



Shire of Busselton

Geographe Bay

BROADWATER FORESHORE MANAGEMENT PLAN

ADOPTED OCTOBER 2005

Prepared by D&A McKenzie, Litoria Ecoservices
on behalf of the Shire of Busselton.

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1. INTRODUCTION

1.1 BACKGROUND

In October 2001, the Shire of Busselton completed the Geographe Bay Foreshore Management Plan¹ providing an integrated coastal management strategy for Geographe Bay and broad management direction for nine foreshore precincts within Geographe Bay, including the Broadwater precinct.

In May 2004, following community concerns over vegetation removal and the impacts of storm surges in the Broadwater area, Council resolved to prepare a detailed management plan for the Broadwater foreshore addressing the effects of storm events, pedestrian and vehicular access and revegetation. The planning process for the development of the Broadwater Foreshore Management Plan (BFMP) involves:

1. Preparation of draft BFMP by consultants.
2. Draft BFMP reviewed by Shire of Busselton.
3. Public community consultation process using the draft as a foundation for the final BFMP.
4. Final BFMP to be adopted and endorsed by Shire of Busselton.

1.2 PURPOSE AND SCOPE OF THE MANAGEMENT PLAN

Litoria Ecoservices prepared the draft BFMP over a six-week period in May/ June 2005, in conjunction with a Shire reference group (Environment, Engineering and Community Development staff) and engaging a selection of stakeholders. The draft BFMP provides detailed site information and management strategies for the area to supplement the broad direction of the Geographe Bay Foreshore Management Plan. Development involved:

- assessment of the current physical and ecological state of the site including native vegetation, weed burden, erosion and storm surge areas, pedestrian and vehicular access and recreational usage;
- input from a selection of local residents, commercial operators and government agencies; and
- development of detailed, prioritised management recommendations for improving and preserving the site values.

The purpose of this management plan is to identify management recommendations to maintain and improve the key qualities of the foreshore site, namely:

- conservation values;
- erosion buffer function;
- recreation values; and
- social values.

The objectives are to:

1. maintain, preserve and enhance conservation values of the site;
2. improve the erosion buffering function of the foreshore (and so resilience to storm events);
3. facilitate sustainable recreation; and
4. foster community ownership of and responsibility for the foreshore.

Limitations must be acknowledged in relation to the term and timing of the project (for example, outside of peak recreational season and with evidence from only one storm event). A detailed flora and fauna survey was not required. The consideration of engineering options for erosion management was outside of the scope of the project brief.

1.3 THE STUDY AREA

This management plan covers the Geographe Bay foreshore area between Harvest Road and Alan Street, Broadwater (Figure 1). It is approximately 1.5 kilometres in length and varies in width from approximately 25-75 metres for the western portion between Harvest Road and Holgate Road, to approximately 150-300m for the eastern portion between Holgate Road and Alan Street.

1.4 LEGISLATIVE AND POLICY FRAMEWORK

A broad range of legislation and local and state policy apply to foreshore areas and the following have been considered in the preparation of this plan:

- Wildlife Conservation Act (1950);
- Busselton District Town Planning Scheme No. 20 (1999);
- Shire of Busselton Bylaws relating to reserves and foreshores;
- Geographe Bay Foreshore Management Plan (2001);
- Coastal Planning and Management Manual (2003); and
- Shire of Busselton Community Infrastructure Division Technical Standards and Specifications.

1.5 STAKEHOLDER CONSULTATION

The development of the draft BFMP involved an initial stakeholder consultation component. Local residents who had contacted the Shire in relation to the Broadwater foreshore were contacted along with community groups, Indigenous Elders for the region, commercial operators along the foreshore and relevant government agencies. In addition, input was included from impromptu discussions with locals and visitors during site visits. All respondents were in favour of supporting and enhancing the recreational, conservation, and community values and addressing the erosion issues of the area. The majority were keen to be involved in the actions.

The draft plan was advertised for public comment, and after consideration of the submissions received, the revised plan was adopted by Council in October 2005.

2. CURRENT STATE: BIOPHYSICAL FEATURES

2.1 SITE DESCRIPTION, VESTING AND PURPOSE

The Broadwater Foreshore area encompasses approximately 19ha of dunal and near coastal vegetation bordered to the south by tourist accommodation complexes and residential housing. Geographe Bay lies to the north and the site adjoins similar recreation reserves to the east and west. The shoreline is punctuated by four man-made rock groynes installed in an attempt to capture sand and promote accretion.

A dual cycle/ pedestrian pathway runs the length of the site which also includes two non-vehicular boat ramps and five public car parks.

The area covers a number of reserves and areas including:

- Reserves 35762, 24483 and 41550 currently vested to the Shire of Busselton as C Class Reserves for the purpose of Public Recreation.
- Reserve 22624 is reported to have been recently (November 2004) vested to the Shire of Busselton as an A Class Reserve for the purpose of Parklands and Recreation.
- The undeveloped portion of the Brockman Cove Road Reserve (east of Norman Road) which adjoins Reserve 22624.
- The plan also covers the “Foreshore Reserve” area north of all of these reserves extending to the high water mark.

Figure 1 identifies the various Reserves and areas making up the study area.

2.2 CLIMATE

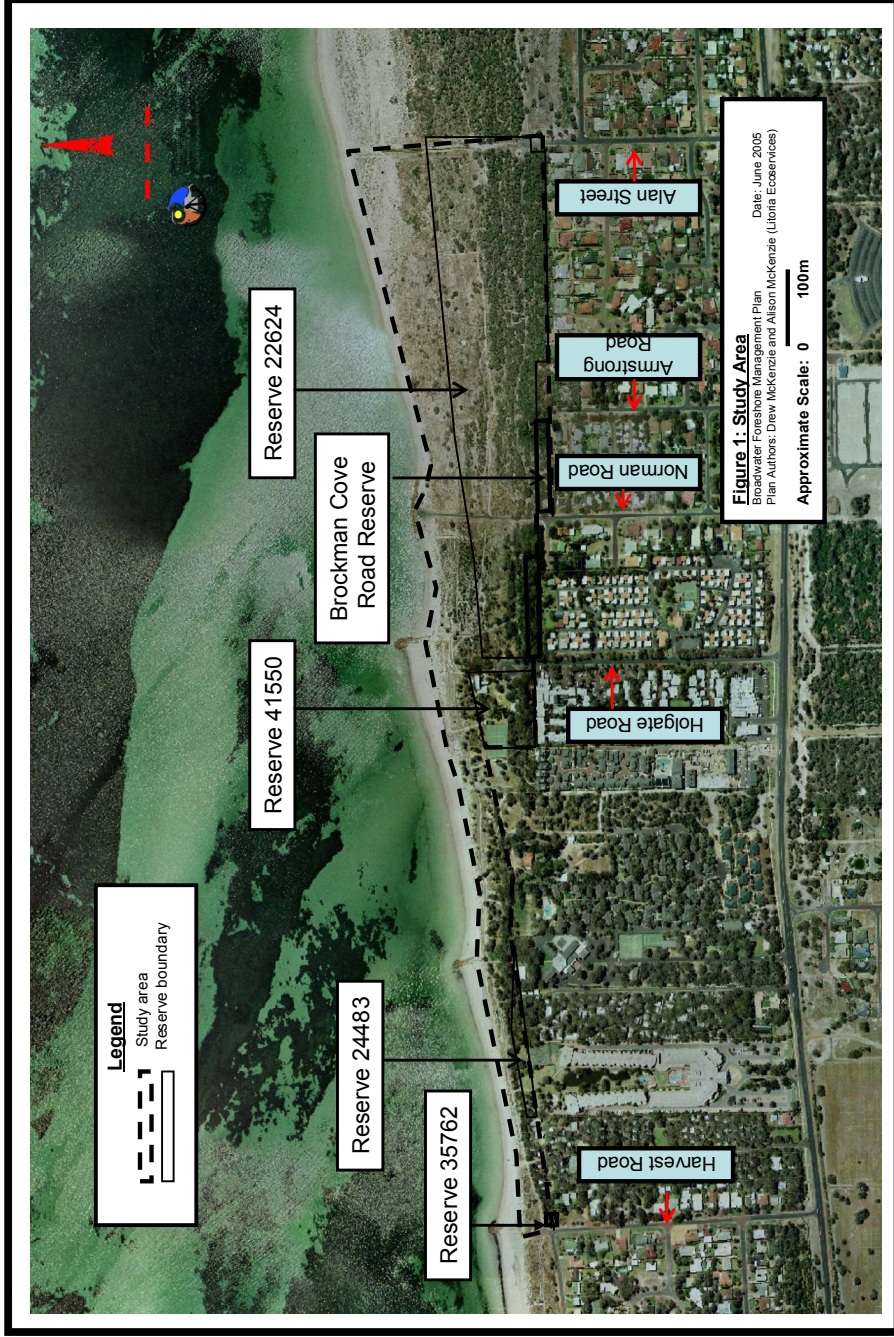
Located in Western Australia’s south-west, the area experiences a Mediterranean climate with hot dry summers and cool wet winters. Busselton has an average annual rainfall of 817 mm with 85% of this rain falling between May and October.

Geographe Bay generally experiences one tidal exchange per day with tidal movements averaging 0.5m. The passage of low pressure systems and associated northerly winds through the area in winter can generate storm surges with the ability to cause considerable erosion¹. Typically the area experiences five or six erosive storms each year².

2.3 COASTAL PROCESSES

The Geographe Bay foreshore is a low energy but dynamic, sandy coastline in the lee of Cape Naturaliste with a relatively unique northerly aspect¹. A longshore drift from west to east predominates along the Bay. The Geographe Bay coast experiences zones of accretion and erosion with a trend towards accretion since 1941³. “Sacrifice areas” downdrift of groynes are identified as potential localised erosion problems^{2,3}. Due to the normally low wave energy and subsequent restricted sediment supply, recovery from erosion events can be slow³.

The seagrass meadows and sandbars just offshore are noted for their contribution to ‘bottom resistance’ and a resultant reduction in wave impact on the foreshore⁴. In addition the dead seagrass or wrack that accumulates on the shoreline with the winter storms serves to reduce the wave impact on the foreshore.



2.4 TOPOGRAPHY

The study area is characterised by low coastal dunes generally less than 3m. Between Alan Street and Holgate Road the dunal system is relatively wide and characterised by a low foredune ridge, followed by a wide (up to 100m) area of low dunes with intervening swales, grading to the higher but still relatively low dune system which extends through to the southern boundary of the site. Between Harvest and Holgate Roads the foredune has been modified with a discontinuous rock “revetment” wall and the paved dual use pathway. Through this portion of the site, the grading of the modified “foredune” into the higher dune is compacted into a 15-50m width.

2.5 GEOLOGY

The study area lies within the southern portion of the Swan Coastal Plain, characterised by low lying marine and fluvial sediments. The site is characterised by unconsolidated calcareous sands of Holocene origin.

