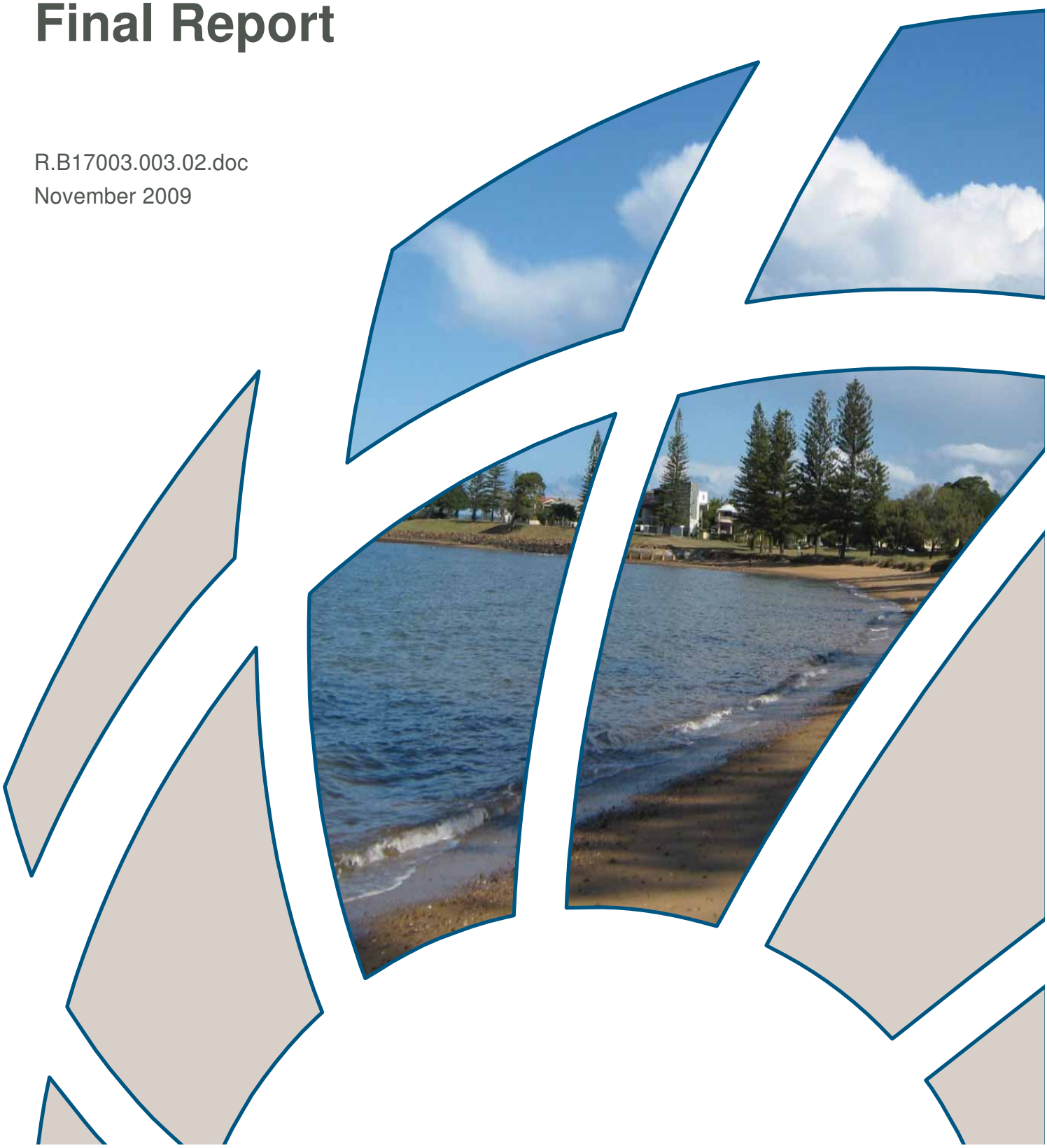
BMT WBM

A part of BMT in Energy and Environment

Redcliffe Shoreline Erosion Management Plan Final Report

R.B17003.003.02.doc
November 2009



Redcliffe Shoreline Erosion Management Plan
Final Report

Prepared For:	Moreton Bay Regional Council
Prepared By:	BMT WBM Pty Ltd (Member of the BMT group of companies)

Offices

Brisbane
Denver
Karratha
Melbourne
Morwell
Newcastle
Perth
Sydney
Vancouver

DOCUMENT CONTROL SHEET

BMT WBM Pty Ltd

BMT WBM Pty Ltd
Level 11, 490 Upper Edward Street
Brisbane 4000
Queensland Australia
PO Box 203 Spring Hill 4004

Tel: +61 7 3831 6744
Fax: + 61 7 3832 3627

ABN 54 010 830 421 002

www.wbmpl.com.au

Document :	R.B17003.003.02.doc
Project Manager :	Joris Jörissen
Client :	Moreton Bay Regional Council
Client Contact:	Peter Marsh
Client Reference	A1023410

Title :	Redcliffe Shoreline Erosion Management Plan – Final Report
Author :	Joris Jörissen, Lyn Raphael
Synopsis :	This report is a Shoreline Erosion Management Plan for the Redcliffe District shoreline and outlines the principal coastal processes, legislative framework and recommended erosion management strategies for this shoreline.

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE OF ISSUE	CHECKED BY		ISSUED BY	
0	14 October 2009	MJA		JGJ	
1	30 October 2009	MJA		JGJ	
2	16 November 2009	MJA		JGJ	

DISTRIBUTION

DESTINATION	REVISION			
	0	1	2	
MBRC	PDF	1+PDF	7+PDF	
DERM	-	-	1	
BMT WBM File	PDF	PDF	1+PDF	
BMT WBM Library	PDF	PDF	PDF	

EXECUTIVE SUMMARY

Background

The Redcliffe District lies about 30km north of Brisbane and is located adjacent to Moreton Bay with Deception Bay in the North and Bramble Bay in the south (Refer to Figure 1-1). The Redcliffe Peninsula is heavily urbanised and includes the coastal townships of Clontarf, Woody Point, Margate, Redcliffe and Scarborough. A significant part of the study area fronts onto the Moreton Bay Marine Park, a national park with significant environmental values. In addition, a RAMSAR wetland site and a Fish Habitat Area are located within the study area at Hays Inlet.

The coastal zone at Redcliffe is an important recreational and aesthetic asset for both the residents of the Redcliffe district and the wider community. The shores of the Redcliffe Peninsula are diverse and comprise sandy beaches with numerous headlands, cliffs and rocky outcrops and areas where mangroves front the shoreline. The Redcliffe shoreline has a history of active shoreline management as shoreline recession has threatened development and assets in the past and various protection and rehabilitation works have been carried out in response to the erosion threat. Historical protection measures include the construction of seawalls and groynes, the use of buffer zones and beach nourishment.

Moreton Bay Regional Council has recognised the importance of the coastal zone to the natural, cultural and socio-economic welfare of its community and has embarked on the process of developing a Shoreline Erosion Management Plan for the Redcliffe Peninsula (RSEMP).

Coastal Processes

The coastal processes at the Redcliffe Peninsula shoreline were investigated with the intention of defining the mechanisms that are responsible for the erosion issues along the shoreline.

The Redcliffe shoreline has an extensive history of active shoreline management as shoreline erosion has threatened development and numerous studies into the coastal processes and options to mitigate erosion along the Redcliffe shoreline have been undertaken in the past. A list of key coastal processes studies that have been considered for the SEMP is presented in Section 3.1.

