

# Woorim Beach Shoreline Erosion Management Plan

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# Woorim Beach

## Shoreline Erosion Management Plan

Prepared For: Caboolture Shire Council

Prepared By: BMT WBM Pty Ltd (Member of the BMT group of companies)

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<b>Title :</b>	Woorim Beach Shoreline Erosion Management Plan
<b>Author :</b>	Dean Patterson; Malcolm Andrews; Dr Ian Teakle, Lyn Raphael
<b>Synopsis :</b>	Report outlining the status of coastal processes and erosion of Woorim Beach and consideration of options and feasibility of engineering works and management action leading to a SEMP for dealing with the existing erosion problems.

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## EXECUTIVE SUMMARY

This Shoreline Erosion Management Plan (SEMP) has been prepared on behalf of the Caboolture Shire Council by BMT WBM Pty Ltd following best management practice in line with the Coastal Protection Act, State Coastal Management Plan and SEQ Regional Coastal management Plan. The beach system along much of the Woorim shoreline is presently in poor condition due to persistent erosion and Council has used beach nourishment over several decades to maintain a minimum level of property protection and beach amenity. Council, EPA and community inputs to the study in response to the information presented on the erosion processes taking place and the effects of the possible solution options have provided policy direction on the SEMP objectives as follows:

- There is demand for restoration and sustainable maintenance of the beach and dune at Woorim. This expectation requires a substantial increase in the sand volume in the beach and dune system as well as appropriate dune management along the whole Woorim and adjacent Bribie Island east coast shoreline.
- There is a demand for protection of the public roads and facilities together with residential and surf club development located on the dune behind the beach and dune system.

Based on the present understanding of the processes and behaviour of Woorim beach, it is considered most improbable that any improvement in the condition of the beach will occur naturally, although there will continue to be normal fluctuations in the level of the beach from time to time associated with storm erosion and subsequent beach recovery. To the contrary, further degradation will occur as progressive erosion continues and the impacts of climate change occur.

As such, continuing with minimal ad-hoc action is considered not feasible as the beach and parts of the dune would erode and remain in poor condition such that:

- For substantial periods of time, beach levels will be low and high tides and waves will impinge on the base of the dune scarp, with no usable beach available for access and recreational use by the community. At such times, there is a safety risk particularly for young children;
- The shoreline will recede, threatening Rickman Parade and the adjacent developed properties with erosion;
- The aesthetic, recreational and environmental value of the beach will continue to be degraded, significantly reducing the economic and social values of the beach for the local and regional community; and
- The shape and function of the dune in trapping sand as a buffer against storm erosion events will be compromised.

While it is not feasible to quantify the socio-economic value of these risk factors within the scope of this study, it is noted that:

- The value of the housing located along Woorim is approximately \$40 million;
- Local residents have purchased their properties on the understanding that the land use controls and zoning are appropriate;

- Bribie Island is a popular tourism focus and Woorim is widely used by the local and regional community for recreation. Many of the houses along the Woorim beachfront are rented to people who holiday there because of the benefits offered by the beach and its amenity.

### **Recommended Action**

The consequences of taking no comprehensive management action and the generic management options outlined in Chapter 4 clearly identify the need to introduce more sand to the beach for beach restoration and protection of the properties. As such, it is strongly recommended that the option to implement beach nourishment, with associated appropriate dune management and maintenance action, be adopted as the primary action to restore and maintain the beach. Provision may be needed also for additional action to provide back-up protection to the erosion prone development along the southern section of Rickman Parade, in either the immediate or longer term future, depending on the timing, extent and sustainability of the proposed nourishment.

### **Beach Nourishment**

As a first assessment, the minimum quantity of sand required to restore the beach would be about 225,000 cubic metres. This may be considered in the context that this quantity may be available and within reasonable cost constraints of Council and it represents approximately 5-6 years life of improvement along the key 1km stretch of beach. It must be recognised that the sand placed on the beach will be integrated into the natural processes of erosion from the beach during storms and subsequent gradual return to the beach by the swell waves. Thus, the sand will be distributed both alongshore and across the profile out to water depths of at least 6-8 metres and the realistic initial benefit of a nourishment quantity of 225,000 m<sup>3</sup> in terms of beach width will probably be around 25-30 metres. This will provide the predicted storm erosion buffer for this section of coastline.

However, progressive loss of sand will occur due to the longshore transport gradient along the beach. Ongoing maintenance nourishment is required to maintain the beach at its improved level. This could be achieved either by annual placement of about 35,000 m<sup>3</sup>/yr or regular placements of equivalent volumes 2 or 3 years apart. The annual approach would provide a more consistent beach condition.

