

Lower Darling River – water quality and flow release update

Following the mass fish deaths in the Darling River at Menindee in March 2023 multiple agencies are continuing to monitor water quality conditions in this area to identify potential risks to ecological communities, implement mitigating measures and minimise the risk of further fish death events. This update provides a summary of information and operational measures up to 17 November 2023.

Monitoring is showing dissolved oxygen levels near the water surface in the Darling River at Menindee have been remaining above the critical thresholds for fish health (i.e. >4 mg/L). However, increasing air temperatures at Menindee last week saw the development of thermal stratification in the Darling River and dissolved oxygen near the riverbed had declined to levels that posed an increased risk to fish health.

The environmental flow release for the lower Darling-Baaka is continuing and is designed to support the recovery of native fish populations that were hard-hit by hypoxic conditions in autumn 2023. The environmental flows have been specifically timed to support Murray Cod breeding and are being maintained at 550 megalitres (ML)/day at Weir 32. In response to the low dissolved oxygen levels and increasing risks to fish health last week, a pulse of water in addition to the environmental flow was released from Lake Pamamaroo to assist with managing downstream water quality. Discharge increased from 100 ML/day on Friday 10 November up to 1,000 ML/day on Sunday 12 November and dropping back to 100 ML/day again on 16 November. As a further measure, discharge from Lake Menindee was reduced from 450 ML/day down to 100 ML/day to encourage the flushing of the weir pool through Menindee township. Discharge from Lake Menindee was increased back up to 450 ML/day on 15 November.

Monitoring showed the increase in flow from Lake Pamamaroo resulted in improved downstream dissolved oxygen levels near the riverbed. The higher flows combined with a drop in air temperature overnight resulted in the complete mixing of the water column on the morning of 12 November and further improvement in dissolved oxygen levels. The environmental release to support Murray Cod breeding will continue from 16 November and assessed on a regular basis.

Increased flows are continuing to make their way down the Murray River following heavy rainfall earlier in October. These unregulated flows will meet downstream Murray River water needs, including filling Lake Victoria, for the time being. The proposed operational releases from Lake Menindee have been temporarily paused by the Murray Darling Basin Authority.

There have been isolated deaths of large Murray Cod and Golden Perch reported near Menindee (single numbers) over the last week, as well as reports of dead Golden Perch above Lake Wetherell. To report any incidents of dead fish, fish struggling or starting to gasp at the water surface, or crayfish exiting the water, please call the NSW Department of Primary Industries Fisheries' Fishers Watch Phonenumber 1800 043 536 or fill in a fish kill protocol and report form (including a photo) at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet or www.dpi.nsw.gov.au/fishing/compliance/report-illegal-activity using the 'dead or dying fish' check box.

Dissolved oxygen levels – Darling River at Menindee

As water temperatures warm up during spring and moving into summer, dissolved oxygen levels were always likely to decrease again. As the surface water of the river is heated by the sun, the water at the bottom of the deeper pools is often not warmed to the same temperature. During the summer months this can result in a difference in temperature between surface and bottom waters which is known as thermal stratification. This can lead to other issues such as increased algal blooms on the surface, and nearer the riverbed, low dissolved oxygen and higher nutrient concentrations. In addition, the amount of dissolved oxygen water can hold decreases with increasing water temperature.

WaterNSW undertook dissolved oxygen and water temperature profile monitoring on 10 November in the Darling River near Menindee. These results showed dissolved oxygen was reaching the critical threshold for fish health of 4 mg/L at a depth of 1 metre at one site and dropping to almost 0 mg/L at the bottom at most sites (Figure 1). The water temperature results also showed a rapid drop through the profile (Figure 2). This thermal stratification was preventing the water near the bottom from being reoxygenated by the atmosphere and photosynthesis by aquatic plants and algae at the surface. The location of the five sites assessed are shown in Figure 3.

In response to the low dissolved oxygen levels and the increasing risks to fish health, a pulse of water was released from Lake Pamamaroo in addition to the existing environmental release. The pulse commenced on 10 November, increasing to 1,000 ML/day on the 12 November and dropping back to 100 ML/day on 16 November. The aim of the pulsed flow was to disrupt thermal stratification which would allow oxygen to mix through the whole water column.