Assessment of historical shoreline behaviour provides evidence of persistent sediment volume losses from the coastal system and progressive erosion. To mitigate these persistent losses of sediment from the Redcliffe shoreline there is an extensive history of active shoreline management including beach nourishment and recycling of sand. In recent years, importation has been from Southern Pacific Sands at Ningi, Moreton Bay (Bribie Island) and the Pine River with an average rate of about 2,500m^3 per year.

The average net longshore sand transport along the Eastern Beaches is northward. The average longshore sand transport rate is not constant along the Eastern Beaches and varies considerably from year to year. On average the net longshore sand transport potential along the Eastern Beaches is in the order of 5,000 m^3 to 10,000 m^3 per year.

The regional sediment transport is strongly influenced by the various coastal features (natural headlands, revetments, groynes and reclamations) that are present along the Redcliffe shoreline.

Several groynes have been built, which have intercepted the northerly sand transport. The most significant of these groynes being at Redcliffe Point, Shields Street, Osbourne Point, Queens Beach North, Drury Point and Scarborough Point. Furthermore, the breakwaters of the Scarborough Boat Harbour and the land reclamations at Bramble Bay intercept the longshore sediment transport.

The effect of these structures has been accumulation of sand on their updrift side (on the south at the Eastern Beaches) and the initiation of erosion on their downdrift side (on the north). It appears that at most groynes sand has accumulated to such an extent that sand bypassing occurs around the groynes during most of the year. Nevertheless, the longshore transport rate tends to be greater on the northern side of these groynes and smaller at the southern side. The southern ends of the beaches therefore experience continued erosion, necessitating seawall construction and beach nourishment at these locations.

The land reclamations at Bramble Bay, the Redcliffe Point groyne and the breakwater of the Scarborough Boat Harbour seem to intercept the longshore transport completely and the sediment transport around these structures is expected to be negligible.

With regard to storm erosion, short-term erosion due to a severe wave and elevated sea water level event (surge conditions), assessments undertaken by KBR predict that if a 50year ARI storm event was to occur with the current beach profile, a shoreline recession of 13m to 16m may be experienced at the Eastern Beaches.

In many areas along the Redcliffe shoreline, the available dune buffer width is less than the calculated short term erosion buffer width requirement of ~16m. This means that at these locations there is an immediate threat of damaging development and infrastructure during erosion events.

Research on likely climate change impacts indicates that two fundamental impacts may affect the shoreline, namely:

- Changes to storm occurrences and storm winds together with their effects on storm surges; and
- Sea level rise.

Both mean sea level rise and intensification of the storm occurrences are likely to have an impact on the maintenance requirements of Redcliffe shoreline. With a historical mean sea level rise of 1.7mm per year, the annual sand volume that is transported from the upper beach to offshore would have equated to about 3,000 m^3 per year. This may increase to 8,000 to 12,000 m^3 per year towards 2059 if mean sea level rise accelerates to projected levels due to climate change. For the development of this SEMP, as a minimum, recognition is therefore required that this may affect the shoreline and any shoreline management action will need to cater for these potential changes.

Based on the evaluation of the existing shoreline and the assessment of the coastal processes, it was possible to identify erosion problem areas along the Redcliffe shoreline. Specific areas of concern, which are to be addressed in this SEMP, and their primary cause, are listed in Table 4-1.

Planning and Legislative Framework

Proposed management options recommended within this SEMP must be consistent with the local government planning scheme, and comply with all relevant legislation (Commonwealth, State and local) and coastal and environmental policies.

The basis and control of management of the coast of Queensland is governed by the *Coastal Protection and Management Act 1995 (Qld).* Statutory plans under the Act, the State Coastal Management Plan (SCMP) and South East Queensland Regional Coastal Management Plan (SEQRCMP), set out more detailed provisions for the management of the coastal zone and recommendations in this SEMP.

Legislation and policies considered in the RSEMP require consideration of issues including, but not limited to:

- The use of coastal structures for property protection;
- The listing of coastal areas adjacent to the Redcliffe District as Marine National Park and hence an area of national significance;
- Protection of species listed as protected under State and Commonwealth legislation and conservation of their habitat;
- Consideration of the places of cultural significance; and
- The maintenance of biodiversity.

SEMP Recommendations

After a review of the coastal processes, risks and values at each of section of the shoreline, potential management options for each beach were assessed. A detailed discussion on the possible management options and the recommended strategies for each individual beach is included in Section 5 of the report.

The overall recommendation for the Eastern Beaches (beaches between Margate Beach and Scarborough Beach) is to prevent further deterioration of the beaches by offsetting the persistent loss of sediment from these beaches and implement planning controls to manage the residual risks. In addition, there are beaches where the current status of the beaches warrants works. A summary of the recommended erosion management strategies for each beach is outlined in Table I-1.

Based on the recommended strategies for each individual beach, the following shoreline management actions are advised:

1 Upgrade of existing foreshore armouring at Princess Terrace/Haysmouth Parade, Clontarf;

2 Formalisation of existing shoreline protection works between Woody Point and Picnic Point, Woody Point;

3 Upgrade of existing seawall at Picnic Point, Woody Point;

4 Beach nourishment of Margate Beach, Margate;

5 Implementation of seawall with beach nourishment at Queens Beach South, Redcliffe

6 Beach nourishment with groyne enhancement at Queens Beach, Redcliffe;

7 Beach nourishment with groyne enhancement at Queens Beach North, Scarborough;

8 Investigate cliff degradation at Drury Point Cliffs (geotechnical investigation and monitoring program);

9 Rock armouring of the cliff base at Scarborough Cliffs, Scarborough;

10 Extension of rock wall along southern end of Oyster Point Esplanade, Scarborough;

11 Ongoing maintenance beach nourishment at eastern beaches, including sand recycling from Redcliffe Point groyne and from Scarborough Point groyne;

12 Ongoing maintenance and repair on all shoreline protection structures within RSEMP study area;

13 Implementation of a monitoring and review program; and

14 Implementation of a dune management program.

A summary of the recommended coastal engineering and management actions for Redcliffe is set out in the Table I-2, including a summary of likely costs. It can be seen that implementation of the recommended capital works (i.e. implementation/upgrade of shoreline structures and initial beach nourishment) would cost in the order of $9M, based on present understanding of the required works and sand sourced from Ningi. The actual costs of implementing the works will vary, depending on the adopted scope, circumstances and timing of the works and activities undertaken. Nevertheless, they provide a basis for planning and budgeting purposes.

This would need to be followed by ongoing maintenance expenditure of about $270,000 per year for beach nourishment and sand recycling operations, plus about $270,000 per year for ongoing maintenance and repair of the various existing and proposed shoreline protection structures. In addition, there should be a minimum provision of about $60,000 per year for beach monitoring, dune management, inspections and project management. It is likely that the monitoring survey costs could be reduced over time.

It should be recognised that protection of private property is primarily the responsibility of the property owners. As such where shoreline protection works are primarily implemented to provide protection to private property, (some of) these works could be partially funded or financed by benefited property owners.

It is noted that non-action, or works inconsistent with the recommended SEMP strategies, may result in greater risks and increased rehabilitation costs in the long run.

If major beach nourishment exercises were planned, then studies are to be undertaken to identify suitable sand sources and methods of delivery. It is recommended that sand sourcing from Moreton Bay is further investigated as a potential source of sand for beach nourishment.

