



"Where will our knowledge take you?"

# Sunshine Coast Sediment Transport Pathways

Specks of Sand | 13 May 2017



# Presentation Outline

- Regional sediment transport pathways
- Local sediment budget
- Sand bypassing mechanisms at Point Cartwright



# Regional sediment transport pathways

- Northern NSW rivers have supplied the modern-day (Holocene) sands to SE Queensland beaches and sand islands
- Sand moves in a net northerly direction, approx. 500,000 m<sup>3</sup> annually bypasses the Tweed River Entrance
- The Sunshine Coast is somewhat disconnected from this major sand transport pathway
- Southern Sunshine Coast beaches characterised by a different type of sand (mostly older Pleistocene material)



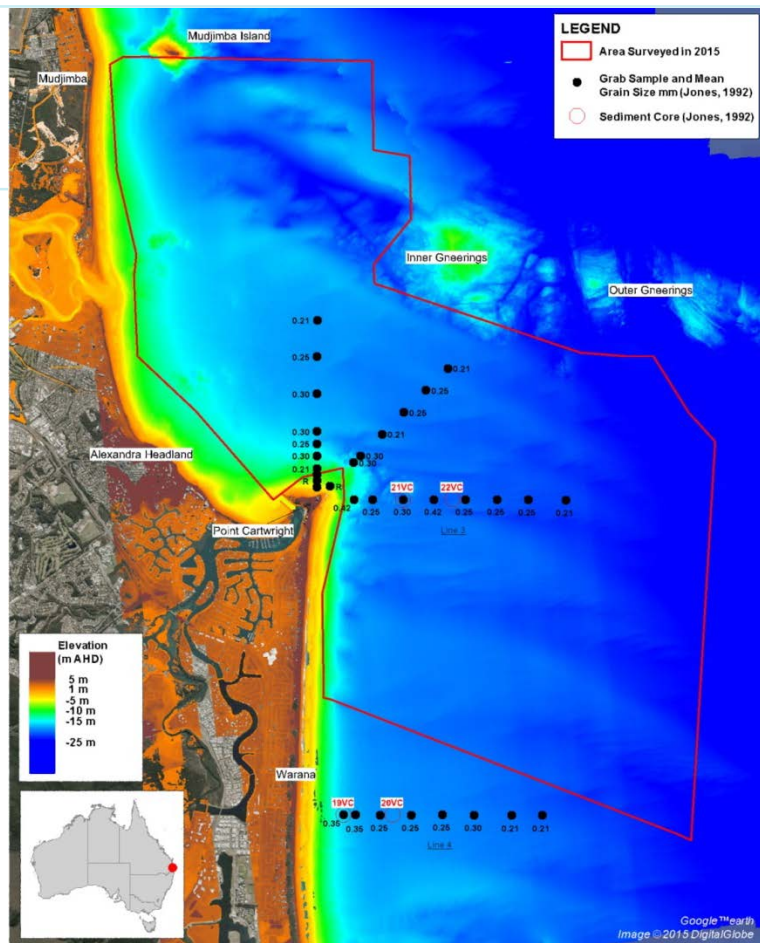
# Regional sediment transport pathways

- The entrance to Moreton Bay accumulates a large volume of sand, only very minor sand transport across the entrance to Caloundra
- Straight coastal alignment, waves arrive with crests parallel to shoreline, low longshore sediment transport rates along southern Sunshine Coast beaches
- Relatively small sediment budget between Caloundra and Point Cartwright, therefore low supply to Mooloolaba Bay and Maroochydore Beach



