Palm Beach Shoreline Project: Monitoring of Success 5 years on

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QCoast2100 Knowledge Sharing Forum 2025

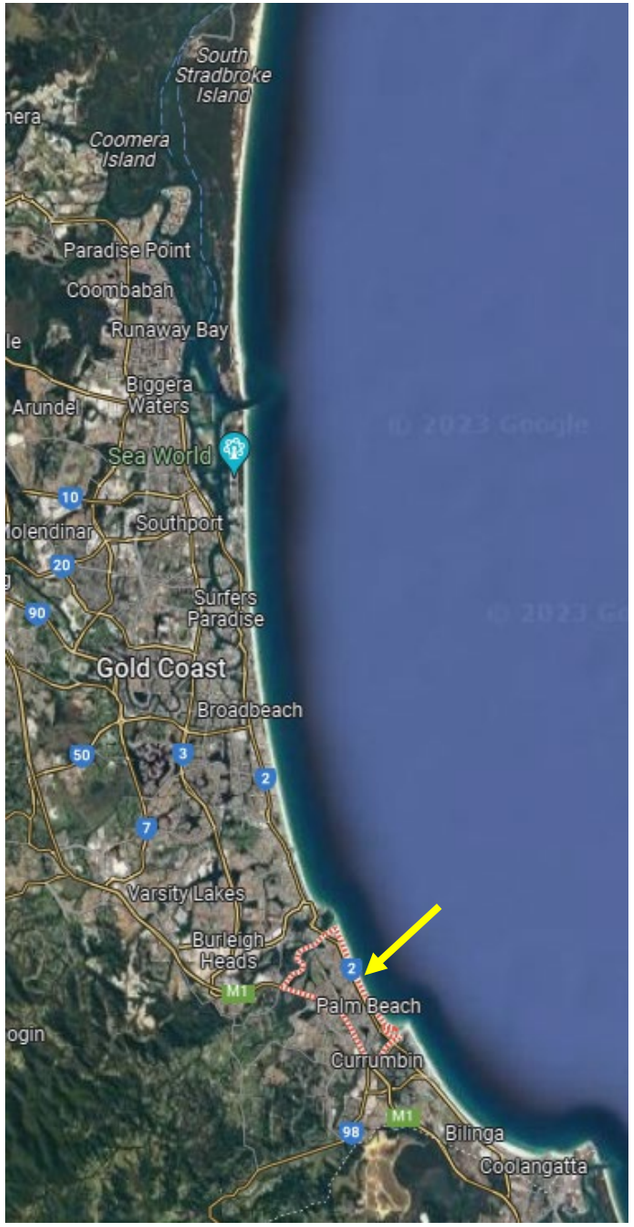
CITY OF GOLDCOAST.™

Presentation Outline

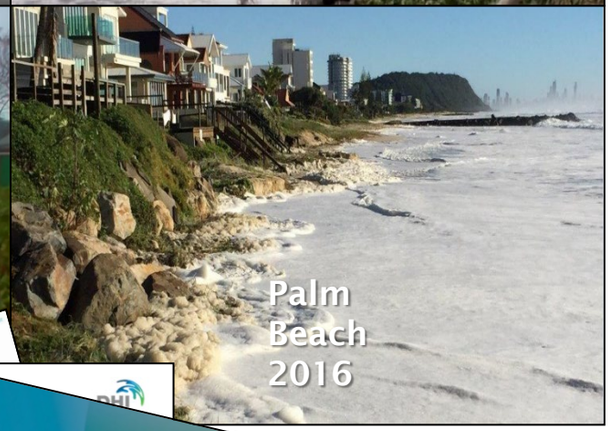
- Project Background
- Key Performance Indicators
- Coastal Protection
- Amenity
- Safety
- Environment
- Maintenance Costs
- Wave Dissipation (not KPI)
- PBSP in Reality

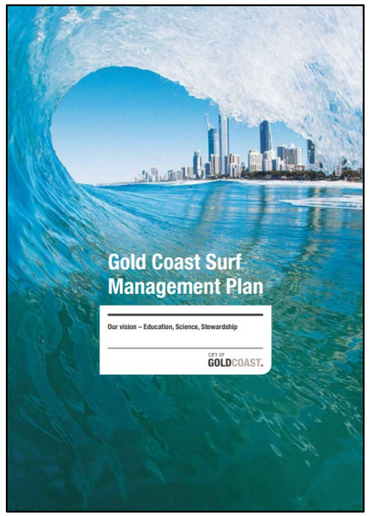
Out of scope – TC Alfred results, project design and construction and during-construction KPIs

