

## 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 26 October 2023.

Now that water temperatures are warming up, the risk of further fish deaths in the Darling River at Menindee is increasing. This risk is exacerbated with the confirmation by the Bureau of Meteorology that El Niño is underway. El Niño typically increases the chance of below average spring rainfall for eastern Australia and above average daytime temperatures for the southern two-thirds of Australia. This is combined with a positive Indian Ocean Dipole, which also typically decreases spring rainfall for much of Australia.

Monitoring is showing dissolved oxygen levels near the water surface in the Darling River at Menindee are remaining above the critical thresholds for fish health (i.e. >4 mg/L). However, oxygen levels are declining below critical levels closer to the bottom of the deeper pools.

The environmental 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. From 20 October releases from Lake Menindee were increased to 450 ML/day. A smaller release of 100 ML/day will continue from Lake Pamamaroo. The volume being discharged from Lake Pamamaroo has been reduced to preserve the water resource in the top lakes.

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 for the time being. The proposed operational releases from Lake Menindee have been paused by the Murray Darling Basin Authority.

There have been isolated dead large Murray Cod (over 10 combined) reported over separate incidents in multiple locations near Menindee. Cause of death is unknown, but unlikely due to hypoxia based on water quality monitoring. 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 Phoneline 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-](http://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](http://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

Data from WaterNSW dissolved oxygen sensors downstream of Lake Wetherell Main Weir, Menindee pump station, Menindee town, and further downstream at Weir 32, are shown in Figure 1. These sensors are set at various depths so may not always reflect the readings taken at the water surface. The temporary sensor installed downstream of Lake Wetherell Main Weir is showing the water being released from Lake Pamamaroo is well oxygenated and in the safe range for fish health. Dissolved oxygen levels at the two sites near Menindee (Menindee pump station and Menindee town) and further downstream at Weir 32 have been fluctuating from day to day. The results from the Menindee town station dropped below the fish health threshold of 4 mg/L on 24 and 25 October, but quickly recovered again.