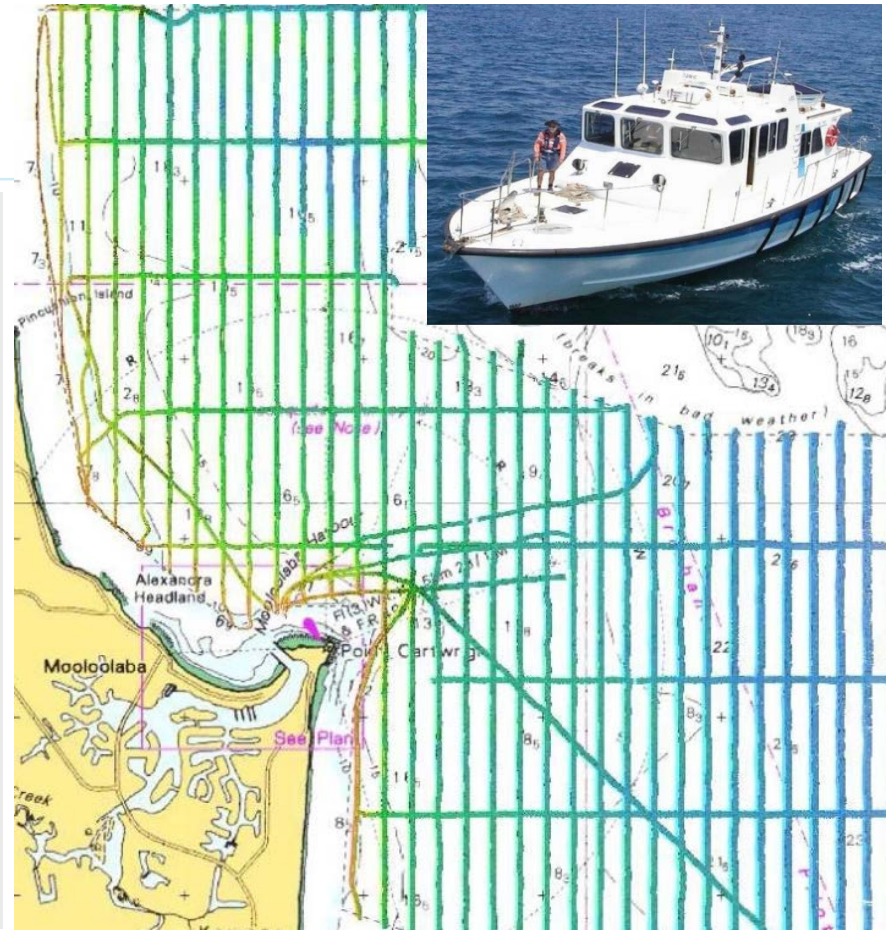
# Local sand budget

- Existing bathymetric LiDAR indicated sandy areas offshore
- Previous sediment coring suggested some areas with deep sand deposits
- Other areas characterised by thin layers of sand above bedrock
- Sub-bottom profiling of offshore area to better understand the volume of local sand deposits