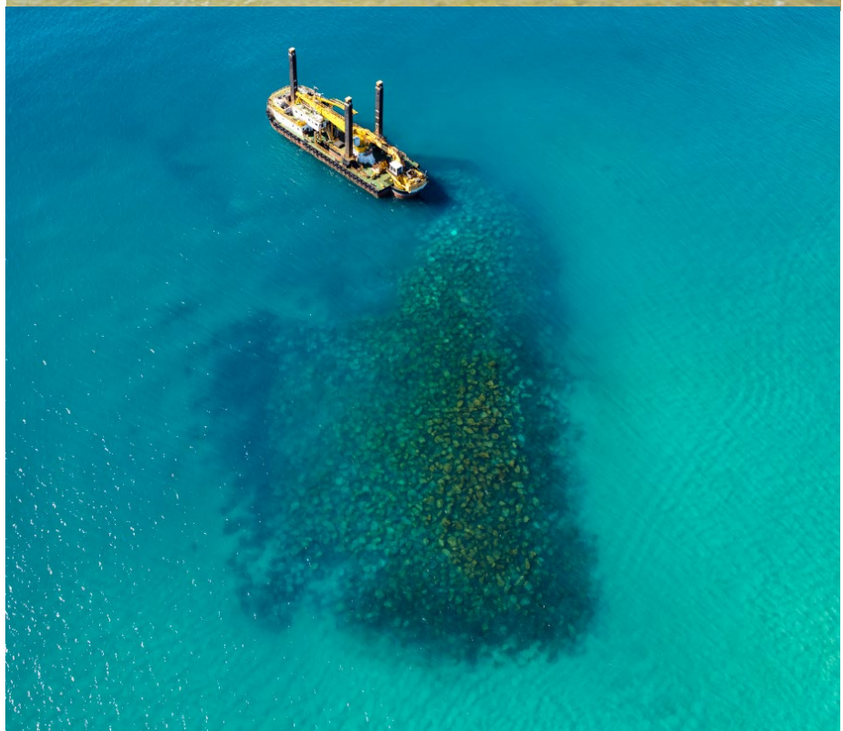
Palm Beach locality



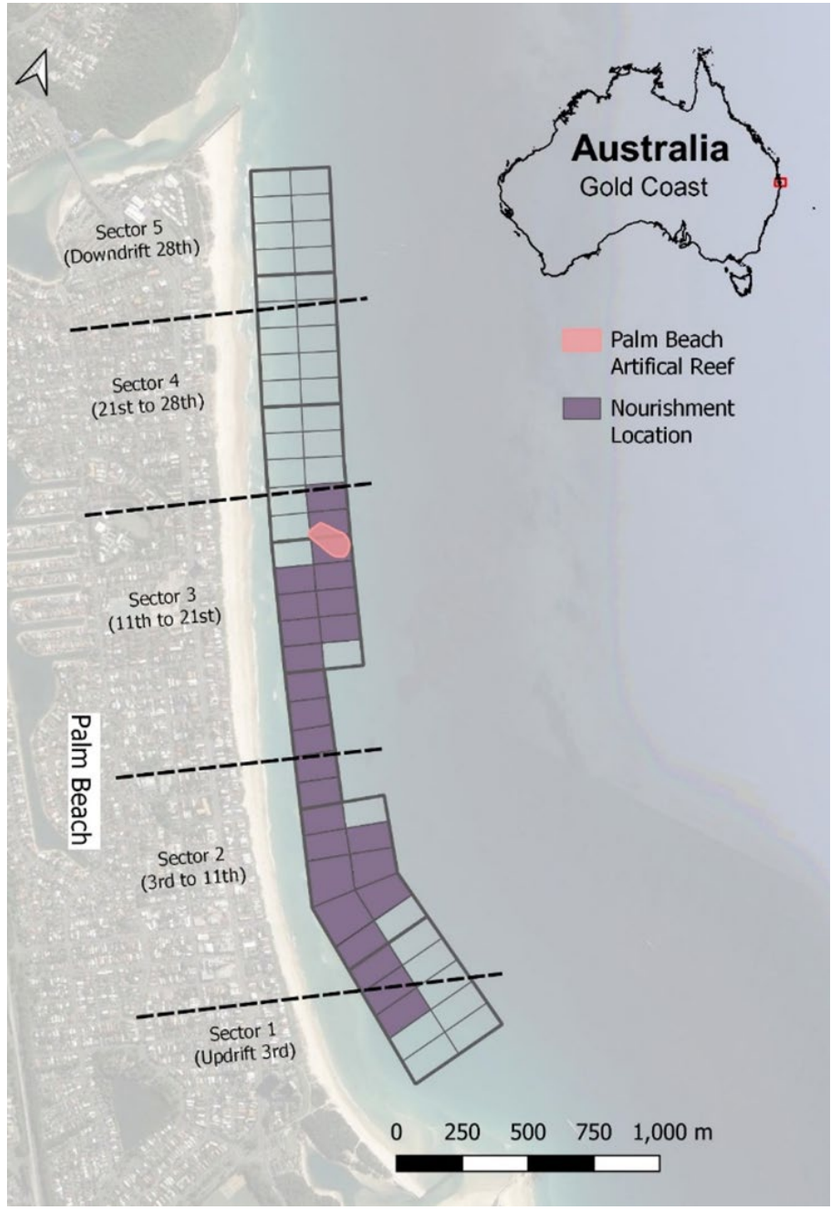
Project Background







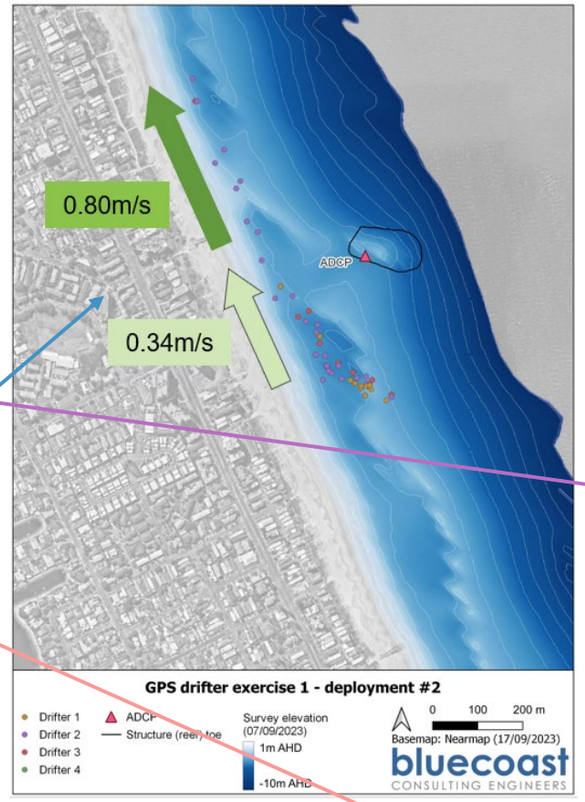
Key Performance Indicators

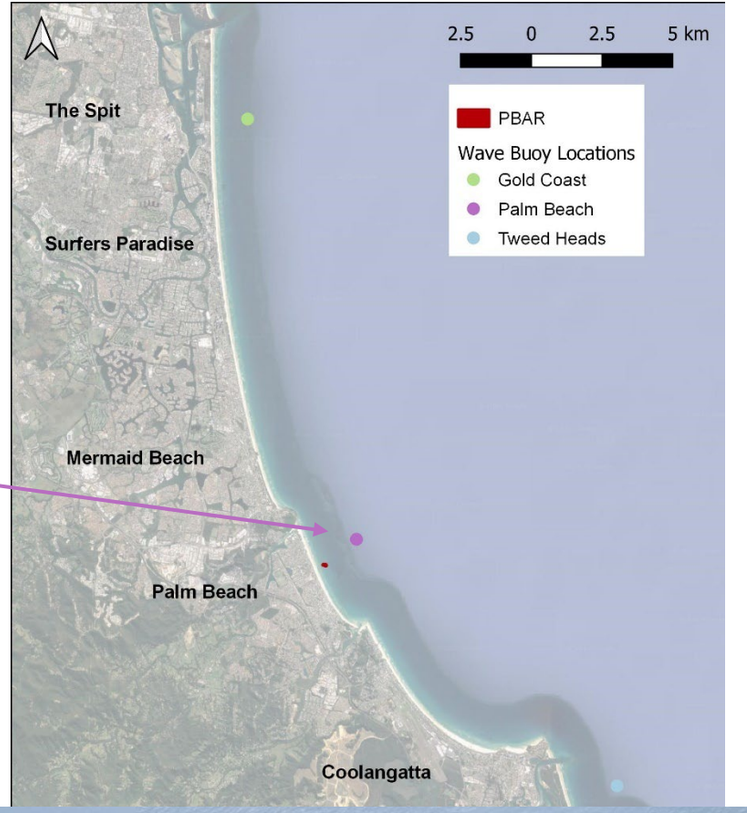


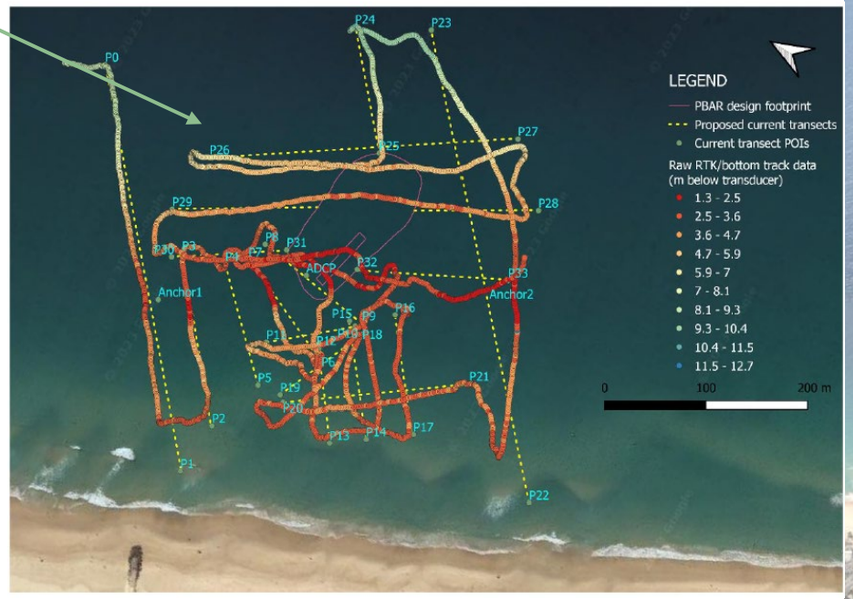
Key Result Area	Key Performance Indicators	Target
Coastal Protection ✓		
Amenity ✓		
Maintenance Costs ✓		
Safety ✓		
Environment ✓		

Monitoring Program

- 35 hydrographic surveys (50 profile lines spaced 50m apart over the reef)
- 7 years of wave data at the Palm Beach wave buoy implemented pre project (2017)
- 2x ACDP deployments (currents and waves):
  - 22/11/2022 to 24/12/2022 period (33 days)
  - 12/10/2023 to 14/11/2023 period (33 days)
- 1x RBR TGR-1050 pressure transducer deployed from 15/05/2024 to 14/06/2024 period (30 days)
- Current Transects
- Monthly Aerial Imagery
- WRL Camera Network
- GPS Drifter (four exercises)
- Drone Data
- Satellite derived shoreline data
- Surf Pocket Tracking Data
- Structural Inspections
- Surf Safety Data





