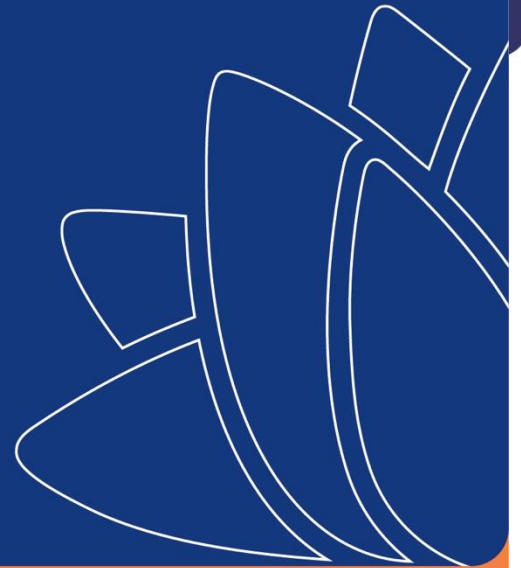




Resilient Valley, Resilient Communities

Hawkesbury-Nepean flooding and Warragamba Dam



Frequently asked questions

December 2021

Why is Warragamba Dam not operated to release water ahead of a forecast flood?

Releasing volumes of water large enough to provide meaningful benefits ahead of a forecast flood could cause significant downstream flooding and damage in low lying areas. Pre-releases from the dam could also reduce evacuation time and increase the risk to life as roads could be cut by the released floodwaters.

Calls for pre-releases ahead of forecast floods also assume a precision in rainfall and weather forecasting that is not currently possible. In June 2016, there were calls to reduce the Warragamba Dam water supply by 5 metres to create air space ahead of expected rainfall and potential flooding. At that time, an East Coast Low was predicted to cause Moderate to Major flooding in the Hawkesbury-Nepean River, and Minor flooding in the Georges River.

The weather system shifted, and most of the flood-generating rainfall moved from the Warragamba catchment to the Georges River catchment - causing Major flooding in Sydney's southern suburbs, but only Minor flooding in the Hawkesbury-Nepean. Lower than average inflows and drought conditions followed - and by February 2020, the dam's storage had dropped by 18.8 metres to 42% capacity.

Had the water supply been lowered by 5 metres in 2016, the dam storage would have dropped to around 26% in February 2020 - a critically low level, even lower than during the Millennium drought when the storage reached 32%.

Warragamba is a water supply dam. Unlike Wivenhoe Dam in South East Queensland, Warragamba Dam is not built or operated to provide flood mitigation. Under strict operating rules, WaterNSW is only authorised to make controlled releases when the dam reaches full supply level, to draw the storage down by up to 1 metre for operational purposes.

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Why wasn't water released from Warragamba Dam ahead of the March 2021 flood?

Some stakeholders have suggested the levels of Warragamba Dam should have been lowered to reduce the risk of flooding prior to the March 2021 flood.

Options for operating Warragamba Dam differently have been thoroughly investigated in developing the Hawkesbury-Nepean Valley Flood Risk Management Strategy. Pre-releasing water ahead of a flood, or permanently lowering water supply, may sound straightforward, but both options have significant drawbacks. See further detail below.

How much warning was there for the March 2021 flood?

While eastern Australia had been experiencing wetter La Niña conditions, there was limited advance warning of the widespread and complex rainfall and flooding event in March 2021.