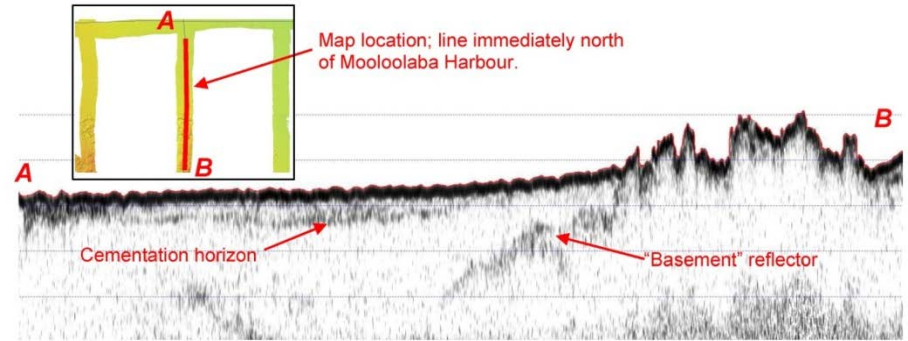
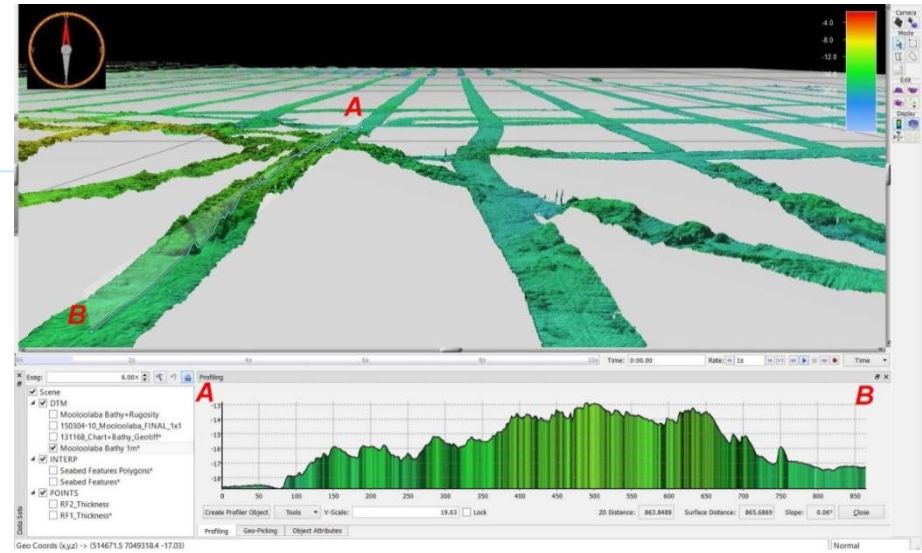
# Sub-bottom profiling

- Work completed by Port of Brisbane (bathymetry) and Acoustic Imaging (sub-bottom profiling) using the Jim Peel survey vessel
- 100% bed coverage not required (and expensive!), lines at approximately 200 m spacing considered suitable
- Sub-bottom profiling able to penetrate sand deposits up to 9 m thick



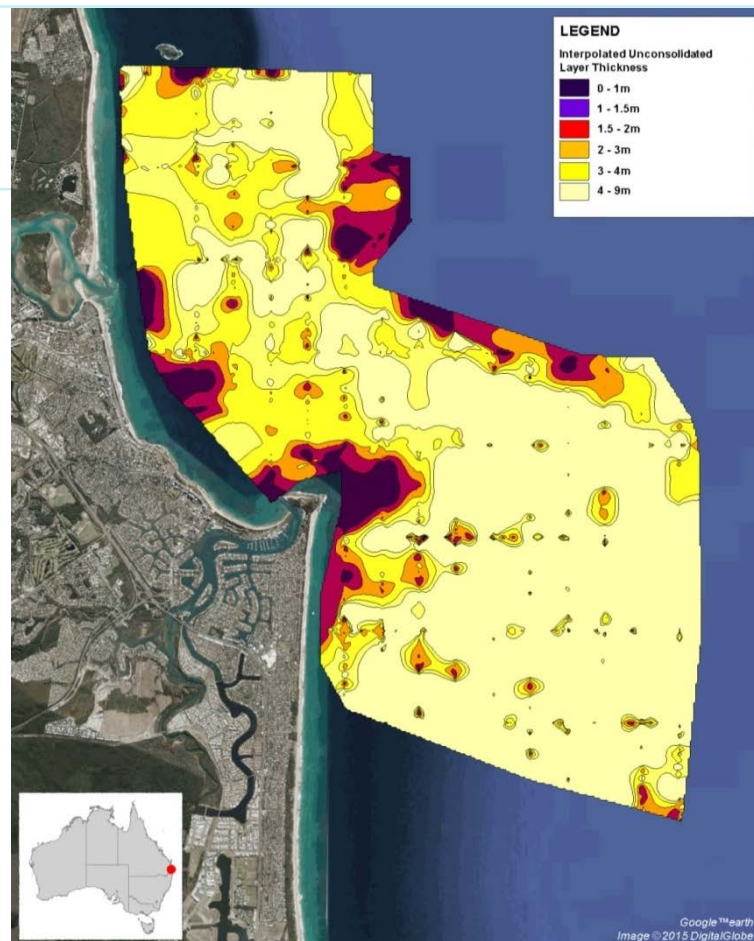
# Sub-bottom profiling

- Bathymetric survey provides details of bed surface
- Able to infer the sand layer thickness based on identification of the “Basement” reflector
- If the Basement reflector signature is not detected sand layer thickness assumed to be >9 m