Table 1 Recommended Erosion Management Strategy for Each Beach

Beach/shoreline location	***Location Map***	***Recommended Erosion Management Strategy***
Princess Terrace to Clontarf Point (Clontarf)	Figure N-8	Upgrade the existing armouring in front of 3 and 5 Princess Terrace and 18 Haysmouth Parade (section of 90m) and implement the Do Nothing option along the remaining section
Clontarf Point to Woody Point	Figure N-6 & Figure N-7	The Do Nothing option
Woody Point to Picnic Point	Figure N-6	Formalise the existing shoreline protection works and, where needed, upgrade the existing structures to an appropriate engineering standard
Picnic Point to Scott's Point	Figure N-6	Upgrade the existing concrete seawall around Picnic Point; and implement the Do Nothing option along the remaining sections
Margate Beach & Suttons Beach	Figure N-5 & Figure N-6	Ongoing maintenance nourishment to offset persistent loss of sediment and prevent further deterioration of the beaches
Queen Beach South	Figure N-4	Seawall with beach nourishment
Queen Beach	Figure N-3 & Figure N-4	Beach nourishment with groyne enhancement
Queen Beach North	Figure N-3	Beach nourishment with groyne enhancement
Drury Point Cliffs	Figure N-3	Undertake geotechnical investigation with ongoing cliff monitoring
Scarborough Beach	Figure N-2	Ongoing maintenance beach nourishment alone
Scarborough Cliffs	Figure N-2	Managed retreat with the rock armouring of the cliff base; Refer to Scarborough Cliffs Options Analysis Report (KBR, 2007A)
Scarborough Cliffs to North Reef Spit	Figure N-2	Allow appropriate protection works via implementation of planning controls
Scarborough Boat Harbour to Albatross Canal	Figure N-1	Extend existing rock wall along oyster Point Esplanade by 80m and implement the Do Nothing option along the remaining sections

Table 2 Summary of Recommended Restoration and Management Actions

The Problem	Residential properties at Princess Terrace and Haysmouth Parade within short term erosion zone	Residential properties between Woody Point and Picnic Point within short term erosion zone	Existing concrete seawall at Picnic Point is in poor condition	Margate Bathing Pavilion, infrastructure and recreational facilities at Margate Beach within short term erosion zone	Persistent shoreline erosion at Captain Cook Park; Significant Norfolk Pines and park facilities within short term erosion zone Sand deposition at creek outlet and Recliffe Jetty	Residential properties at Queens Beach within short term erosion zone	Public car park and Council facilities at Queens Beach North within short term erosion zone	Likely Cliff Erosion at Drury Cliffs, but rate of erosion and associated risks unknown	Cliff Erosion at Scarborough Cliffs; Risk of sudden slumping of cliffs and unsafe public beach access (possible casualties)	Road along Oyster Point within short term erosion zone	Persistent loss of sand from Eastern Beaches	Maintenance requirements of existing/recommended shoreline protection structures	Limited records of beach processes and behaviour.	Project management to ensure satisfactory completion.
Do Nothing	Private property under erosion threat during storm events	Private property under erosion threat during storm events	Existing concrete seawall at Picnic Point likely to fail during significant storm events	Margate Bathing Pavilion, infrastructure and recreational facilities under erosion threat during storm events	Loss of significant trees and park facilities; Blockage of stormwater drainage system, siltation at Redcliffe Jetty	Private property under erosion threat during storm events	Public carpark and Council facilities under erosion threat during storm events	Ongoing cliff erosion with possible sudden slumping; Possible casualties	Ongoing cliff erosion; Possible casualties (public beach access)	Infrastructure under erosion threat during storm events	Beaches continue to be starved of sand; erosion would continue with reduced beach area and shoreline recession	Deterioration of protection performance	A collection of anecdotal observations of beach behaviour lacking quantified data.	Responsible use of public funds must have milestones of achievement
Proposed Action	Upgrade 90m of existing rock revetment	Formalise/upgrade existing shoreline protection works along 400m of shoreline	Replace existing 80m seawall with a rock wall	Beach nourishment (60,000m^3)	Implementation of 130m long seawall with beach nourishment	Beach nourishment (60,000m^3) plus groyne enhancement of Osbourne Point groyne	Beach nourishment (37,000m^3) plus groyne enhancement of Donkin Street groyne	Undertake geotechnical investigation with ongoing cliff monitoring	Armouring of cliff base Upgrade of staircase	80m extension of existing rock wall	Ongoing beach nourishment and sand recycling (18,000 m^3/yr)[1]	Ongoing maintenance and repairs	Monitoring at eastern beaches	Project Management
The Outcome	Protection of private property	Protection of private property	Protection of parkland and park facilities	Protection of public assets and improved beach amenity	Protection of public assets and improved beach amenity	Protection of private property and improved beach amenity	Protection of public assets and improved beach amenity	Need for erosion management works determined	Safe public beach access	Protection of public infrastructure	Beaches are maintained at their improved level	Protection of public land, public assets and private property	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
Cost Estimates (based on 2009 costing, future years need to allow CPI increases)	$15k design and approvals[#] $110k works	To be determined; assessment of structural capacity of existing structures required	$35k design and approvals[#] $290k works	$290k design and approvals[#] $2.4 Million works	$60k design and approvals[#] $0.5 Million works	$300k design and approvals[#] $2.5 Million design, approvals and works	$190k design and approvals[#] $1.6 Million design, approvals and works	$100k to $150k	$50k design and approvals[#] $420k works	$12k design and approvals[#] $100k works	Ongoing at $270k/yr	Ongoing at 270k/yr	5 year monitoring program $0.15M at $30k/yr	5 year Project Management $0.15M at $30k/yr
Timing	1-2 years	2-5 years	2-5 years	1-2 years	0-1 years	1-2 years	1-2 years	0-1 years	0-1 years	0-1 years	ongoing	ongoing	0 – 5 years	0 – 5 years
Possible Funding Sources	Council allocation, Private property holders, eligible state/federal government funds	Council allocation, Private property holders, eligible state/federal government funds	Council allocation, eligible state/federal government funds	Council allocation, Private property holders, eligible state/federal government funds	Council allocation, eligible state/federal govemment funds	Council allocation, Private property holders, eligible state/federal govemment funds	Council allocation, eligible state/federal government funds	Council allocation, eligible state/federal government funds	Council allocation, eligible state/federal govemment funds	Council allocation, eligible state/federal government funds	Council allocation, eligible state/federal government funds	Council allocation	Council allocation with EPA support, eligible state/federal government funds	Council allocation with EPA support, eligible state/federal govemment funds

[1] This may need to be increased to about 25,000m^3 per year in the future if mean sea level rise accelerates to projected levels due to climate change.

[#] Nominal value of 12% of works costs assumed

SESSION: OPERATIONS

ACTING SESSION CHAIR – CR GREG CHIPPENDALE (DEPUTY MAYOR)

ITEM 1
REDCLIFFE SHORELINE EROSION MANAGEMENT PLAN – DIVISIONS 5 & 6
35-2190; 36-2140 (HV, Engineer Waterways & Coastal Planning, Pine Rivers)

1. Executive Summary
Council successfully gained a subsidy from the Department of Infrastructure and Planning (formerly Department for Local Government), in October 2007 under the Shoreline Erosion Management Planning Scheme for development of the Redcliffe Shoreline Erosion Management Plan (SEMP).

The purpose of this report is to advise Council of the erosion problem areas identified along the Redcliffe shoreline during the development of the Redcliffe SEMP and recommended management strategies to address these. The recommended management strategies should be considered for incorporation into future Council Capital Works and Maintenance Programs.

2. Background
Council recognised the importance of the coastal zone to the natural, cultural and socio-economic welfare of the community. Redcliffe peninsula's eastern beaches had been identified as a priority area for erosion management as shoreline erosion was threatening amenity, infrastructure and development. A comprehensive study was needed to ensure appropriate coastal management.

Consulting engineers, BMT WBM Pty Ltd, were appointed to undertake the development of the Redcliffe SEMP after Council received subsidy approval in October 2007.