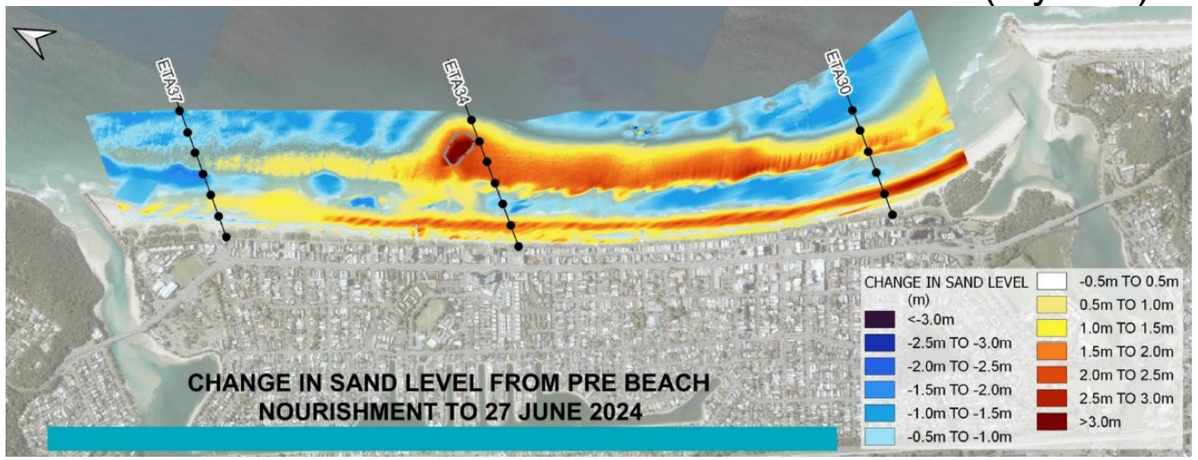


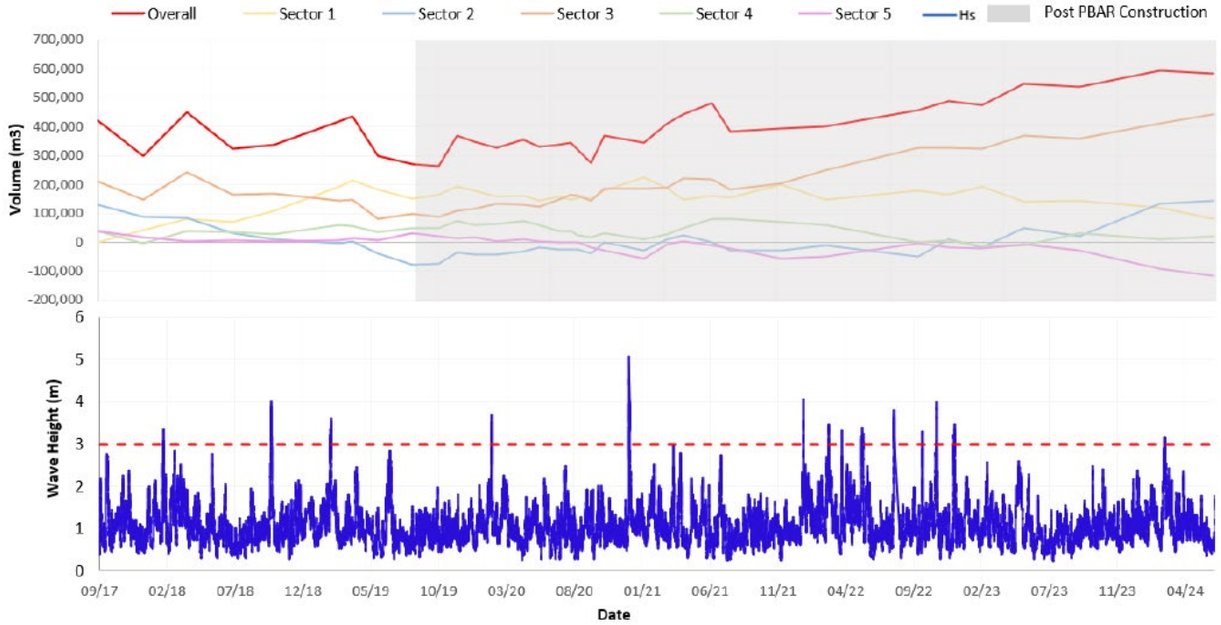
Coastal Protection

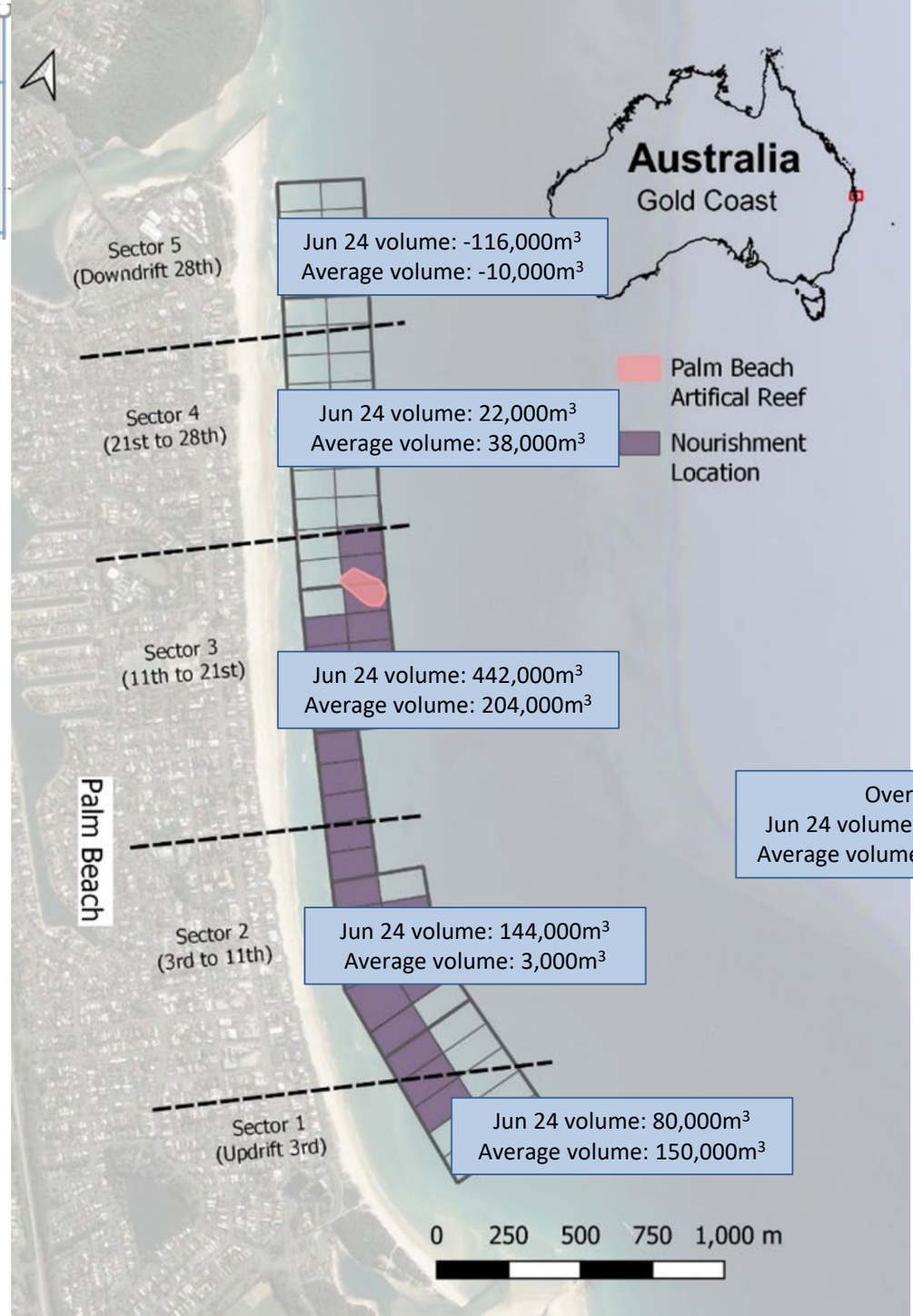
Beach Volume

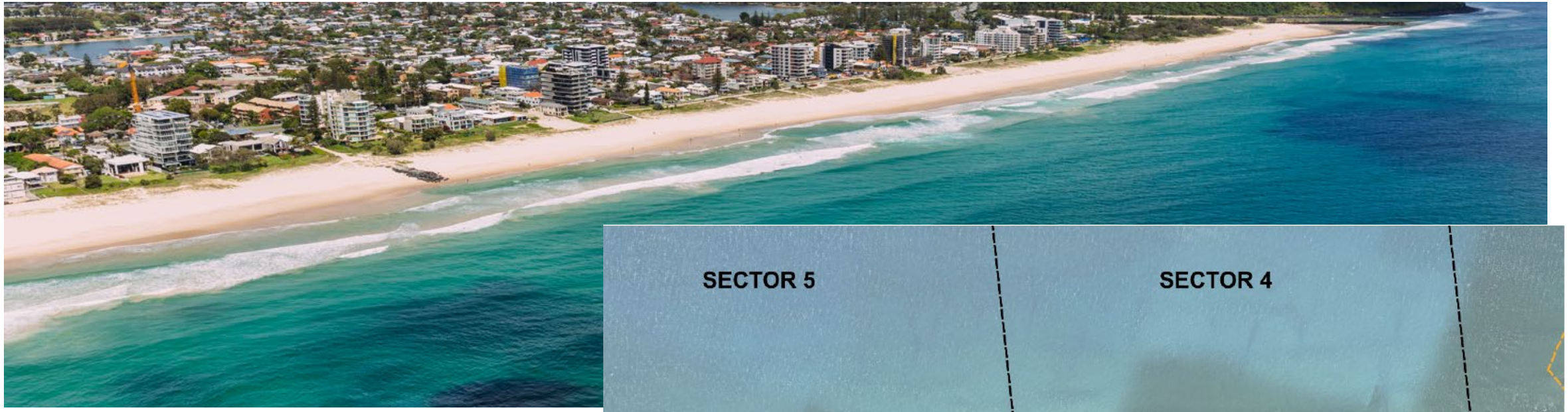
Key Performance Indicator	Target
Sustained increase in beach volume to act as a buffer against storm erosion	Overall sustained increase in beach volume of at least 300,000 cubic metres above pre-project levels