2.6 HYDROLOGY

The main hydrological feature of the site is the stormwater detention basin located at the end of Holgate Road which receives stormwater from adjacent developments. This pond overflows to the east through the swale which runs parallel to the foredune. There is no formal outlet for this water to enter Geographe Bay, however, it is understood that during periods of extended heavy rainfall it exits the site just west of Norman Road.

A drain runs northwards along the boundary of the study area from Alan Street to Geographe Bay. It is understood that this drain carries stormwater from the streets and residences surrounding and adjacent to Alan Street. The entrance of this drain to the Bay closes off periodically (generally during the summer months) and generally has to be “opened up” by Shire staff prior to the winter rains in order to avoid backing up of water in the drain into the surrounding streets.

Minor stormwater flow occurs along and adjacent to the dual use path (DUP) between Harvest and Holgate Roads and creates minor erosion at the points at which this water crosses the modified foredune.

2.7 NATIVE VEGETATION AND WEEDS

The vegetation of the site has been categorised based on structural characteristics in accordance with Specht⁵ and a condition assessment undertaken based on the Vegetation Condition Scale of Keighery⁶ (supplied as Appendix 1). Four vegetation communities have been identified and are closely related to the topography of the site. These are described below (with weed species identified by a ‘*’) and shown in Figures 2 and 3. Areas of particular degradation not consistent with the condition rating given for the entire community are also identified, refer to Figure 4.

2.7.1 Peppermint Low Woodland

This unit is characterised by a canopy of Peppermint (*Agonis flexuosa*) with a shrub layer dominated by Basket Bush (*Spyridium globulosum*), Coastal Beard-heath (*Leucopogon parviflorus*), Berry Saltbush (*Rhagodia baccata* subsp *baccata*) and Rigid Wattle (*Acacia cochlearis*). Other common species include Coastal Sword-sedge (*Lepidosperma gladiatum*), Shark's Tooth Wattle (*Acacia littorea*), Native Rosemary (*Olearia axillaris*), Prickle Lilly (*Acanthocarpus preissii*) and Native Wisteria (*Hardenbergia comptoniana*).

Common weed species of this unit include Couch* (*Cynodon dactylon*), Kikuyu* (*Pennisetum clandestinum*), other lawn grasses, Soursob* (*Oxalis pes-caprae*), *Oxalis depressa**, Rose Pelargonium* (*Pelargonium capitatum*), Dune Onion Weed* (*Trachyandra divaricate*) and Hare's Tail Grass* (*Lagurus ovatus*). Bridal Creeper* (*Asparagus asparagoides*) and Arum Lily* (*Zantedeschia aethiopica*) were scattered through parts of this unit.

Whilst a number of weed species are present within this unit, most are limited to isolated disturbed areas adjoining freehold land or alongside pathways or firebreaks. The weed species rarely dominate, currently having minimal impact on the overall structural integrity of the vegetation community. However, other disturbances to this community, primarily the abundance of formal and informal pathways, vehicle tracks, firebreaks and encroachments of turf or landscaping by adjoining landholders are impacting on the integrity of this unit. Overall the unit was assessed as in **very good condition** but **with isolated degraded areas**.

2.7.2 Open Herbland

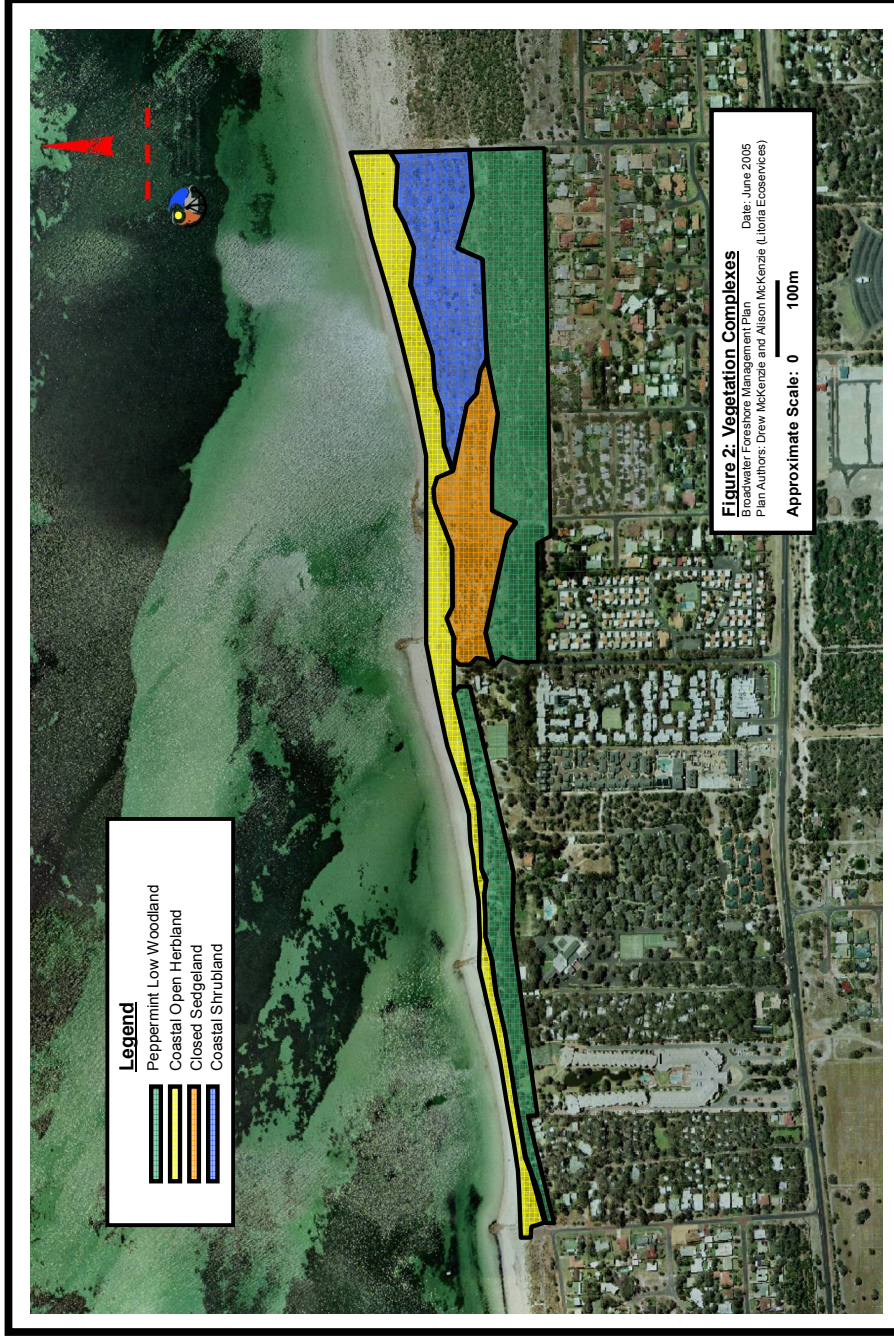
The foredune area, including the "foredune" built up around the rock revetment wall at the western end of the site, has a sparse vegetative cover dominated by herbaceous weed species. The dominant species of this unit varies along the length of the unit and include Sea Rocket* (*Cakile maritima*), Dune Onion Weed*, Hairy Spinifex (*Spinifex hirsutus*), Marram Grass* (*Ammophila arenaria*), Marine Couch (*Sporobolus virginicus*), Thick-leaved Fan-flower (*Scaevola crassifolia*), Rose Pelargonium* and Sea Spurge* (*Euphorbia paralias*). Other species occurring on the landward edge or protected portions of this unit include Rigid Wattle, Knotted Club Rush (*Isolepis nodosa*), Coastal Sword-sedge, Berry Saltbush, Sea Spinach* (*Tetragonia decumbens*) and Dune Cabbage* (*Arctotheca populifolia*). Occasional specimens of Rottnest Teatree (*Melaleuca lanceolata*) and Peppermint are found in this unit.

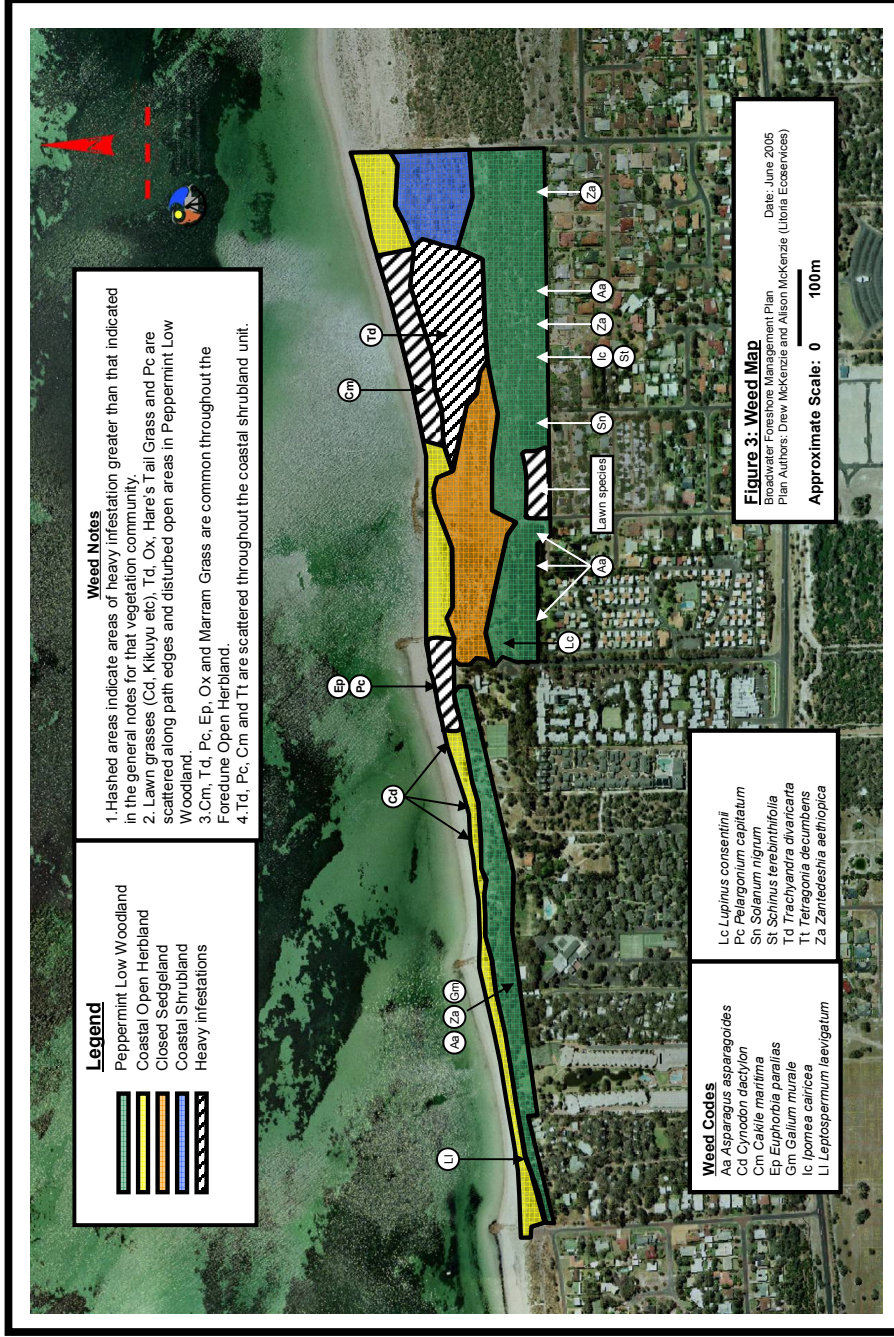
The dominance of weed species within this unit is high and in some areas represents as much as 90% of the vegetation cover. Erosion and poor foredune development through parts of the site leads to frequent disturbance by storm surge events. This vegetation community was assessed as **degraded with completely degraded areas**.