The development of a SEMP serves to:
- identify significant coastal erosion issues;
- develop an understanding of the underlying coastal processes contributing to erosion problems;
- develop and evaluate options for erosion protection and management;
- provide planning for the delivery of selected erosion protection and management options;
- ensure erosion protection and management measures are consistent with State and Regional Coastal Management Plans and other government policies.

The aim of the Redcliffe SEMP is to provide a plan for the management of shoreline erosion along the Redcliffe Peninsula shoreline. This whole of coastline approach is supported by the Department of Environment and Resource Management (DERM) rather than adhoc protection works. The Redcliffe SEMP should allow Council to maintain and increase, where possible, the amenity of the Redcliffe beaches.

SEMPs are DERM's preferred method for local governments to address shoreline erosion issues at the local level. SEMPs enable local governments and their communities to develop effective and sustainable erosion management strategies.

ITEM 1
REDCLIFFE SHORELINE EROSION MANAGEMENT PLAN – DIVISIONS 5 & 6 - 35-2190; 36-2140 (HV, Engineer Waterways & Coastal Planning, Pine Rivers) (Cont.)

The following resolution appears on Minute Page 08/758 of the General Meeting of Council held 20 May 2008:

Ex. Sustainability Committee Meeting held 14 May 2008 (MP. 08/645)

RECOMMENDATION
Direction is sought regarding Council representation on the Technical Working Group for the Redcliffe Shoreline Erosion Management Plan project.

COMMITTEE RECOMMENDATION
1. That the information be noted.
2. That Councillors Frawley and Houghton be nominated to represent Council on the Technical

Other members of the Technical Working Group (TWG) included MBRC staff, state agencies including DERM (formerly EPA), DPI&F, DNRW and Consultant BMT WBM.

At three meetings of the TWG (13 May 2008, 2 October 2008 and 6 March 2009), BMT WBM presented draft findings from the study and the meetings were also used as an opportunity to provide comments on the development of the Redcliffe SEMP. All comments received through the TWG were taken into consideration in the preparation of the final Redcliffe SEMP report. A copy of the Redcliffe SEMP Final Report can be made available on request.

3. Explanation of Item
An approved Redcliffe SEMP will streamline development approvals where the application is consistent with the SEMP intent. This does not however imply automatic approval and any proposal from Council or private property owners will still need to undergo a more detailed development assessment by DERM.

SEMP Recommendations
The Redcliffe SEMP evaluated the existing shoreline coastal processes, identified erosion problem areas along the Redcliffe shoreline and recommended restoration and management actions in accordance with current legislative frameworks. A summary of these erosion problem areas and the recommend actions are provided in Table 1 below. Council is not responsible for implementing or maintaining any protection works on private properties.

Table 1: Redcliffe SEMP investigation areas with identified problems and proposed management actions (See Figure 1 for Redcliffe Locality Plan)

Location	Problem	Primary causes	Proposed Action	Priority Ranking for Possible Capital Works
Princes Terrace to Clontarf Point	Slow but persistent shoreline erosion	Reduced sediment supply from Bramble Bay	Upgrade 90m of existing rock revetment	2
Clontarf Point to Woody Point	No erosion identified. Adequate maintenance of existing structures required		Maintain existing shoreline erosion structures	
Woody Point to Picnic Point	Ongoing erosion/illegal dumping of armouring material on foreshore (“Gayundah” wreck)	Differentials in longshore sediment transport rate	Formalise/upgrade existing shoreline protection works along 400m of shoreline	3

ITEM 1
REDCLIFFE SHORELINE EROSION MANAGEMENT PLAN – DIVISIONS 5 & 6 - 35-2190; 36-2140 (HV, Engineer Waterways & Coastal Planning, Pine Rivers) (Cont.)

Location	Problem	Primary causes	Proposed Action	Priority Ranking for Possible Capital Works
Picnic Point to Scott's Point	Structural integrity of existing seawall at Picnic Point inadequate Ongoing beach erosion/ insufficient dune buffer width	Geotechnical distress due to wave overtopping Lack of sand supply/ longshore sediment transport to the north	Replace existing 80m seawall with a rock wall and beach nourishment	3
Margate Beach and Suttons Beach	Ongoing beach erosion/insufficient dune buffer width Sand drift (sediment transport by wind) transports sand into park causing siltation of recreation areas & pathways	Lack of sand supply/ longshore sediment transport to the north Accumulation of sand behind Redcliffe Point groyne	Beach nourishment (60,000m^3) and Sand relocation	2 2
Queens Beach South	Shoreline erosion threatens significant Norfolk Pines, a foreshore bikeway and other foreshore assets	Shoreline realignment in response to implementation of Redcliffe Jetty offshore breakwater	Implementation of 130m seawall with beach nourishment	1
Queens Beach	Ongoing beach erosion/insufficient dune buffer width Ongoing erosion at downdrift end of Shield Street groyne	Lack of sand supply/ longshore sediment transport to the north	Beach nourishment (60,000m^3) plus enhancement of Osbourne Point groyne	2
Queens Beach North	Ongoing erosion at downdrift end of Osbourne Point groyne	Differentials in longshore sediment transport rate	Beach nourishment (37,000m^3) plus enhancement of Donkin Street groyne	2
Drury Point Cliffs	Cliff erosion at base of Drury Point Cliffs	Increased wave energy	Geotechnical investigation with monitoring	1
Scarborough Beach	Ongoing erosion at downdrift end of Drury Point groyne	Differentials in longshore sediment transport rate	Ongoing maintenance beach nourishment alone	3
Scarborough Cliffs	Cliff erosion at base of Scarborough Cliffs	Increased longshore sediment transport to the north	Armouring of Scarborough cliffs base and upgrade of staircase	1
Scarborough Cliffs to North Reef Split	Ongoing erosion at downdrift end of Scarborough Point groyne	Increased longshore sediment transport to the north	Maintain existing shoreline erosion structures Put planning controls in place to allow private property owners to do works for hazard mitigation.	#
Scarborough Boat Harbour to Albatross Canal	Slow but persistent shoreline erosion	Reduced sediment supply from around North Reef Point	80m extension of existing rock wall along Oyster Point Esplanade	1
Most eastern beaches	Ongoing shoreline erosion	Lack of natural sand supply Losses due to sea level rise	Ongoing beach nourishment and sand recycling (18,000 m^3/yr)[1]	#

ITEM 1
REDCLIFFE SHORELINE EROSION MANAGEMENT PLAN – DIVISIONS 5 & 6 - 35-2190; 36-2140 (HV, Engineer Waterways & Coastal Planning, Pine Rivers) (Cont.)

Location	Problem	Primary causes	Proposed Action	Priority Ranking for Possible Capital Works
Existing and future shoreline protection structures	Reduced performance without maintenance	Storm wave attack	Ongoing maintenance and repairs	#

[1] This may need to be increased to about 25,000m^3 per year in the future if mean sea level rise accelerates to projected levels due to climate change.

Ongoing maintenance program

Ranking 1 is highest priority and ranking 3 is the lowest priority.

The SEMP also recommended the implementation of an ongoing monitoring and review program to increase Councils records and knowledge of beach processes and behaviours and that this program be implemented within 5-10 years. The estimated cost of the beach monitoring program and the project management of the recommended implementation program is $60,000/year for a minimum period of 5 years.