Volumetric difference between June 17 – June 24 (7 years)





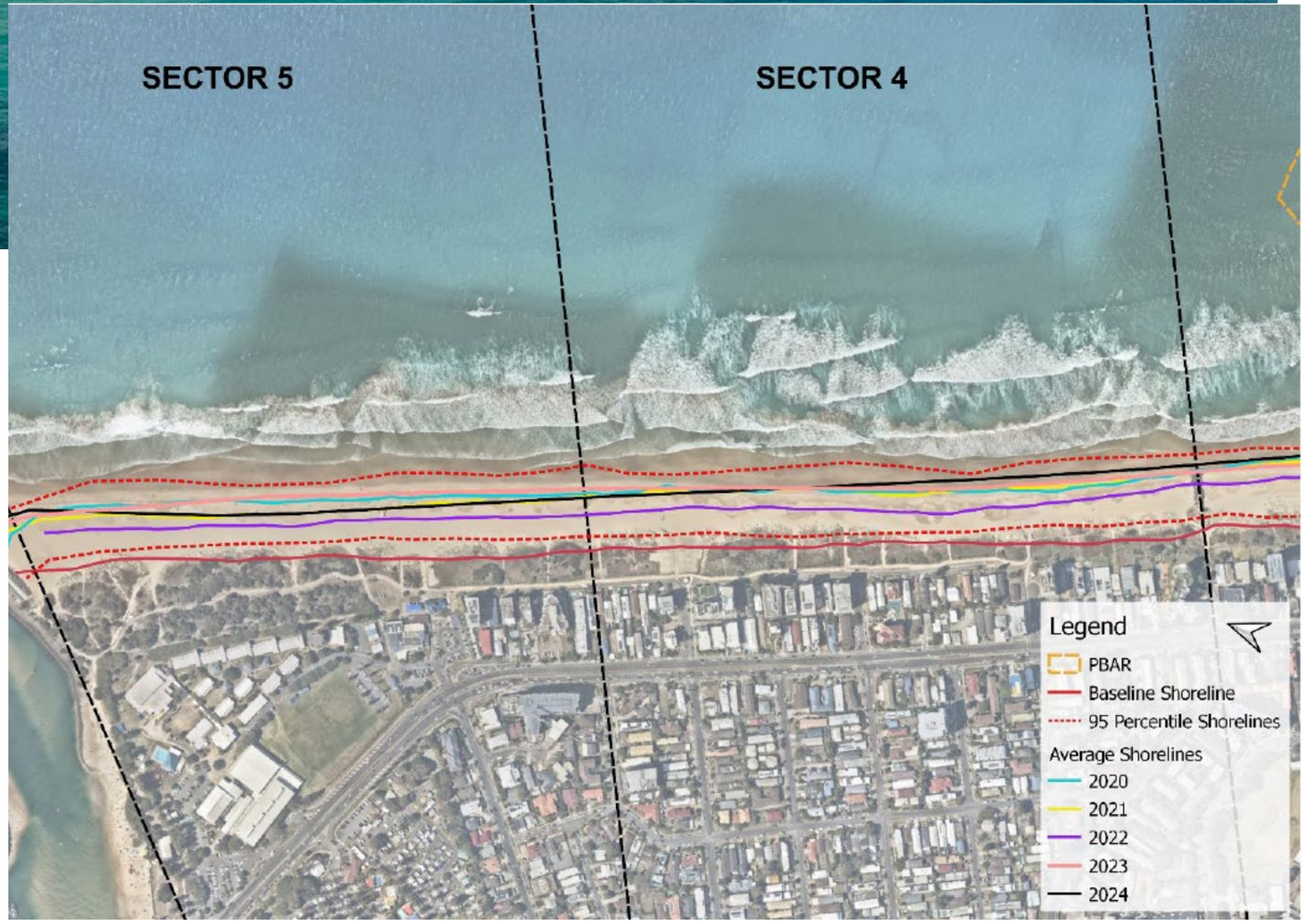




Coastal Protection

Downdrift Impacts

Key Performance Indicator	Target
No unacceptable downdrift impacts	Downdrift shoreline adjustment within the range of natural shoreline variability in historical record