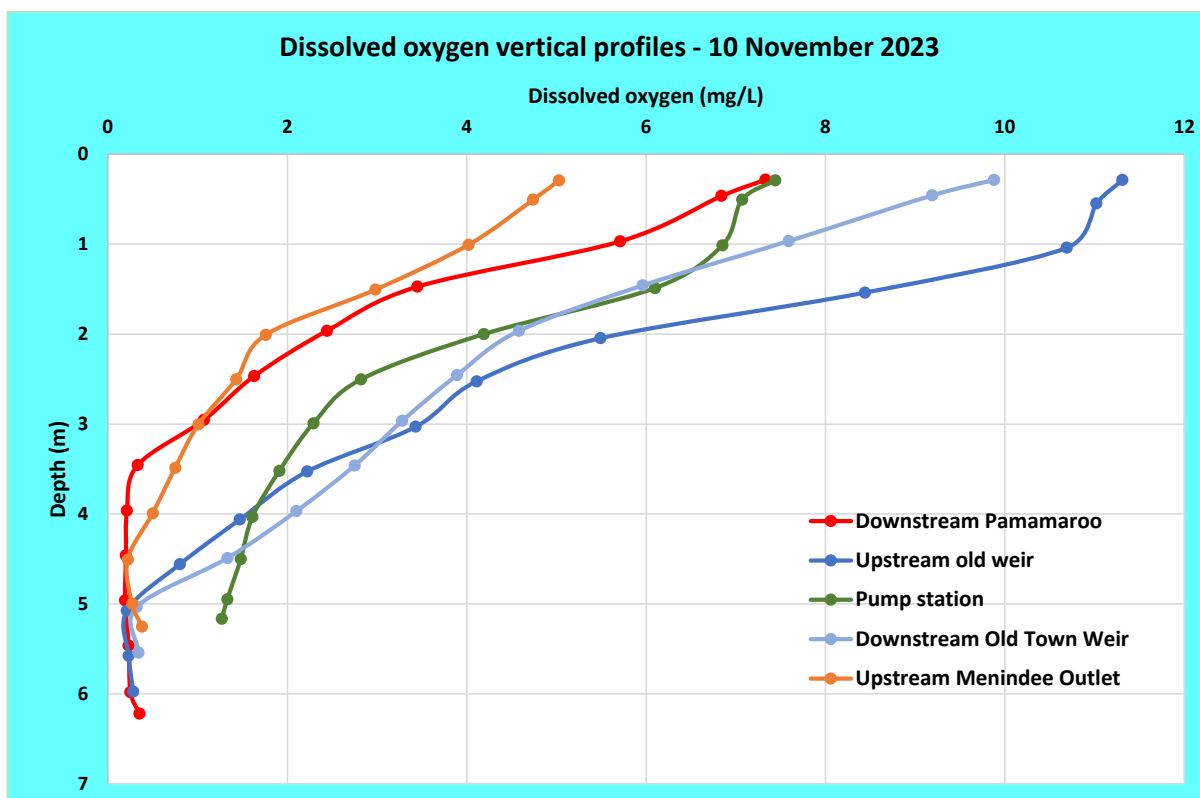


Figure 1: Dissolved oxygen (mg/L) profiles at five sites in the Darling River at Menindee: 10 November 2023