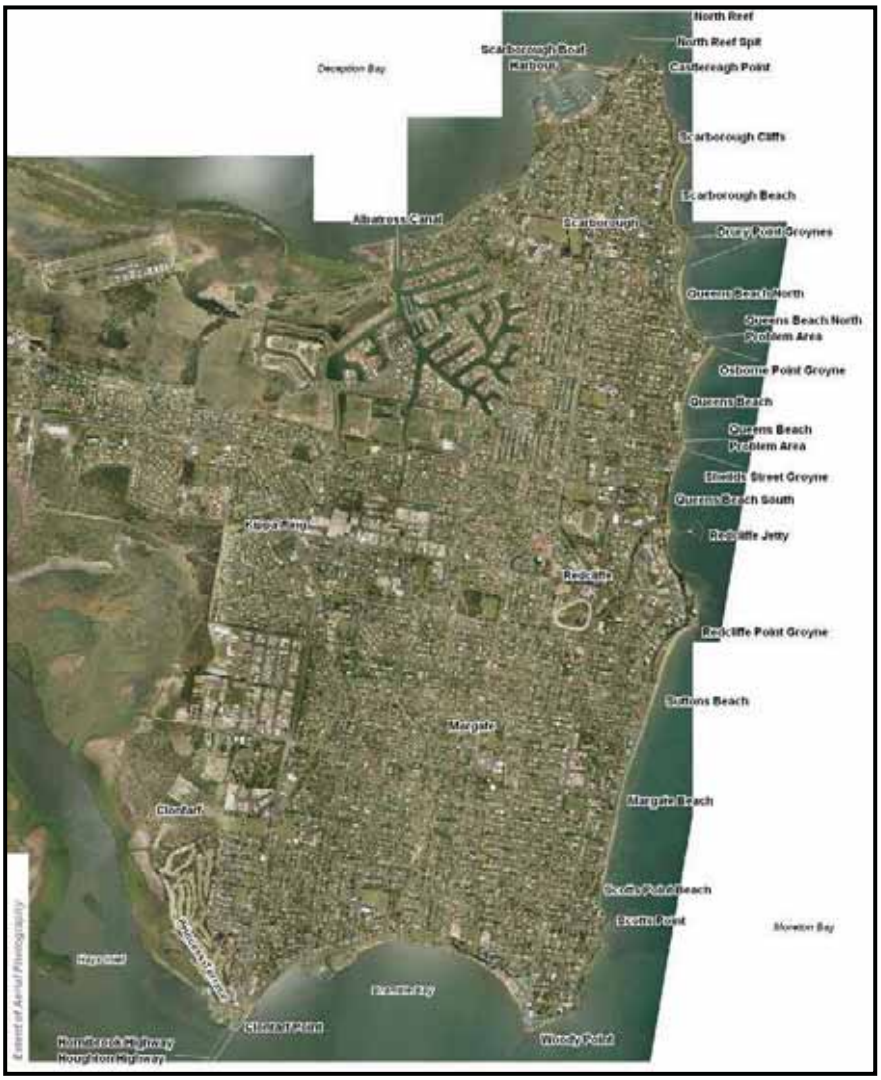


Figure 1: Redcliffe Locality Plan

ITEM 1
REDCLIFFE SHORELINE EROSION MANAGEMENT PLAN – DIVISIONS 5 & 6 - 35-2190; 36-2140 (HV, Engineer Waterways & Coastal Planning, Pine Rivers) (Cont.)

Priority Management Actions

- Captain Cook Park (Queens beach South)

The Redcliffe SEMP recommends the construction of a 130m long sea wall along the foreshore for the protection of the Norfolk Pines and park facilities at Captain Cook Park. Council awarded the contract for the construction of this seawall on 10 November 2009.

- Drury Point Cliffs

The Redcliffe SEMP recommends that an investigation be undertaken by a geotechnical engineer to identify the risks associated with cliff deformations and to continue monitoring the erosion. The cliffs were surveyed in 2006 and again in October 2009. The average rate of erosion at the cliffs, over the last three years, is 30mm/year. Allowance of $100,000 - $150,000 should be considered for the 2010/11 draft budget for the investigation and monitoring of the erosion at Drury Point Cliffs.

- Scarborough Beach

The Redcliffe SEMP recommends that ongoing maintenance beach nourishment be undertaken for Scarborough Beach. This will maintain the existing shoreline at its present position but will not eliminate the risk to the Norfolk Pines along the shoreline. It is proposed that the options identified in the SEMP be assessed in more detail to address the issue of protection of the Norfolk Pines at the southern end of Scarborough Beach.

- Scarborough Cliffs

The Redcliffe SEMP recommends the placement of rock armour at the base of the cliffs to prevent any further erosion. The cliffs were surveyed in 2006 and again in October 2009. The average rate of erosion at the cliffs, over the last three years, is 100 mm/year confirming the need for protection works.

- Scarborough Boat Harbour to Albatross Canal

The Redcliffe SEMP recommends extending the existing rock wall (Endeavour Esplanade) along Oyster Point Esplanade by 80m to provide the necessary protection for the road.

Ongoing Management actions to be undertaken

- To improve and maintain the beaches along the Redcliffe shore, ongoing beach nourishment and sand recycling of approximately 18,000m^3/year is recommended.
- To maintain existing and future shoreline protection structures along the Redcliffe shoreline, an appropriate allowance should be considered for inclusion in Council's maintenance budget.

4. Strategic Implications

4.1 Legislative/Legal Implications

In accordance with Section 2.2.3 of the SEQ Regional Coastal Plan under the State Coastal Plan and Coastal Protection and Management Act, Redcliffe peninsula's eastern beaches have been identified as a priority area for erosion management as the shoreline erosion is threatening development and effective management needs are to be considered to achieve appropriate coastal management. DERM approval of specific shoreline works is required. Adoption of a SEMP is DERM's preferred method for local government to generally address shoreline erosion issues.

4.2 Corporate Plan / Operational Plan

Marine Foreshore and Coastal Areas outcomes: Sustainable marine life, foreshore and coastal area. The Redcliffe SEMP has been produced in line with the Redcliffe District's vision by addressing the following planning themes from the previous Corporate Plan:

- "Environment – Our community will protect, preserve and restore the natural environment, value natural resources, be energy efficient and committed to ecological sustainability".

- "City Infrastructure – Our community will grow and develop in a way that preserves and promotes Redcliffe's unique lifestyle and will be supported by modern, sustainable well maintained and responsive, utilities and infrastructure".

4.3 Policy Implications
The Redcliffe SEMP should be taken into consideration when assessing Prescribed Tidal Works.

4.4 Delegated Authority Implications
There are no delegated authority implications arising from this report.

4.5 Financial Implications
Detailed project estimates will be compiled for the capital and operational works recommended in the Redcliffe SEMP. The cost estimates will be presented to Council for consideration in the 2010/11 budget and future budgets.

4.6 Consultation / Communication
The Redcliffe SEMP recommendations were discussed with the Divisional Councillors on 18 November 2009. After Council's acceptance of the Redcliffe SEMP Report, it will be made available for public viewing.

5. Conclusion
To enable Council to make informed decisions regarding erosion problems along the Redcliffe shoreline, it is recommended that the Redcliffe SEMP Report be adopted and the recommended management actions be considered for implementation.

RECOMMENDATION

1. That Council adopt the Redcliffe Shoreline Erosion Management Plan Report.

2. That the Redcliffe Shoreline Erosion Management Plan Report be made available for public viewing at the Redcliffe Office and Library and on Council's website.

3. That the owners of properties fronting the Redcliffe shoreline be notified of the adoption of the Redcliffe Shoreline Erosion Management Plan Report and viewing opportunities by correspondence from the Chief Executive Officer.

4. That the Asset Planning and Delivery officers prepare detailed cost estimates for the capital and operational works recommended in the Redcliffe Shoreline Erosion Management Plan Report for consideration in Council's future budgets.