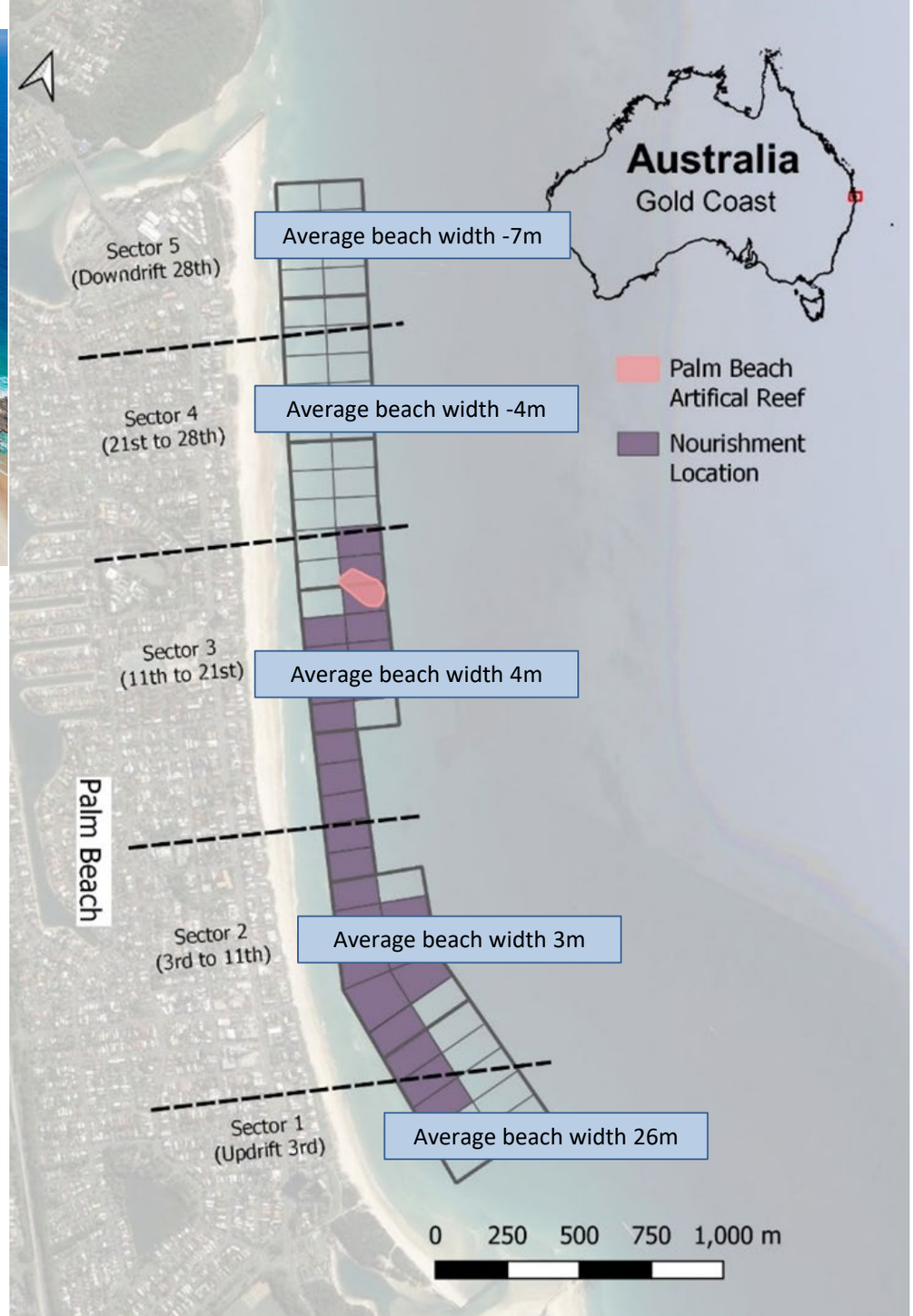


Amenity

Beach Width

Key Performance Indicator	Target
Maintain or improve beach amenity	Useable beach width maintained or increased compared to pre-project levels

Beach Sector	Baseline Beach Width (m)	Average beach Width since June 2017 (m)	Average beach width change (m)
1	107	133	26
2	67	70	3
3	81	83	4
4	103	99	-4
5	148	141	-7
Overall	101	105	4



Amenity

Surf Amenity

Key Performance Indicator	Target
Increase in rideable waves in the area of the artificial reef	The artificial reef to produce a rideable wave on a regular basis
No negative impact on surfing conditions in the lee of the artificial reef	No reduction in number of rideable waves in the lee of the artificial reef

Average surf metrics between October 2020-March 2021

Location	Artificial reef	Lee of artificial reef
Surfable waves (%)	30	82
Surfable days per week	2.1	5.7
Avg. ride duration (s)	6.9	5.2
Avg. ride length (m)	35	16
Avg. ride speed (m/s)	5	3

