# High Density ENCs

Proof of Concept

IHO ENC WG4 meeting, Monaco 10-12 June 2019
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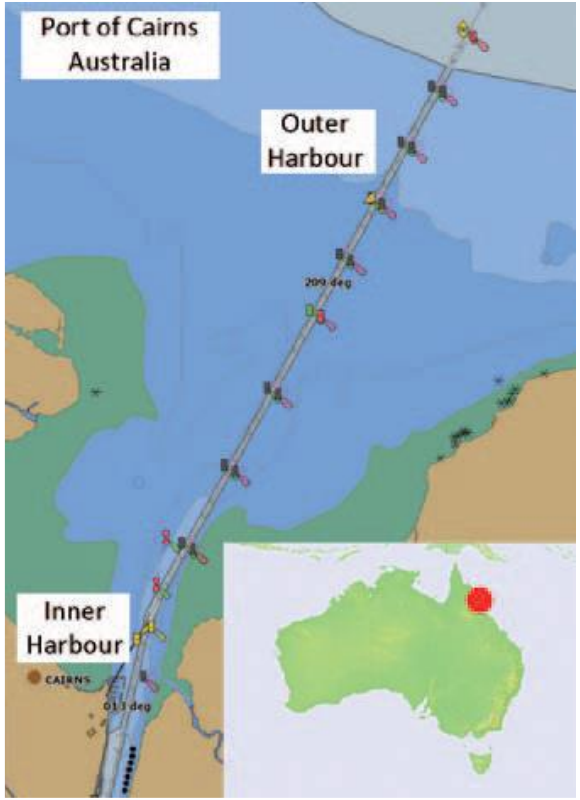
# Introduction

- Electronic charts with greater scale and bathymetric content than any Hydrographic Office's ENC (equivalent to a paper nautical chart) are not a novelty for many ports around the world.
- Such charts are normally produced by Port Authorities and are used by marine pilots on the Portable Pilot Units (PPU).
- The Australian Hydrographic Office (AHO) and Land Information New Zealand (LINZ) have experimented with, and now published, High Density (HD) ENCs
- These ENCs – like any other official ones – are available both to ships' ECDIS and to Marine Pilots' PPUs.

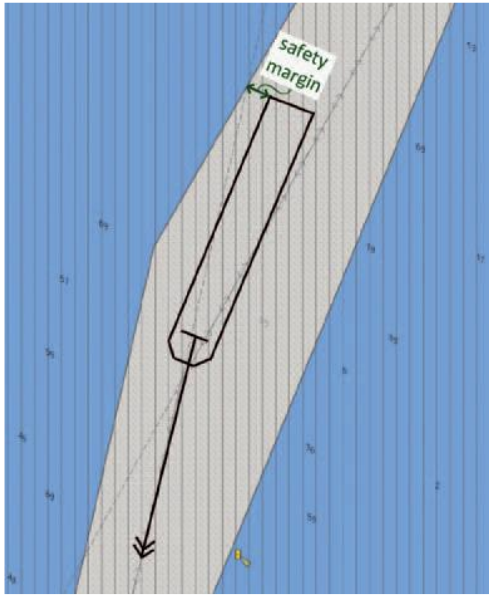
- Why are HD ENCs so important for the conduct of vessels in confined waters?
- Why is it so important that these HD ENCs become available to both ECDIS and PPUs?

# Port of Cairns - Australia



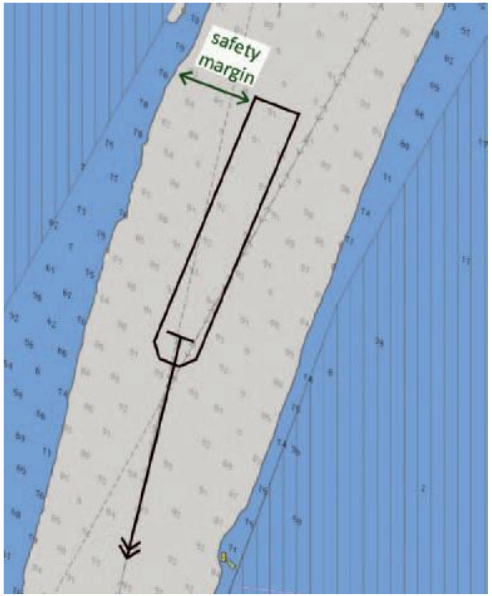

In 2015, a simulator study was carried out to determine the safety margins of a 260m long cruise ship navigating within the 90m wide channel that leads to the Port of Cairns

