Tracking Depth Changes in Lake Illawarra

wollongong
city of innovation

Wollongong City Council (WCC) and Shellharbour City Council (SCC) have undertaken an initial analysis of water levels and have also completed bathymetric surveys in Lake Illawarra to address community feedback that was received as part of the development of the Lake Illawarra Coastal Management Program (CMP).

Since the permanent opening of the entrance channel, the lake has undergone many changes, and one of these is changes in depths across the lake. Factors such as shifts in the tidal regime; sediment inputs into the lake, and fast-flowing water eroding the lake bed all have an influence on the depths in the lake.

Bathymetric surveys

In 2023, WCC and SCC completed an updated bathymetric survey of Lake Illawarra to measure the elevation of the lake bed. The results of this survey were compared to a previous survey completed in 2008 to see if there were any changes. This project was supported with technical and financial assistance from the NSW Government.

Where was the survey undertaken?

The survey was undertaken across Lake Illawarra in both the Wollongong and Shellharbour Local Government Areas. It included major creeks that flow into the Lake. It did not include the entrance channel, where other recent surveys have already been completed.

Why do we need a bathymetric survey for the Lake?

This project relates to Action FB3 in the Lake Illawarra CMP. This action was included in the CMP based upon community concerns that the lake was becoming shallower.

By comparing the elevation of the bed in the Lake between 2008 and 2023, we can see if there are any areas in the bed of the lake that are getting deeper or are getting higher.

The results will be used to inform future management options around the lake.

What did we find?

Except for a few locations such as near the entrance channel area, there have only been relatively small changes to the lake bed since 2008.

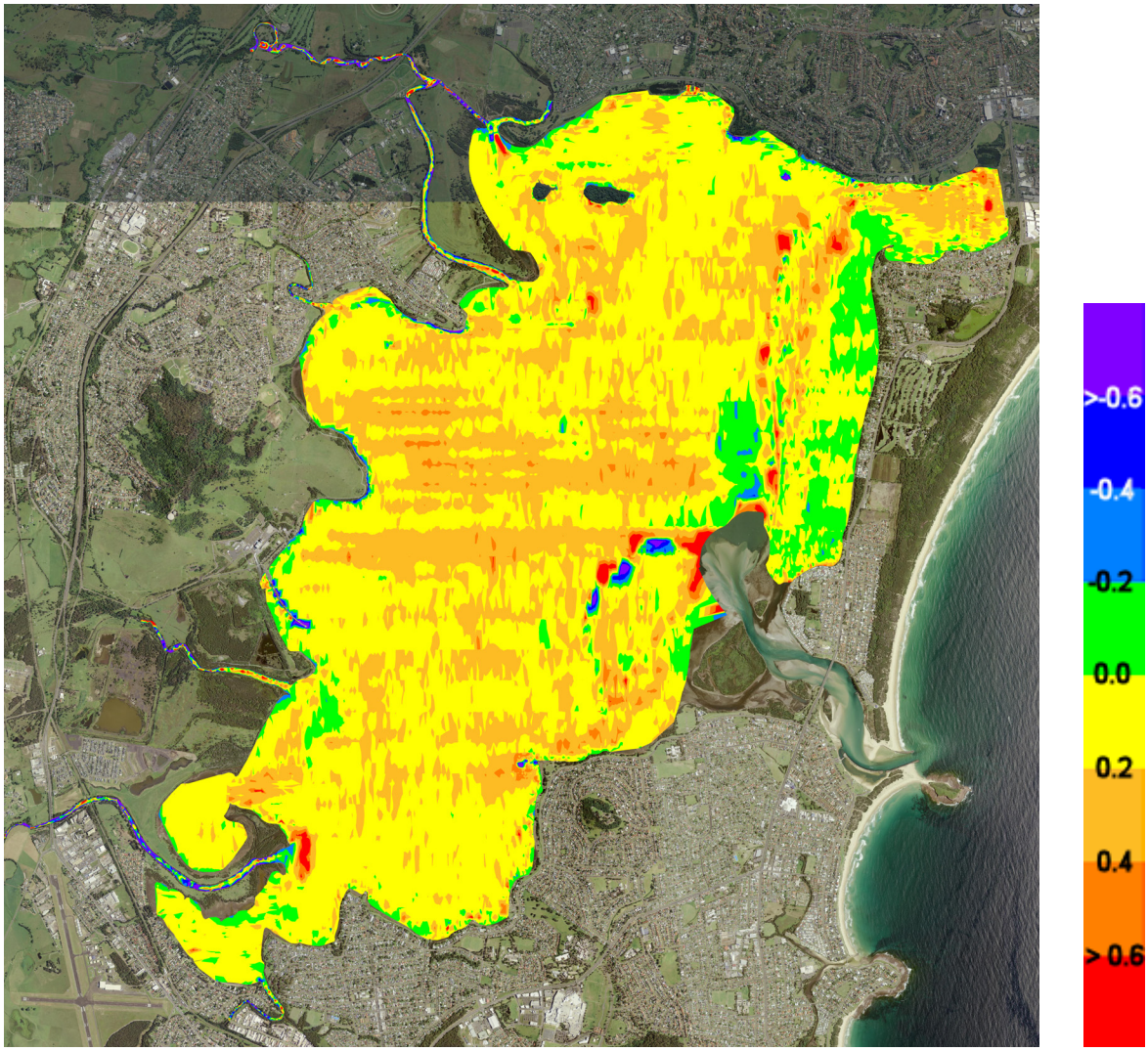
What is bathymetry?

