

Hydrodynamic Modelling

Why was modelling undertaken?

The Port of Townsville is seeking a new 10-year permit for the sea placement of maintenance dredged material.

Hydrodynamic modelling was used to predict how maintenance dredging may affect:

- Water quality;
- Turbidity (water clarity);
- Sediment deposition; and
- Sensitive marine habitats such as seagrass and coral reefs.

What is hydrodynamic modelling?

Hydrodynamic modelling uses specialised computer software to simulate:

- Tides and currents;
- Waves;
- Water movement;
- Sediment transport; and
- Dredge plume behaviour.

The model helps predict how sediment released during maintenance dredging moves through Cleveland Bay and the surrounding marine environment.

Natural variability in Cleveland Bay

Cleveland Bay naturally experiences high levels of turbidity due to tides, waves, winds and river flows. The modelling assessed dredging-related increases relative to these existing conditions and found that predicted increases are generally small compared with natural variability experienced across the bay.

What was assessed?

The assessment considered:

Scenario	Assessment
Expected Case	400,000 m ³ over approximately 35 days
Upper Case	600,000 m ³ over approximately 50 days
Climate Conditions	El Niño (dry), La Niña (wet) and Neutral years

The Upper Case represents a conservative scenario that could occur if additional dredging is required following major events such as cyclones.



Why can we have confidence in the results?

The modelling framework:

- Has been developed and refined over more than a decade
- Was independently peer reviewed
- Was reviewed by the Australian Institute of Marine Science (AIMS)
- Has been calibrated and validated using field monitoring data from Cleveland Bay
- Assessed multiple dredging volumes and climate conditions
- Uses current industry guidance and best-practice methodologies

The 2026 assessment reached broadly similar conclusions to the previous 2014 assessment despite updates to the model and incorporation of additional data.

KEY FINDINGS

Water Quality

The modelling predicts:

- A small, localised Zone of Low Impact within and immediately adjacent to the Port;
- Higher impact zones largely confined to dredging and placement areas;
- Detectable dredge plumes extending beyond the Port in some scenarios; and
- No predicted adverse impacts to mapped coral or seagrass habitats from changes in water quality.

Although dredging-related turbidity may be detectable in some areas outside the Port, predicted water quality changes remain within the range of natural variability experienced in Cleveland Bay.



Water Quality Zones of Impact – Expected Case (400,000 m³)
– La Niña Conditions

Sediment Deposition



Sediment Deposition Zones of Impact – Expected Case (400,000 m³)
– La Niña Conditions

The modelling predicts:

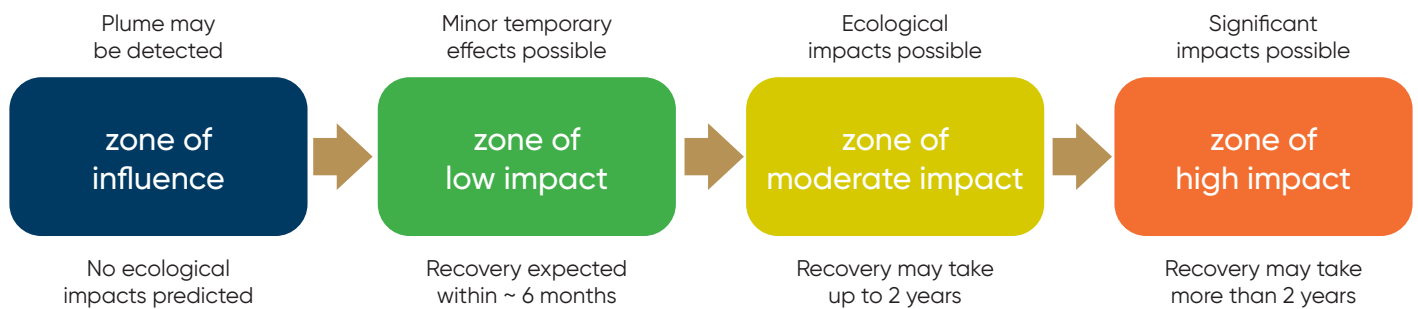
- Higher impact zones largely confined to dredging and placement areas;
- No mapped coral habitats within modelled Zones of Impact;
- Most mapped seagrass habitats outside Zones of Impact; and
- A small area of seagrass offshore from the Strand occurring within a Zone of Low Impact. Any impacts in this area are predicted to be minor, temporary and recoverable.

These figures show modelled impact zones and do not represent the extent of a dredge plume at any single point in time.

Understanding the Zones of Impact

Zone	What it means
Zone of Influence	Dredge plumes can be detected but no impacts are predicted
Zone of Low Impact	Minor temporary effects may occur, with recovery expected
Zone of Moderate Impact	Larger impacts may occur and recovery may take longer
Zone of High Impact	Significant impacts may occur with longer recovery periods

These zones are based on locally derived environmental thresholds developed using Cleveland Bay monitoring data.



Will impacts accumulate over time?

The model indicates that impacts are:

- Short-term;
- Localised; and
- Primarily confined to dredging and placement areas.

Because impacts are temporary and limited in extent, cumulative impacts from repeated maintenance dredging campaigns are not predicted over the proposed 10-year permit period.

KEY SUMMARY

Across all dredging volumes and climate conditions assessed, maintenance dredging impacts are predicted to remain localised and temporary. No adverse impacts are predicted for mapped coral habitats, and only a small area of mapped seagrass is predicted to experience minor, temporary and recoverable effects.

Overall, the assessment concluded that maintenance dredging and placement is unlikely to result in measurable long-term impacts to sensitive marine habitats in Cleveland Bay.

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