SA River Murray Flow Report

Government of South Australia
Department for Environment and Water

Report #48/2022

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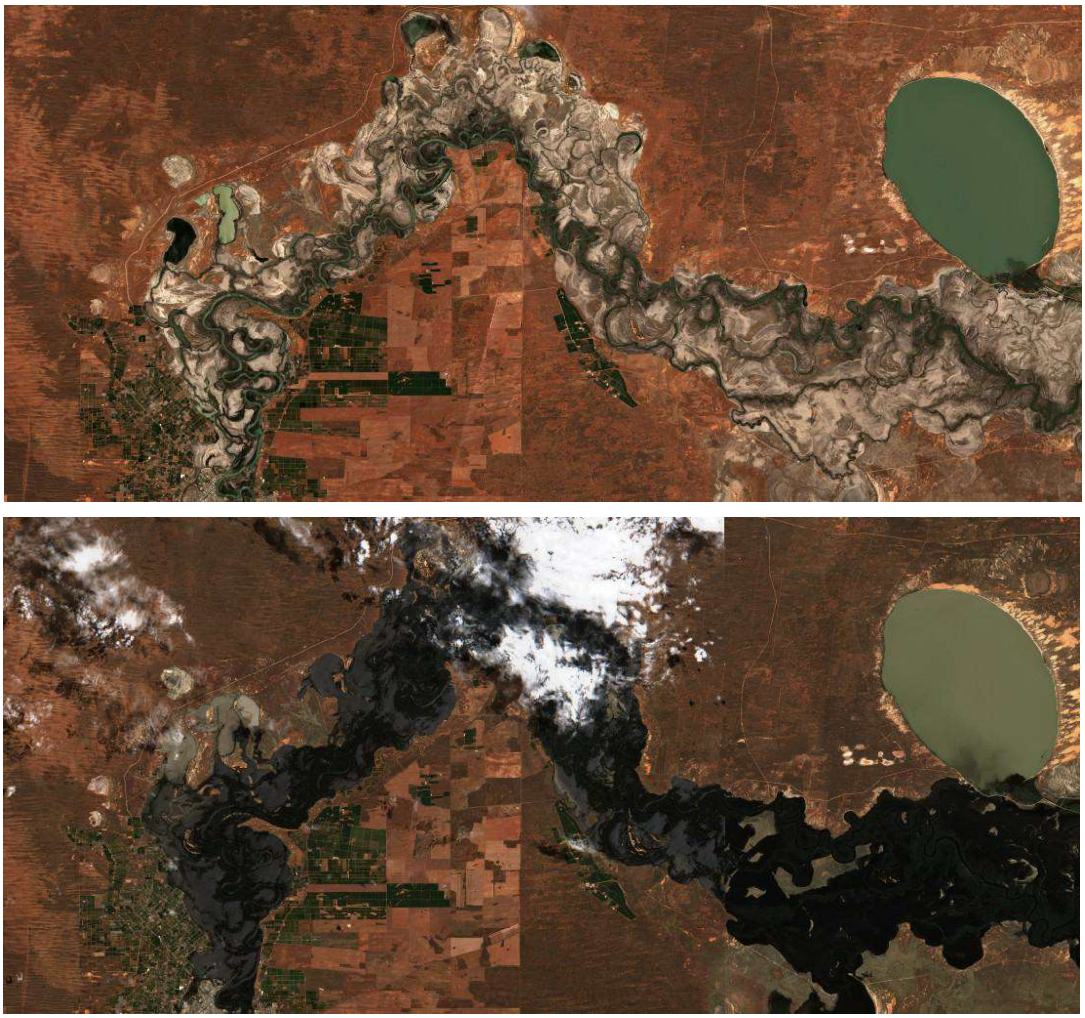
This supersedes the previous Flow Report issued by the Department for Environment and Water (DEW) on 2 December 2022. The next Flow Report will be provided on Friday 16 December 2022.

Flow outlook

During the last week, river managers have observed that a significant amount of flow is bypassing river monitoring sites used for calculating the Flow to SA (A4261001). Floodwaters have now spread across much of the floodplain near the border, with flow also occurring through anabranches and across floodplain areas that are normally dry. This situation is extremely challenging for measuring river flow.



Sentinel-2 L2A images on 9 December 2020 (top) and 8 December 2022 (bottom) (OpenStreetMap ©SentinelHub) showing multiple channels (2020) and floodwaters across floodplain (2022). SA border is in centre of image and Lake Victoria on right side of image.