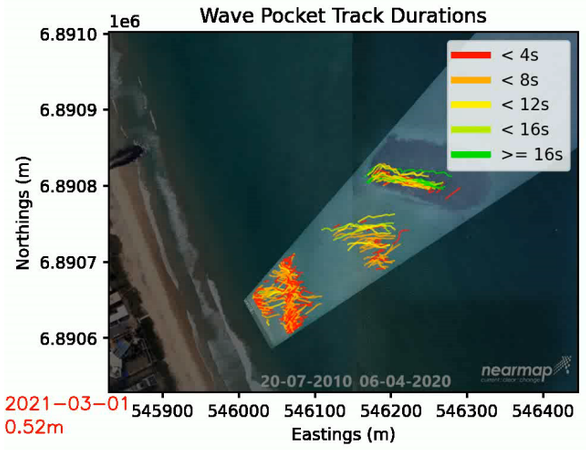


Image Source: Bluecoast Consulting Engineers

Video footage source: Andrew Shield

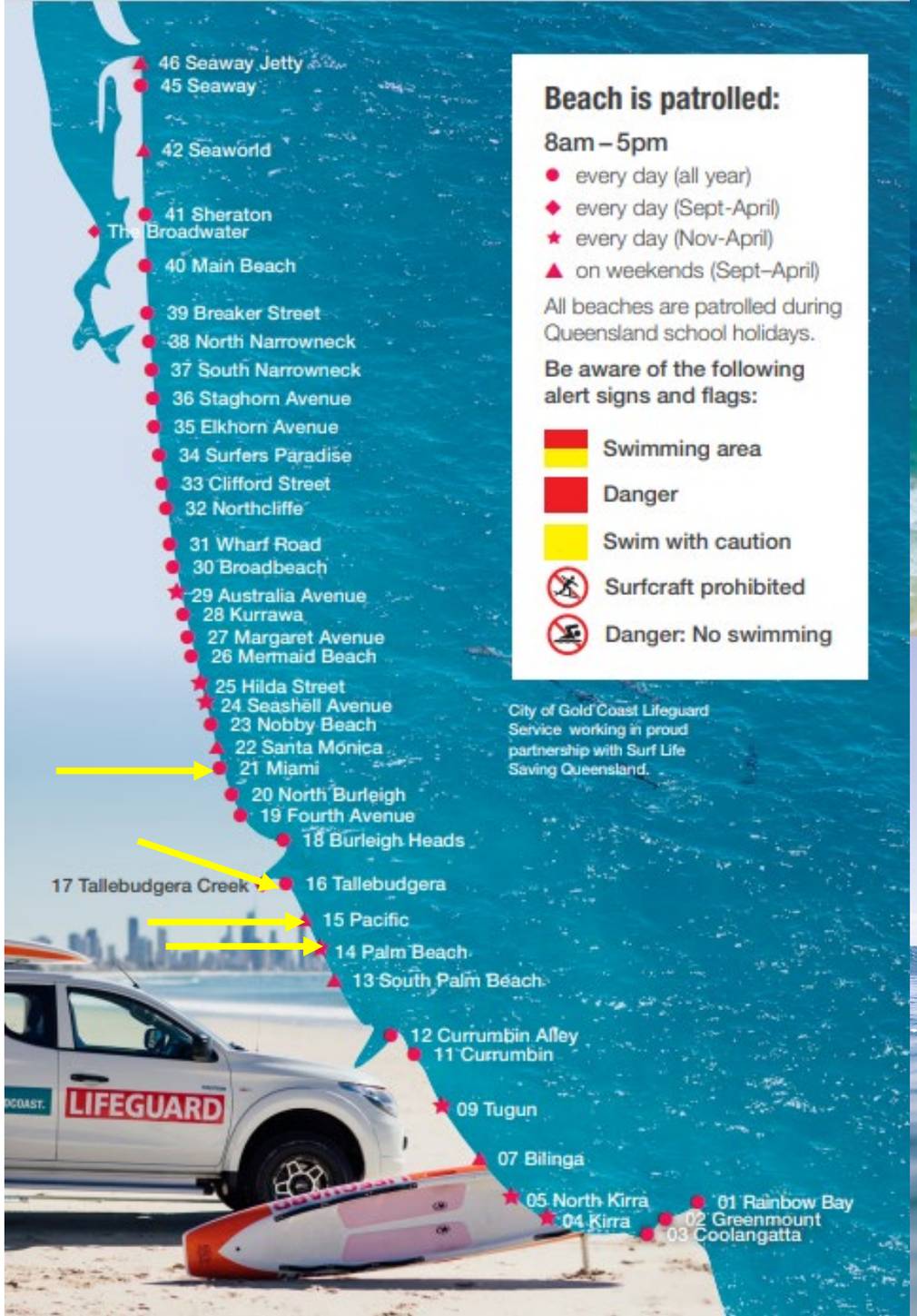
Safety

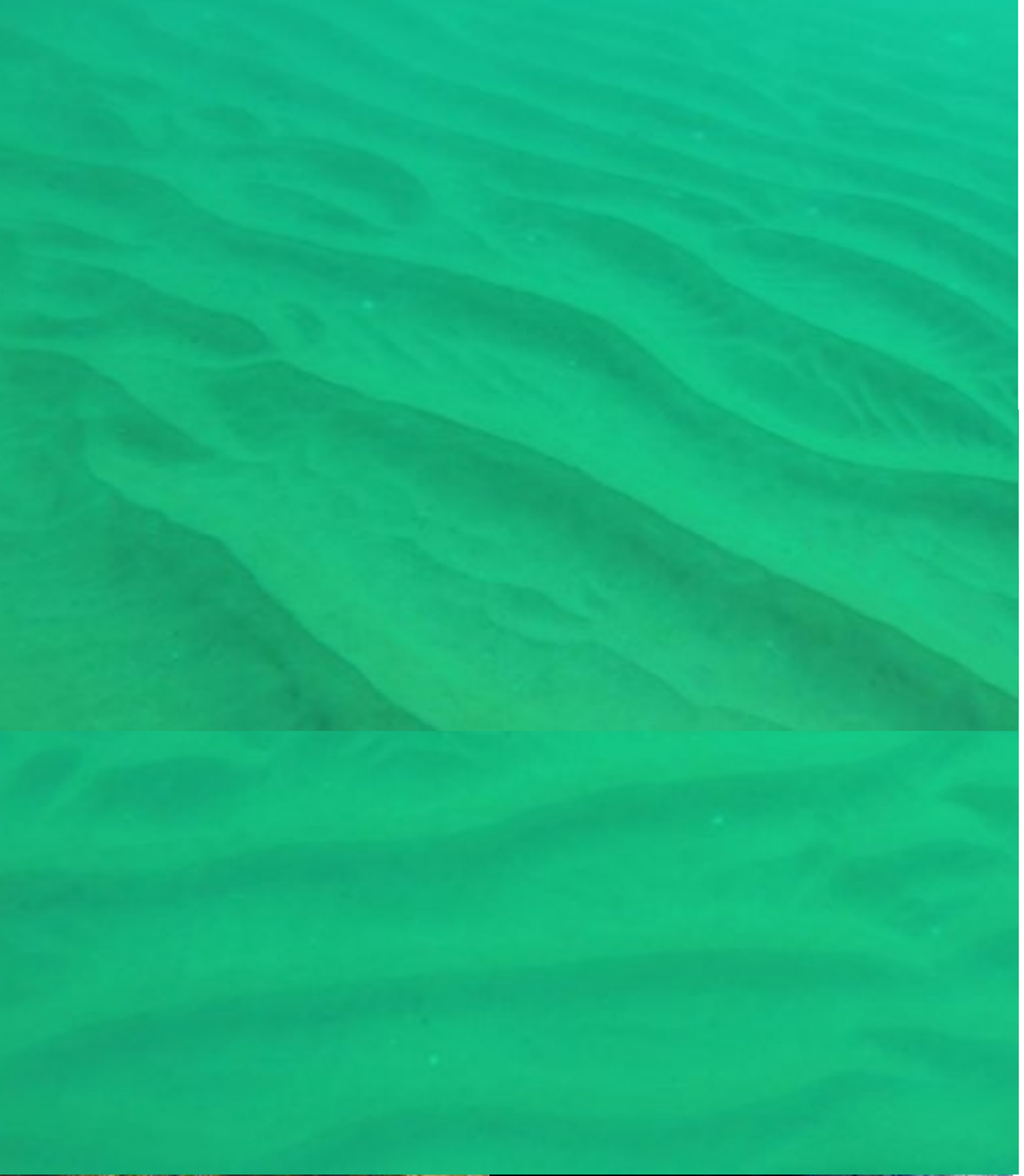
Swimmer

Key Performance Indicator	Target
For swimmer safety, rip currents generated over the artificial reef should not occur 200m from the shore.	Reportable Safety Incident Frequency Rate consistent with other beach areas on the Gold Coast

Surfer

Key Performance Indicator	Target
Wave breaking characteristics over the artificial reef and the surface of the artificial reef to be consistent with surfing safety at nearby surf breaks.	Reportable Safety Incident Frequency Rate consistent with nearby surf breaks





Environment

Key Performance Indicator	Target
Increase in the abundance and diversity of marine life in the local area of the artificial reef	is an ecological community consistent with that on the nearby Palm Beach Natural Reef having regard to differences such as water depths

- Seaweed
- Common invertebrates – sea squirts, feather stars
- Schools of fish – yellow-tail scad, eastern promfish, bream, trevally, snapper
- Sea turtles

Environmental conditions occurring at this shallow artificial reef may ultimately influence the composition of the reef community, but it is expected that the marine flora and fauna on the artificial reef will become more similar over time to the nearby natural reef