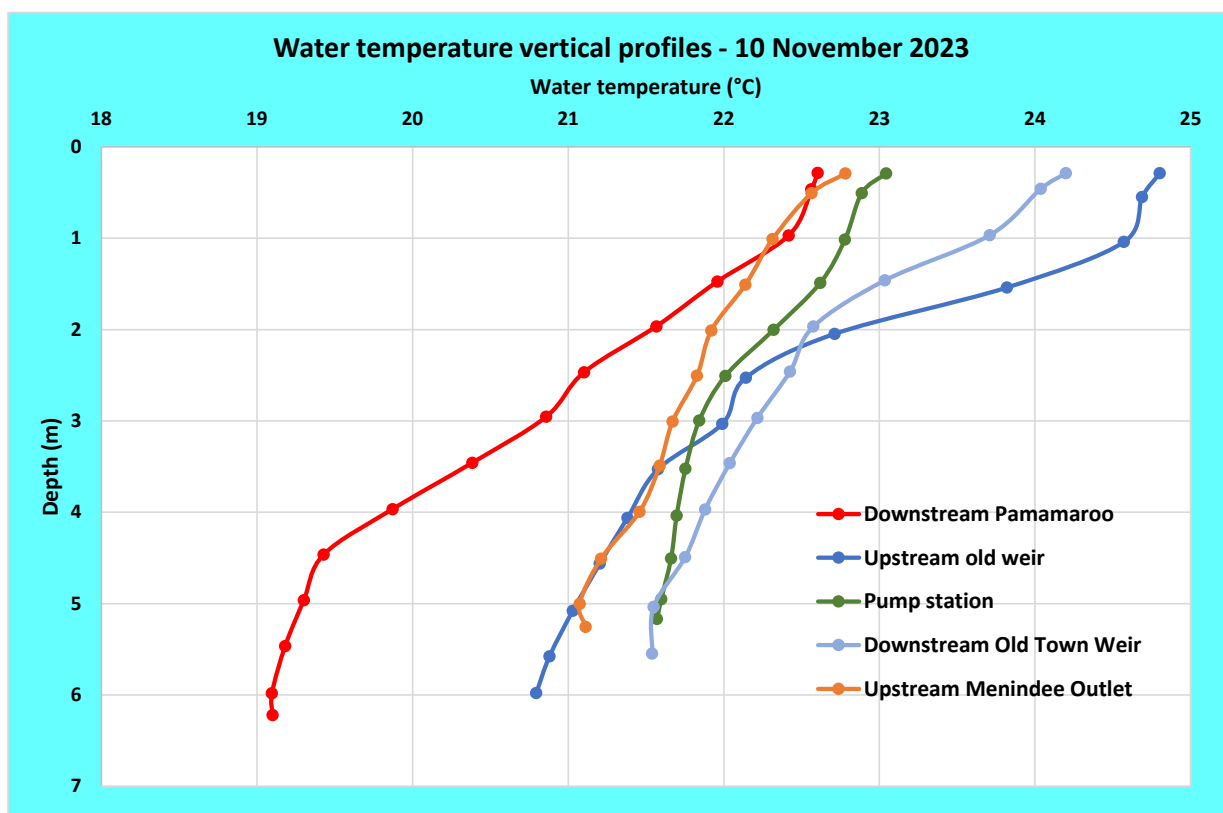


Figure 2: Water temperature (°C) profiles at five sites in the Darling River at Menindee: 10 November 2023