2.7.3 Coastal Shrubland

This unit is dominated by Rigid Wattle along with Shark's Tooth Wattle, Basket Bush, Coastal Sword-sedge, Berry Saltbush, Coastal Beard-heath, Prickle Lilly and Dodder Laurel (*Cassythia racemosa*). This unit is punctuated with isolated specimens or small stands of Peppermint (predominantly dead) and Rottnest Teatree.

Several weed species are present within this unit including Dune Onion Weed*, Rose Pelargonium*, Sea Rocket* and Sea Spinach*. Where this vegetation unit is buffered from





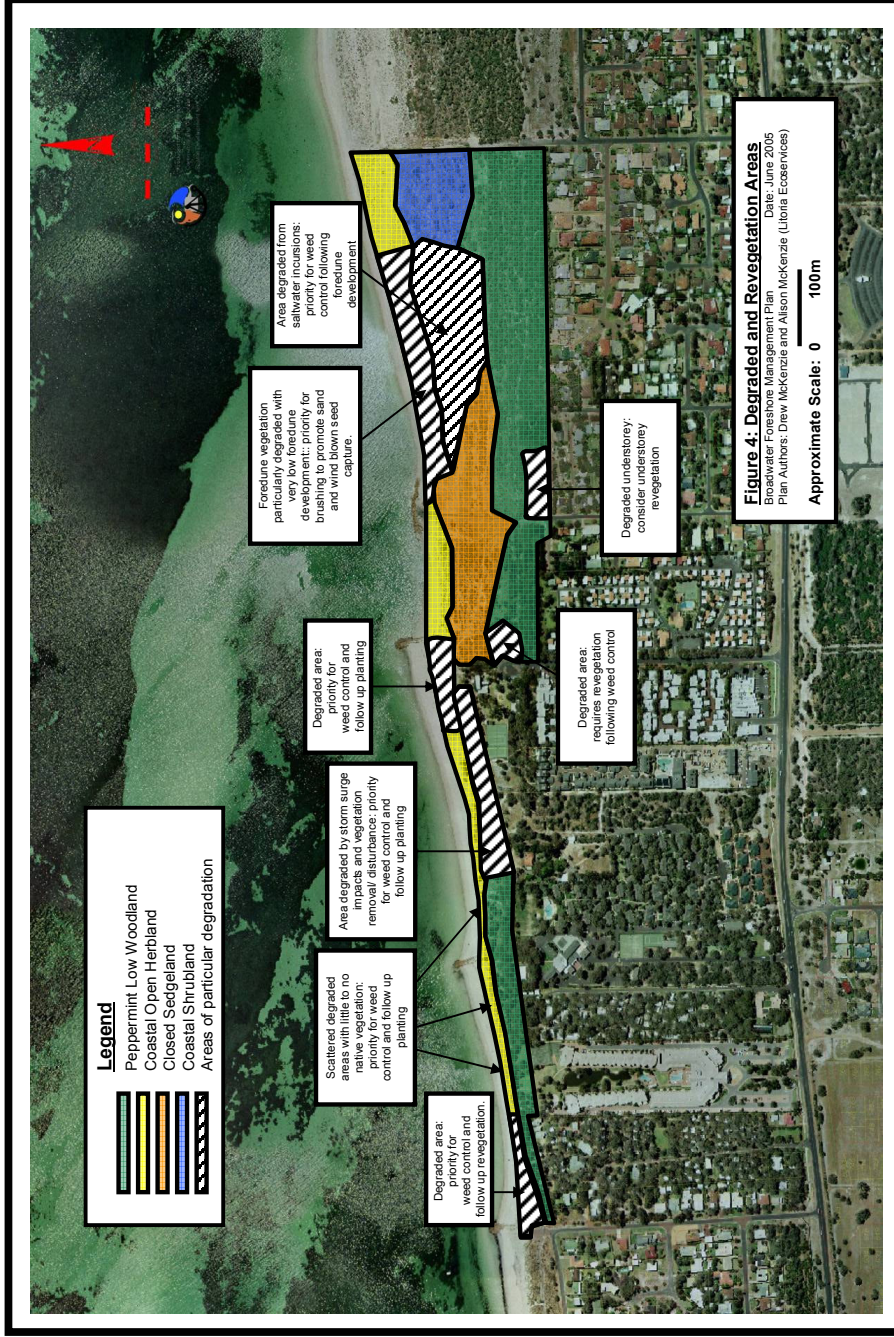


Figure 4: Degraded and Revegetation Areas
 Broadwater Foreshore Management Plan Date: June 2005
 Plan Authors: Drew McKenzie and Allison McKenzie (Litorea Ecoservices)
 Approximate Scale: 0 100m

the disturbances of storm surges and salt laden winds by a developed foredune, the vegetation condition is assessed as **good**. However, where a well developed foredune is lacking in front of this unit, weed species co-dominate and native species such as Rigid Wattle make up less of the total foliage projective cover and dead specimens of this species and Peppermint are common. In such situations, the variety of native species is reduced and the vegetation condition is assessed as **degraded**.

2.7.4 Sedgeland/ Grassland

This vegetation unit is associated with some of the lower swale areas behind the foredune in the Holgate Road to Alan Street stretch of the site. It is dominated by Knotted Club Rush and Marine Couch, with the introduced Pypgrass* (*Ehrharta villosa*) dominating portions of the unit. Isolated stands or individuals of Rottnest Teatree, Peppermint and Rigid Wattle are scattered through this unit.

Whilst a number of weed species are scattered through this unit including, Dune Onion Weed*, Rose Pelargonium*, Sea Rocket* and Sea Spurge*, the most significant disturbance to this unit is the exposure to episodes of saltwater incursion due to storm surge. This has killed off many of the Peppermints and to a lesser extent the Rigid Wattles. It is important to note that the Peppermints that have died through this area were relatively young and probably recent colonisers of the area. Overall the condition of this unit was assessed as **good**.

2.8 NATIVE FAUNA AND FERAL ANIMALS

It was beyond the scope of this project to conduct a detailed assessment of the fauna inhabiting the site. However, opportunistic sightings of mammals, reptiles and birds were made during the site assessment.

The **Western Ringtail Possum** (*Pseudocheirus occidentalis*) (WRT), or Nguara, is resident within the site and a number were sighted during the site assessment. This species, once widely distributed throughout the south-western forests of Western Australia is now almost exclusively restricted to coastal areas of peppermint woodlands and peppermint/ tuart associations between Bunbury and Albany. The species is now recognised and protected under the Commonwealth Environment Protection and Biodiversity Conservation Act and the Western Australian Wildlife Conservation Act as Vulnerable (to extinction) and Threatened (Schedule 1 – fauna that is rare or likely to become extinct) respectively. The fact that this listed species is locally abundant within the study area is of conservation significance and reinforces the importance of maintaining the good condition of the Peppermint Low Woodland which forms the species' primary habitat within coastal areas.

It should be noted that the WRT was not popular among some neighbouring residents due to the smell, mess and noise problems associated with their numbers present on private land. In general, however, most of the commercial tourist operators, although experiencing similar maintenance issues associated with the WRT, saw the species' presence as popular among their customers and positive overall.

The **Quenda or Southern Brown Bandicoot** (*Isodon obesulus*) was reported by some adjacent residents as occurring through the western half of the site and quite likely occurs through the length of the site. Despite suffering a reduced range since the introduction of the fox, this species is widespread on the coastal plain of the South-West. Although it is no longer listed under Schedule 1 of the Western Australian Wildlife Conservation Act it is an important record for the site.

Rabbits were sighted on a number of occasions on turf or lawn areas of the site during the field assessment. Although they do not currently appear to be significantly impacting on native vegetation, the impact of their grazing is likely to hinder revegetation efforts (consider protective measures). Control of rabbits in similar foreshore areas along Geographe Bay is undertaken by the Shire using Pindone baiting⁷. Should monitoring identify increasing population numbers or impacts on the site, baiting could be considered.

Foxes are identified to be present in many adjoining foreshore areas of Geographe Bay and may utilise the site although no signs were recorded during the site assessment and long term residents and tourism operators did not report any sightings. Foxes are identified as one of the main predators of the Western Ringtail Possum and Quenda, however, the proximity of the site to residential properties and the occurrence of domestic dogs using the area would make conventional fox baiting measures problematic. Given the fact that the Western Ringtail Possum population does not appear to be significantly affected by fox predation currently, unless monitoring identifies dramatic increases in the population or their impact on the site, their control is not seen as a priority. Residents should be encouraged to report fox sightings in the area in order to ascertain if management is warranted. It is noted that feral and/or wandering domestic **cats** may also utilise the site.

Three **frog** species, the Moaning Frog (*Helioporus eyrie*), Squelching Froglet (*Crinia insignifera*) and Western Banjo Frog (*Limnodynastes dorsalis*) were recorded during the site assessment, within the stormwater detention basin and the Alan Street drain. Note, however that the number of species recorded for the site is limited by the seasonality of the assessment, a lack of nocturnal surveying and the fact that the stormwater detention basin was recently cleaned out by the Shire resulting in significant disturbance to the fringing vegetation and resident frog populations in the short term. Given the source of water, the artificial nature of the drain and detention basin feeding into both of the winter wet areas of the site, any additional frog species occurring on site are likely to be generalist, relatively common species.

The only **reptile** species sighted during the assessment was the Bobtail Skink (*Tiliqua rugosa*), however, locals reported frequent snake sightings including Tiger Snakes (*Notechis scutatus occidentalis*) and Dugites (*Pseudonaja affinis affinis*). A broad range of other reptile species are likely to utilise the site.

The following **bird** species were observed on site while undertaking the site assessment. Once again this list is particularly limited and a longer term bird survey would expand this list considerably.