Flow going around river monitoring sites has also been observed at a number of other sites both upstream of the border and within South Australia. The current observed flow and river level is also much higher than what has previously been gauged during field visits at many monitoring locations, or it has been almost 50 years since field measurements were made at this flow.

Consequently river managers advise that at these current flood levels, River Murray flow estimates should be interpreted with a high degree of caution. For example, recent field gaugings at Wentworth demonstrated that the flow being reported for that site was being significantly overestimated, which is why flow reporting from this site has being suspended by the MDBA. This has occurred at a number of gauges throughout the system. Monitoring sites considered to be of higher reliability are Wakool Junction and Euston, noting that there may still be a small amount of error at these sites given the very high flows.

Changes to the river channel and floodplain which have occurred since the 1970s (for example, roads, levees, increased vegetation, other infrastructure, etc) are also believed to be accounting for some local increases in observed water levels compared to historic floods.

Flow forecasts provided by the Department for Environment and Water, which are developed in consultation with the MDBA, Bureau of Meteorology and other upstream water management agencies, have been measured against the total River Murray flow crossing the South Australian border. As flow and water levels have increased near the border in recent weeks, the difference between the forecast and calculated Flow to SA has increased, which is now understood to be caused by an increasing amount of flow bypassing the river monitoring site and the topographic changes referred to above. In demonstration of this, river levels at Renmark have now exceed levels observed during the 1974 flood, despite the recorded Flow to SA being approximately 20 GL/day less than what was recorded in 1974. Consequently, the daily calculated Flow to SA (A4261001) is not considered to be a useful measure in relation to the forecasted flow and water levels. Hydrographers are currently visiting a number of sites to undertake field gaugings of flow and water level and further advice may be provided on this issue when investigations are completed.

Predicted peak flow and water levels are not affected by the discrepancy in the daily calculated Flow to SA.

Water levels near the South Australian border are currently similar to 1974 flood levels and the total flow is estimated to be approximately 180 GL/day.

It is forecast that the total flow at the South Australian border will reach a peak in the range of 190 GL/day to 220 GL/day in the last week of December 2022.

The current flow at the border comprises:

- full December Entitlement Flow (7 GL/day)[1]
- interstate trade adjustments
- Additional Dilution Flow (ADF) and
- Unregulated flow.

The flow over Lock 1 is approximately 125 GL/day and will increase to around 140 GL/day over the coming week.

Current and forecast water levels

The table below shows estimated high water levels (based on historical events and modelling) and approximate timing of those water levels at various flows at the SA border in the coming weeks.

Historical water levels and other modelled water levels at different flow rates can be found at the following link: https://cdn.environment.sa.gov.au/environment/images/Tabulated-Version-Flows-vs.-levels-100GL-250GL-FINAL.pdf

[1] The entitlement flow for South Australia under the Murray-Darling Basin Agreement determines the minimum flows that South Australia will receive across the border. In December 2022, approximately 0.63 GL/day of this is Commonwealth environmental water.

Note that forecasts are based on information available at the time of preparation and may change due to rainfall events or changed operations upstream.

Updates will now be provided on anticipated water levels. These may vary from previous forecasts as more information becomes available and will take into account observations at sites upstream.

Location	Normal Pool Level (m AHD)	Current level at 9/12/22 (m AHD)	Water level is currently	Forecast peak water level (m AHD)	Estimated timing of peak	1974 flood level (m AHD)	Modelled water level at 220 GL/day (m AHD)
Lock 6	19.25	-	Rising		24 – 31 Dec	21.01	-
Renmark Pump Stn		-	-	18.8		18.54	18.92
Lock 5	16.30	18.20	Rising	18.4		18.07	18.59
Lyrup		17.11	Rising	17.4		-	17.74
Berri		16.15	Rising	16.3	25 Dec – 5 Jan	16.27	16.68
Lock 4	13.20	15.15	Rising	15.7		15.66	16.23
Loxton		14.69	Rising	15.1	26 Dec – 6 Jan	15.04	15.75
Cobdogla		-	N/A			13.43	14.66
Lock 3	9.80	12.91	Rising	13.6	28 Dec – 8 Jan	13.17	14.35
Overland Corner		12.44	Rising	13.3		12.73	13.80
Waikerie		-	Rising	11.6	1 – 12 Jan	11.24	12.16
Lock 2	6.10	9.97	Rising	10.6	2 – 13 Jan	10.29	11.15
Cadell		-	Rising	9.4		9.16	9.83
Morgan		8.16	Rising	9.2	4 – 15 Jan	8.57	9.54
Lock 1	3.20	5.68	Rising	7.5	5 – 16 Jan	6.81	7.78
Swan Reach		5.16	Rising	6.7		6.04	7.02
Mannum PS		1.69	Rising	3.5		3.14	3.75
Murray Bridge		1.22	Rising	2.5	6 – 17 Jan	2.02	2.68
Jervois		-	-	1.7		1.55	1.84
Wellington		0.86	-	1.4		-	1.48
Lake Alexandrina	0.75	0.83	Varying	<1.0		< 1.0	-