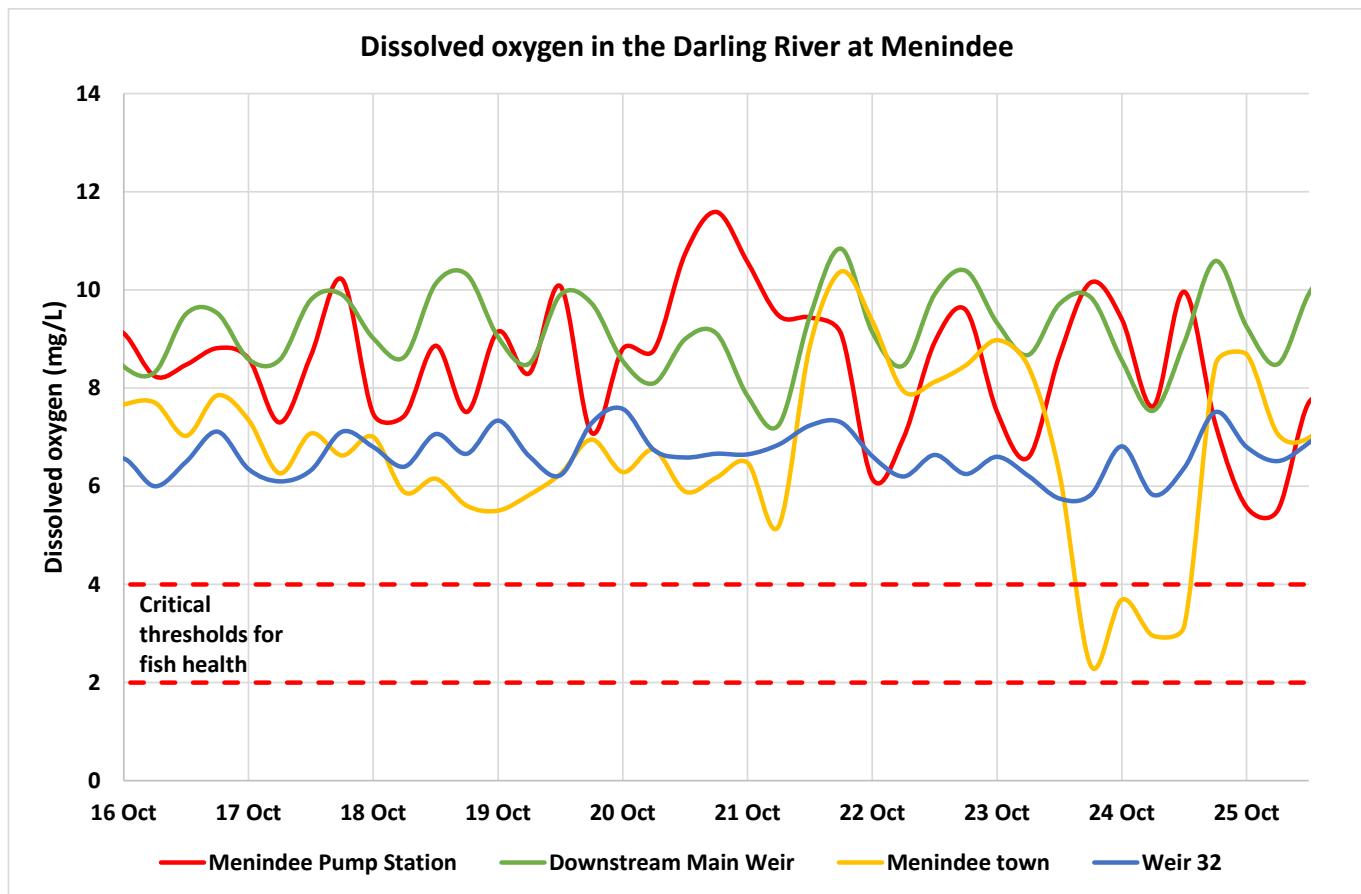


Figure 1: Dissolved oxygen (mg/L) in the Darling River at Menindee: Menindee pump station, Menindee town and Weir 32 – 16 to 25 October 2023

In addition to the release of oxygenated water from lakes Pamamaroo and Menindee, water temperatures have been low over recent months. The amount of dissolved oxygen water can hold increases with decreasing water temperature. The process of bacteria breaking down organic material in the river slows down as water temperature decreases, which uses up less oxygen. The combination of these two processes has provided an opportunity for dissolved oxygen levels to recover over winter.

As water temperatures warm up during spring and moving toward summer, dissolved oxygen levels are likely to decrease again. As the surface water of the river is heated by solar radiation, 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.

Monitoring by the Department of Planning and Environment – Environment and Heritage Group shows that the water near the surface was warmer than at the bottom in the Darling River at Menindee when air temperatures increased to 36°C last week (Figure 2). With a drop in temperatures and higher wind speeds, the thermal stratification had started to break down on 22 October and had broken down completely on 25 October.

The dissolved oxygen results also show the water had formed two distinct layers, with the water at the surface being well oxygenated, while the oxygen levels near the bottom are not being replenished and had declined below the critical threshold of 2 mg/L (Figure 3). Once the thermal stratification had broken down on 25 October, these two layers started to mix. Dissolved oxygen is now completely mixed through the whole profile.