5. That the Director Asset Maintenance and Construction ensure the inclusion of the recommended maintenance works for consideration in future maintenance budgets.

COMMITTEE RECOMMENDATION

1. That the Officer's recommendations be adopted with amendment to Table 1 - Redcliffe SEMP investigation areas with identified problems and proposed management actions contained within the Redcliffe Shoreline Erosion Management Plan as follows:

   'the priority of the southern end of Scarborough beach be amended from a priority ranking for possible capital works from 3 to 1'.

2. That an immediate sand nourishment be undertaken in accordance with budget availability.

Table 1 (Revised): Redcliffe SEMP investigation areas with identified problems and proposed management actions

Location	Problem	Primary causes	Proposed Action	Priority Ranking for Possible Capital Works
Princes Terrace to Clontarf Point	Slow but persistent shoreline erosion	Reduced sediment supply from Bramble Bay	Upgrade 90m of existing rock revetment	2
Clontarf Point to Woody Point	No erosion identified. Adequate maintenance of existing structures required		Maintain existing shoreline erosion structures	
Woody Point to Picnic Point	Ongoing erosion/illegal dumping of armouring material on foreshore ("Gayundah" wreck)	Differentials in longshore sediment transport rate	Formalise/upgrade existing shoreline protection works along 400m of shoreline	3
Picnic Point to Scott's Point	Structural integrity of existing seawall at Picnic Point inadequate Ongoing beach erosion/ insufficient dune buffer width	Geotechnical distress due to wave overtopping Lack of sand supply/ longshore sediment transport to the north	Replace existing 80m seawall with a rock wall and beach nourishment	3
Margate Beach and Suttons Beach	Ongoing beach erosion/insufficient dune buffer width Sand drift (sediment transport by wind) transports sand into park causing siltation of recreation areas and pathways	Lack of sand supply/ longshore sediment transport to the north Accumulation of sand behind Redcliffe Point groyne	Beach nourishment (60,000m^3) and Sand relocation	2 2
Queens Beach South	Shoreline erosion threatens significant Norfolk Pines, a foreshore bikeway and other foreshore assets	Shoreline realignment in response to implementation of Redcliffe Jetty offshore breakwater	Implementation of 130m seawall with beach nourishment	1
Queens Beach	Ongoing beach erosion/insufficient dune buffer width Ongoing erosion at downdrift end of Shield Street groyne	Lack of sand supply/ longshore sediment transport to the north	Beach nourishment (60,000m^3) plus enhancement of Osbourne Point groyne	2
Queens Beach North	Ongoing erosion at downdrift end of Osbourne Point groyne	Differentials in longshore sediment transport rate	Beach nourishment (37,000m^3) plus enhancement of Donkin Street groyne	2
Drury Point Cliffs	Cliff erosion at base of Drury Point Cliffs	Increased wave energy	Geotechnical investigation with monitoring	1

Location	Problem	Primary causes	Proposed Action	Priority Ranking for Possible Capital Works
Scarborough Beach **Southern end of Scarborough Beach**	Ongoing erosion at downdrift end of Drury Point groyne	Differentials in longshore sediment transport rate	Ongoing maintenance beach nourishment alone **Asses available options to determine appropriate protection works**	3 **1 @**
Scarborough Cliffs	Cliff erosion at base of Scarborough Cliffs	Increased longshore sediment transport to the north	Armouring of Scarborough cliffs base and upgrade of staircase	1
Scarborough Cliffs to North Reef Split	Ongoing erosion at downdrift end of Scarborough Point groyne	Increased longshore sediment transport to the north	Maintain existing shoreline erosion structures Put planning controls in place to allow private property owners to do works for hazard mitigation.	#
Scarborough Boat Harbour to Albatross Canal	Slow but persistent shoreline erosion	Reduced sediment supply from around North Reef Point	80m extension of existing rock wall along Oyster Point Esplanade	1
Most eastern beaches	Ongoing shoreline erosion	Lack of natural sand supply Losses due to sea level rise	Ongoing beach nourishment and sand recycling (18,000 m^3/yr)[1]	#
Existing and future shoreline protection structures	Reduced performance without maintenance	Storm wave attack	Ongoing maintenance and repairs	#

[1] This may need to be increased to about 25,000m^3 per year in the future if mean sea level rise accelerates to projected levels due to climate change.

Ongoing maintenance program

@ Updated in line with recommendation 1, Page 09/3679, of Co-ordination Committee Meeting held on 1 December 2009.

Ranking 1 is highest priority and ranking 3 is the lowest priority.

CONTENTS

1 INTRODUCTION 1-1

1.1 Background 1-1

1.2 Description of the Redcliffe SEMP Study Area 1-1

1.3 Coastal Management Requirements 1-2

2 PLANNING AND LEGISLATIVE FRAMEWORK 2-1

2.1 Coastal Act and Plans 2-1

2.1.1 Coastal Management Plans 2-2

2.1.1.1 State Coastal Management Plan 2-2

2.1.1.2 South-East Queensland Regional Coastal Management Plan 2-3

2.2 Other Legislation and Approvals 2-8

2.2.1 Commonwealth 2-8

2.2.1.1 EPBC Act 2-8

2.2.2 Queensland 2-8

2.2.2.1 Integrated Planning Act 1997 2-8

2.2.2.2 Land Act 1994 2-9

2.2.2.3 Marine Parks Act 2004 2-9

2.2.2.4 Nature Conservation Act 1992 2-10

2.2.2.5 Environmental Protection Act 1994 2-11

2.2.3 Indigenous Legal Issues 2-12

2.2.4 Other Considerations 2-12

2.3 Regional Plans 2-12

2.3.1 SEQ Regional Plan 2-12

2.3.2 Shorebird Management Strategy – Moreton Bay 2-14

2.4 Local Government 2-14

2.4.1 Redcliffe City Planning Scheme Plan 2-15

3 COASTAL PROCESSES & CAUSES OF EROSION 3-1

3.1 General Considerations 3-1

3.2 Previous Reports and Studies 3-2

3.3 Geological Framework 3-3

3.4 Coastal Processes 3-4

3.4.1 Water Level Variations 3-4

3.4.1.1 Astronomical Tide 3-4

3.4.1.2 Storm Tide Levels 3-4

3.4.2 Sand Transport Mechanisms 3-5
3.4.2.1 Cross-shore Sand Transport 3-6
3.4.2.2 Longshore Sand Transport 3-7
3.4.3 Sediment Supply 3-8
3.4.4 Cliff Erosion 3-9
3.4.5 Storm Erosion Potential 3-9
3.4.6 Coastal Inundation 3-10
3.4.7 Erosion Prone Areas 3-11
3.5 Present and Future Shoreline Erosion 3-12
3.5.1 Assessment of Coastal Segments 3-12
3.5.1.1 Princess Terrace to Clontarf Point 3-12
3.5.1.2 Clontarf Point to Woody Point 3-13
3.5.1.3 Woody Point to Redcliffe Point 3-14
3.5.1.4 Redcliffe Point to North Reef Spit 3-17
3.5.1.5 Scarborough Boat Harbour to Albatross Canal 3-19
3.5.2 Climate Change Impacts 3-20
3.5.2.1 Changes to Storm Occurrences 3-20
3.5.2.2 Future Sea Level Rise 3-20
3.5.2.3 Beach Profile Response due to Climate Change 3-21