## Existing ENC Band 5




the Harbour ENC provides only an 8.3m maintained depth value that is associated to the dredged area that covers most of the outer harbour

## High Density ENCs Band 6




- 1:2500 compilation scale
- coverage based on the availability of MB survey data
- depth contours at 1m interval
- soundings with a 50m spacing
- essential Navaids & Nav Lines

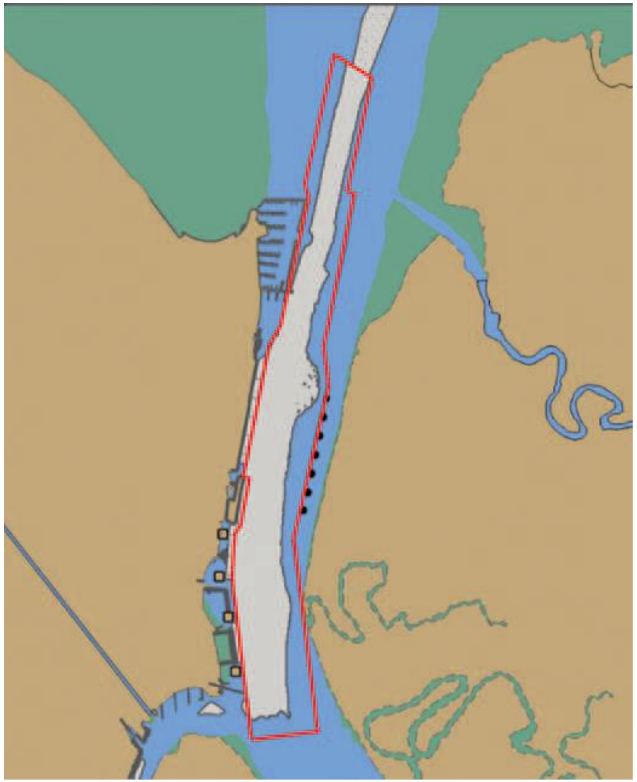
The enhanced bathymetric content revealed significantly **increased safety margins**.

The lack of enhanced bathymetric content for the same turn between outer and inner harbour became one of the key factors in deciding that the same class of cruise ship could not enter the port with an adequate safety margin.

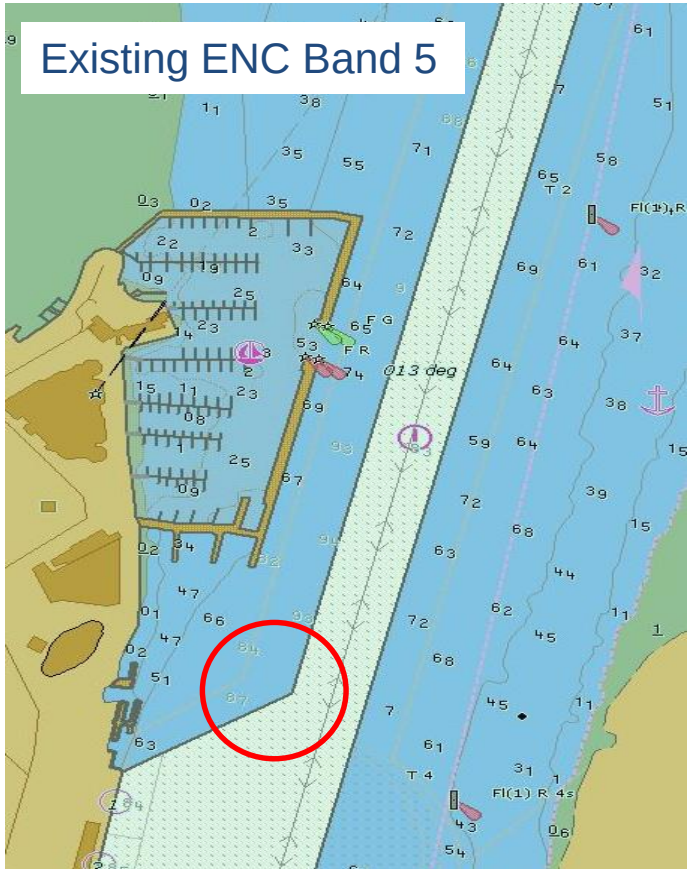
The decision was reconsidered as a result of the 2015 study, and these vessels are now able to enter Cairns.