Review of potential sand sources indicates feasible options from two sources. Firstly, sand from offshore in deep water (greater than 15m depth), in association with navigation channel dredging can be cost-effectively delivered by Port of Brisbane Corporation (PBC). Secondly, sand derived from onshore sources, particularly recycling from the accreted area at Skirmish Point, however this is more expensive and currently constrained due to its inclusion in a Fish Habitat Area.

Cost-effective placement of the sand from the PBC dredge involves pumping out by 'rainbowing' the sand into the nearshore zone and allowing the waves to move it onshore and alongshore. As the beach develops and the sand becomes dry, the wind will blow sand back into the foredunes where, with appropriate control management, primary vegetation species (Spinifex) will grow and trap the sand. The process of foredune development to provide the dunal buffer against storm erosion may be assisted by scraping the sand back towards the dune during the nourishment process, with the deepened area progressively filled by the pumped sand.

### **Dune Management**

Parts of the dune system backing the beach are in poor condition with extensive areas eroded to a bare sand dune scarp and no space for foredune development. The native dune plants and dune ecology there are degraded and the dune is vulnerable to wind erosion. It is recommended that, in conjunction with the nourishment to supply sand into the beach and foredune areas, the dunes be rehabilitated and managed to ensure adequate vegetative cover and protection from excessive pedestrian interference. This will restore their function in trapping wind-blown sand in a manner consistent with the natural processes. Accordingly, it is recommended that the existing dune and vegetation status be assessed and action taken as part of the nourishment design and implementation to reshape the main dune and to establish and maintain suitable native plants in accordance with EPA guidelines.

A range of generic beach and dune management guidelines for developed and undeveloped areas are also included in the SEMP recommendations, as set out in Chapter 5.

### **Protective Seawall**

Future circumstances may see the need for a protective seawall construction along about 150m of the dune scarp at the southern end of Rickman Parade, most particularly the southernmost 50m. This may be required if the timing and/or extent of the nourishment are such that adequate immediate or future protection of the development from major cyclone erosion is not achieved. If required, any such seawall should be located as far landward within the dune as practicable such that it would be covered by the dune under most circumstances and exposed only during severe erosion.

Any seawall construction should be considered only where and when necessary to protect Rickman Parade should the top of the scarp recede to within about 5m of the road after the nourishment works have been implemented. It is noted that funds are best directed towards beach nourishment to the maximum extent possible. For example, should a 150m section of seawall be considered, a cost of about \$0.5 million could be involved, equivalent to a quantity of about 100,000 m<sup>3</sup> of nourishment sand. Careful consideration of the need for such a seawall should be undertaken in the context of the feasibility of directing those funds to nourishment for protection. However, it is realised that this may be affected potentially by (for example) ongoing availability of suitable nourishment sand at reasonable cost and in reasonable time.

### **Beach Monitoring**

A program of ongoing beach surveys and low cost observations is recommended to monitor beach behaviour and response to works as a basis for future action planning. Some of the beach monitoring work to add to the available knowledge of how the beach behaves can be implemented immediately at low cost, while more comprehensive monitoring surveys and investigations to locate future sand sources will require allocation of significant funds.

### **Implementation Program and Costs**

The broad implementation program over the next 5 years is set out in Table E1. Planning and works for initial beach restoration would cost about \$1.48 million, on the basis that PBC can assist with the nourishment, programmed for 2008-09 following planning and approvals in 2007-08. This would then

need to be followed by ongoing maintenance expenditure of about \$430,000 per year from 2009-10 onwards.

Additionally, should circumstances evolve requiring a section of seawall along about 150m of Rickman Parade, a cost of about \$0.5 million could be involved, equivalent to a quantity of about 100,000 m<sup>3</sup> of nourishment sand. Careful consideration of the need for such a seawall should be undertaken in the context of the feasibility of directing those funds to nourishment as indicated above.

It is noted that non-action, or works inconsistent with the recommended SEMP strategy, may be inefficient and involve greater cost in the long run. As an example, construction of a protective seawall without sand nourishment would be detrimental to the beach and may involve considerably greater future socio-economic losses and expense on seawall maintenance than would be needed with the beach restored by effectively implemented nourishment.