Notes to assist in interpretation:

1. The extent of inundation shown in DEW flood maps are matched to the modelled water levels shown above.
2. There is a high degree of uncertainty with the calculation of flow rates at current flood levels. There are no major tributaries entering the River Murray between the border and the Lower Lakes. Historically, the peak flow at the SA border will 'attenuate' (reduce) as the flood peak moves down the river towards the Lower Lakes. The degree to which the peak attenuates is different for every flood.
3. Between the SA border and Morgan, the modelled water levels and inundation extents relate to the total flow at the SA border. The current measured flow at the SA border (QSA - A4261001) is no longer considered applicable to modelled levels. DEW flood modelling has assumed that minimal attenuation of the flood peak will occur (a

conservative assumption). If attenuation does occur, the modelled water levels and inundation extents will over-predict the actual values.

4. Between Morgan and Wellington, the modelled water levels and inundation extents relate to the maximum flow measured at Lock 1.
5. Water levels downstream of Lock 1 can be impacted by wind events which may cause temporary increases in water levels.
6. It is expected that barrage operations will be able to safely pass the forecast flood peak and maintain water levels in the Lower Lakes below 1.0 m AHD.

Live and/or daily information on current River Murray flow and water levels can be viewed at the websites below[2]:

- Real-time water monitoring data across South Australia, including locations along the River Murray (interactive water data site - Department for Environment and Water)
- Daily water levels and flow rates recorded at monitoring stations along the River Murray (SA Water)
- An overview of flow rates, dam release rates and river heights across the River Murray system and its tributaries (Murray-Darling Basin Authority)
- Latest river heights for the River Murray (Bureau of Meteorology)

Flood inundation mapping

As floods don't regularly occur in South Australia it can be hard to plan for one or even know if you are at a high risk of being impacted. To help people know if they are at a greater risk of being affected by flooding, communities can view inundation maps prepared by DEW for a range of river flows.

Inundation mapping for the River Murray from north of Renmark to Wellington for flows ranging from 60 GL/day to the highest flood on record (341 GL – the 1956 flood) is available via the Flood Awareness Map.

To use the Flood Awareness Map to see if your property is impacted at various flows, follow the steps below (also shown on the image):

1. Open the Flood Awareness Map and agree to the terms and conditions;
2. Search to your property via the search box at the top of the map or via council area or suburb drop down lists;
3. In the box titled '*Flood Studies*' select '*Flood Mapping of the River Murray 2014*';
4. Then select, the flow band you wish to view e.g. *'200,000 ML per day flow'*.
5. (optional) Change Map Type to Aerial Photograph and use the Transparency Slider to improve the presentation.

[2] The Department for Environment and Water has no direct control over the content of any linked sites, or the changes that may occur to the content on those sites. It is your responsibility to make your own decisions about visiting linked external sites, and about the accuracy, currency, completeness, quality, reliability and suitability for any purpose of information contained in such sites.
Links to external websites do not constitute an endorsement or a recommendation of those sites, including any information, material or third party products or services available from or through those sites. You are responsible for being aware of which organisation is hosing any site you visit.

Decommissioning of River Murray River Vessel Waste Disposal Stations

As flow to South Australia has risen all river vessel waste disposal stations above Lock 1 are offline. The river vessel waste disposal station at Goolwa remains open at this point, however we will be monitoring this station on a regular basis.

These proactive and preventative measures are required to minimise risks to public safety and water quality and ensure infrastructure is protected. The temporary closure of this infrastructure is to ensure that when the flows do recede, the systems can go back online in a timely manner.

In the interim while flows are high, commercial options are available for businesses to utilise temporarily at houseboat owners and operators expense while the disposal stations are closed.