# Sand layer thickness

- Sub-bottom survey results mapped
- Significant sand deposits throughout the southern half of the survey area (>9 m in many locations)
- Generally thin layer of sand (0-3 m thickness) over rock north of Point Cartwright



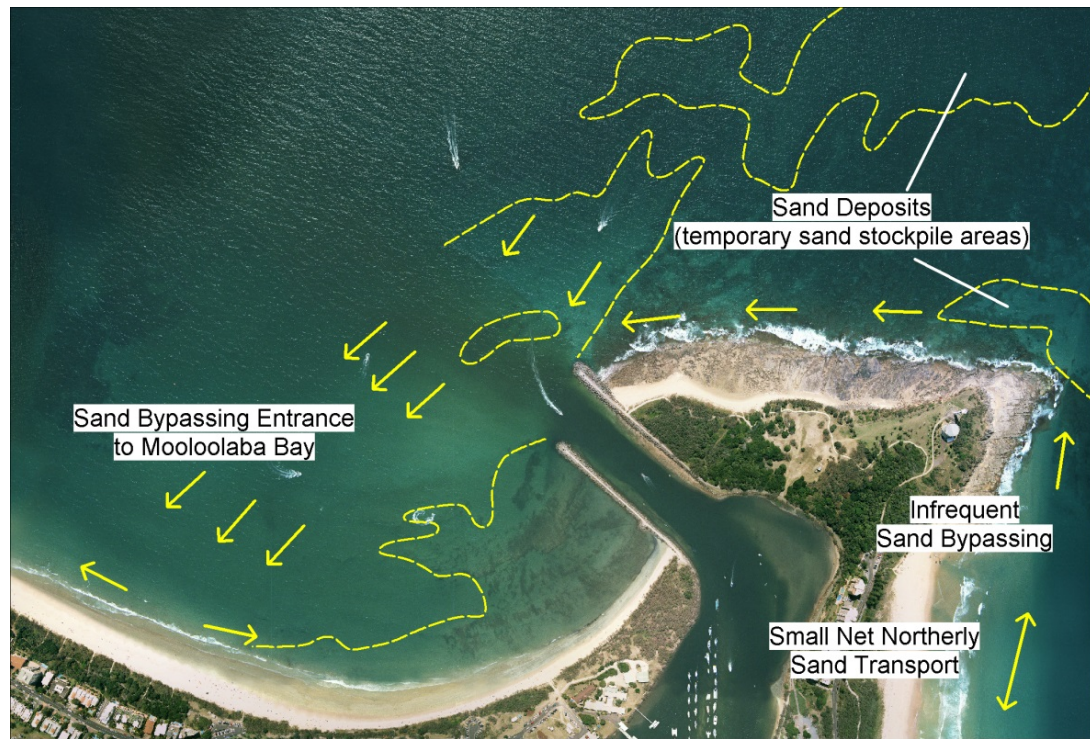
# Why is Council interested in potential offshore sand deposits?