**Table E 1 Summary of recommended restoration and management actions**

<b>The Problem</b>	Long term progressive beach erosion.	Ongoing nourishment.	Dune vegetation management	Limited records of beach processes and behaviour.	Project management to ensure satisfactory completion.	Protective seawall (if required)
<b>Do Nothing</b>	Woorim would continue to be starved of sand; erosion would continue with reduced beach area and erosion threat to Rickman Parade and property.	Sand volumes will not provide enough protection to withstand storm events or cater for sea level rise.	Continued weed growth smothering and over growing struggling native plants.	A collection of anecdotal observations of beach behaviour lacking quantified data.	Responsible use of public funds must have milestones of achievement	Rickman Parade threatened with erosion: <ul style="list-style-type: none"> <li>• South end immediate</li> <li>• North end within 5-10 yrs</li> </ul>
<b>Proposed Action</b>	Initial nourishment 225,000m <sup>3</sup> .	Maintenance renourishment 35,000m <sup>3</sup> /yr from Offshore and/or onshore sources	Woorim dune rehabilitation and vegetation management	Woorim monitoring	Project Management	Initial limited seawall construction south from 2 <sup>nd</sup> Ave. Any further construction only as needed
<b>The Outcome</b>	Sand dredged onto Woorim to provide sufficient sand to restore the beach, provide property protection and form an incipient dune.	Provide sufficient sand to maintain the improved beach.	Dune vegetated with native species to provide stability from wind erosion, sand trapping capacity and natural dune habitat	Records of beach before and during accretion in correlation to the works being undertaken.	Scheduled tasks completed on schedule and on budget to the satisfaction of the community, council and EPA..	Protection of southern end of Rickman Pde and property subject to immediate erosion threat
<b>Cost Estimates</b> <small>(based on 2007 costing, future years need to allow CPI increases)</small>	\$0.2M design and approvals \$1.25M works	Ongoing program at \$0.35M/yr	Ongoing program at \$10k/yr	5 year Monitoring program \$0.25M at \$50k/yr	5 year Project Management \$0.1M at \$20k/yr	Initial works \$0.5M Possible future works up to \$2.0M if nourishment is inadequate
<b>Timing</b>	2007/08 – 2008/09	2009/10 - ongoing	2007/08 - ongoing	2007/08 - 2011/12	2007/08 - 2011/12	2008/09-2009/10
<b>Funding Sources</b>	Council allocation with EPA support	Council allocation with EPA support	Council allocation with EPA support	Council allocation with EPA support	Council allocation with EPA support	Council allocation with EPA support
<b>2007/08</b>	<b>\$0.27</b>	\$0.2M		\$50k	\$20k	
<b>2008/09</b>	<b>\$1.26M</b>	\$1.13M	\$10k	\$50k	\$20k	\$ 50k
<b>2009/10</b>	<b>\$0.88M</b>		\$0.35M	\$10k	\$50k	\$ 0.45M
<b>2010/11</b>	<b>\$430k</b>		\$0.35M	\$10k	\$50k	
<b>2011/12</b>	<b>\$430k</b>		\$0.35M	\$10k	\$50k	

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# 1 INTRODUCTION

## 1.1 Background

Woorim Beach is located towards the southern end of the east coast of Bribie Island (Figure 1-1). The beach sweeps in a gentle smooth curve around the southeastern part of Bribie Island. It faces east and is exposed to east to northeast ocean waves, but receives considerable protection by Moreton Island from the predominant southeast swell waves. The beach is exposed to winds and locally generated wind waves from the southeast to north sectors. The beach is backed by a substantial dune typically 5-8 metres in height.

Woorim Beach is a popular sandy beach used for surfing, swimming, walking and jogging. Because of the shelter offered by Moreton Island and the offshore North Banks, wave conditions are generally mild and safe for swimming. Surf club facilities are provided together with car parking and recreational park areas on the foreshore. At present the beach is typically particularly narrow with a steep eroding dune face in the vicinity of the surf club as a result of persistent coastal erosion.

The beach varies substantially in height and width in response to both seasonal wave conditions and progressive shoreline recession. It is believed to have diminished progressively over many decades and is considered inadequate as a recreational asset. The high tides reach and impact on the base of the dune for significant periods of time during and after erosion events. There is a potential imminent threat of erosion into the development along the southern section of Rickman Parade.

## 1.2 Coastal Management Requirements

Along the developed Woorim Beach area:

- Beach amenity, access and safety are significantly diminished by erosion. When the beach is eroded, waves reach the base of the dune on high tides and an unstable high steep dune scarp often forms. This is potentially dangerous, particularly for small children;
- Beach recovery following storm erosion is slow and natural redevelopment of a sustainable suitably wide recreational beach in front of the existing dune scarp alignment is unlikely;
- Erosion has extended close to the southern section of Rickman Parade and there is a threat of short term storm erosion of the road and adjacent development there;
- Wind erosion of the dune has been a problem in the past and requires careful management; and
- The natural character of the beach has been altered by some limited protective works (geotextile bag wall).

These issues are likely to be exacerbated in the event of future sea level rise.

In the undeveloped areas to the north and south, coastal processes involving longshore sand movement and erosion and accretion of the beach associated with storms and subsequent beach recovery are able to occur naturally. The beaches there are in good condition and the dune system is extensive.



Figure 1-1 Woorim Beach

The present study is aimed at developing a Shoreline Erosion Management Plan (SEMP) based on identifying and assessing engineering and management options for dealing with the erosion problem. Policy guidance for identifying and assessing issues, specific objectives and suitable options is provided through liaison with the Woorim SEM Study Steering Committee