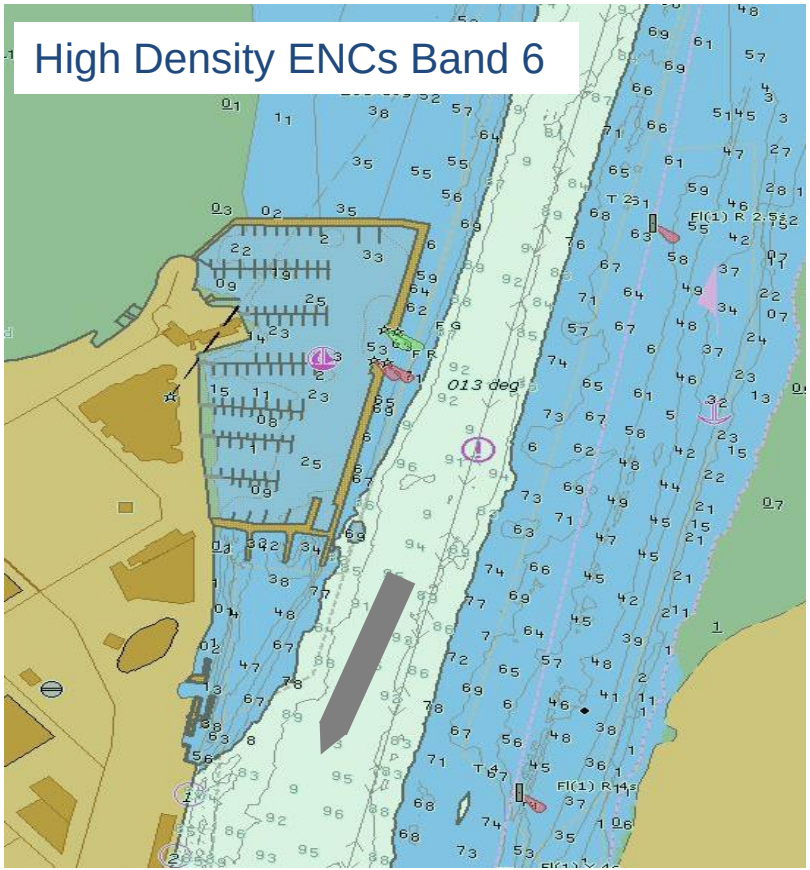
This proves the **commercial relevance, as well as the enhanced safety** of HD ENCs.

The new Australian HD ENCs band 6 comply with the existing IHO S-57 standard. The Cairns channel was covered by 2 adjacent ENCs with a coverage aligned to the port's survey areas and the frequency of surveys.



