

# PROPOSED “REEF” TO RESTORE, PROTECT & ENHANCE NOOSA MAIN BEACH

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## INTRODUCTION

The coastal town of Noosa Heads (Figure 1), is one of Australia’s premier beach resorts attracting a large number of tourists from Australia and overseas. It is ideally situated on Laguna Bay, which is sheltered by the large Noosa Headland. Noosa Main Beach lies between this Headland and the Noosa Woods groyne. To the north of the groyne there is a relatively stable sand spit and beach which was created when the Noosa River entrance was relocated and trained in 1978.

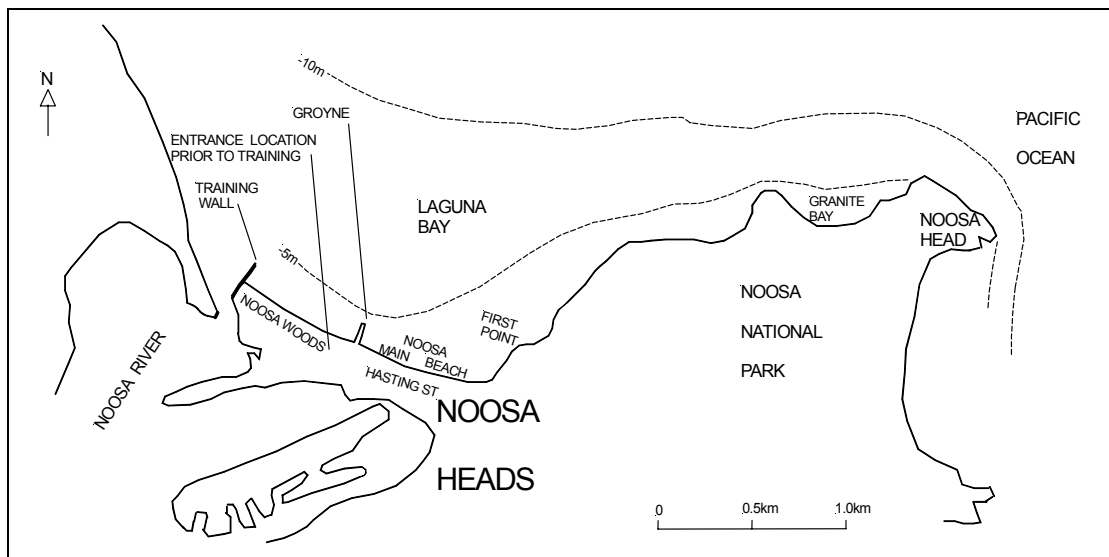


Figure 1 Site Map

Despite training of the entrance, groyne construction and regular nourishment, the rock wall protecting the beachfront properties is frequently exposed and the general lack of beach detracts from the recreational value and aesthetic quality of Noosa Main Beach. The problem has previously been addressed by regular beach nourishment involving the placement of approximately 80,000m<sup>3</sup> of sand every 2 years. To date, around 1Mm<sup>3</sup> of sand has been pumped onto the beach from the estuary, and the approved areas in the estuary for sand removal have now been depleted. A study of alternate sources is underway, however approval for further large-scale sand removal from the estuary is uncertain due to possible environmental impacts. Investigations into offshore sand reserves have not located suitable reserves, which can be economically used for long-term beach nourishment of Noosa Main Beach.

The erosion results in a significant adverse economic impact on the local tourist economy. In addition, when sand is pumped onto the beach the impact on beach users and swimmers is of concern. To allow determination of a sustainable long-term solution to the erosion problem, the brief prepared by Noosa Council called for all possible options to be investigated, with the primary objective being “to stop or minimise loss of sand from Noosa Main Beach”. Recommendations were sought for the beach’s restoration and protection. From discussions with the Shire Engineer / Director - Works, it was clear that as well as being sustainable, any recommended works should also:-

- preserve the amenity for the existing stakeholders
- if practical, improve the beach and surfing amenity.

## OVERVIEW OF COASTAL PROCESSES

Numerous studies have previously been carried out and these provided a good framework to develop an effective long-term solution. However, the coastal system at Noosa is very complex and has been affected by extensive development and coastal engineering works. Therefore, it is important that the various coastal processes be better understood and modelled to allow determination of an appropriate and definitive solution to the erosion problem for the existing situation. The study involved the following methodology:-

- The data from a wide range of sources were reviewed, and conceptual models of the regional behaviour developed to allow understanding of the past and possible future regional behaviour.
- The extensive current and wave measurements were analysed to allow development of numerical wave and circulation models of Laguna Bay and, in more detail, along Main Beach. The aim of the analysis and modelling was to explain or expand on the processes identified in the conceptual models, while focusing more directly on Noosa Main Beach to determine the causes of the local erosion problem.
- The numerical models were then used to develop and test practical solutions, and to formulate a final recommendation to provide a management strategy to address the erosion problem at Noosa Main Beach.