- Beach nourishment is the preferred erosion mitigation strategy – however viable sand sources are limited
- A healthy beach can response to erosion events
- Sunshine Coast recreational, social and economic values dependent on access to healthy beaches
- Proven benefit, delays the need for hard structures

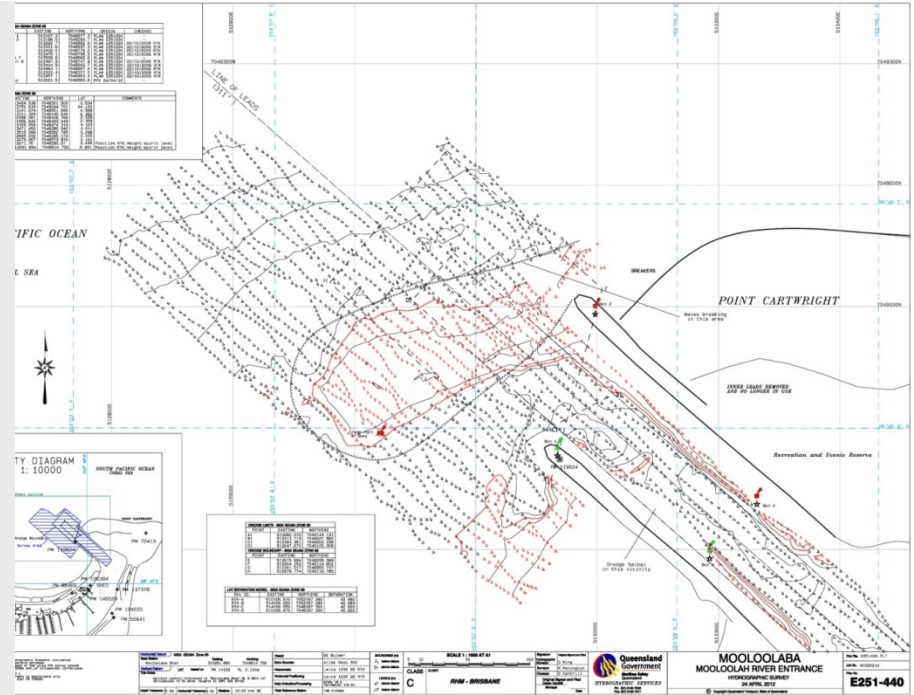


# Point Cartwright & Mooloolaba Harbour Entrance

- Managed by the Queensland Department of Transport and Main Roads (TMR)
- Ongoing monitoring of waves and entrance condition to ensure safe navigation
- Periodic entrance shoaling requires maintenance dredging