# HD ENCs in Cairns enabled safer and more efficient approach to the berth

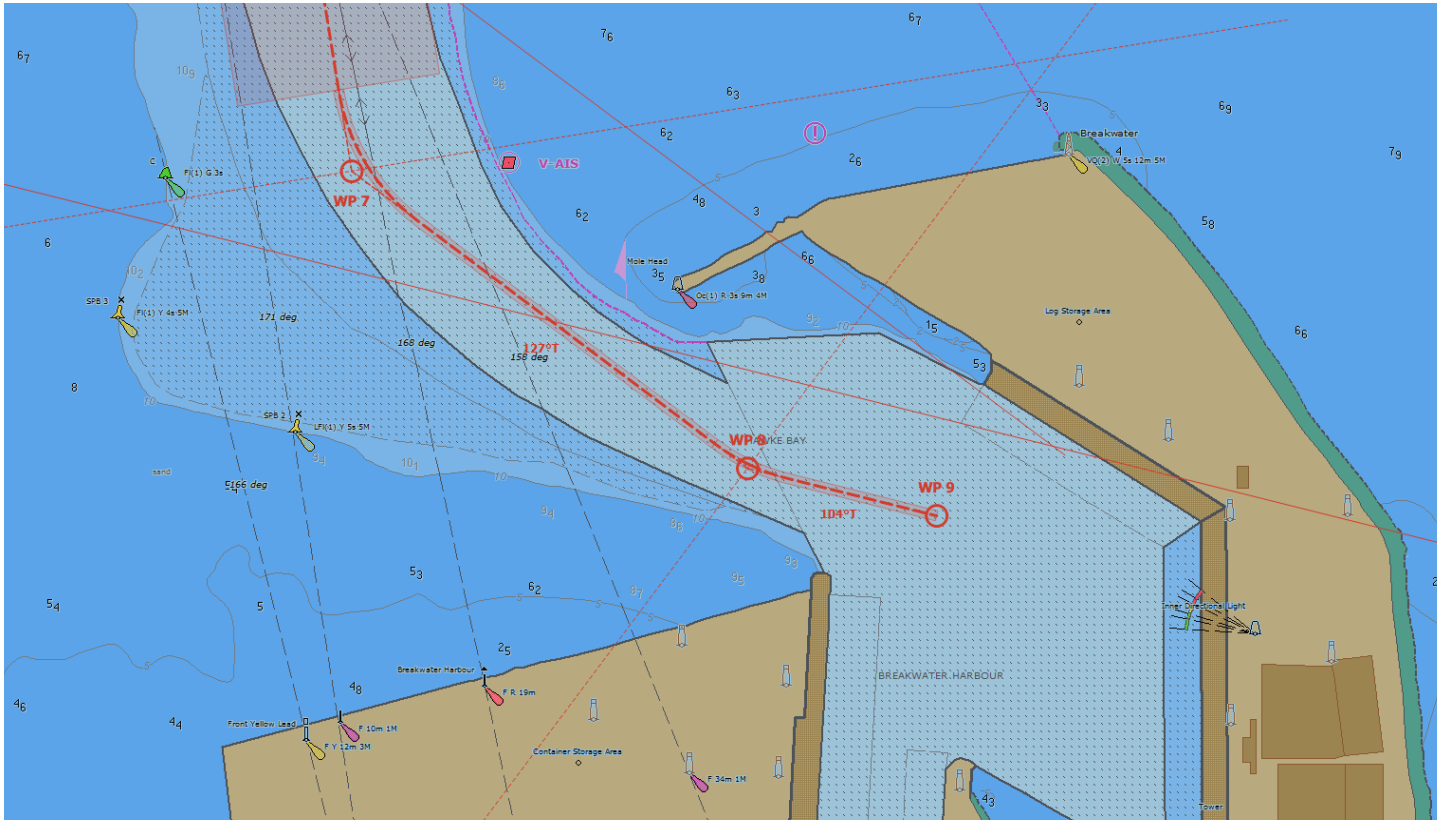


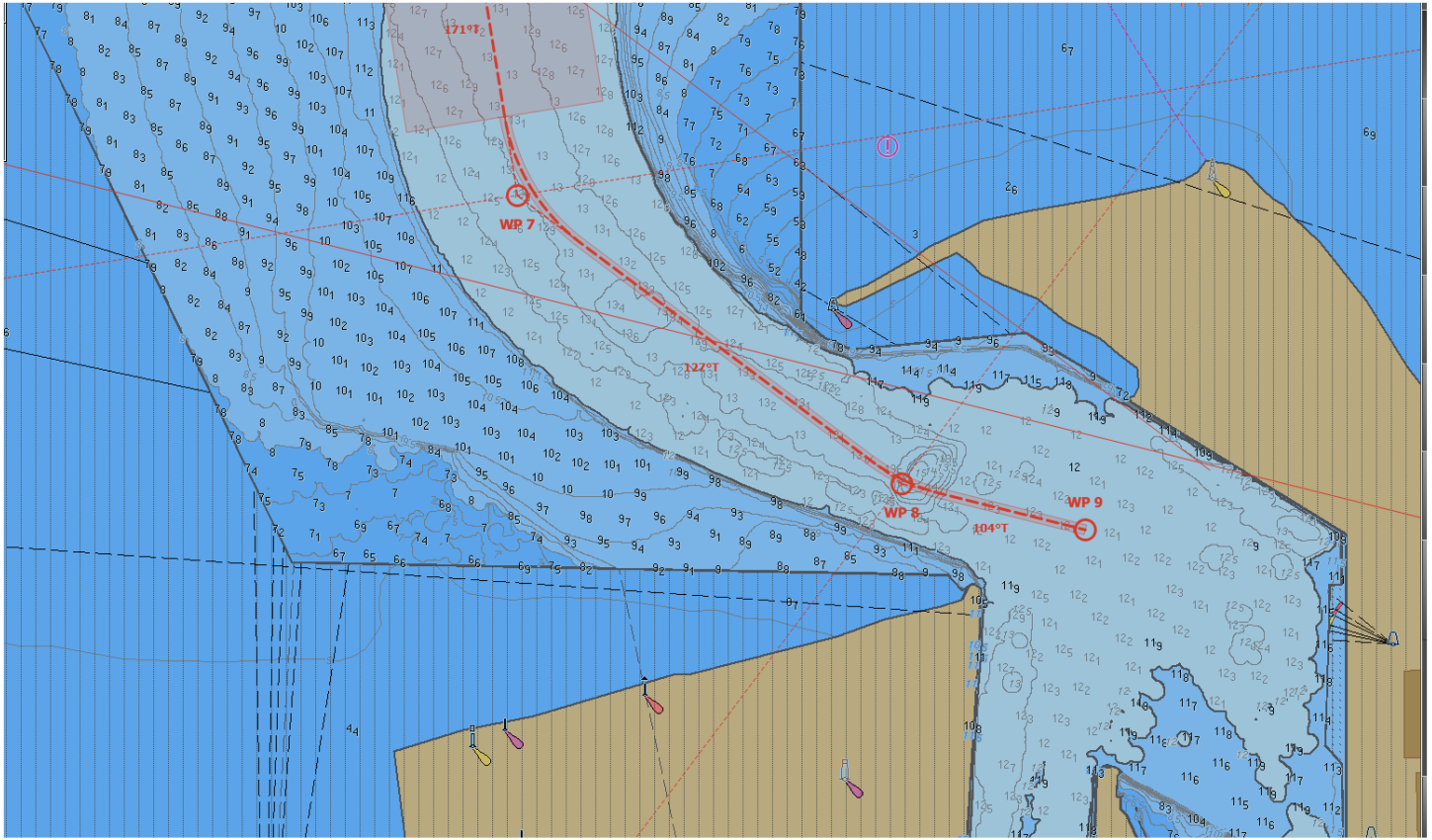
# Proof of concept – Napier (NZ)

- New Band 6 HD ENCs published in 2019
- Port survey area reviewed to match ENC coverage
- Depth contours interval 0.5m
- Spot soundings spacing 30m
- Compilation scale 2500

