. The hydrological modelling undertaken for this option shows that providing a minimum daily flow to the Barwon–Darling by drawing down on water in storages would come at considerable cost to towns, communities and industries in the tributaries. It is not unreasonable to expect that implementing this option may result in significant drought impacts to towns and communities, water users and the environment in these valleys if the storages are progressively drawn down to provide minimum flows. A minimum flow would replace the natural variability of flows in the system which may have a detrimental impact on the ecology of the Barwon–Darling. However, there may be benefits to towns, communities and industries in the Barwon–Darling system with the continual replenishment of weir pools. Initial economic assessment, considering changes in annual average extractions by general security users within the Barwon–Darling and its tributaries, shows significant potential impact. All impacts to the tributaries are above $10 million/year with the highest occurring within the Namoi Valley at nearly $20 million/year. In drier climate periods, when the restrictions allowing greater connectivity would more often be triggered, these impacts may meaningfully increase.
Limitations	No environmental modelling was undertaken as the modelling is sufficient to demonstrate the effect of this option. The Macquarie Valley was not included in this analysis as under regulated flow conditions around 90% of the water is absorbed by the Macquarie Marshes.

Table 10. Summary of hydrologic model results impacts on average diversions on users as a result of providing a 500 ML/day flow to the Barwon–Darling

Valley	Change in total long-term diversions
Border Rivers	-17%
Gwydir	-8%
Namoi	-22%
Barwon–Darling	5%

Image courtesy of Destination NSW. Menindee Lake, Menindee.

Department of Planning and Environment