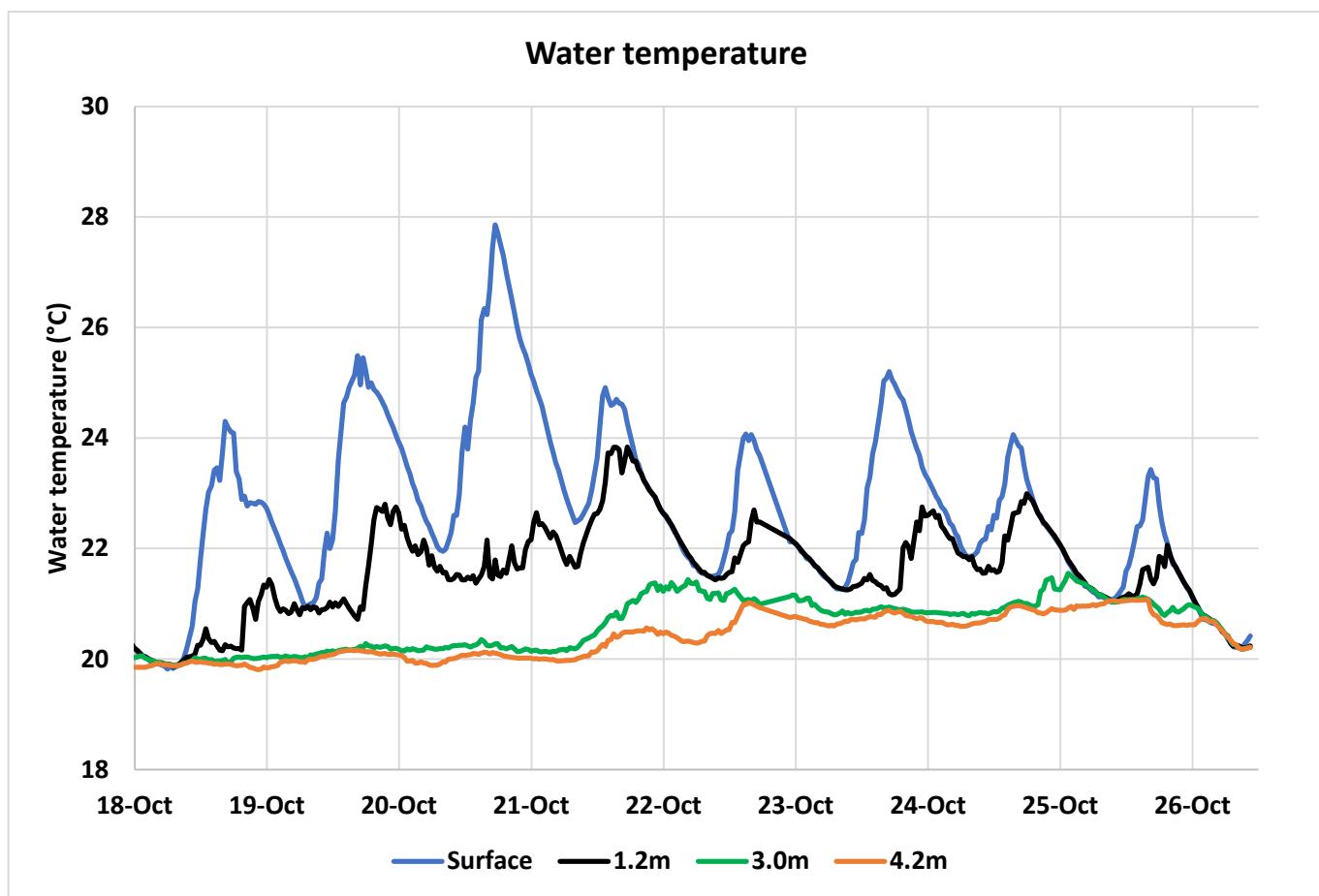


Figure 2: Water temperature (°C) profiles at the Darling River at Menindee

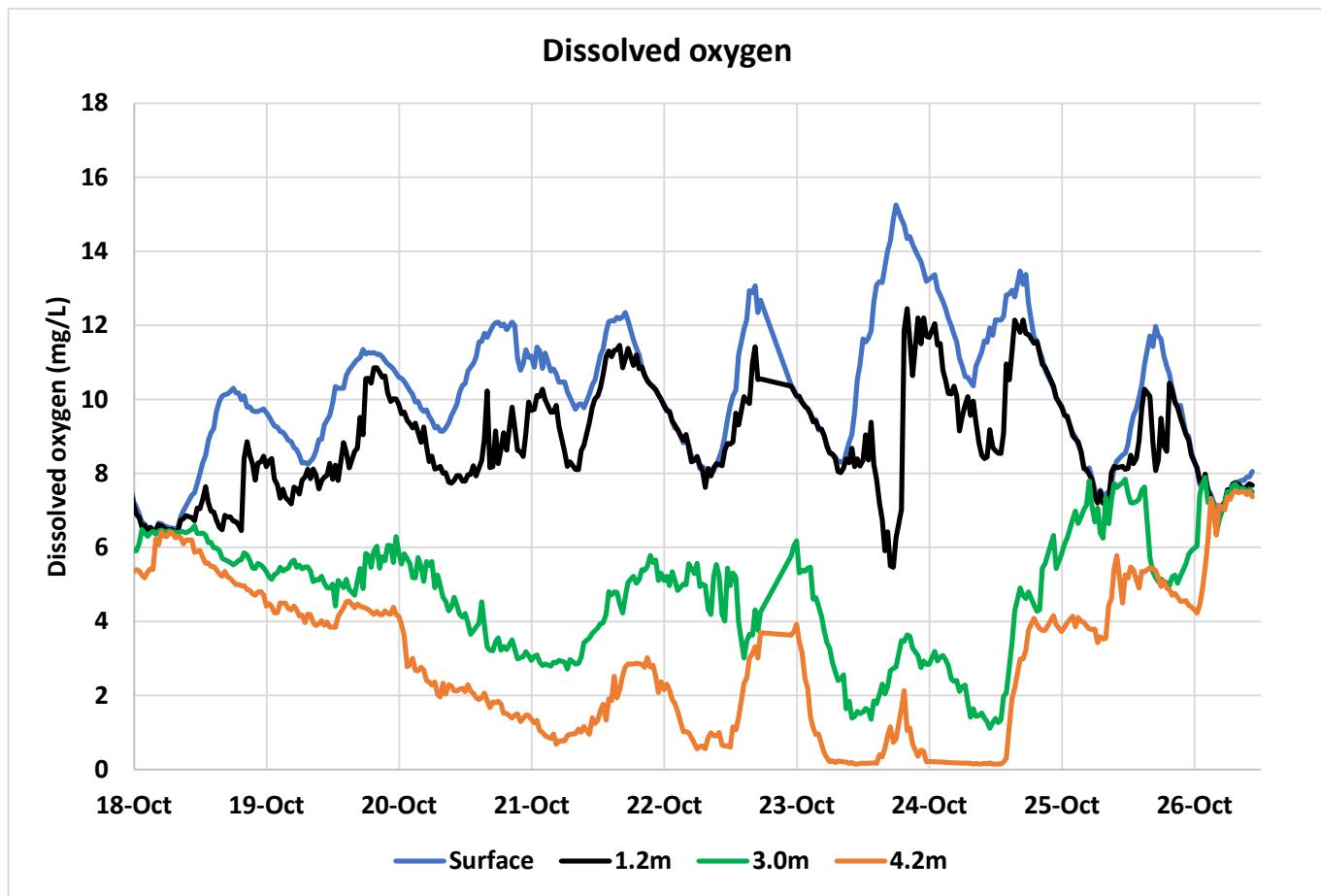


Figure 3: Dissolved oxygen (mg/L) profiles at the Darling River at Menindee

WaterNSW undertook dissolved oxygen and water temperature profile monitoring on 23 October in the Darling River near Menindee. The location of the five sites assessed are shown in Figure 6.

The results show a similar pattern to the multi depth monitoring site, with oxygenated water near the water surface but decreasing to critical levels near the riverbed (Figure 4). There is a rapid decline in water temperature to a depth of around 1 to 2 metres and is then fairly consistent down through the rest of the profile (Figure 5). Throughout this short critical period there was always a large volume of oxygenated water near the surface to maintain fish health in the weir pool.