# Existing ENC Band 6 with dredged areas



# New HD ENC Band 6 without dredged areas

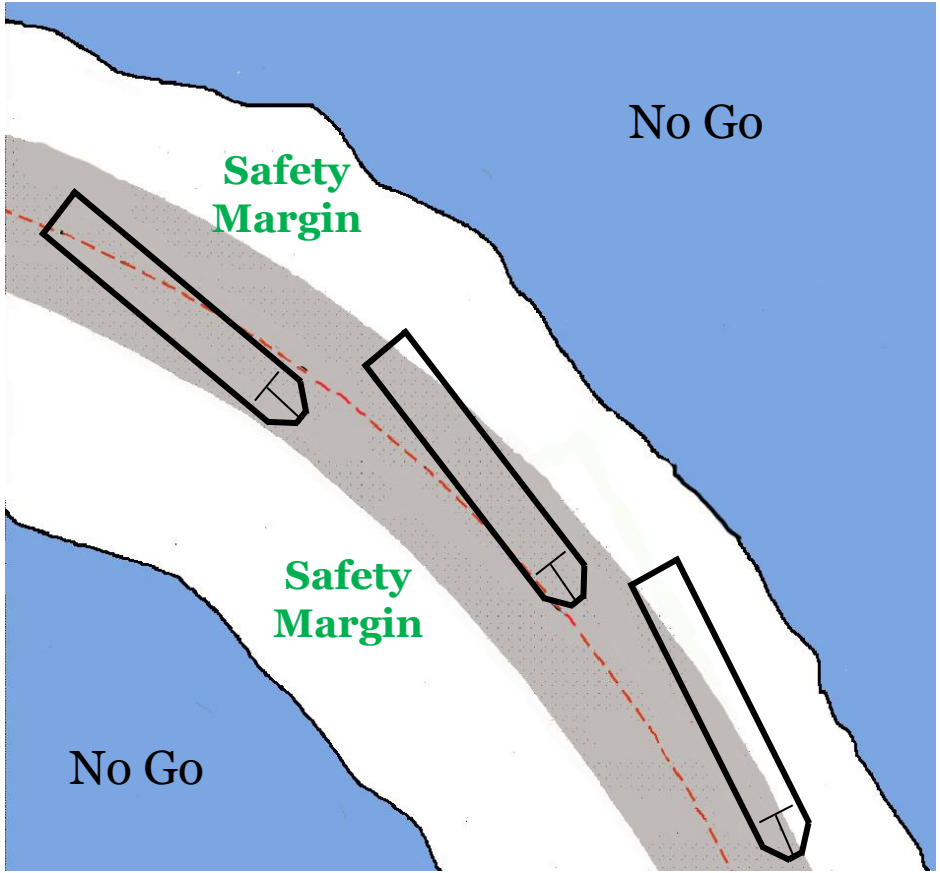


# Window of opportunity to scale up production of HD ENCs

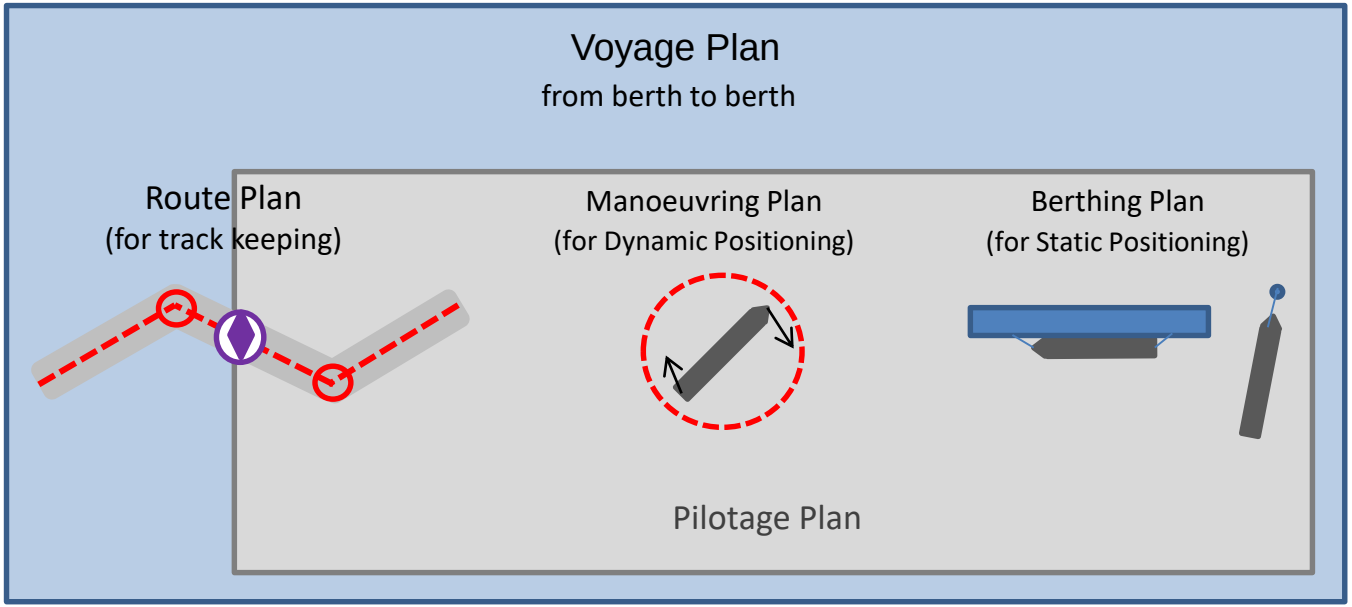
- NZ and AU investigators frustrated with repeat accidents due to:
  - lack of **detailed pilotage plans** and
  - lack of timely interventions of bridge teams

- NZ Transport Accident Investigation Commission (TAIC) **watchlist**
- Australian Transport Safety Board (ATSB) **safety watch**

HD ENCs **enable** more detailed pilotage plans, i.e. that gives a reasonable chance to any bridge team memeber to intervene timely




High Density ENCs enable **higher resolution** and **more accuracy** in the visualization of no go areas and, as a result, of the **safety margin**




HD ENCs enable the creation of pilotage plans
that go **beyond the mere route plan**

# Why are HD ENCs so important for the planning and conduct of vessels in confined waters?

- The first conceptual innovation of High Density ENCs is about giving the possibility to **visualise safety margins with higher resolution** and **better accuracy** than a standard harbour ENC.
- The second conceptual innovation of HD ENCs is about providing more detailed information on depths within navigable areas, which is an important piece of information **to anticipate the effects of hull-seabed interactions.** This was not possible by looking only at harbour ENC's dredged areas derived from paper charts.

- HD ENCs can be used to create **more accurate simulator models for Port feasibility Studies**, thus making them more accurate and robust.