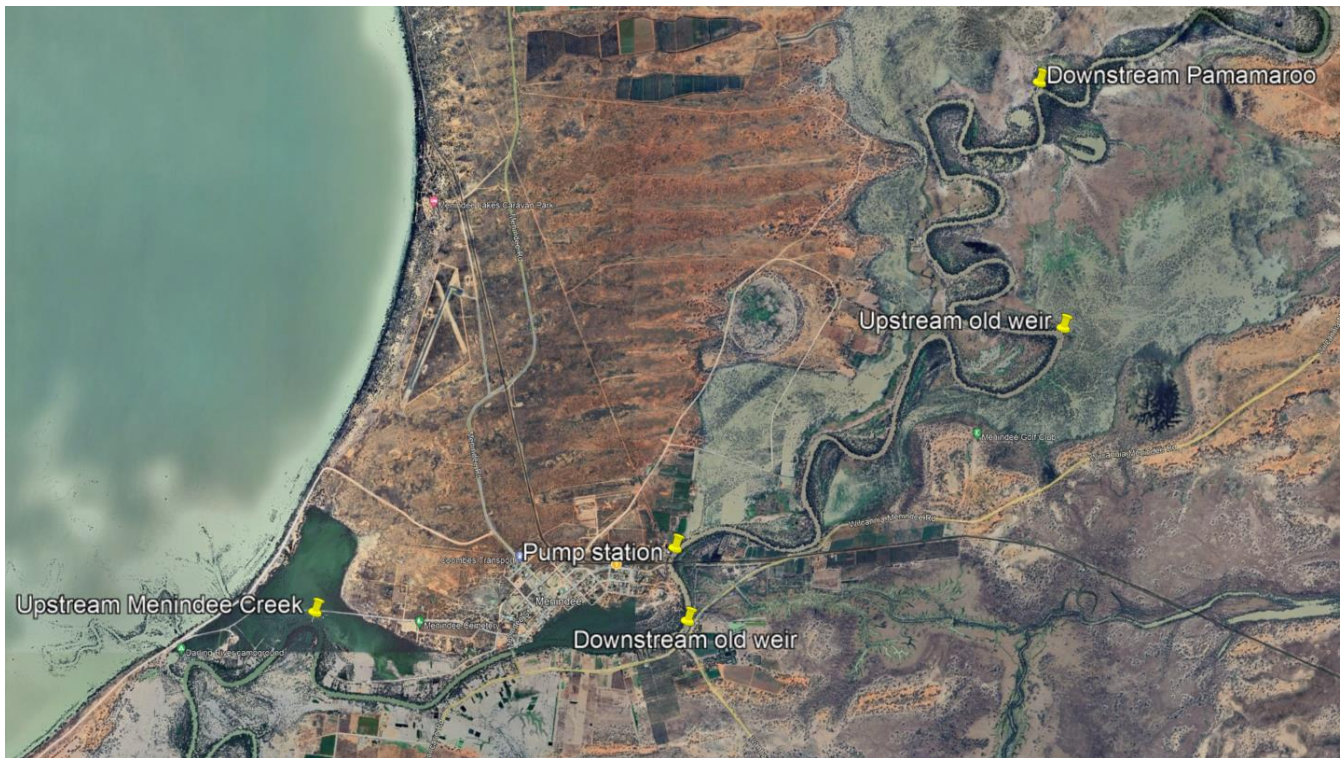


Figure 3: Location of vertical profile monitoring sites in the Darling River near Menindee; 10 November 2023

Monitoring by the Department of Planning and Environment – Environment and Heritage Group also shows that with the increasing air temperatures at Menindee, thermal stratification was established, with a difference in water temperature between 1.2 metres and 3.0 metres (Figure 4).

The increase in flow on 10 November resulted in some mixing and a steady increase in water temperature in the bottom layer. This combined with a drop in air temperature saw mixing occurring on the morning of 12 November, with uniform water temperature through the whole profile. There has been some stratification occurring during the day near the water surface, but this has been breaking down again each night.