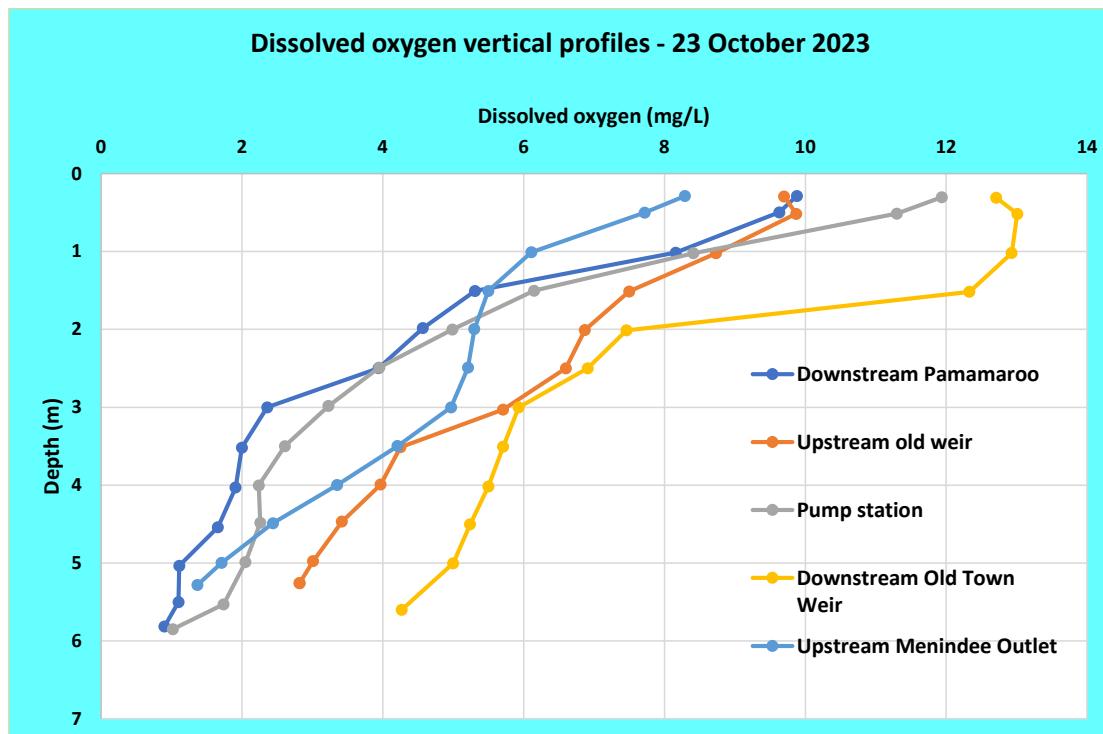


Figure 4: Dissolved oxygen (mg/L) profiles at five sites in the Darling River at Menindee: 23 October 2023

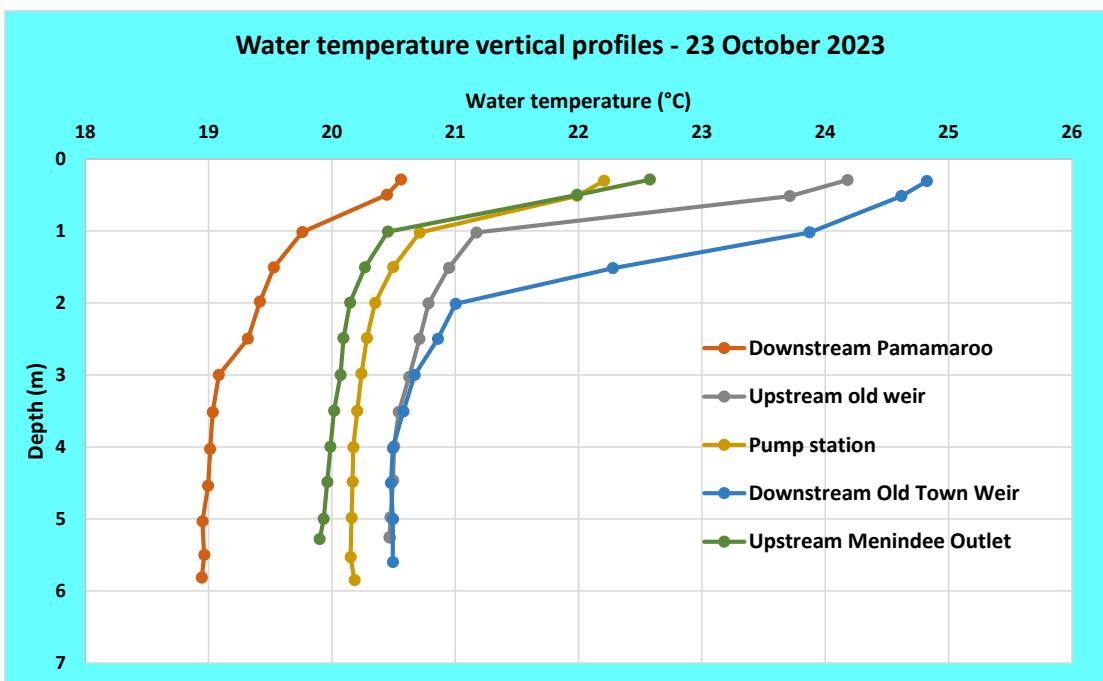


Figure 5: Water temperature (°C) profiles at five sites in the Darling River at Menindee: 23 October 2023