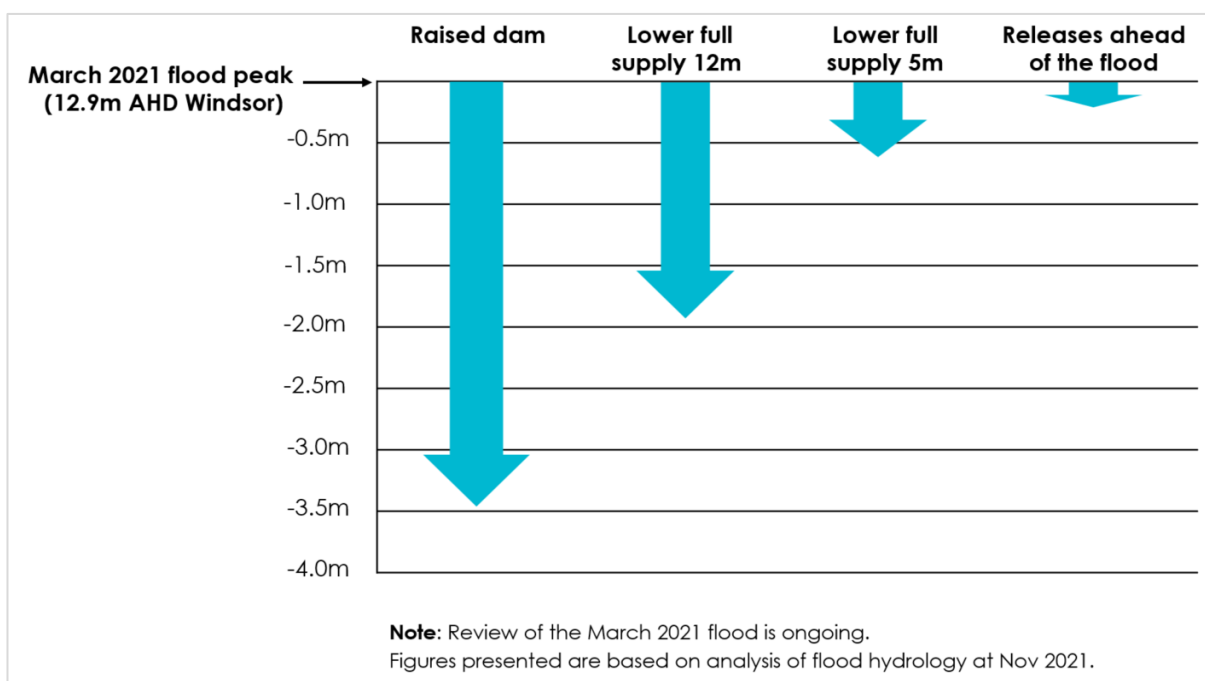
Until Thursday 18 March, a major rain event was not forecast for the Hawkesbury-Nepean catchment. The dam was then at 96.3% capacity. The Bureau of Meteorology upgraded the forecast on Thursday afternoon, almost doubling forecast rainfall. The ongoing forecast, and resulting rainfall and flooding, continued to escalate in the following days, with the dam beginning to spill on Saturday 20 March.

What difference would pre-releases from the dam have made to the March 2021 flood?

Due to the quickly evolving nature of the rainfall and forecasting, the dam operators would not have had enough certainty that the rainfall would fill the dam until the morning of Friday 19 March 2021. By then, analysis has shown it would not have been possible to release enough water to make any meaningful difference to the flood. Warragamba Dam started spilling on the evening of Saturday 20 March 2021.

Based on a release from the dam starting at 9am on Friday 19 March, the flood peak levels at Windsor and Penrith would have been reduced marginally by 0.2m and 0.3m respectively. The options to raise the dam, or to permanently reduce the dam water supply by 5m or by 12m, have also been analysed (see figure below).

Figure: March 2021 flood peak reduction at Windsor with Warragamba Dam flood mitigation options



While the pre-release scenarios would have reduced flood levels at both Penrith and Windsor, the impact is small when compared to the other scenarios. All pre-release scenarios perform the worst at Windsor,

which is the centre of the exposed population. This is due to the volume of water required to be mitigated to have a benefit in the vast Windsor floodplain.

With pre-releases beginning on 19 March:

- outflows from the dam would have begun over 1 day earlier
- Yarramundi Bridge would have closed over 1 day earlier
- North Richmond Bridge and the Sackville ferry service would close around half a day earlier, bringing forward the isolation of communities
- the minor flood level at Windsor would have been reached around half a day earlier.