If you have any questions, please contact the DEW Engagement Team on DEW.WIOCommunications@sa.gov.au

Closure of Government owned levee banks

The Department for Environment and Water has closed all Government owned levee banks along the Lower Murray from Mannum to Wellington. Recreational activity along the levee banks will not be allowed during this time. Local Irrigation Trust members and contractors will have continued access and are encouraged to take all necessary precautions when working on the levees, particularly during or following wet weather.

Access to the following levee banks is closed for public recreation: Burdett, Cowirra, Jervois, Long Flat, Mobilong, Monteith, Mypolonga, Neeta, Pompoota and Wall Flat.

The Department is taking these preventative measures to minimise risks to public safety. We are being proactive in closing the levee banks temporarily so when the flows do recede, we can reopen in a timely manner once water levels have fallen sufficiently.

We acknowledge that there are privately owned levee banks along the Lower Murray. As they are managed and maintained by private landholders, access to these levee banks may also be closed at the discretion of the landholder.

If you have any questions, contact the DEW Engagement Team on DEW.WIOCommunications@sa.gov.au

Environmental news

Unregulated flows have been continuous to SA since July 2021 due to wetter than average conditions across much of the Murray-Darling Basin and flows are increasing due to significant flooding in NSW and Victoria. Apart from small volumes that are delivered as part of SA's entitlement flow, deliveries of water for the environment are generally on hold until flooding recedes. High flows provide a range of benefits for the environment in SA, including:

- connecting the river with floodplains and wetlands, inundating areas that have been dry for many years;
- allowing fish dispersal and movement into new habitats and throughout the Murray-Darling Basin;
- providing 'flowing water habitat' to benefit native fish, animals and plants in the River Murray channel that have adapted to a riverine environment, including supporting spawning and recruitment of large native fish. Golden perch have been detected spawning in the South Australian Murray in recent weeks;
- improving water quality and productivity in the Coorong, providing a food-rich environment for fish and birds including healthy populations of keystone native plant *Ruppia tuberosa*;
- providing habitat for birds, frogs and threatened small-bodied native fish species in the Lower Lakes;
- removing excess salt from the River Murray.

Murray Mouth

Dredging operations at the Murray Mouth have now ceased due to the good condition of the Mouth and the forecast higher flows.

There are a number of shallow zones in and adjacent to the Murray Mouth. Mariners should use caution when traversing the mouth area, follow all directions, reduce speed and avoid travelling at low tide. Mariners equipped with echo sounders

should check depths regularly. Navigation through the Murray Mouth is only permitted during daylight hours. Exclusion Zones established around the dredging operations are in place to ensure public safety. Refer to Notice to Mariners No 42 of 2016 Notice 42.

There is a partial park closure in place for the northern tip of the Coorong National Park. For more information visit Coorong partial park closure notice.

Barrage operations and water levels in the Lower Lakes

The water level in Lake Alexandrina is approximately 0.83 m AHD and Lake Albert is approximately 0.78 m AHD.

As of Friday 2 December 2022, all operational gates across all 5 barrages were opened and will remain constantly open for the next few months to pass the floodwaters, even during storm events.

Lake holders and communities in the Lake Alexandrina region, particularly between Loveday Bay and Narrung Peninsula and in the vicinity of Goolwa, Hindmarsh Island and Mundoo Islands, are advised that short-term salinity increases are possible over the next few months due to flood-related barrage operations.

While the high volume of fresh water entering the Coorong estuary from the River Murray means the water downstream of the barrages is much fresher than usual, there is a small chance that saltier water will enter Lake Alexandrina for short periods from high tides or storms.

Residents pumping water from the Lower Lakes are advised to check real-time salinity data here: https://water.data.sa.gov.au/

During December to February 2022, it is expected that barrage operations will be able to safely pass the forecast flood peak and maintain average lake levels below 1.0 m AHD. As flooding is not expected to occur at the Lower Lakes, flood warnings for the River Murray and flood inundation maps only extend as far downstream as Wellington.

The forecast high tide on Monday 12 December may lead to reverse flows through the Goolwa barrage and temporary increases in lake levels upstream of the barrage. Levels may reach around 1.0 m AHD in the local area.

As of Tuesday 6 December 2022, the weekly releases were approximately 301 GL. It has been identified that the volume calculated as being released from the barrages is under estimating the releases from Goolwa and Mundoo. This issue is being worked on and it is estimated to take a number of weeks to rectify. In the meantime the community should be aware that there is more water being released from Goolwa and Mundoo than is being reported.