# Persistent shoaling event 2011-2013

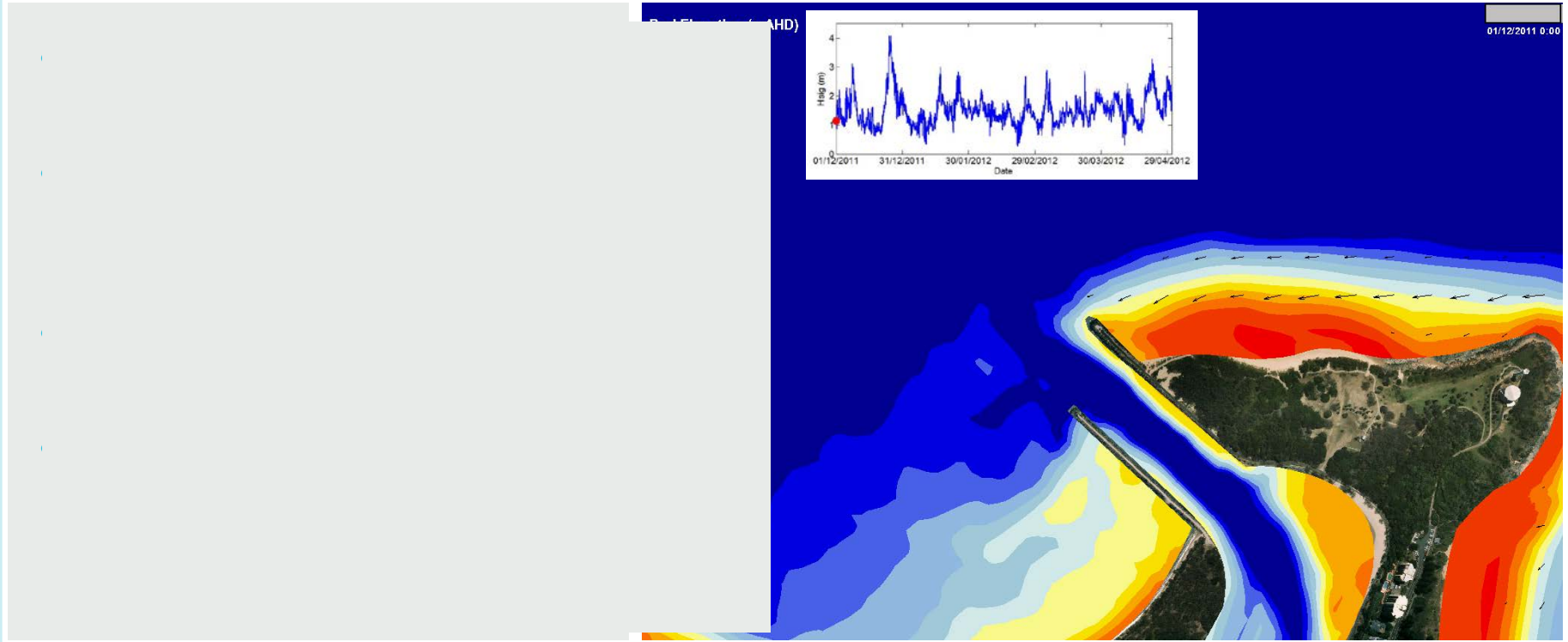


# Detailed assessment of persistent shoaling event

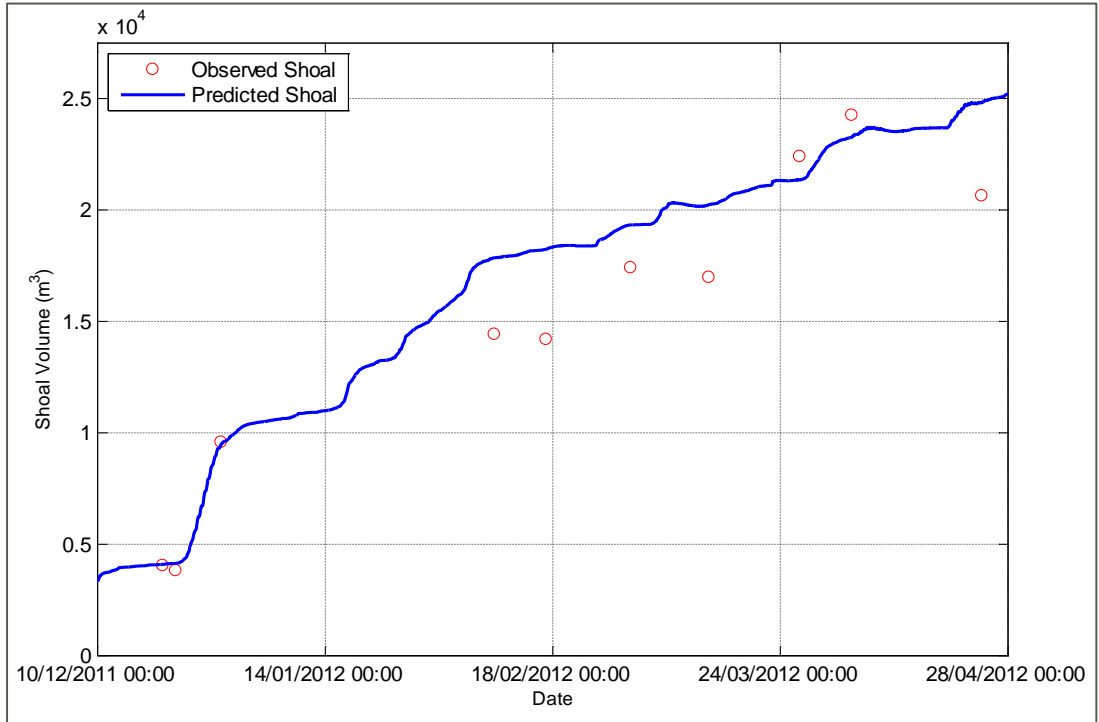
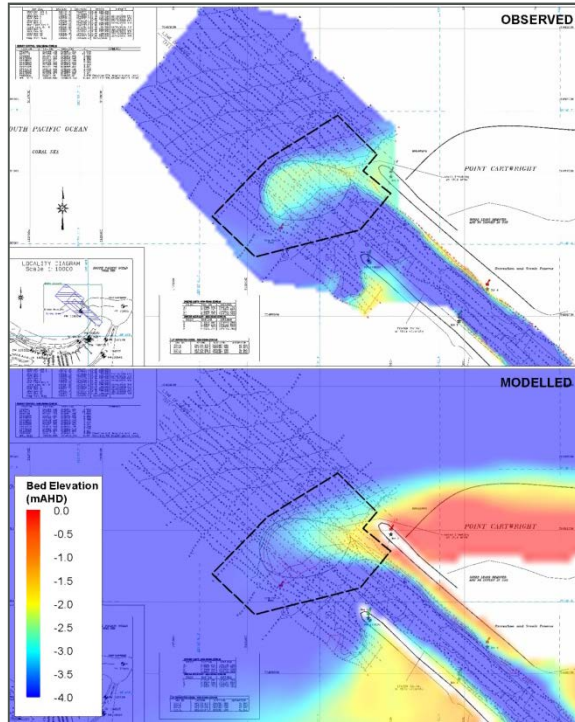
oke Island & Mooloolaba)  
ng “normal” conditions