Common Name	Species Name	Common Name	Species Name
White Faced Heron	<i>Ardea novaehollandiae</i>	Splendid Fairy Wren	<i>Malurus splendens</i>
Pacific Black Duck	<i>Anas superciliosa</i>	White-browed Scrubwren	<i>Sericornis frontalis</i>
Osprey	<i>Pandion haliaetus</i>	Yellow-rumped Thornbill	<i>Acanthiza chrysoptera</i>
Silver Gull	<i>Larus novaehollandiae</i>	Silvereye	<i>Zosterops lateralis</i>
Common Bronzewing	<i>Phaps chalcoptera</i>	Australian Magpie	<i>Gymnorhina tibicen</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>	Australian Raven	<i>Corvus coronoides</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>		

2.9 FIRE MANAGEMENT

The Geographe Bay Foreshore Management Plan¹ identifies fire as a risk through the Broadwater precinct. Recent fires in the vicinity of Holgate Road (late 1999/ early 2000) and 50-60m in front of Sandy Bay Holiday Park (late 2004/ early 2005) were reported or evident. Open beach fires were also reported as a frequent summer occurrence along the Holgate to Harvest Roads stretch.

It was identified that Shire policy and practice does not support prescribed burns in foreshore areas⁸ and this was supported by some of the stakeholders consulted due to the length of time taken for vegetation to recover and the associated weed infestation. Authorised vehicle access should be maintained throughout the site for emergency fire control.

Concerns were raised by some stakeholders with regard to the fire risk posed by the dead Peppermints killed off by previous storm surge events. It is noted that some of these Peppermints have already been removed. Given the location of the remaining trees and the nature of the surrounding vegetation, these trees are not considered to significantly increase the fire risk of the area. Further, the dead trees play a useful role in wind break protection and dune and soil stabilisation. As such, removal is not recommended at this point in time.

2.10 EROSION

Figure 5 identifies erosion and storm surge issues. The rock revetment wall between Harvest Road and Holgate Road has been effective in protecting this area from storm surge and erosion south of the wall. However, where large gaps or low points in the rock wall exist, subsequent storm surge and erosion have caused damage to the DUP and saltwater incursion has seriously impacted vegetation south of the DUP.

Erosion damage and the impacts of storm surges are evident in the lee of the groynes at Holgate Road (in particular) and Norman Road. The four rock groynes in the study area are identified in the Geographe Bay Foreshore Management Plan¹ and by stakeholders as contributing significantly to the erosion problem. Coupled with or perhaps resulting from the erosion evident in this section, is the lack of development of a significant foredune ridge which could provide a valuable line of defence against coastal erosion and prevent the frequent incursion of saltwater and disturbance to the vegetation communities behind the foredune ridge.

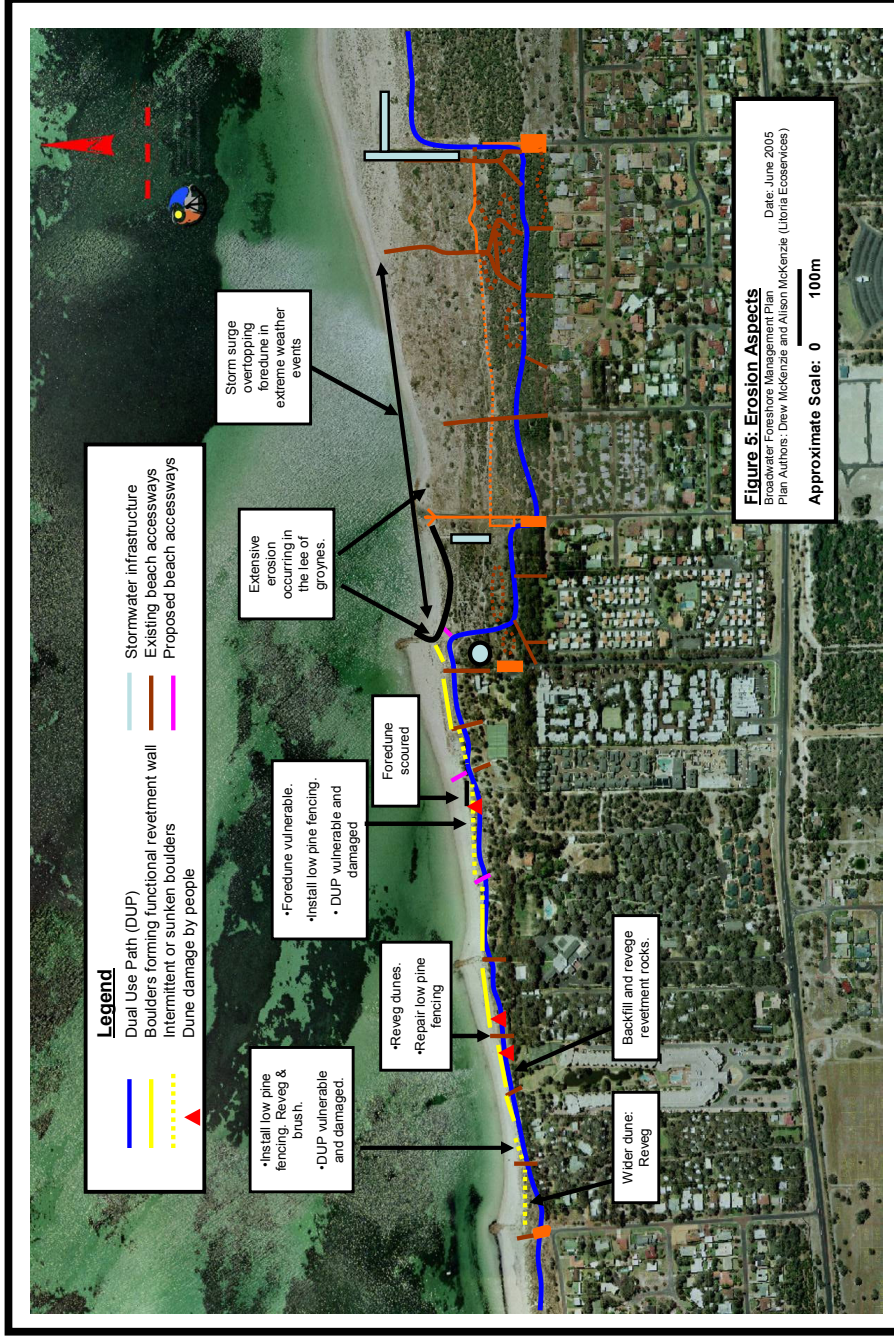
The Department of Planning and Infrastructure (DPI) and the Shire of Busselton is currently undertaking a significant study into the issue of erosion, in the form of the 'Shoreline Scoping Study Geographe Bay (Busselton)'. This study should shed light on the long term significance of the erosion problems currently being experienced in parts of the site and provide direction for the longer term management of the issue.

Preliminary advice⁹ received from the DPI and the Senior Coastal Engineer (Dr Bill Edwards) undertaking the Study suggest that the area east from the Holgate Road groyne has actually accreted over the long-term since 1941 and that significant erosion of the shoreline beyond the 1941 vegetation line is not expected. Episodic (acute) erosion is a natural part of the coastal processes through this area and as such, management should be tailored towards tolerating minor annual sea inundations and fluctuations of the shoreline over time.

Human impacts contribute to erosion problems in the study area, including dune and vegetation disturbance (via informal walk tracks to beach, jumping off fragile dunes and disturbing sand build up around the revetment wall, driving vehicles over foredune and other

vegetation, cutting branches for views and breaking branches for fires). Seasonal fencing and/or warning signs may be required when erosion creates significant dropoffs at usual accessways. Infrastructure along the foreshore must be able to withstand the winter storms or allowance for seasonal dismantling of infrastructure must be made.

Vegetation is identified as essential to the long term stability of the coastline.



3. CURRENT STATE: HUMAN USE ATTRIBUTES

3.1 INDIGENOUS HERITAGE

A search of the Department of Indigenous Affairs Register of Aboriginal Sites highlights many Aboriginal Heritage Sites in the Shire of Busselton, although none of the listed sites were located in the Broadwater foreshore study area. Two Aboriginal Elders were consulted as part of the initial stakeholder engagement, and both confirmed there were no specific sites of significance known. However, the Geographe Bay foreshore area was used extensively by Nyungar groups for camping and hunting, and evidence of this in the Broadwater foreshore may be revealed if a survey was undertaken by Indigenous consultants.

While no major earthworks are proposed for the study area, if any digging works are to be undertaken as part of future management, Indigenous representatives should be informed (as per the State and Commonwealth Heritage Acts and the Native Title Act 1993).

Walking on site with one of the Aboriginal Elders, several stories were told. This highlighted the potential for including Indigenous cultural material (with permission from the Elders) in interpretive signage for the site (refer to Appendix 4).

3.2 RECREATIONAL USE

The study area encompasses reserves that are to be managed for the primary purpose of recreation, with the area readily and frequently accessed by local residents, from both north and south of the Bussell Highway (note the population increases with new developments is only beginning to be experienced). In addition, recreation is of key importance for the tourism enterprises adjacent to the foreshore.

The study area is utilised for:

- Walking, cycling and exercising
- Promenading
- Fishing
- Boating
- Dog exercise
- Swimming, snorkelling, kitesurfing, jetskiing and waterskiing, although the last two activities are prohibited by the Department of Planning and Infrastructure.
- Beach activities
- Playground fun and picnics

These uses are well catered for.

Nuisance activities include beach fires (generally burning local vegetation and brushings) and associated litter, dune disturbance by bicycles, vehicles and tracks to cubbyhouses etc. Resorts reported increasing incidence of non-guests accessing the foreshore through their properties rather than via the public roads, easements and pathways. Stingers were reported to accumulate between the Holgate and Norman Road groynes during summer.

Although summertime is the peak period for recreational use, locals and smaller numbers of visitors recreate in the area year-round.

3.3 FACILITIES AND INFRASTRUCTURE

3.3.1 Pedestrian and Bicycle Access

Pedestrian and bicycle access is facilitated by the dual use pathway (DUP) which runs the entire east – west length of the study area. This path accommodates access by people with disabilities and using mobility aids. It is popular with locals for exercising, socialising and commuting and with visitors for appreciating Geographe Bay. For local commuters and visitors, the DUP provides an access corridor through to Busselton’s town centre.

The DUP is a bitumen surface with maintenance required to address damage from rainwater flows and dune instability. In particular, the section crossing Norman Road is loose gravel, making the turns in this stretch hazardous for cyclists. The multi-use nature and popularity of the DUP suggests directional and regulatory signage would be advantageous.