Bathymetry is the study and mapping of the beds or floors of waterbodies such as oceans, lakes and rivers, much like the mapping of the shape of the land. It involves sending sound beams down and collecting data as they bounce back from the bed of the waterbody.



To consult the full report, please scan the QR code or visit or see the 'Works and Projects' section at **wollongong.nsw.gov.au/lake-illawarra**

The map below shows these changes. The orange/red areas show where the bed of the lake and creeks has risen (sedimentation), while the blue/purple areas show where the bed of the lake and creeks are getting deeper (erosion). The majority of the lake is yellow/green, indicating those areas have changed by less than 20cm. Some of this will be within the error margin of the survey technology.



What causes sedimentation?

Sedimentation of the lake bed can be caused by: runoff and stormwater bringing in sediment from creeks and drainage systems; erosion of creek banks; sand transported in from the ocean; and blown in by winds. Sediment transport into the lake is a natural process that has occurred over thousands of years. It has been impacted by human actions including land clearing, agriculture and urban development in the catchment.

In Lake Illawarra, sediment transport into the lake has increased since European settlement. Recent rates of sediment input to the lake are about 7mm a year, whereas before European settlement these were between < 1-4mm per year.

What causes erosion?

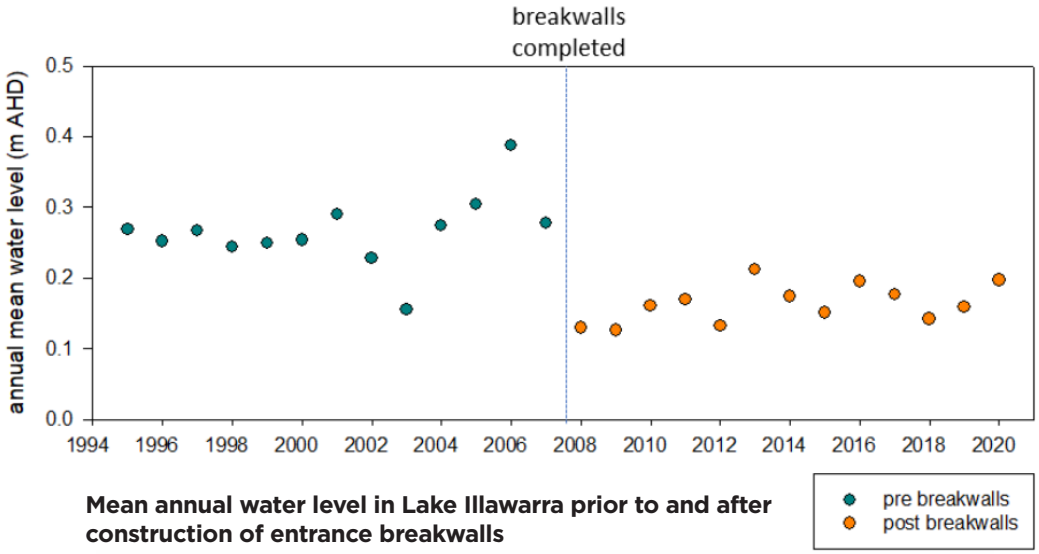
Erosion of the bed of the lake can be caused by fast moving water pushing sediment from one place to another. Since the permanent opening of Lake Illawarra with breakwalls, we have seen the entrance channel deepen in places due to fast flowing tidal currents. The sediment transported by this process has built up at the end of this channel where it meets the lake (red areas in the map above).

