

NARROWNECK REEF MONITORING AND LESSONS – 10 YEARS ON

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In response to the increasing occurrences of beach erosion along Surfers Paradise and Main Beaches, the Northern Gold Coast Beach Protection Strategy [NGCBPS] was developed. The primary objective of this strategy was to widen the beach and dunes to provide an increased storm buffer. The second objective was to improve the surfing conditions at this location.

The NGCBPS incorporated a large artificial reef to provide a coastal control point for extensive beach nourishment and to enhance surfing locally. The works incorporated extensive monitoring, including: video imaging; hydrographic and beach surveys; aerial and oblique photography; surf observations; GPS surfing track plots; and dive inspections.

Visual observations clearly show that while erosion had been a recurring problem in the past, there is now a much wider beach and storm erosion to date has easily been contained within the wider beaches. A clear salient feature was predicted and is often visible in the lee of the reef. However, these features are not always evident.

Analysis of video imaging by WRL showed that the beaches continue to experience the high variability [$\pm 20\text{m}$] that is typical of Gold Coast beaches. Full analysis shows that the salient is $\sim 100\text{m}$ north of the reef centreline and up to 30m in width with a secondary groyne effect of $\sim 10\text{m}$ that has little impact on littoral transport. It has been noted that longer-term beach changes corresponding to the groyne effect are of less importance than the shorter-term storm erosion.

In terms of surfing, the reef provides improved surfing conditions for a wide range of surf craft. Records show that waves break on the reef for wave heights over $0.7 - 2.0\text{m}$, depending on the tide. WRL coastal imaging cameras were used to establish the frequency with which waves break on the reef. From this analysis, it was determined that waves were breaking $\sim 50\%$ of the time.

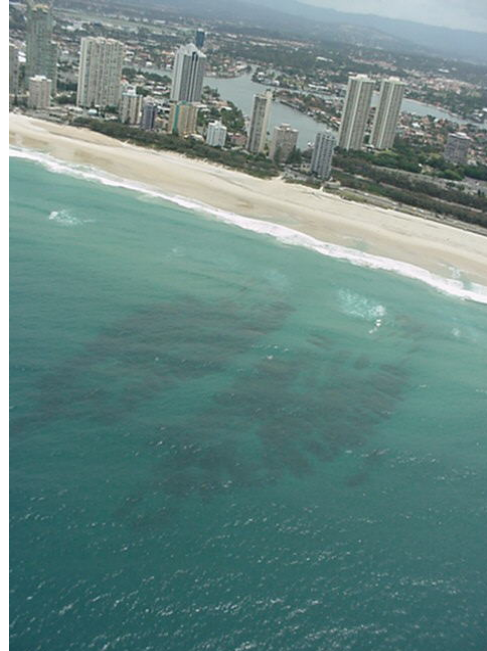


Figure 1: Aerial of Narrowneck Artificial Reef

WRL noted that “Wave breaking on the reef at Narrowneck continues to be commonly visible in images obtained by the coastal imaging system ...” and “It is concluded that the reef continues to achieve the objective of enhancing potential surfing opportunities at Narrowneck.”

While waves tend to be more spilling than plunging in average conditions and at higher tides, larger swells, lower tides and offshore winds have the potential to produce hollow, plunging breakers [ideal for quality surf].



Figure 2: Photo of surf break at Narrowneck

GPS allowed surf tracks taken to be analysed (Figure 2). At present, data has been collected and analysed from six hours of surfing – some 22 separate rides. Breaker heights during the data collection were typically <2m. The data displays that recorded rides averaged 150-200m, but reached up to 260-270m on both the north and south reefs. Ride times averaged 30 seconds, but reached up to 60 seconds.

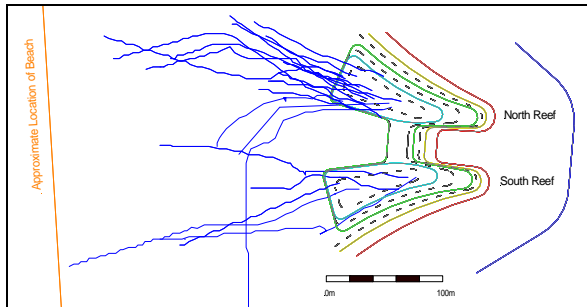


Figure 3: Plot of surf tracks

In small conditions, waves do not break on the reef. The bar formations around the salient, however, provide favorable conditions for the shore-break and it is common to find significantly more surfers directly on the bar in the lee of the reef than on the shore-breaks on either side.

It is also common for the flags to be set up directly in the lee of the reef, indicating that it produces a safer swimming environment than natural conditions on the adjacent beaches and does not encourage the formation of dangerous rip conditions.

Observations of wave breaking clearly show that while the actual wave transformation can be similar to that predicted by the modelling during certain conditions, it is clear that this is often not the case as Gold Coast conditions are often short-crested and bi-modal.

The Narrowneck Artificial Reef has achieved the secondary objective of improved surfing. In hindsight, this objective was appropriate, but needed to be more precisely defined. Promotion by the media prior to construction led to unrealistically high surfer expectations.

During the design, construction and monitoring phases, the design of the reef has been progressively amended to improve safety aspects & effectiveness.

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