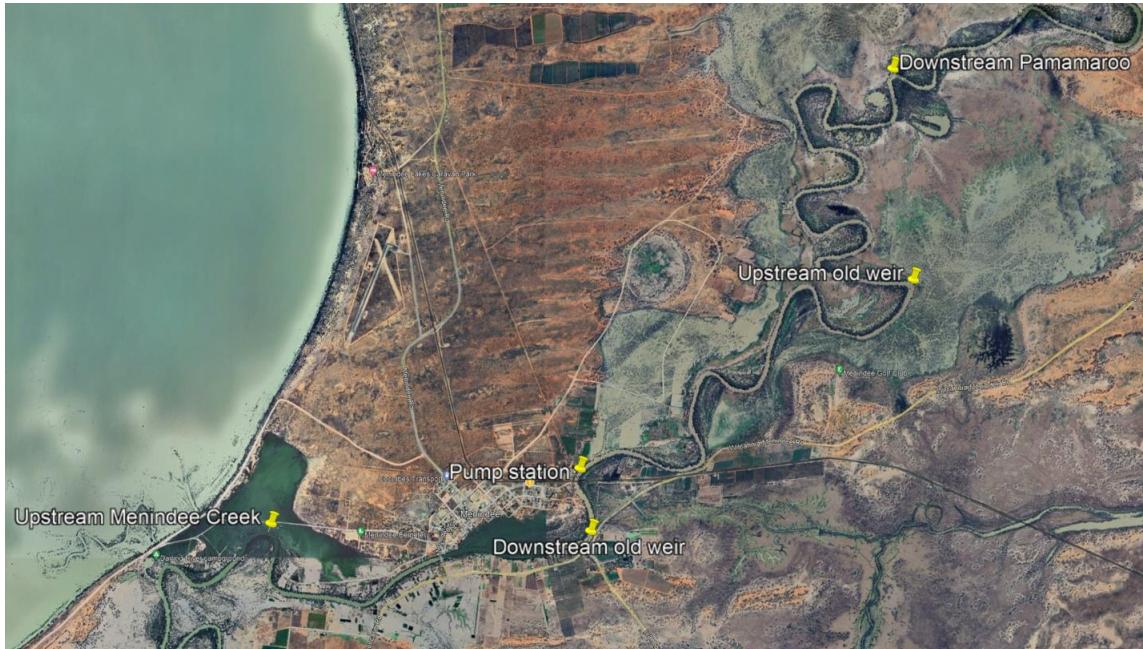


Figure 6: Location of vertical profile monitoring sites in the Darling River near Menindee: 23 October 2023

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 26 October there have been reports of dead large Murray Cod (over 10 combined) reported over separate incidents at multiple locations near Menindee. Cause of death is unknown, noting that it is unlikely due to hypoxia based on water quality monitoring. 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 were delivered at a rate of 550 ML/day for native fish outcomes, particularly Murray cod breeding, in the lower Darling-Baaka.

Operational releases from Menindee Lakes commenced on 28 September to meet water demands in the Murray River and increased to 1,000 ML/day before being paused by the Murray Darling Basin Authority, due to 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.

A discharge of 550 ML/day at Weir 32 is being maintained using environmental allocations, to continue supporting Murray Cod breeding. 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. Additional water from Lake Pamamaroo can be released in small ‘pulses’ if monitoring shows there is a need to disrupt thermal stratification and minimise algal growth in the weir pool between the Main Weir and Menindee Creek. Ongoing dissolved oxygen monitoring will inform operations to mitigate potential fish deaths. The volume being discharged from Lake Pamamaroo has been decreased to preserve the water resource in the top 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.

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 Department of Planning and Environment’s Water Group has postponed the planned work to remove the remaining sections of Menindee’s old town weir to the level of the natural riverbed. The removal was planned for October 2023. However, following a review of current river conditions, it has now been determined that delaying the removal of the Old Town Weir to winter 2024 is a lower risk option.

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 the lower Darling River at Burtundy, Ellerslie and Tapio with 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@dpe.nsw.gov.au](mailto:waterqualitydata@dpe.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](http://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: [www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/blackwater](http://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/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](http://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](http://www.epa.nsw.gov.au/working-together/community-engagement/updates-on-issues/menindee-fish-kill)

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