Maintenance Costs

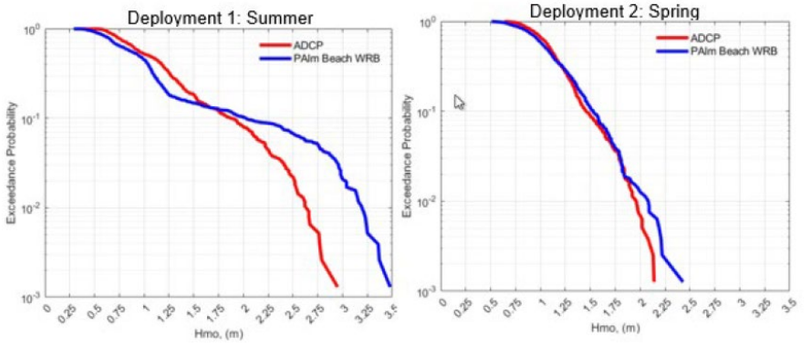
Key Performance Indicator	Target
Minimise maintenance costs	Average annual maintenance costs to be less than one percent of the total outturn cost

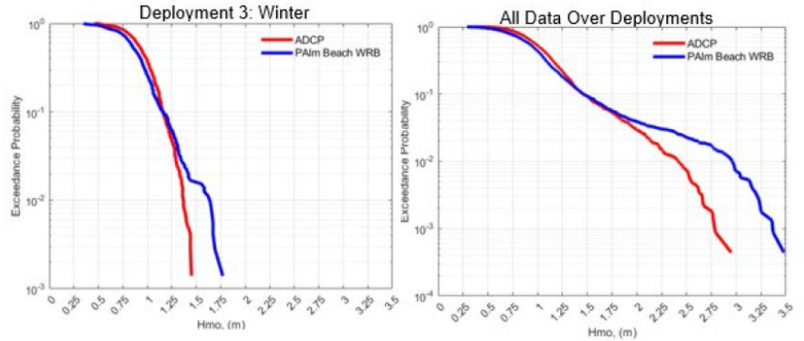
- Palm Beach artificial Reef is within all the pre-defined limits for safety and structural integrity
- The condition of the artificial reef is comparable to the ‘as constructed’ RPEQ certification report
- No maintenance works are required.

Wave Dissipation

Wave Height Observations Over the PBAR

- Wave heights over the PBAR are generally higher than at the Palm Beach WRB due to shoaling.
- During major swell events, wave heights drop as they move across the PBAR:
  - Average reduction: **17% (0.3m)**
  - Maximum reduction: **49% (1.71m)**
- When offshore waves are **below 1.5m**, wave heights **increase** over the PBAR
- When offshore waves are **above 1.5m**, wave heights **decrease** significantly over the PBAR





TC Alfred – PBSP in Reality

10th March 2025 (3 days post TC Alfred)

22nd April 2025 (43 days post TC Alfred)

https://search.informit.org/doi/pdf/10.3316/informit.477104508283653 (KPI's)
https://icce-ojs-tamu.tdl.org/icce/article/view/13024 (planning design and construction)

Acknowledgments

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Reef Check Australia

Questions