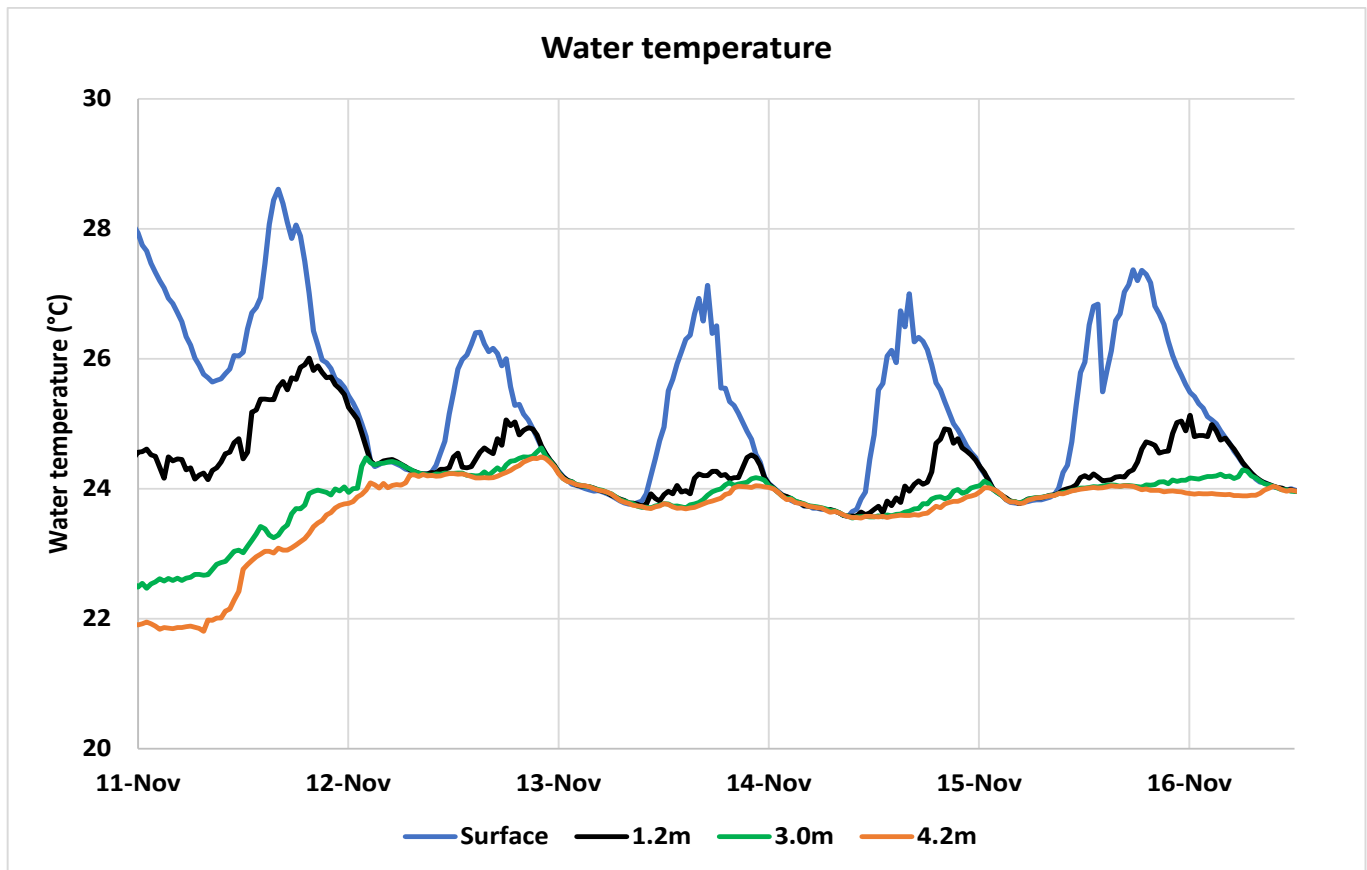


Figure 4: Water temperature (°C) continuous monitoring in the Darling River at Menindee

The dissolved oxygen results also show stratification between 1.2 and 3.0 metres. The lack of mixing resulted in very low dissolved oxygen near the bottom. Similar to water temperature, the increase in flow saw a gradual improvement in dissolved oxygen on 11 November before the complete mixing on 12 November (Figure 5). The breakdown in stratification on the morning of 12 November caused the oxygenated surface waters and low oxygen bottom waters to mix completely, producing a dissolved oxygen level above 6 mg/L through the water column. Dissolved oxygen near the water surface has been increasing during the day as algae and aquatic plants photosynthesise, and then mixing again overnight.