# Why is it so important that HD ENCs become available to both ECDIS and PPUs?

- Because the risk of ever decreasing safety margins to conduct vessels in confined waters requires the **ship's crew to be on the same page with the marine pilot**, especially when safety margins are small.
- Sharing mental models is in fact the essence of **Bridge Resource Management** (BRM), whose ultimate aim is the prevention of accidents caused by intentions and/or actions not challenged in due time or not challenged at all.
- **HD ENCs support one of BRM's essential components**: the implementation of a 'pilotage plan' agreed between the ship's crew and the pilot.

# Key success factors

- The Australian Hydrographic Office and Land Information New Zealand have succeeded in demonstrating that HD ENCs can be created and maintained in S-57 format.
- The challenge ahead is **managing new stakeholder requirements** and **making as much use of cartographic automation** as possible.
- In order to manage stakeholder requirements, cartographers need to understand the demands of navigation in confined water, while users need to understand potential and constraints of existing IHO standards
- In Australia and New Zealand, this **mutual understanding** was promoted during the numerous simulator-based training courses and workshops attended by marine pilots, harbour masters, ship's crew and cartographers.

# Conclusion

Other IHO Member States may benefit from the Australian Hydrographic Office and Land Information New Zealand experience, which demonstrates how HD ENCs

**exceed the mere equivalence to paper charts**

**thus enabling ECDIS to deliver its full potential**