Australia's National
Science Agency

Water quality on Norfolk Island

This brochure has been co-designed with collaborators from Norfolk Island, to explain the key findings of our Norfolk Island Water Quality Assessment Technical Report.



Credit: Rob Ryan

The ocean around Norfolk Island is home to vibrant and unique marine ecosystems. The cultural, historic, ecological, and economic value of the coral reefs is recognised and protected by the Norfolk Marine Park. The park spans over 188,000 square kilometres, with no-take areas in place to safeguard biodiversity.

Yet over the past decades, marine experts and community members alike have raised concerns about the declining health of the reef near the island, and the delicate ecosystems it supports. Norfolk Island's nutrient run-off and declining water quality have been linked to reduced coral cover and disease outbreaks in the lagoon.

In 2019, CSIRO – Australia's national science agency – was commissioned by the Australian Government to assess Norfolk Island's water resources. This research was expanded in 2021 to monitor water quality and develop guideline values for contaminants, to help protect the marine ecosystem around Norfolk Island.

Water flows above and below ground

On Norfolk Island, water can flow into the ocean via overland flow or streamflow, or through the soils and aquifers underground.



Surface water – from creeks and overland flow – can discharge directly into Emily Bay. This happens when enough surface water accumulates to move the sand that plugs up the creek at the beach between rainfalls. When it rains, a greater volume of surface water is flushed into the ocean, carrying excess nitrogen from the land.

Groundwater is hidden below ground and can flow in different directions before discharging into creeks, wetlands and the bays. Over longer periods of time, rain can influence groundwater levels and flows. But generally, a single rainfall won't have a big impact on how much groundwater is discharged.



Credit: Neil Tavener

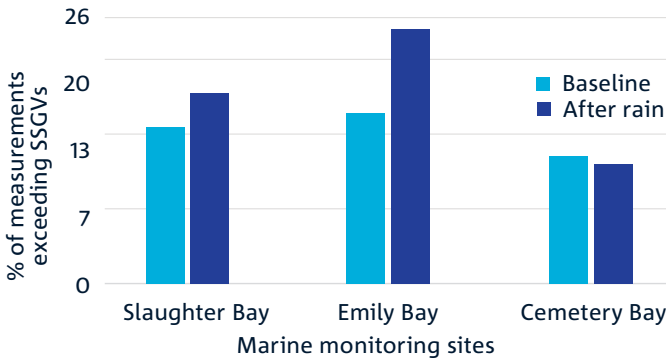
Contaminants from the island wash into the ocean

As they flow towards the ocean, both surface and groundwater pick up contaminants from a range of human activities and land uses on the island. Acid sulfate soils – which can lead to reduced pH, less oxygen in the water, and the release of heavy metals – also threaten water quality. From 2021, our researchers began monitoring water quality at several sites on and around Norfolk Island.

They analysed seawater from the Norfolk Marine Park, surface water in Watermill Creek and Town Creek, and groundwater across the southern part of the island. They also measured seawater quality in places with little to no impact from the island. These are our reference sites, to compare with places polluted by contaminants.

The main contaminant our researchers detected was nitrogen. Soils naturally contain a certain amount of nitrogen. But human activities like fertilising plants, rearing animals and processing sewage can all add extra nitrogen to the soil and water.

On Norfolk Island, contamination from nitrogen-rich human, dog, cattle and bird (e.g., chicken and duck) waste was detected in the surface water. Only human waste was detected in the groundwater. Based on current land use, cattle manure, failing wastewater systems and fertiliser are the largest potential sources of excess nitrogen on the island.



Water quality is poorer at Slaughter and Emily Bays than at Cemetery Bay. Under baseline and rain event conditions, Slaughter and Emily Bays have a higher percentage of water quality measurements that exceed site-specific guideline values (SSGVs for protecting 95% of species from toxicants) compared to Cemetery Bay.



Credit: Rob Fitzpatrick

Key points:

Water flowing from the island carries contaminants like excess nitrogen into the ocean.

As of 2026, Emily Bay and Slaughter Bay are most affected, especially after rain.

Higher levels of nitrogen harm the health of coral reefs and marine life.

Community, industry and government can act together to protect the reef.


Credit: Susan Prior

Contaminants harm marine life and ecosystems

Even though nitrogen occurs naturally in soils, too much entering the ocean at once can cause disease in corals and overgrowth of algae. As algae takes up more space on the reef, it stops coral from growing back. Over the long term, this damages the health of the marine ecosystem, because lots of species rely on corals to thrive.

Improving water quality helps coral reefs be healthier and more resilient to the combined impacts of climate change and contaminants. Reducing the flow of contaminants into the ocean from the island gives local reefs the best chance of recovering from rising sea surface temperatures, which are causing coral bleaching all around the world.

What happens next?

Changing rainfall patterns and warming sea temperatures are likely to increase the pressures on Norfolk Island's coral reef ecosystem. Improving water quality from the Island's surface and groundwater will help corals to better withstand and recover from marine heatwaves and extreme rainfall events. A coordinated suite of actions to manage contaminants like nitrogen, and to prevent it from entering surface water, groundwater and the ocean, will help to produce a sustainable long-term improvement in water quality and ecosystem health. Various investigations and studies have already been undertaken to progress this. Upgrading wastewater management systems, continuing scientific monitoring, and works to protect waterways and their banks are among the actions being undertaken by governments and agencies. Success requires coordinated action, supported by scientific evidence and funding to implement measures to improve water quality. Continuing to monitor water quality is also critical to determine the effectiveness of different management strategies, and to help understand whether water quality is improving over the long-term.

Acknowledgements

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