This scale of flooding can have serious consequences for communities downstream of Windsor. Far from reducing the risk, pre-releases could inhibit evacuation and property-saving efforts.

With La Niña declared this summer, why aren't releases being made from the dam?

It has been suggested that because La Niña has been declared for the 2021-2022 summer, Warragamba Dam should be drawn down early in the season. This is because La Niña events are typically accompanied with an increased chance of wetter catchments and fuller storages.

There have been La Niña years with Hawkesbury-Nepean floods, such as in 1950, 1956, and 1988. However, there have also been La Niña years without Hawkesbury-Nepean floods, such as in the dry La Niña of 1938-1939. It's also noteworthy that 3 of the 4 largest Hawkesbury floods since Warragamba Dam was completed in 1960 did not correlate with La Niña – in 1961, 1978 and 1990.

The actual pattern of rainfall in La Niña years is also unpredictable. For example, rain associated with the 2020-2021 La Niña largely missed the catchment for Wivenhoe Dam in south-east Queensland, which subsequently fell to 36% capacity. Wivenhoe Dam is the main supply of water for Brisbane and the greater Ipswich area. In short, the occurrence of La Niña does not guarantee heavy rainfall, or heavy rainfall within a specific catchment.

Greater Sydney's water supply is currently at its sustainable limit. As Warragamba Dam stores around 80% of total supply, releasing stored water from the dam because of a La Niña could represent a significant risk to water security.

Warragamba Dam's gates operate automatically when the dam reaches full supply. Importantly, under strict operating rules, WaterNSW is only authorised to make controlled releases when the dam approaches full supply level, to draw the storage down by up to 1m for operational purposes. The operational releases are made to stop the gates from being triggered unintentionally when the dam is nearing full. Small releases are made at 100% to maintain this level.

Releasing water early to mitigate downstream flooding is currently not authorised, so WaterNSW cannot lower the storage based on weather forecasts.

Why isn't Warragamba Dam's level being permanently lowered to mitigate floods?

Dam lowering options have significant implications for Greater Sydney's water supply system. Sydney's catchments experienced a severe drought between 2017 and early 2020 that demonstrated the water supply system can deplete at a faster rate than had previously been anticipated.

Flooding and Warragamba Dam FAQ

Greater Sydney's water supply is currently at its sustainable limit and any permanent reduction in the capacity of Warragamba Dam would expose to the city to water security risk, particularly in relation to drought.

Lowering the storage level of the dam by **5 metres** would have limited benefits for the larger floods that pose most risk to lives and property while reducing the dam's capacity by around 18%, which would bring forward augmentation for water security lost, most likely through new desalination infrastructure.

Permanently lowering the full supply level by **12 metres** was also investigated. The storage holds a greater volume at the top, narrowing towards the bottom, so the maximum impact for flood mitigation is at the top. Due to this deep 'V' shaped storage, this option would reduce the dam's water supply capacity by around 40% (around 30% of Sydney's water supply), which would require significant investment (high cost of infrastructure and high ongoing cost of operations) in other water sources before this option could be used.

This option would offer moderate flood mitigation capacity. The benefits would be largely eroded by mid-century with predicted moderate climate change. Significant modifications would be needed to the dam to allow for emptying to this level. This option would also likely have implication for water quality.

Warragamba Dam flood mitigation options have been assessed in detail for the Flood Strategy and reassessed for the Warragamba Dam Raising Environmental Impact Statement.

The detailed Flood Strategy Options Assessment Report can be found on the Infrastructure NSW website at: <https://www.infrastructure.nsw.gov.au/media/1976/taskforce-options-assessment-report-2019-v2.pdf>



For more information about flooding in the Hawkesbury-Nepean Valley, visit www.myfloodrisk.nsw.gov.au

For more information about the Flood Strategy, visit www.insw.com/flood-strategy