Figure 6 shows the formal beach access paths, including:

A1	End of Harvest Rd: sandy track from carpark. Wide enough for boat trolleys.
A2	Across DUP from Acacia Caravan Park: Boat ramp intended for pedestrian and manual boat trolley (non-vehicular) access. Seasonally erected (from crushed limestone) and maintained by Acacia Caravan Park under agreement with the Shire; open to the general public.
A3	North of DUP from Abbey Beach Resort: Timber walkway and steps (x 6) only recently erected by the Shire. Concern raised whether the structure was adequately stabilised to cope with storm surges.
A4	Across DUP from Amblin Caravan Park: Boat ramp erected (concrete, timber, rubber mats) and maintained by Amblin Caravan Park. Arrangements unclear. Pedestrian access difficult and potentially unsafe at present due to slope and condition of the ramp as well as narrowness for dual use (boats and pedestrians).
A5	North of DUP from Geographe Bayview Resort: Timber viewing area and steps (x 12 – 18) to beach.
A6	Proposed new beach access. Foot track exists from house at Geographe Bayview Resort to low pine fence at beach. Some fencing is in place. Timber steps may be required in the future to accommodate the large and predicted increasing volume of traffic from the Resort which has a large frontage to the foreshore.
A7	Proposed new beach access. Low pine fencing and/or timber steps required for beach access north of DUP to meet the paved path from Broadwater Bungalows (south side of DUP), and so formalise and consolidate existing tracks across the foredune.
A8	In front of Broadwater Resort: Concrete south of DUP, concrete north of DUP then sandy. May need additional low pine fencing to support revegetation.
A9	End of Holgate Road, in front of Stilts Kiosk: Sandy track north of DUP, adequate low pine fencing. Concrete south of DUP.
A10	Proposed new beach access. Allowing for fluctuations of the foredune in this area, steps should be considered to minimise erosion from the DUP to the beach behind the groyne. Infrastructure should be seasonally erected and removed as this area in the lee of the groyne is particularly dynamic.
A11	Bitumen path through Peppermints from Armstrong Road.
A12	Bitumen path (covered in sand at beach end) through Peppermints from easement.
A13	Bitumen path through Peppermints from easement.
A14	Alan St: formed path west of drain, to beach. Unfenced but no evidence of side tracks.

Additional informal beach access is evident throughout the site, with more prominent sites including in front of Geographe Bayview Resort and Broadwater Bungalows. Fencing (including repair of existing fencing) and revegetation may reduce the erosion impacts and disturbance caused by these tracks, along with formalising strategic additional pathways (as noted above).

Amongst the wider stretch of the study area, to the east of Norman Road, there are several tracks in addition to the DUP, both formal and informal. Informal foot and bicycle tracks exist amongst the Peppermint Woodlands leading to the beach, to cubbyhouses and to bike jumps/ circuits.

Low pine fencing lines much of the northern side of the DUP. This serves to discourage people from disturbing the dunes and vegetation and in some places provides a safety function, providing a barrier in front of the rock revetment wall and steeper sandbanks. Several posts and rails are missing or damaged. Where fencing is intact and are closer together they have been effective in restricting people traffic across vegetation or susceptible dunes.

3.3.2 Vehicle Access and Parking

Provision for authorised vehicle access within the study area is necessary for emergencies and fire management, as well as maintenance by Shire of Busselton staff, which includes maintenance of toilets at Alan Street, litter removal, maintenance of access paths and the DUP and clearing of drains.

Vehicle access within the study area was noted or reported:

- Along the west – east track between Norman Road and Alan Street (vehicles and motorbikes). Access at Alan Street is gated but not at Norman Road. This track has been useful for tending to fires in the past.
- To the northern end of Norman Road which ends out on the groyne.
- Onto the beach from the end of Norman Road, both to the east and west of the groyne despite the placement of boulders to discourage this.
- Motorbikes along the DUP have caused disturbance and a safety risk to other users of the path.
- Along the DUP around the boat ramps. These ramps are not intended for vehicle use, rather trolley and trailer access only. However, it was reported that vehicle use is common over summer with parking occurring on turfed areas of the dune system at A4. This is considered an inappropriate use of the study area and poses a safety risk for pedestrians using the ramps for beach access and using the DUP.

Five roads north off the Bussell Highway lead to accessways for the foreshore:

- Harvest Road: High and increasing use was reported particularly over summer with a need for increased facilities identified. The carpark is situated in the foredune area with the DUP crossing through the middle. Relocation should be considered if the carpark is to be expanded.
- Holgate Road: 29 carpark spaces (including one designated for disabled users) service the foreshore, the playground and kiosk at Holgate Road Reserve, as well as the Broadwater Beach Resort's restaurant and bar which is open to the public. The carpark is frequently full with vehicles parking on the curbside (and parking for events reported as inadequate). 'No parking' signs line the length of Holgate Road.
- Norman Road: Currently Norman Road extends out onto the rock groyne within the Bay. Fishermen, elderly people taking in the view from their vehicles, local workers

having lunch and others drive out and park here. The road base is usually covered in sand and two-wheel-drive vehicles occasionally get bogged. Turning is restricted and a cleared area in the foredune has been established off to the western side of the road to accommodate parking and turning. During winter, sand build up and water flows across the road create maintenance and safety issues.

Vehicle use is evident into the dune area to the east along the ungated track and also onto the beach front possibly for the launching of boats. The DUP crosses Norman Road and this section is hazardous for bikes, pedestrians and vehicles. While there is a vehicle slowing device in place, the existing warning sign may be inadequate.

- Armstrong Road: Two tight carparking spaces exist at the end of Armstrong Road.
- Alan Street: A large carparking area exists at the end of Alan Street, adjacent to facilities. Authorised vehicle access is available.

3.3.3 Toilets, Picnic and Playground Facilities

One public amenities block (with one male and one female toilet) is located at Alan Street. No other public amenities are available in the study area, with the next nearest facilities at Abbey Boat Ramp on Geographe Bay Road, approximately 1.5 km west of Harvest Road. Tourist operators reported use of their amenities by non-guests as a problem.

Picnic tables are provided by the Shire of Busselton at the Holgate Road Reserve. Playground equipment is provided by the Shire of Busselton at Alan Street and at the Holgate Road Reserve. The Holgate Road Reserve is very popular and in part is maintained by the Broadwater Beach Resort. The Resort also maintains a sand volleyball court in the Reserve. No shade shelters are provided and these could be considered for future improvements. Fixed shade structures on the beach are considered inappropriate due to the instability of the dune system.

3.3.4 Rubbish and Dog Waste

Rubbish bins are provided and maintained by the Shire of Busselton's Parks and Gardens staff, at Harvest Road, Holgate Road, Norman Road and Alan Street. Parks and Gardens staff undertake litter removal and tourist operators are proactive in keeping the foreshore adjacent to their properties litter-free.

Shire Bylaw 3.(i) relates to rubbish and litter on reserves and foreshores. Overall litter was not apparent as a major issue and this was supported by several stakeholders. Hotspots of litter that were noted during site visits in May and June 2005, include:

- In dunes near A2;
- Immediately east of the Holgate Road carpark.

Corresponding with permitted dog exercise areas and dog on-leash areas, dog waste bags are provided at Harvest Road, at A9 near Holgate Road, Armstrong Road, Norman Road and Alan Street. Used bags can be disposed of in rubbish bins which are located in the vicinity. Locals reported the system as being effective for reducing dog waste on paths and on the beach, although the supply of bags needed to be maintained more regularly.

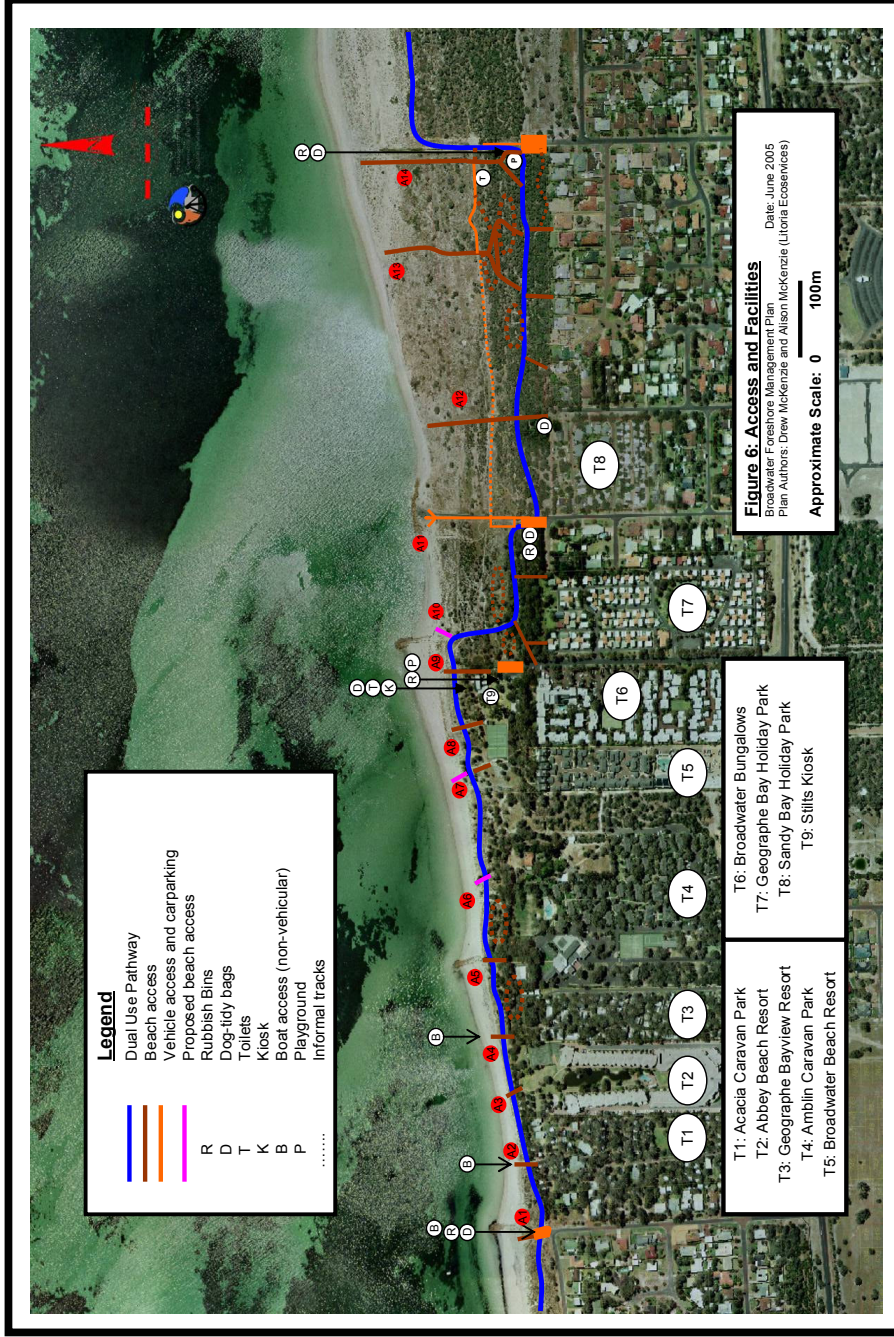
3.3.5 Signage and Lighting

Currently signs are scattered throughout the study area, ranging from regulations and prohibited activities to commercial advertising and liability advices. Several of the signs are old, faded or fallen over and as such are ineffective, an eyesore and hazardous.

Billboards facing the foreshore create visual pollution and may not be in line with the Shire's Foreshore and Reserves Bylaw 4.(g). A signage plan for the study area was favoured by several users of the DUP and other stakeholders. This could encompass directional information (including an orientation map), regulatory information and interpretive information (refer to Appendix 4).