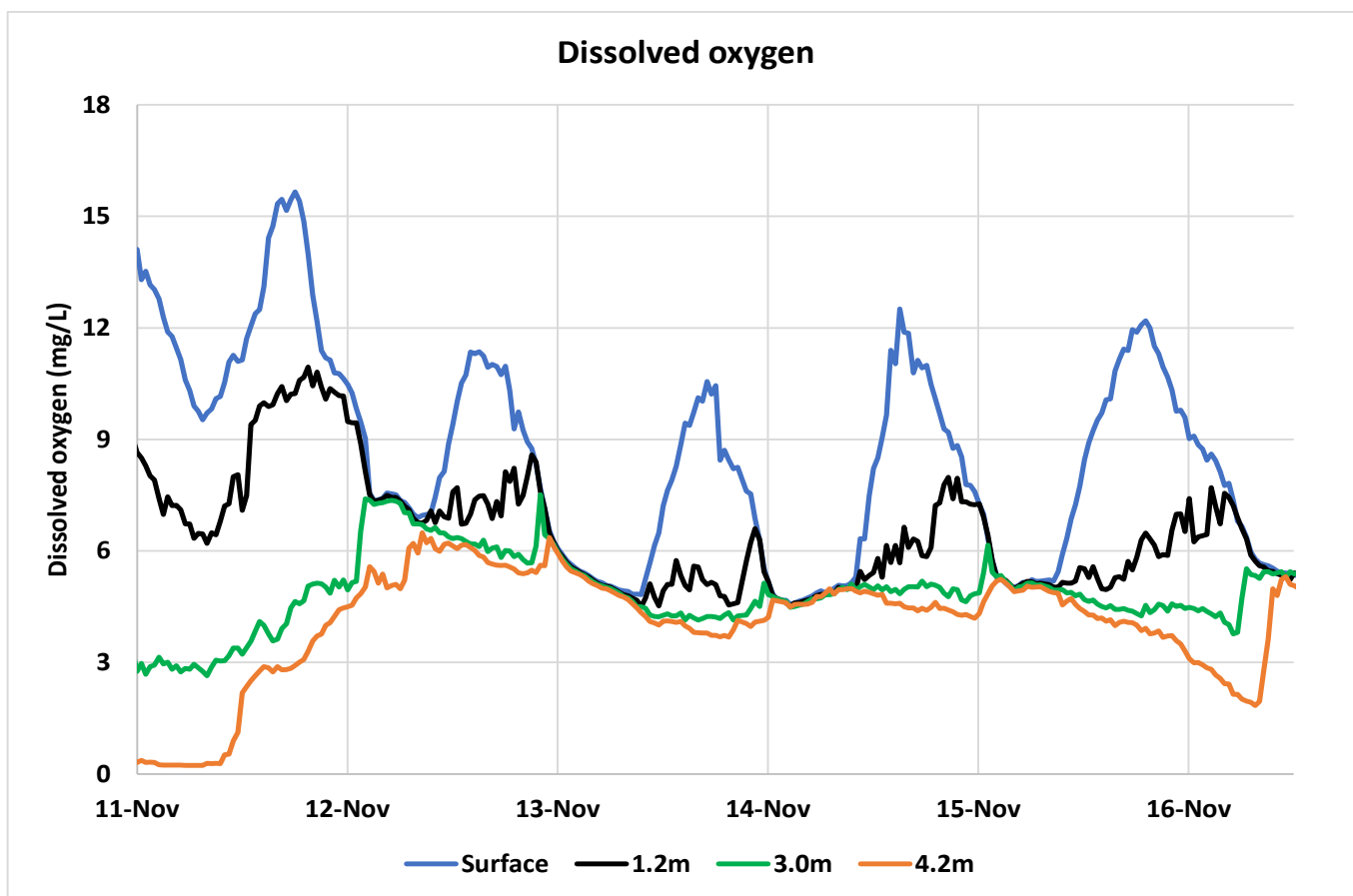


Figure 5: Dissolved oxygen (mg/L) continuous monitoring in the Darling River at Menindee

NSW and Commonwealth agencies will continue to work together and monitor dissolved oxygen levels in this area and advise the best operational measures to mitigate risks to aquatic life as much as possible. This can involve adjusting the timing, size and location of releases from the lakes into the lower Darling-Baaka River to maintain the quality of the water in the river. Releases from both Lake Pamamaroo and Lake Menindee continue to be managed to minimise the risk of further hypoxia-related fish deaths in the Darling River at Menindee.

Fish death summary

In the past week to 17 November there have been isolated deaths of large Murray Cod and Golden Perch near Menindee (single numbers), as well as reports of dead Golden Perch above Lake Wetherell. There have been no other reports of native fish deaths.

Large numbers of Bony Herring and Carp remain in the reach of Darling River between Main Weir and Menindee Creek (Weir 32 weir pool). There remains a risk of further fish deaths in the Menindee area as fish (particularly Bony Herring) may be in poor condition from previous low oxygen conditions, limited food supply and may be more susceptible at reduced flow rates.

What is being done?

Flow releases into the lower Darling-Baaka

From late August, environmental water allocations have been delivered at a rate of 550 ML/day for native fish outcomes, particularly Murray Cod breeding, in the lower Darling-Baaka. The flows comprise 450 ML/day from Lake Menindee and releases of 100 ML/day from Lake Pamamaroo to provide some support for water quality in the Menindee town reach.

Water in addition to the environmental flow from Lake Pamamaroo was released in a pulse over the weekend, commencing on 10 November. Monitoring showed there was a need to disrupt thermal stratification and reduce the risk to fish health from declining dissolved oxygen levels in the weir pool between the Main Weir and Menindee Creek. Discharge increased from 100 ML/day on 10 November up to 1,000 ML/day on 12 November and reducing again to 100 ML/day on 16 November. As a further measure, discharge from Lake Menindee was reduced from 450 ML/day down to 100 ML/day to further encourage the flushing of the weir pool through Menindee township. Discharge from Lake Menindee was increased back up to 450 ML/day on 15 November.

Discharge from lakes Pamamaroo and Menindee will return to the Murray Cod breeding flow from 16 November. Ongoing monitoring will continue to inform operations to mitigate potential fish deaths.

Operational releases from Menindee Lakes have been temporarily paused by the Murray Darling Basin Authority due to earlier heavy rainfall and tributary inflows to the Murray River from the upper catchment. These unregulated flows will meet the needs of water users in the Murray River for the time being, rather than releasing water from Menindee Lakes.