4 COASTLINE MANAGEMENT CONSIDERATIONS 4-1

4.1 Beach Erosion Problem 4-1
4.2 Generic Option Considerations 4-3
4.3 Decision Matrix 4-4
4.4 General Considerations 4-5
4.4.1 Beach Nourishment Options 4-6
4.4.1.1 Nourishment Alone 4-8
4.4.1.2 Nourishment with Control Structures 4-8
4.4.1.3 Nourishment with Terminal Protection (Seawalls) 4-9
4.4.2 Structural Protection Options 4-10
4.4.2.1 Seawalls 4-10
4.4.2.2 Groynes and Artificial Headlands 4-11
4.5 Material Sources and Costing Considerations 4-12
4.5.1 Beach Nourishment 4-12
4.5.1.1 Offshore Marine Sand Sources 4-13
4.5.1.2 Land-based Sand Sources 4-14
4.5.2 Coastal Structures 4-14

5 OPTIONS AND RECOMMENDED STRATEGIES FOR EACH COASTAL UNIT 5-1

5.1 Princess Terrace to Clontarf Point 5-1
5.1.1 Introduction 5-1
5.1.2 Shoreline Management Options Considered 5-1
5.1.3 Recommended Strategy 5-3
5.2 Clontarf Point to Woody Point 5-4
5.2.1 Introduction 5-4
5.2.2 Recommended Strategy 5-4
5.3 Woody Point to Scott's Point 5-4
5.3.1 Introduction 5-4
5.3.2 Shoreline Management Options Considered 5-5
5.3.2.1 Do Nothing 5-5
5.3.2.2 Planning Controls 5-6
5.3.2.3 Beach nourishment alone 5-6
5.3.2.4 Terminal Protection alone 5-6
5.3.3 Recommended Strategy 5-7
5.4 Scott's Point Beach, Margate Beach and Suttons Beach 5-8
5.4.1 Introduction 5-8
5.4.2 Shoreline Management Options Considered 5-8
5.4.3 Recommended Strategy 5-10
5.5 Redcliffe Point to North Reef Spit 5-11
5.5.1 Introduction 5-11
5.5.2 Queens Beach South 5-12
5.5.3 Queens Beach 5-14
5.5.4 Queen Beach North 5-16
5.5.5 Drury Point Cliffs 5-18
5.5.6 Scarborough Beach 5-19
5.5.7 Scarborough Cliffs 5-22
5.5.8 Scarborough Cliffs to North Reef Spit 5-23
5.5.9 Recommended Strategy 5-24
5.6 Scarborough Boat Harbour to Albatross Canal 5-25
5.6.1 Introduction 5-25
5.6.2 Shoreline Management Options Considered 5-25
5.6.2.1 Do Nothing 5-25
5.6.2.2 Terminal protection alone 5-26
5.6.3 Recommended Strategy 5-26
5.7 Summary 5-27

6 PROGRAM OF WORKS AND COST ESTIMATE 6-1

6.1 Program of works 6-1
6.2 Sand sourcing 6-2
6.3 Funding 6-2

7 REFERENCES 7-1

APPENDIX A: COASTAL MANAGEMENT DISTRICT A-1

APPENDIX B: EROSION PRONE AREA B-1

APPENDIX C: FISH HABITAT AREA – HAYS INLET C-1

APPENDIX D: MORETON BAY MARINE PARK ZONING PLAN D-1

APPENDIX E: POTENTIAL AND ACTUAL ACID SULFATE SOILS E-1

APPENDIX F: MORETON BAY RAMSAR SITE F-1

APPENDIX G: MARINE VEGETATION G-1

APPENDIX H: AREAS OF COASTAL BIODIVERSITY SIGNIFICANCE (MARINE) H-1

APPENDIX I: AREAS OF COASTAL BIODIVERSITY SIGNIFICANCE (TERRESTRIAL) I-1

APPENDIX J: KEY COASTAL SITE J-1

APPENDIX K: EPBC ACT PROTECTED MATTERS REPORT K-1

APPENDIX L: AREAS OF STATE AND REGIONAL BIODIVERSITY SIGNIFICANCE L-1

APPENDIX M: CULTURAL HERITAGE OVERLAY M-1

APPENDIX N: SHORELINE TYPES AND COASTAL STRUCTURES N-1

APPENDIX O: HISTORICAL AERIAL PHOTOGRAPHY O-1

LIST OF FIGURES

Figure 1-1	Locality Map	1-3
Figure 3-1	Summary of Storm Tide Levels for Redcliffe	3-5
Figure 3-2	Uncoordinated armouring of the foreshore near "Gayundah" wreck	3-14
Figure 3-3	Scott's Point and Scott's Point Beach	3-16
Figure 3-4	Suttons Beach	3-16
Figure 3-5	Recent dune top-up at Margate Beach	3-17
Figure 3-6	Accretion at Redcliffe Pier since construction of offshore breakwater	3-18
Figure 3-7	Dumped Rubble on Dune Front at a public toilet block near Michel Road	3-20
Figure 3-8	Sediment transport pathways and existing beach nourishment operations	3-23
Figure 3-9	Coastal Segments within Redcliffe SEMP Area	3-24
Figure 4-1	Beach at Osbourne Point groyne showing impact of a groyne	4-12
Figure 5-1	Redcliffe Peninsula Locality Plan	5-29
Figure O-1	Clontarf, May 1957	O-1
Figure O-2	Clontarf, July 1972	O-1
Figure O-3	Clontarf, June 1982	O-2
Figure O-4	Clontarf, December 1987	O-2
Figure O-5	Clontarf, June 1991	O-3
Figure O-6	Clontarf, Aug 1997	O-3
Figure O-7	Clontarf, Feb 2002	O-4
Figure O-8	Clontarf, April 2007	O-4
Figure O-9	Queens Beach South, October 1995	O-5
Figure O-10	Queens Beach South, August 1997	O-5
Figure O-11	Queens Beach South, July 2002	O-6
Figure O-12	Queens Beach South, August 2006	O-6
Figure O-13	Scarborough, May 1957	O-7
Figure O-14	Scarborough, July 1978	O-7
Figure O-15	Scarborough, June 1991	O-8
Figure O-16	Scarborough, August 2006	O-8

LIST OF TABLES

Table 1	Recommended Erosion Management Strategy for Each Beach	v
Table 2	Summary of Recommended Restoration and Management Actions	vi
Table 2-1	Objects for marine park zones within the study area	2-10
Table 3-1	Tidal Planes at Redcliffe Peninsula	3-4

Table 3-2	**Extreme Storm Tide Conditions at Redcliffe Point – From (Cardno, 2009)**	**3-11**
Table 4-1	**Specific areas of concern for Redcliffe SEMP**	**4-3**
Table 4-2	**Matrix of Beach System Management Options**	**4-5**
Table 5-1	**Recommended Erosion Management Strategy for Each Beach**	**5-24**
Table 5-2	**Recommended Erosion Management Strategy for Each Beach**	**5-28**
Table 6-1	**Summary of Recommended Restoration and Management Actions**	**6-4**

1 INTRODUCTION

1.1 Background

The Redcliffe District lies about 30km north of Brisbane and is located on Moreton Bay. The Redcliffe Peninsula is surrounded by Deception Bay in the North and Bramble Bay in the south (Refer to Figure 1-1). The Redcliffe Peninsula is heavily urbanised and includes the coastal townships of Clontarf, Woody Point, Margate, Redcliffe and Scarborough. The total population of the peninsula is about 50,000 people (2006).

A significant part of the study area fronts onto the Moreton Bay Marine Park, a national park with significant environmental values. In addition, a RAMSAR wetland site and a Fish Habitat Area is located within the SEMP study area (Hays Inlet).

The coastal zone at Redcliffe is an important recreational and aesthetic asset for both the residents of the Redcliffe district and the wider community. The shores of the Redcliffe Peninsula are diverse and comprise sandy beaches with numerous headlands, cliffs and rocky outcrops and areas where mangroves front the shoreline. The Redcliffe shoreline has a history of active shoreline management as shoreline erosion has threatened development and assets in the past and various protection and rehabilitation works have been carried out in response to the erosion threat. Historical protection measures include the construction of seawalls and groynes, the use of buffer zones and beach nourishment.