Locals reported confusion amongst non-locals, with a lot of vehicular traffic going up and down streets looking for access ways etc. Installation of "Beach Access" signs at the Bussell Highway may be a useful means of directing traffic to appropriate access paths and facilities.

At present lighting along the DUP exists at or near A3, A4 and A5, provided and maintained by the adjacent tourism operator. In view of the high use of the DUP on summer evenings several of the tourist operators and locals suggested lighting the DUP. Any consideration of lighting the DUP should be in a broader context, in view of the DUP running through Broadwater and several other foreshore precincts. Cost and maintenance issues, lightpole location in relation to the dynamic foreshore system, liability and safety issues and other aspects would all need to be considered.



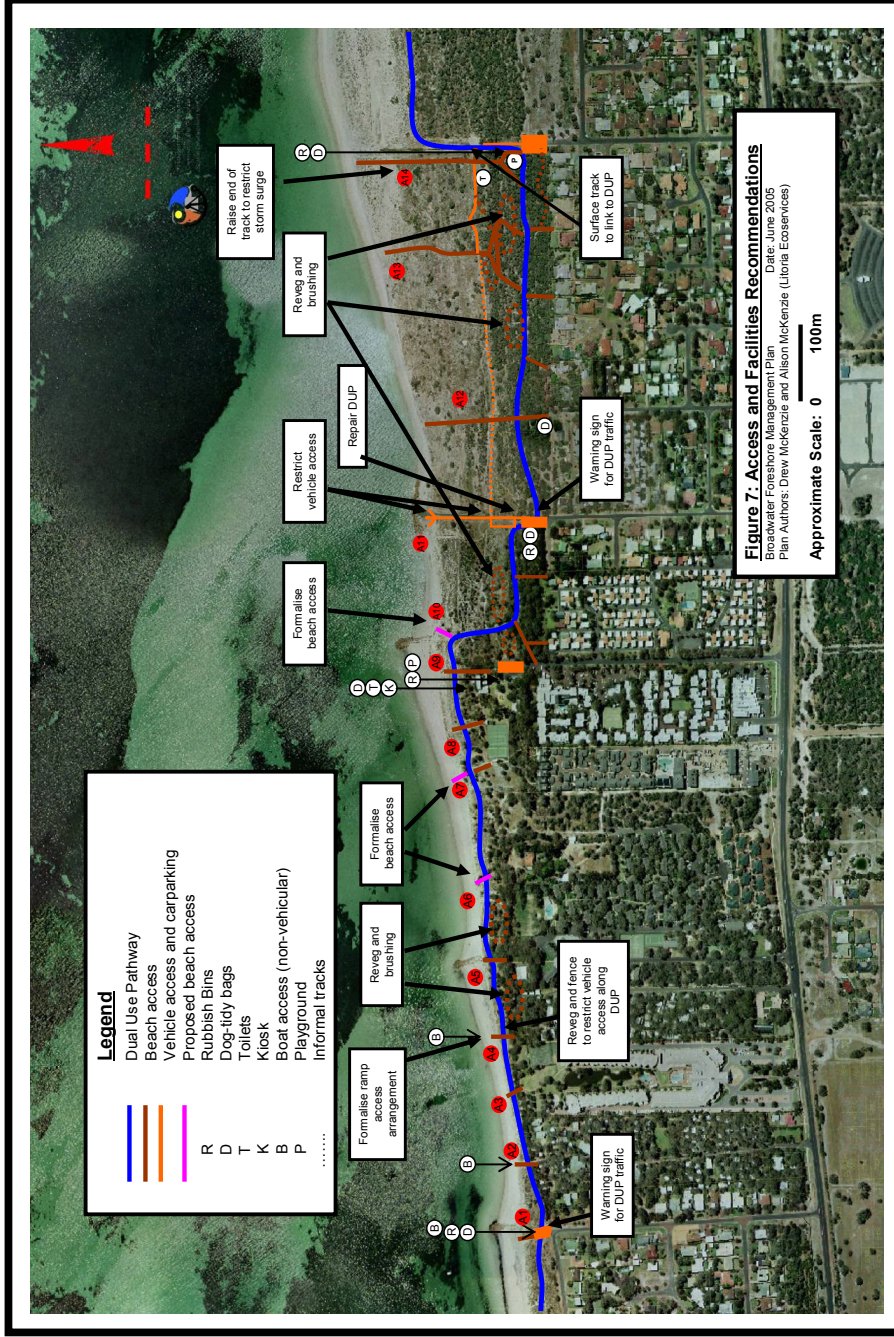
Legend

- Dual Use Pathway
- Beach access
- Vehicle access and carparking
- Proposed beach access
- Rubbish Bins
- Dog-tidy bags
- Toilets
- Kiosk
- Boat access (non-vehicular)
- Playground
- Informal tracks

Figure 6: Access and Facilities
 Broadwater Foreshore Management Plan
 Date: June 2005
 Plan Authors: Drew McKenzie and Alison McKenzie (Ultonia Ecoservices)
 Approximate Scale: 0 100m

T1: Acacia Caravan Park
 T2: Abbey Beach Resort
 T3: Geographe Bayview Resort
 T4: Amblyn Caravan Park
 T5: Broadwater Beach Resort

T6: Broadwater Bungalows
 T7: Geographe Bay Holiday Park
 T8: Sandy Bay Holiday Park
 T9: Stitts Kiosk



4.0 MANAGEMENT RECOMMENDATIONS

4.1 INTRODUCTION

Management recommendations have been developed based on the stated aim and objectives, site assessment, literature reviews and stakeholder consultation, and then grouped according to the four key qualities of the foreshore. They have been identified as high, medium or low priority and many of the recommendations meet more than one of the four stated objectives. Guiding principles provide the overarching framework for the specific management recommendations.

4.2 GUIDING PRINCIPLES

4.2.1 Conservation

Weed Management

- Weed management should start in areas of good condition and work outwards towards heavily infested/ degraded areas.
- Site and soil disturbance should be minimised as it promotes further weed growth.
- The rate of native plant regeneration should dictate the rate of weed removal.
- Weed management should focus on priority weeds with the greatest potential to degrade the site and declared plants which the Shire has a legislative obligation to control.
- Recognise that preventing weeds entering the site is one of the most effective and efficient methods of weed control.
- As a general rule, manual weed removal is preferred over chemical control.
- Recognise that weed species can have positive benefits on the site (eg foredune stabilisation).
- Recognise the vegetation disturbance occurring at the interface of the site with freehold land along the southern boundary via encroachment of structures, turf and landscaping planting, a source of weeds and nutrient loading of the site through fertiliser use and dumping of green waste.
- Recognise the impact of storm surge and saltwater inundation on vegetation and consider this in vegetation and weed management, particularly in the eastern half of the site where it is expected to continue as a natural coastal process.

Revegetation

- Natural regeneration is favoured over revegetation. However, some parts of the site are sufficiently degraded to suggest that revegetation is appropriate.
- Revegetation should only utilise locally native species and where possible stock of local provenance. Species appropriate for revegetating the relevant zones are identified in Appendix 2. It is noted that the Geographe Community Landcare Nursery can supply native species of local provenance if pre-arranged and ordered.
- Revegetation will require the use of plant protection devices (ie tree bags), due to the presence of rabbits on site.
- Planting should be scheduled to coincide with winter rainfall in order to increase survival rates and minimise on-going maintenance.
- Recognising the impact of erosion and storm surge effects, some areas are considered inappropriate for revegetation until these impacts can be addressed and the foredune area stabilised.

Fauna

- Recognise the significance of the presence of the listed Western Ringtail Possum within the study site and the priority of protection and enhancement of its habitat.
- Recognise the potential of feral fauna, namely foxes and rabbits, to have a major impact on the conservation and recreation values of the site.

Fire

- In accordance with general Shire practice within foreshore areas, prescribed burning is not recommended within the Broadwater precinct.
- Authorised vehicle access should be maintained throughout the site for emergency fire control.
- Open fires are inappropriate for the site and are prohibited under Shire by-laws.

4.2.2 Erosion

- Engineering measures are beyond the scope of this management plan. However, engineering structures (ie groynes) appear to be contributing to localised foredune erosion particularly east of Holgate Road. Any attempt to address this localised erosion may need to consider engineering solutions and the impacts of the groynes.
- The forthcoming release of the Geographe Bay Scoping Study (commissioned by the Department of Planning and Infrastructure and the Shire of Busselton) should guide the long term stabilisation and management of erosion issues.
- Acknowledge and manage human contributions to erosion. In particular, vehicle and pedestrian access management is critical in removing a key cause of vegetation and dune disturbance.
- Vegetation is essential for the long-term stability of the coast¹⁰.

West of Holgate Road

- Erosion and storm surge impacts in the western half of the site should be considered the priority due to the proximity of the DUP and private property to the water's edge.

East of Holgate Road

- Episodic (acute) erosion is part of the normal coastal behaviour, and this section of the site is not expected to recede any further landwards of the 1941 vegetation line⁹.
- Management of the area east of the Holgate Road “should be tailored to tolerate minor sea inundation and the natural fluctuation of the shoreline due to accretion/ erosion over time”⁹.

4.2.3 Recreation

- Recognise ‘recreation’ as a designated purpose and a priority value of the study area. As per the Geographe Bay Foreshore Management Plan¹, ‘recreational activities should be given a high priority as a beach use along the Geographe Bay Foreshore’.
- Managing the recreational use of the study area is an important precursor for achieving conservation and erosion outcomes.
- Service facilities should be designed to minimise impact on landform. Vegetation and dune disturbance due to infrastructure and facilities should be minimised if not avoided.
- The study area is public open space. The value of this public asset to commercial operators is recognised as is their involvement in maintaining it.
- Residential developments and expansion of existing tourism developments mean the usage of the study area is increasing and management must address the associated pressures.
- Vehicle access should be facilitated for authorised use, including management and emergencies, but public vehicle access is not considered appropriate in the study area.

- Signs and maps should be utilised at strategic points to direct movement through the foreshore and to enhance the recreational experience. They should enhance the landscape rather than detract from it.
- Recognise the connectivity of the DUP between numerous precincts along the Geographe Bay foreshore, and factor this into planning decisions for signage, lighting, maintenance etc.

4.2.4 Social/ Community

- Recognise the importance of local ownership of the area, and the associated sense of place and pride, which contribute to a stronger sense of community and a sense of responsibility for the area.
- Recognise the concern for and interest in the area expressed by local residents and tourist operators and provide ongoing opportunities for involvement in foreshore management.
- Recognise the longterm significance of the Geographe Bay Foreshore to the Nyungar people.
- Recognise the profile of tourism in the Broadwater precinct, with the concentration of resorts and caravan parks sharing the foreshore as a focal point.
- Recognise the opportunity and value for people to recreate in and experience the natural coastal environment.
- Recognise the constraints on financial and other resources available to the Shire of Busselton to manage the foreshore and encourage collaborative actions and community involvement.