The study found that since 1967 when the impacts of numerous cyclones and the start of major coastal protection works occurred, coastal development pressures have led to major modification of both the lower Noosa Estuary and the open coast. It is apparent that the coastal system is still responding to these changes and possibly to atypical climatic conditions. It would appear that the regular impact of cyclones (on average one large event every 10 years) did not have any long-term recession effects. While cyclones caused immediate cut-back, they also provided the driving mechanism to release large quantities of sand from the south around Noosa Heads and into the Laguna Bay system, thereby providing a long-term supply of sand to rebuild and maintain the beach.

By the mid 1960's, substantial property development was commencing at Noosa. The major storm events in 1967 – 1968 caused significant damage, which prompted property owners to dump rocks for protection along Noosa Main Beach. It should be noted that this, and previous severe erosion, occurred before the training wall, groyne and seawall construction, and was the catalyst for the boulder wall construction. Since construction of the trained entrance in 1978, a new system has been established and approximately 1 Mm<sup>3</sup> of nourishment has been pumped to the Main Beach. This nourishment has rapidly eroded, indicating that the supply of sediment around Noosa Headland was not matching the transport potential along Main Beach. The groyne construction in 1982-83 further influenced the local coastal processes. The key conclusions for conditions at Noosa Main Beach since 1983 are:-

- The current along the beach is formed by misalignment of the nearshore wave angles to the shoreline, continuation of wave-driven flows, which initiate along first point, and bay-wide wind-driven circulation.
- To solve or significantly reduce the erosion problem along Noosa Main Beach, the alongshore westward current, which is generated due to the oblique waves, needs to be negated or reduced.
- Due to the particular conditions around Noosa beach, the coastal processes are very dynamic and variable. In addition, the complexity associated with movement of sand slugs around the headland, the presence and changing shape of the ebb-tidal delta and the capacity of the estuary to absorb sediment within the flood-tidal delta gives the site many individual characteristics. These specific conditions and variability need to be accommodated for a restoration strategy for Noosa Main Beach to be successful.

The effects of sea level rise need to be recognised as this will lead to a general long-term recession of beaches unless appropriate action is implemented. A number of areas around the world, including the Gold Coast, have already implemented strategies to protect the beaches and/or the shoreline development against the impacts of storms and the effects of sea level rise.

## OPTIONS INVESTIGATED

Various methods, or combinations of methods, could be used to address the present problem with varying degrees of effectiveness and efficiency. As the coastal areas worldwide are becoming more important and valuable to the community, numerous works are being implemented to mitigate the impacts of ongoing or episodic erosion. Due to the cost of resumptions and subsequent loss of tourism and rate income, the “do nothing” and retreat options are not practical long-term options. The following options were evaluated in detail:

- a) ongoing beach nourishment
- b) extension of Noosa woods groyne
- c) a submerged permanent nearshore breakwater
- d) a nearshore sand berm
- e) a submerged “V” shaped artificial reef structure
- f) realignment of the Noosa river mouth
- g) energy absorbing seawall

### **RECOMMENDED “REEF” OPTION**

The modeling of each option found that there is no simple solution to the present erosion problem, and a solution was recommended that merges the best components of the various options to address the fundamental cause of the erosion.

The recommended solution is a nearshore berm or reef structure consisting of a curved, submerged, low-gradient berm, extending from the groyne and running offset from shore-parallel to the east towards First Point across the existing isobaths. For this structure in this location, sand-filled geotextile sand bags are the most user-friendly and cost-effective solution. This “bagged berm” wave realignment structure would act much like a natural, submerged fringing reef with a shallow semi-protected area inshore of the reef. The reef would have two functions:-

- to reduce wave energy reaching the shoreline and thereby reduce sediment movement
- to realign the wave crests to reduce littoral drift to the west

By nourishing the area inshore of the reef so that there is no interruption to downdrift sediment transport, the potential for downdrift erosion will be mitigated. Although the need for ongoing nourishment is not likely to be totally eliminated, these works will greatly reduce the maintenance volume required, and will be sustainable with the sand reserves available. The new stable beach, lagoon area and surf area will improve the amenity for all the existing stakeholders. The reef is to be designed to create safe swimming and surfing conditions as well as coastal protection. The modeling of the reef will need to ensure that body and bodyboard surfers who venture out of the lagoon onto the reef are provided with a safe surf break. For the more experienced surfers there is an area away from the main surfing area at the western end of the reef where there is an opportunity to provide a high quality board surf break.

### **IMPLEMENTATION**

Noosa Shire Council has adopted the recommended solution that is estimated to cost approximately \$2.5m. Funding is to be provided by Council with a levy on the properties in the Hastings Street benefited area and a subsidy from the Queensland State Government. Detailed modeling of the reef layout is presently underway, and it is anticipated that subject to approvals, construction should occur in the winter of 2001.