Some creek banks have also eroded, with this sand building up in the creek channels and where they join with the lake. For example, in the above map, Macquarie Rivulet shows sedimentation where it connects into the lake (red area in map).

Water levels / tide measurements

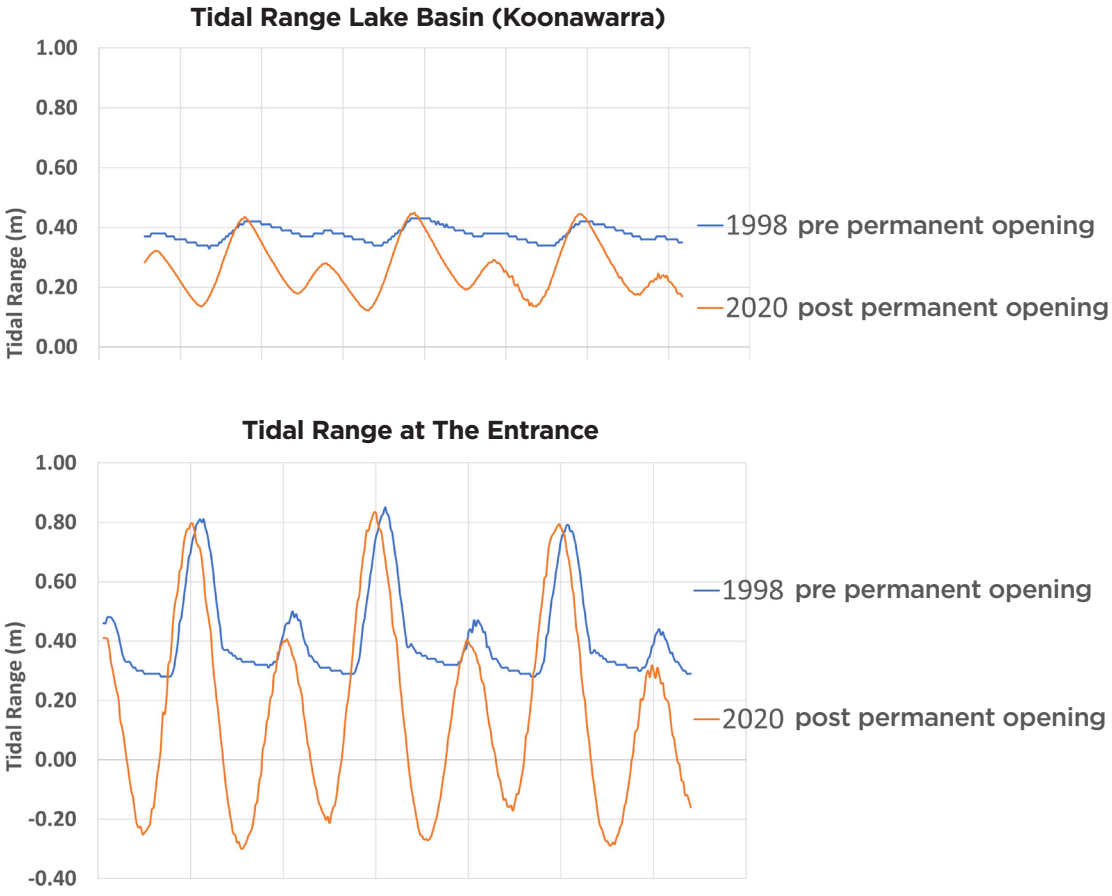
The permanent opening of the entrance channel has caused the lake to become more tidal, meaning that changes in water height across the Lake are more extreme and noticeable. In particular, low tides have become lower.

Analysis of water levels from before and after the permanent opening has shown that the mean water level in the lake has dropped by approximately 15cm and daily maximum tides can now be over 0.3 metres. Historically, the maximum tidal range was 0.1 metres.