4.3 RECOMMENDED ACTIONS

		MANAGEMENT ACTIONS		Priority
#				
GENERAL				
G1		Confirm the recreational purpose of Reserve 22624, recently vested to the Shire of Busselton as an A Class Reserve.		H
G2		At the next review of the lease conditions governing Reserve 41550 ensure that these conditions are consistent with this management plan, with the designation of the area (public open space) and current management of the area.		M
G3		Investigate the use of the undeveloped portions of Brockman Cove Road Reserve for relocation of Norman Road carpark and/or incorporation into Recreation Reserve to consolidate the Reserve area.		M
G4		Investigate the apparent encroachments into the reserve adjacent to Lots 62 to 66 Sandpiper Cove, in the form of landscaping, turf establishment, formal fencing, planting of weed species, damage to Pepperminths and creation of temporary structures.		M
G5		Investigate the apparent encroachments into the reserve adjacent to Sandy Bay Holiday Resort, Geographe Bayview Resort, Geographe Bay Holiday Park, Amblin, Abbey Beach Resort and Acacia Caravan Park, in the form of dumping of green waste, landscaping, turf establishment, reticulation, storage of materials, camping facilities and infrastructure.		M
C1		Eradicate declared (P1, P4) Arum Lily patches in front of Lots 72 and 64 on Sandpiper Cove and in front of Geographe Bayview Resort.		H
C2		Treat isolated Bridal Creeper patches within the Peppermint woodland: <ul style="list-style-type: none"> • adjoining Geographe Bay Holiday Park; • in front of Geographe Bayview Resort; and • in front of the developed portion of Brockman Cove. 		H
C3		Eradicate isolated Blackberry Nightshade patches in front of Lot 66 Sandpiper Cove and 10m west of the Acacia boatramp.		L
C4		Eradicate single Brazilian Pepper tree at the eastern end of Catalpa Close.		L
C5		Eradicate isolated infestation of Coastal Morning Glory/ Mile-a-Minute in front of Lot 62 Sandpiper Cove.		M
C6		Eradicate isolated patch of Western Australian Lupin in the disturbed area east of the Holgate Road carpark followed by revegetation using species from the Peppermint Low Woodland list in Appendix 2.		M
C7		Revegetate the disturbed area around the Alan Street toilet block using species from the Peppermint Low Woodland list in Appendix 2.		L
C8		Revegetate the disturbed understorey north of the undeveloped portion of Brockman Cove.		M
C9		Avoid smothering dune vegetation when clearing sand build up from the DUP, and utilise this sand to contribute to backfilling of revetment wall.		M
CONSERVATION				

MANAGEMENT ACTIONS			Priority
#	MANAGEMENT ACTIONS	Priority	
CONSERVATION			
continued			
C10	Consider revegetation and brushing of informal tracks within the Peppermint Low Woodland between Alan Street and Holgate Road.	M	
C11	Undertake revegetation and weed control north of the DUP between Holgate Road and Harvest Road as indicated on Fig. 4.	M	
C12	Following implementation of relevant stabilisation measures (E3, E4) consider progressively weeding the Coastal Shrubland and Sedgeland/ Grassland.	L – M	
C13	Establish interpretative signage through the Peppermint Woodland section of the DUP increasing awareness of the Western Ringtail Possum and the importance of Peppermint Woodlands. Refer to Appendix 4 and Dunsborough-Busselton Environment Centre's WRP education resources.	M	
C14	Monitor and review the need for feral animal controls. Encourage locals to report sightings or changes in population numbers.	M	
E1	Investigate and consider repairing the degraded parts of the existing rock revetment wall identified on Figure 5 in order to prevent storm surge damage of the DUP and foreshore vegetation.	H	
E2	Provide a permanent/ formal outlet for stormwater runoff from the DUP at current points of erosion.	L	
E3	Refer to the forthcoming Geopraphe Bay Scoping Study and incorporate any relevant erosion management recommendations or findings, including in relation to erosion in the lee of Holgate Road and Norman Road groynes.	H	
E4	Ensure that vegetation and DUP management east of Holgate Road is compatible with the expected natural minor annual sea inundation and fluctuations of the shoreline.	H	
E5	Implement the recommendations regarding access provision, fencing and revegetation to minimise human contributions to erosion.	H	
E6	Install temporary fencing and warning signs when hazardous erosion occurs along the DUP.	H	
R1	Conduct regular monitoring and maintenance of the DUP and all beach accessways, in particular during winter when damage due to stormwater flows (E2), storm surges and erosion occurs.	M – H	
R2	Improve surface of DUP at Norman Road. (Note, consider R12 proposed works in same area)	M	
R3	Repair and replace existing low pine fencing throughout the site, minimising gaps where possible.	M	
R4	Provide additional, formal beach access at A6, A7 & A10 on Figure 6.	M,H,M	
R5	Formalise agreement and conditions with Amblin management re pedestrian and boat access at A4 (Refer to agreement with Acacia for A2).	H	
R6	Create a rise at the end of the track at A14 (eg using crushed limestone) in order to correct the existing gap in the foredune and so restrict seawater inflows.	L	
EROSION			
RECREATION			

MANAGEMENT ACTIONS			Priority
#			
R7	Formalise (surface) the track between the DUP and the toilet block at Alan Street (south of the drain).		M
R8	Revegetate and utilise brushing in the dunes south of the DUP in front of Geographe Bayview Resort (west of A6) and in front of Amblin (west of A5) to discourage access and tracks along the property boundaries. Monitor effect and fence off if necessary.		L
R9	Monitor impact and usage of informal tracks between Holgate Road and Alan Street for impacts on dune system (vegetation and erosion). Consider brushing, revegetation and fencing if necessary.		M
R10	Install fencing to restrict vehicle access and revegetate the dune area south of the DUP at A4.		H
R11	Harvest Road Carpark. If circumstances at the Harvest Road carpark change (e.g. shoreline erosion threatens to wash it away, usage of the area increases to the extent informal parking begins to occur on the dune vegetation, or there are a number of incidents reported involving vehicles and DUP users) within 5 years the location of the current carpark be reviewed. There are considered to be two locations for potential relocation and expansion: 1. south of the DUP and west of the existing carpark; and 2. vacant reserve on the eastern end of Harvest Road. The vacant reserve on the eastern side at the end of Harvest Road is also considered to be suitable for the provision of public toilets and picnic facilities however at the time of preparing this report it was considered that current use of this site did not warrant the construction of these facilities. Review existing Lease arrangements with Kiosk at Reserve 41550 with regard to public access to toilets.		L - M
R12	Restrict vehicle access to the Norman Road groyne beyond the informal track that runs off to the east of Norman Road. Develop a carpark and turning area in the disturbed area to the west and south of this point. Refer to Appendix 4.		H
R13	Undertake initial cleanup of identified litter hotspots so as to maintain the amenity.		M
R14	Continue provision of rubbish bins. Monitor litter and bin adequacy as usage of the area increases.		M
R15	Ensure bin locations are visible from and close to dog waste bag dispensers.		L
R16	Ensure a continuous supply of dog waste bags at existing dispensers.		M
R17	Rationalise and remove existing signs (especially those in disrepair) and install themed signage and maps that convey directional, regulatory and interpretive information at strategic locations throughout the study area. Such signage would be most effective if continuous along the full length of the Geographe Bay foreshore. Include the new signs on the Shire's assets maintenance register. Refer to Appendix 4.		H

RECREATION
continued

MANAGEMENT ACTIONS			
#	#	Priority	
RECREATION <i>continued</i>	R18	Improve warning signs where vehicles interact with DUP traffic, namely at Harvest Road and Norman Road, as an interim measure until carpark relocation decisions are made and implemented.	H
	R19	Install a sign for Holgate Road Reserve, similar to the low-impact one facing the carpark, to face the DUP and beach access to clarify that the area is for public use.	M
	R20	Install a 'No through road' sign at the interface of Bussell Highway and Norman Road.	L
	R21	Consider installation of 'Beach access' signs at the Bussell Highway indicating location of key accessways.	L
	R22	Review commercial advertising along the DUP to ensure current signs are in line with Shire bylaws.	M
	S1	Advertise and support the establishment of a Friends of Broadwater Foreshore/ Reserve group to participate in ongoing management.	H
SOCIAL	S3	Educate foreshore users by utilising interpretive signage and other appropriate measures (eg "Friends of Reserves" activities) to raise awareness of the values of the foreshore area, protection etc.	M
	S4	Invite community participation in the development of themed signage (R17) and include conservation, cultural and historical (including Indigenous), erosion and protection/ care information.	H

Priorities: L = low, M= medium, H = high

REFERENCES

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4. Extract from *Report MRI 2899* by Department of Conservation and Land Management, provided by Shire of Busselton.
5. Specht (1981) in Heisler, J (2000) *Botany Basics for Beginners in Native Plant Identification*. University of the Sunshine Coast, Caloundra.
6. Keighery, BJ. (1994). *Bushland Plant Survey: A guide to plant community survey for the community*. Wildflower Society of Western Australia (Inc.), Nedlands.
7. Personal communication with T. Morley, Officer responsible for pest management, Shire of Busselton, June 2005.
8. Personal communication with P. Wild, Fire Control Officer, Shire of Busselton, June 2005.
9. Personal communication with L. Dubczuk, Coastal Engineer, Department of Planning and Infrastructure, June 2005.
10. *Coastal Planning and Management Manual* (2003) Published by the Western Australian Planning Commission, Perth.
11. Brown, K. and Brooks, K. (2002). *Bushland Weeds: A practical guide to their management*. Environmental Weeds Action Network (Inc.), Greenwood.

APPENDIX 1: VEGETATION CONDITION SCALE

Vegetation Condition Scales are from Keighery⁶.