Flows from Lake Cawndilla into the Great Darling Anabranch

Commonwealth environmental water is being released from Lake Cawndilla to maintain connectivity through the Great Darling Anabranch to provide a pathway for juvenile golden perch to migrate from the Basin's north to the south. The flow is also benefitting vegetation, waterbirds, bush birds, aquatic bugs, frogs, yabbies and other animals that live on the floodplain.

River operators, Commonwealth and state agencies have been working together on options for releases to best meet the needs of all water users.

In coming months (once the MDBA needs to start drawing on the Menindee Lakes again to meet water demands in the Murray River) river operators are looking at an option to deliver a portion of its operational requirement for the River Murray system from Lake Cawndilla, at a likely rate of 500 ML/day. This flow will replace the existing environmental flow. The proposal is supported by Anabranch landholders and requires agreement from Basin states to trial this arrangement.

Environmental Water Holders will meet any loss of resource from delivering this water via the Great Darling Anabranch rather than the Darling River.

Using water from Lake Cawndilla to help meet operational demands allows water managers to conserve more water in the ‘upper lakes’ of Pamamaroo and Wetherell for use as a drought reserve. At the same time, it delivers an environmental benefit by helping to keep the Great Darling Anabranch flowing and facilitate the dispersal of native fish predominantly golden perch into the Murray River. This is a ‘win-win’ for the environment and the community that relies upon the water supply of the upper lakes.

Menindee Old Town Weir

The NSW Government remains committed to removing the remaining sections of the weir when conditions allow for it to be safely completed and environmental risks, such as potential fish deaths, can be reduced. The removal of the weir builds on the work previously undertaken to remove parts of the weir in 2020, which independent experts have confirmed significantly improved fish passage and boat safety. The Government will continue to engage with the community as the project progresses.

Native fish programs

Programs to benefit native fish, such as improving fish passage and habitat restoration to provide conditions conducive to fish breeding and population growth, are ongoing. These works are vital and provide an environment where fish populations can bounce back from low oxygen events.

Blue-green algae

WaterNSW undertake routine blue green algae monitoring in Menindee Lakes and in the Darling River. Alert warnings are declared where algal cell numbers exceed the triggers identified in the Guidelines for Managing Risk in Recreational Waters (NHMRC 2008).

The most recent results indicate a red alert warning for recreational use in Lake Tandure, the Darling River upstream of Pomona and the Great Darling Anabranch at Silver City Highway. Algal numbers at most sites in the Menindee Lakes area remaining in the amber alert range for recreational use ([Algae Alerts NSW map - WaterNSW](#)). When a red alert warning is in place, people should avoid recreational activities that brings them into contact with the water and drinking untreated water. At the amber alert warning level, blue-green algae may be multiplying in numbers but remains suitable for recreational use. The water may have a green tinge and musty or organic odour.

The water should be considered unsuitable for potable use and alternative supplies or prior treatment of raw water for domestic purposes should be considered. The water may also be unsuitable for stock watering. Water users should use caution and avoid water where signs of blue-green algae are present.

Weather outlook

Refer to the [Bureau of Meteorology website](#) for the latest forecasts.

Additional information

To notify the NSW Department of Planning and Environment – Water of potential blackwater events email: waterqualitydata@dpie.nsw.gov.au

To report dead fish, fish struggling or gasping at the water surface, or crayfish leaving the water please call the NSW DPI Fisheries Phoneline 1800 043 536 or fill in a fish kill protocol and report form at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet

Information on recent fish deaths is available at: [Fish kills in NSW](#). When reporting, please include the name of the river/waterbody, location and date of your observation and provide photographs. If possible, please also record what species are affected and an estimate of number of each species observed.

Further information on blackwater events can be found at the DPE Water website at: water.dpie.nsw.gov.au/allocations-availability/drought-and-floods/hypoxic-blackwater

Additional information is also available on the Murray-Darling Basin Authority website at: www.mdba.gov.au/publications/mdba-reports/water-management-101-factsheets

Operational updates are available at: [WaterInsights - WaterNSW](#)

Water quality data collected after the fish deaths at Menindee is available on the Environment Protection Authority web page at: www.epa.nsw.gov.au/working-together/community-engagement/updates-on-issues/menindee-fish-kill

To report suspected algal blooms see the [WaterNSW website](#).