Moreton Bay Regional Council has recognised the importance of the coastal zone to the natural, cultural and socio-economic welfare of its community and has embarked on the process of developing a Shoreline Erosion Management Plan (SEMP) for the Redcliffe District shoreline.

This report is prepared as part of the development of a SEMP for the Redcliffe District shoreline. The aim of the SEMP is to provide a plan for the management of shoreline erosion along the Redcliffe Peninsula shoreline. It is Moreton Bay Regional Council's objective to maintain and increase where possible the amenity of the Redcliffe beaches.

1.2 Description of the Redcliffe SEMP Study Area

The region's coastline is dominated by Moreton Bay, which is formed by a series of barrier islands, most notably Bribie, Moreton (the largest), North Stradbroke, and South Stradbroke. Numerous smaller islands, such as Coochiemudlo, Macleay, St Helena and Russell, together with many shoals, banks and reefs, occur mainly in the southern portion of the Bay. Moreton Bay is a shallow body of water, with an average depth of only 6.8 m (Dennison and Abal, 2000). The absolute tidal range varies from 2.6 to 2.9 m inside the Bay to 1.9 m along the open coast of the Coral Sea.

The study area of this SEMP is the shoreline of the Redcliffe Peninsula, which stretches from Princess Terrace at Clontarf in the south to Albatross Canal at Scarborough in the north. It includes Margate, Suttons, Queens Beach South, Queens Beach North and Scarborough Beach and selected sections of shoreline along Deception Bay, Bramble Bay and Hays Inlet.

The Redcliffe shoreline has a length of about 16km and is diverse in appearance. It comprises sandy beaches with numerous headlands, cliffs and rocky outcrops and areas where mangroves front the shoreline. Generally, the shoreline is fronted by a wide and shallow foreshore with exposed bed rock at some locations. There are numerous shoreline protection structures along the shoreline, including several groynes, a range of revetment walls and (offshore) breakwaters. Furthermore, there are a number of land reclamations in the study area. These land reclamations are generally surround by revetment walls.

Most of the existing beaches are artificial with imported sand, placed onto the beach for beach nourishment. Maps of shoreline type and existing coastal structures are presented in Appendix N.

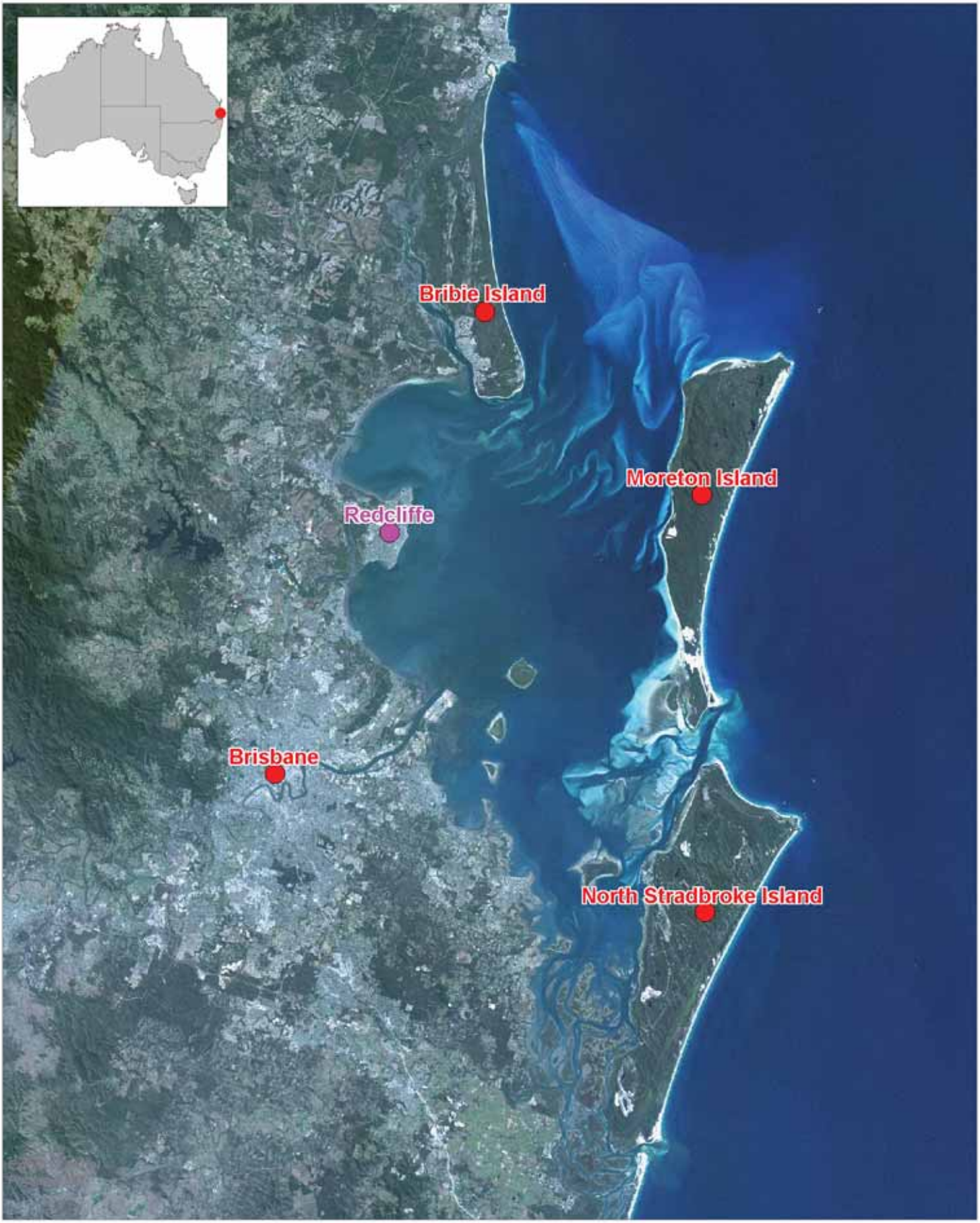
1.3 Coastal Management Requirements

The coastline along the Redcliffe Peninsula is subject to a range of natural and man-made threats and various erosion protection and rehabilitation projects have been carried out in the past. In general the following points can be made regarding the beaches:

- The shoreline movements appear to be slowly erosive and are influenced by the medium to long term deficit in the natural supply of sand to the beaches;
- The foreshore has substantial development, comprising of private residential property and public infrastructure. Coastal structures in the form of rock walls have been constructed to protect private property and infrastructure against erosion threats;
- The available dune buffer width in most areas is considered to be insufficient to accommodate both short term storm erosion and medium term shoreline fluctuations.

The present study is aimed at reviewing the dominant coastal processes, which shape the beach, the legislative conditions and values which may restrict the implementation of viable shoreline erosion management options and the existing management options which are currently in use.

An understanding of the coastal processes and legislative conditions is essential for the development of engineering and management options for dealing with risk associated with shoreline erosion. Ongoing policy guidance for identifying and assessing issues, specific objectives and suitable options will be provided through liaison with the SEMP Steering Committee and the SEMP Technical Working Group (TWG)



Title:

Locality Map of Redcliffe SEMP study area

Figure: 1-1

Rev: A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map

N

0 10 20km

Approx. Scale

BMT WBM
www.wbmpl.com.au

Filepath : I:\B17003_I_JGJ_RedcliffeSEMP\DRG\COA_012_080919_LocalityMap.WOR