Pristine	Pristine or nearly so, no obvious signs of disturbance
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

APPENDIX 2: SPECIES LIST FOR EACH VEGETATION COMMUNITY

Species	Common Name	Peppermint Low Woodland	Coastal Shrubland	Sedgeland/ Grassland	Open Herbland
NATIVES: Trees/ Overstorey Species					
<i>Agonis flexuosa</i>	Peppermint	D*	I	I	R
<i>Melaleuca lanceolata</i>	Rottnest Teatree		I	I	I
NATIVES: Shrubs/ Mid-stratum species					
<i>Acacia cochlearis</i>	Rigid Wattle	D*	D*	I	I*
<i>Acacia cyclops</i>	Coastal Wattle	-	-	I	I*
<i>Acacia littorea</i>	Shark's tooth Wattle	C*	C*	R	-
<i>Spyridium globulosum</i>	Basket Bush	D*	C*	-	-
<i>Leucopogon parviflorus</i>	Coastal Beardheath	C*	C*	-	-
<i>Hibbertia cuneiformis</i>	Cut-leaf Hibbertia	I*			
<i>Exocarpus sparteus</i>	Broom Ballart	I*			
<i>Olearia axillaris</i>	Native Rosemary	C*	I*	-	R
NATIVES: Understorey/ Groundcovers/ Vines					
<i>Acanthocarpus preissii</i>	Prickle Lilly	C*	C*	R	-
<i>Carpobrotus virescens</i>	Coastal Pigface		I	I*	
<i>Cassythia racemosa</i>	Dodder Laurel	I	D	-	-
<i>Conostylis aculeata.</i>	Prickly Conostylis		I	I	
<i>Dianella brevicaulis</i>	Blueberry Lily	R*			
<i>Hardenbergia comptoniana</i>	Native Wisteria	C*	-	-	-
<i>Isolepis nodosa</i>	Knotted Club Rush	-	I	D*	-
<i>Lepidosperma gladiatum</i>	Coastal Sword-sedge	C*	C*	I*	C*
<i>Rhagodia baccata subsp. Baccata</i>	Berry Saltbush	C*	C*	I	I
<i>Santalum acuminatum</i>	Quandong	I*			
<i>Scaevola crassifolia</i>	Thick-leaved Fan- flower	-	-	-	C (Patchy)
<i>Spinifex hirsutus</i>	Hairy Spinifex	-	-	-	C*
<i>Sporobolus virginicus</i>	Marine Couch	-	C*	D*	C*

D - Dominant C - Common I - Isolated patches R - Rare

*** Recommended revegetation species within this unit.**

Notes: 1. A number of landscaped areas and landscape plantings occur within the study area and these species have not been included within this list.

2. This list is not intended to be comprehensive but rather indicative of each vegetation community and useful for planning and implementing revegetation and weed control efforts.

**APPENDIX 2 continued:
SPECIES LIST FOR EACH VEGETATION COMMUNITY**

Species	Common Name	Peppermint Low Woodland	Coastal Shrubland	Sedgeland/ Grassland	Open Herbland
WEED SPECIES					
<i>Ammophila arenaria</i>	Marram Grass				C
<i>Asparagus asparagoides</i>	Bridal Creeper	I			
<i>Cakile maritima</i>	Sea Rocket		I	I	D
<i>Cynodon dactylon</i>	Couch	C			I
<i>Euphorbia paralias</i>	Sea Spurge		I	C	C
<i>Galium murale</i>	Bedstraw	I			
<i>Lagurus ovatus</i>	Hare's Tail Grass	C	I	I	
<i>Leptospermum laevigatum</i>	Victorian Teatree	R			
<i>Lupinus consentinii</i>	WA Lupin	I			
<i>Oxalis depressa.</i>		I	I		I
<i>Oxalis pes-caprae</i>	Soursob	C	I		I
<i>Pelargonium capitatum</i>	Rose Pelargonium	C	C	I	D
<i>Pennisetum clandestinum</i>	Kikuyu	C			
<i>Polygala myrtifolia</i>	Butterfly Bush	I			
<i>Rumex sp.</i>	Dock		I		
<i>Schinus terebinthifolia</i>	Brazilian Pepper	I			
<i>Senecio elegans</i>	Purple Groundsel				I
<i>Stenatophrum secundatum</i>	Buffalo Grass	I			
<i>Tetragonia decumbens</i>	Sea Spinach			I	C
<i>Trachyandra divaricata</i>	Dune Onion Weed	C	D	I	D
<i>Tropaeolum majus</i>	Nasturtium	I			
<i>Zantedeschia aethiopica</i>	Arum Lily	I			

D - Dominant C - Common I - Isolated patches R - Rare

- Notes:** 1. A number of landscaped areas and the single stormwater detention basin occur within the study area and these species have not been included within this list.
2. This list is not intended to be comprehensive but rather indicative of each vegetation community and useful for planning and implementing revegetation and weed control efforts.

APPENDIX 3: METHODS OF WEED CONTROL

Species	Nature of Infestation	Some suggested methods of management and control*
Arum Lily <i>Zantedeschia aethiopica</i>	Isolated plants or populations	Manual removal (removing the tuber completely from the soil); Chemical removal: Metsulfuron methyl or chlorsulfuron 0.4g/15l of water +pulse. Higher concentrations in hand held applicators can avoid off target damage to native vegetation.
Bridal Creeper <i>Asparagus asparagoides</i>	Patchy	Biological control with the introduction of Rust and Leaf Hopper.
Western Australian Lupin <i>Lupinus cosentinii</i>	Single patch	Hand remove scattered plants.
Rose Pelargonium <i>Pelargonium capitatum</i>	Widespread	Hand pull isolated plants removing the entire stem, spot spraying with metsulfuron methyl 5g/ha + pulse.
Dune Onion Weed <i>Trachyandra divaricata</i>	Widespread	Wipe with 50% glyphosate solution before flowering.
Pyp Grass <i>Ehrarta villosa</i>	Dense Pockets	Spray with Verdict 520 10ml/10L (500ml/ha) or Glyphosate 1% with penetrant.
Couch <i>Cynodon dactylon</i>	Isolated patches	Solarisation; shade out with revegetation, glyphosate 1% (follow up required)
Kikuyu <i>Pennisetum calndestinium</i>	Isolated patches	Solarisation; Glyphosphate 1% with follow up within same growing season.
Hare's Tail Grass <i>Lagurus ovatus</i>	Widespread in parts	Prevent seed set-spray with 10ml/10l Fusilade (500ml/ha).

- *Notes: 1. These management methods are adapted from those suggested within *Bushland Weeds: A practical guide to their management*¹¹.
2. Before commencing, check that the suggested methods are still currently recommended and that the chemical is registered for the intended purpose.
3. Only appropriately trained, qualified and equipped people should undertake chemical control and it is recommended that chemical use within the study area only occur under the supervision of or by appropriately trained Shire of Busselton staff.

APPENDIX 4: ADDITIONAL NOTES RE MANAGEMENT RECOMMENDATIONS

R12: Restrict vehicle access to the Norman Road groyne - important considerations:

- DUP traffic is still affected; include warning signs and traffic slowing devices.
- The existing bitumen road out to the groyne could be retained for use as pedestrian beach access. Bollards would be required to restrict vehicle access, although authorised access for emergency and maintenance purposes should be facilitated by a lockable barrier.
- A lockable barrier should restrict access to the eastern vehicle (management) track as well as groyne access.
- Expanding the carparking at Norman Road may reduce the pressure at Holgate Road, by providing an alternative access to the beach and still an easy walk to the kiosk and other facilities. Use could be encouraged by including playground and/or public amenities in the carpark redevelopment.
- Disturbance of intact native vegetation should be minimised.
- The amenity of residents of Brockman Cove (west) should be considered.

R17: Themed signage and mapping considerations:

1. Directional Information, including:
 - walking tracks and beach accessways
 - vehicular boat ramps
 - toilets, playgrounds, picnic areas, kiosk
 - key street names and the main carparks
 - distance markers in relation to Busselton jetty and Dunsborough
 - accommodation houses
2. Regulatory Information, including:
 - fires, camping, littering prohibited
 - no vehicles or motorbikes
 - boating, waterskiing, jetskiing restrictions
 - dog access
3. Interpretive Information, including:
 - cultural heritage – historical and ongoing significance, particularly to Indigenous groups
 - conservation – vegetation types, weed identification, seagrass wracks on the beach, bandicoots and western ringtail possums, birdlife etc. *See below*

Liaise with stakeholders including Department of Transport, Shire of Busselton, Indigenous representatives, tourism operators etc. Local school, community and arts groups could be involved to localise the format and content.

Additional considerations:

- identifiable yet non-intrusive, in order to blend in (colour and design) and enhance the foreshore environment
- themed, creating a sense of connectivity along the pathways
- consistent with Shire of Busselton bylaws
- weatherproof and graffiti-proof
- installed away from erosion risk areas

Refer to the Department of CALM's Signage Manual and the GBFP (2001) proposals for themed signage across the nine foreshore precincts.

Content suggestions for incorporation into interpretive information:

Indigenous Heritage

Aboriginal Elders carry a wealth of information on cultural ways and natural systems (wisdom, lore and ecological insights). The interpretive information signs could provide a useful way to raise the awareness of cultural values, as well as appreciation for the conservation values of the site. Close liaison with Elders showing respect and appropriate cultural sensitivity should underly such a project.

An example told during consultation for the draft BFMP:

Aboriginals associated the flowering time of the Basket Bush (*Spyridium globulosum*) with Western Ringtail Possums carrying young, and avoided hunting the possums in order to sustain the possum population for future food source.

Western Ringtail Possum

This area of the Broadwater foreshore is home to the Western Ringtail Possum (*Pseudocheirus occidentalis*). This species, once widely distributed throughout the south-western forests of Western Australia is now almost exclusively restricted to coastal areas of peppermint woodlands and peppermint/ tuart associations between Bunbury and Albany. The Busselton area represents one of the strongholds for this threatened species and the Peppermint (*Agonis flexuosa*) trees which form the canopy of the vegetation in this area are critical to their survival with Peppermint leaves representing their primary food source and their canopy refuge from their main predator the Fox.

Rather than feeding them human food which may damage their health and encourage unfavourable behaviour, the best way to help the Western Ringtail Possum is to look after its Peppermint Woodland habitat by staying to the marked paths, helping with local weed eradication and revegetation efforts, planting locally native species especially Peppermints in areas adjoining the reserve.

The Western Ringtail Possum is easily distinguished from the Common Brushtail Possum (the only other large possum species found in the area) by its short rounded ears, and slender, prehensile tail with a white tip.

APPENDIX 5: IMPLEMENTATION AND FUNDING SUGGESTIONS

Management priorities, as shown on Figures 4, 5 and 7 include:

- restricting and redirecting vehicle and pedestrian access;
- maintaining DUP and beach accessways;
- rehabilitation, including brushing and revegetation, to support conservation values and dune stabilisation for erosion buffer function;
- addressing erosion measures;
- addressing tenure issues, lease conditions and encroachments;
- developing signage for educational and informative purposes; and
- involving the community.

Management recommendations may be undertaken by:

- the Shire of Busselton
- a Friends of Broadwater Reserve group, if formed, with collaboration between community and commercial stakeholders and the Shire.

Local ownership can be enhanced and promoted by encouraging participation of school groups, non-environmental community groups and the general public by promotion and advertising of activities.

Funding may be obtained from:

- Shire of Busselton operational budgets;
- Lottery Commission, including the Gordon Reid Foundation Conservation Grants;
- Coastwest and Commonwealth funded programs such as Envirofund and Coastcare;
- Tourism Development Grants from the WA Tourism Commission;
- Wetlands and Threatened Species Network funding programs;
- Arts funding programs; and
- Sponsorships, donations and in-kind support from local businesses.

Other funding sources may be identified in the 'OurCommunity' grants resource kit, held by the Shire.

Additional labour resources may be sourced in partnerships with:

- GreenCorps;
- Conservation Volunteers Australia; and
- Shell Coastal Volunteers.

Evaluation methods will need to be considered prior to work commencing. Photo monitoring may provide a simple means for before and after comparisons, as well as repeat site assessments which can be compared against 'current state' descriptions in the BFMP.