Fishways at all barrages and at Hunters Creek (11 in total) were open during the entire week to provide fish passage between the Coorong and Lower Lakes.

Total daily release volumes from the barrages can now be accessed via Water Data SA by searching for the gauge A4261002. Gate openings at the barrages during the week can be seen in the table below.

Barrage (total number of gates)	Goolwa (120)	Mundoo (25)	Boundary Creek (5)	Ewe Island (110)	Tauwitchere (319)	Total daily release volume
30 Nov 2022	117	23	5	106	297	52 GL
1 Dec 2022	120	25	5	110	317	45 GL
2 Dec 2022	120	25	5	110	317	43 GL
3 Dec 2022	120	25	5	110	317	42 GL
4 Dec 2022	120	25	5	110	317	30 GL
5 Dec 2022	120	25	5	110	317	37 GL
6 Dec 2022						52 GL
Objective of releases	Passing flood flows through the lakes while maintaining average lake levels below 1.0 m AHD					

Number of barrage gates open each day for the week ending Tuesday 28 November 2022

Water levels and barrage operations are monitored closely by the South Australian Government, Murray-Darling Basin Authority and Commonwealth Environmental Water Office.

Marine Safety

The Department for Infrastructure and Transport has established a dedicated marine safety page regarding the current high flow situation. As well as general safety information, this website lists identified current marine hazards. For more information please visit: https://www.marinesafety.sa.gov.au/river-murray-high-flows-2022-marine-safety-advice.

Blackwater

Blackwater occurs naturally when floods wash leaves, grass and cropping material off riverbanks and floodplains into waterways. High levels of organic matter in waterways, combined with warm weather, can cause oxygen levels in the water to drop. This is known as hypoxic (low oxygen) blackwater, which can have a blackish colour and a strong, unpleasant smell.

There is currently no blackwater present in the South Australian section of the River Murray. There have however been recent reports of low dissolved oxygen levels and blackwater in upstream sections of the river and its tributaries as a result of recent flooding.

PIRSA, DEW, SA Water and the Murray-Darling Basin Authority, along with other relevant government agencies, continue to closely monitor blackwater events upstream and plan mitigation measures should it reach South Australia.

When dissolved oxygen levels in water drop below critical levels, it can cause fish and crustaceans to die. To report sightings of large numbers of dead or distressed fish, please contact the 24-hour Fishwatch hotline on 1800 065 522.

Further information

All information regarding the 2022 River Murray flood event (including that of partner agencies) can be accessed via the following link: http://www.sa.gov.au/topics/emergencies-and-safety/river-murray-flood

The SA Department for Environment and Water (DEW) has developed a number of products to assist in the interpretation of information during the high flows:

- River Murray estimated water levels by flow rate in an illustrative map and in a table;
- River Murray estimated travel times during flood events;
- Frequently asked questions;
- Inundation maps for the River Murray are available at Flood Awareness Map & River Murray Inundation Maps.

The Water Data SA website is South Australia's comprehensive water information portal. For real-time data (like salinity, water levels) go to the following page: Water Data SA. Please note that some surface water monitoring stations may be removed as river flow increases and that data will be unavailable for those stations until they are reinstated.

Up-to-date River Murray salinity, flow and water level information can also be accessed at the SA Water and Murray-Darling Basin Authority websites:

- Water allocation and carryover announcements
- SA Water River Murray info - levels, flows etc.
- Murray-Darling Basin real-time water data

The latest news, information and announcements about the River Murray and Basin Plan are available at River Murray Update.

Information on the management of acid drainage water in the Lower River Murray can be accessed at:
Managing Acid Sulfate Soils Research Project

Details of river height and rainfall information in the River Murray within Victoria and New South Wales are available at the Bureau of Meteorology website:

- Victoria rainfall and river conditions
- NSW rainfall and river conditions

Information provided by the Commonwealth Environmental Water Office can be accessed at CEWH Environmental Watering.

Information on The Living Murray can be accessed at MDBA TLM.

Chowilla Floodplain Icon Site management Chowilla-floodplain.

Katarapko Floodplain site management

Pike Floodplain site management

Department for Environment and Water Home page.

Information provided by the Department for Infrastructure and Transport on boat licences, registering motor boats, owning and operating water craft, and boat and marine safety can be accessed at Boating and marine.

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