Mean annual water level in Lake Illawarra prior to and after construction of entrance breakwalls

Comparison of tidal ranges before and after opening of the lake entrance

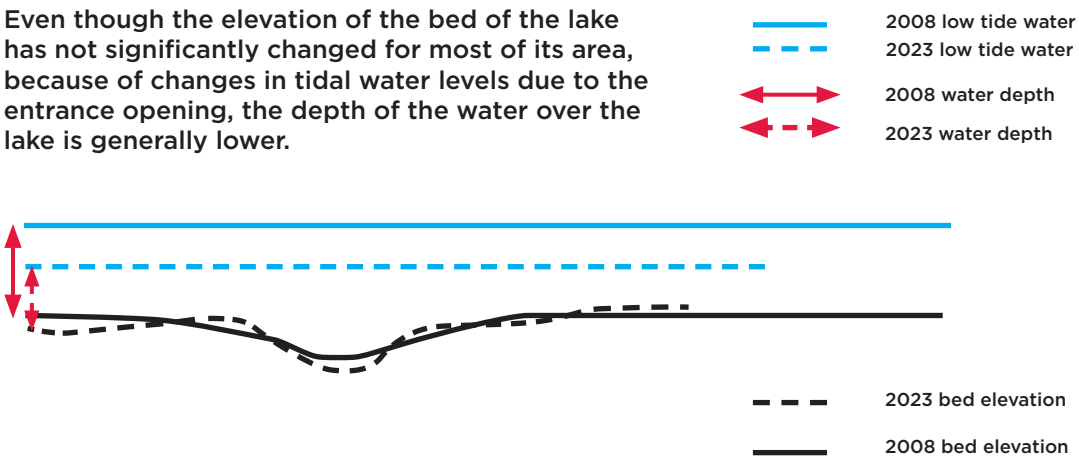


Graphics supplied by the NSW Government Department of Climate Change, Energy, the Environment and Water. Important to note that 1998 readings followed a period of heavy rainfall and represent the maximum tidal range that has been recorded in Lake Illawarra.

Shallowing of the Lake

Whilst the bathymetric survey shows there has been changes in the lake's bed level since 2008, the change in tidal conditions, as a result of the permanent entrance, is also a key driver of the changes in water depth across the majority of the lake. In places, the lake can appear less deep due to a drop in water levels during low tide, rather than because of sediment build up.

Even though the elevation of the bed of the lake has not significantly changed for most of its area, because of changes in tidal water levels due to the entrance opening, the depth of the water over the lake is generally lower.



How are we Managing Sedimentation and Erosion?

We have completed a study to better understand which banks are eroding and what treatments could be applied. Works have started at some locations.

So far we have revegetated 90ha of foreshore areas, this decreases the risk of erosion.

We have employed Building Compliance Officers to improve compliance with erosion and sediment controls from developments.

We have implemented stricter pollution reduction targets in Council's DCP for new developments to reduce the amount of sediment being transported to the lake from these developments in runoff.

We are developing Building and Sediment education material and programs for construction sites in the lake catchment to reduce sediments (red area in map).

Can we manage water levels/ tidal regime?

Because of the impacts the permanent entrance channel opening has had on water depth but also erosion of the foreshore (more so along the lake entrance), we are currently working with expert consultants and State Government Agencies on identifying options to modify the lake entrance that could result in changing the tidal regime and resulting water levels. We will discuss this project separately with the community in the second half of 2024 as those options are likely to influence other values the community hold for the lake such as water quality, recreational activities and fishing.

- Sloss, C., Jones, B., Brooke, B., Heijnis, H., & Murray-Wallace, C. (2011). Contrasting sedimentation rates in Lake Illawarra and St Georges Basin, two large barrier estuaries on the southeast coast of Australia. Journal of Paleolimnology, 46, 561-577. DOI 10.1007/s10933-011-9507-z
- Ferguson, A., Wiecek, D., Hughes, M., Hanslow, D., Wainwright, D., & Scanes, P. (2021). Form and function of NSW intermittently closed and open lakes and lagoons – Implications for entrance management. State of NEW and Department of Planning, Industry and Environment. https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Estuaries/form-and-function-of-nsw-intermittently-closed-and-open-lakes-and-lagoons-210150.pdf

For more information visit wollongong.nsw.gov.au/lake-illawarra

Shellharbour CITY COUNCIL

wollongong city of innovation

NSW GOVERNMENT

This project is supported by the NSW Government's Coastal and Estuary Management Program