**ays of the 2011-2013 shoal evolution**

# Design Shoal Event Simulation



# Persistent Shoal Event Model Validation



# What do we know about sand bypassing at Point Cartwright?

- Sand deposits stockpile to the north and north-east of Point Cartwright
- Under certain wave conditions 'sand slugs' can move toward the entrance
- Training of the Mooloolah River Entrance occurred in 1968/69
- Since this time the entrance has experienced episodic shoaling, notable events in the early 1970s, 1985-1987, 1996, 2003-2004, 2008 and 2011-2013
- Approximately 200,000 m<sup>3</sup> of sand moved past the entrance 2011-2013, however annual net northerly longshore transport rates as low as 10,000 m<sup>3</sup>/year known to occur

# Maroochydore Beach erosion

- Extended periods without shoaling at Mooloolaba indicates reduced northerly longshore transport rates
- Periods of low transport rates can lead to severe erosion at Maroochydore Beach
- Sometimes maintenance is needed to maintain a healthy beach system



# Maintaining Maroochydore Beach

- Maroochydore Beach Nourishment Project:
  - 125,000 m<sup>3</sup> in 2013
  - 75,000 m<sup>3</sup> in 2015
  - 20,000 m<sup>3</sup> 'top-up' in 2016
- Lower Maroochy River sand borrow area infills at a rate of 50,000 m<sup>3</sup>/year, insufficient sand source over the long term
- Sunshine Coast likely to need additional sand sources to mitigate erosion associated with sea level rise



## Take home messages...

- Sunshine Coast longshore sediment transport rates much smaller than Gold Coast
- Much of the nearshore area is characterised by a thin layer of sand over rock
- Point Cartwright is a major 'control', annual volumes bypassing the headland can fluctuate significantly (between 10,000 and 200,000 m<sup>3</sup>/year)
- Erosion at Mooloolaba and Maroochydore linked to bypassing at Point Cartwright
- Beach nourishment is the preferred erosion mitigation strategy, but known sand sources are limited



"Where will our knowledge take you?"

**Thank you**

**Dr Matthew Barnes**

Senior Coastal Engineer

[matthew.barnes@bmtwbm.com.au](mailto:matthew.barnes@bmtwbm.com.au)