NORTH COOGEE
FORESHORE MANAGEMENT PLAN

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Table of Contents

North Coogee Foreshore Management Plan

LIST OF TABLES

LIST OF FIGURES

Acknowledgments

North Coogee Foreshore Management Plan

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- Stockland
- LandCorp
- City of Cockburn
- City of Fremantle.

Summary

North Coogee Foreshore Management Plan

The North Coogee Foreshore has an important role in the history of Perth dating back to the earliest days of Aboriginal and European settlement. In subsequent years the foreshore area has been the site for a range of industrial uses that have tended to overshadow the foreshore's natural attractions with limited numbers of local residents experiencing its intrinsic value. As demands for additional recreation areas rose with increasing populations, Local and State Government recognised the potential that exists within the urban area for the development of conservation and recreation facilities.

The coastal zone, an interface between sea and land, provides opportunities for both conservation through the protection of remnant native flora and recreation through the development of lineal Dual Use Paths (DUP) that link together essential elements of the coastal zone, into a resource of regional importance.

Following a series of initiatives by Local and State Government Departments, strategic planning documents were commissioned by residential development proponents LandCorp and Stockland to identify opportunities and guide appropriate works in the North Coogee area, including the adjacent ocean foreshore. The preparation and implementation of a Foreshore Management Plan (FMP) is required to ensure that the coastal redevelopment proceeds in a manner that is beneficial to the area's natural and social environment. Commitments to the FMP were made in the adopted South Beach Structure Plan Report (September 2002) and adopted by the Cities of Fremantle and Cockburn. Each local government will administer the implementation of adopted plans within their respective areas.

The purpose of this FMP is to identify the major environmental issues that are relevant to the foreshore's natural, cultural and recreational values and to recommend strategies that can be implemented to improve the amenity of the area. The FMP also presents a Concept Plan to ensure development occurs in a way that enhances the area's cultural and natural potential and provides a recreation opportunity that will cater to a broad range of visitors.

The endorsement of this Foreshore Management Plan by the City of Cockburn and the community, and the implementation of its recommendations by Stockland, LandCorp and the City of Cockburn, will transform an important coastal foreshore area into a resource that complements its landscape setting. The North Coogee Foreshore area will provide an additional link in what is set to become a chain of coastal recreational reserves of regional importance in the City of Cockburn.

1.0 Introduction

North Coogee Foreshore Management Plan

1.1 Background

The North Coogee Foreshore is part of the Cockburn coast which represents an area with a rich and diverse natural and cultural character. Typically associated with the industrial activities of the past, the area is now being returned to the community as an area providing recreational and cultural opportunities. The North Coogee area provides an important interface with the South Beach area of the City of Fremantle.

With a high level of urban development and a significant rise in population in the City of Cockburn a new focus is centred on the foreshore area as the local residents increased their usage of available beaches. More local residents are using the dune and coastal foreshore for a range of recreational pursuits. As a result there is a need to address these recreation and social needs whilst respecting and preserving the cultural and environmental integrity of the coastal edge.

Recently in 2004, land developers Stockland and LandCorp initiated a residential development over a number of lots in South Fremantle and Hamilton Hill which adjoin the North Coogee Foreshore area. As part of the rezoning of the land under the Metropolitan Region Scheme (MRS), a Foreshore Management Plan (FMP) was required to be prepared and implemented. In June 2006, a working group was formed consisting of representatives from the Cities of Fremantle and Cockburn, LandCorp, Stockland and various consultancy organisations.

A number of studies have been undertaken on the foreshore area, which include:

- ocean processes to address beach erosion and shoreline movement;
- site contamination assessment; and
- health risk assessment.

There has been a high level of stakeholder involvement in the determination of appropriate land uses for the North Coogee Foreshore area. As part of the preparation of the Foreshore Management Plan community and stakeholder input was sought through a workshop process and direct consultation.

1.2 Study Aim and Objectives

The objectives of this Foreshore Management Plan are to:

- describe relevant aspects of environmental, cultural, social and infrastructural importance;

- integrate the adjacent built environment particularly the proposed ANI apartment complex with the foreshore in terms of access, recreation, circulation and landscape treatments;
- identify issues that will require effective management;
- develop a range of management recommendations and implementation guidelines to address identified management issues; and
- present a Concept Plan that graphically illustrates the intent of the Foreshore Management Plan.

The intention of the FMP is to present a vision of how the foreshore reserve should function and to provide a document that relevant management authorities can use to effectively enhance the area's natural, cultural and recreational values.

1.3 Study Area

1.3.1 Site Context

The City of Cockburn is one of Western Australia's fastest growing local government authorities. The City contains approximately 13 km of coastline which provides a range of environmental, social, recreational, cultural and economic values to the local and regional community.

The City's coastal zone plays a major regional role in satisfying social and recreational needs and provides a significant economic function through the Henderson Marine Industry area.

The City of Cockburn contains a portion of one of the most beautiful coastlines in the metropolitan area. The offshore areas of Cockburn Sound and Owen Anchorage are large expanses of water protected from oceanic wave energy by the chain of islands, stacks and reefs which represent the Garden Island Ridge System. The limestone outcrops of these submerged and emergent geomorphic features offer a diverse range of habitat for marine biota, both flora and fauna, while also offering a relatively close and safe destination for recreational activities for the general public.

The main recreational beaches within the City include Woodman Point, Coogee Beach, C. Y. O'Connor Beach and North Coogee. North Coogee is the City's most northern beach which directly abuts South Beach in the City of Fremantle.

1.3.2 Study Site

The study area for the Foreshore Management Plan is bound by Island Street Groyne to the north, Railway Reserve to the east, low water mark of the Indian Ocean to the west and Catherine Point groyne to the south (Figure 1).

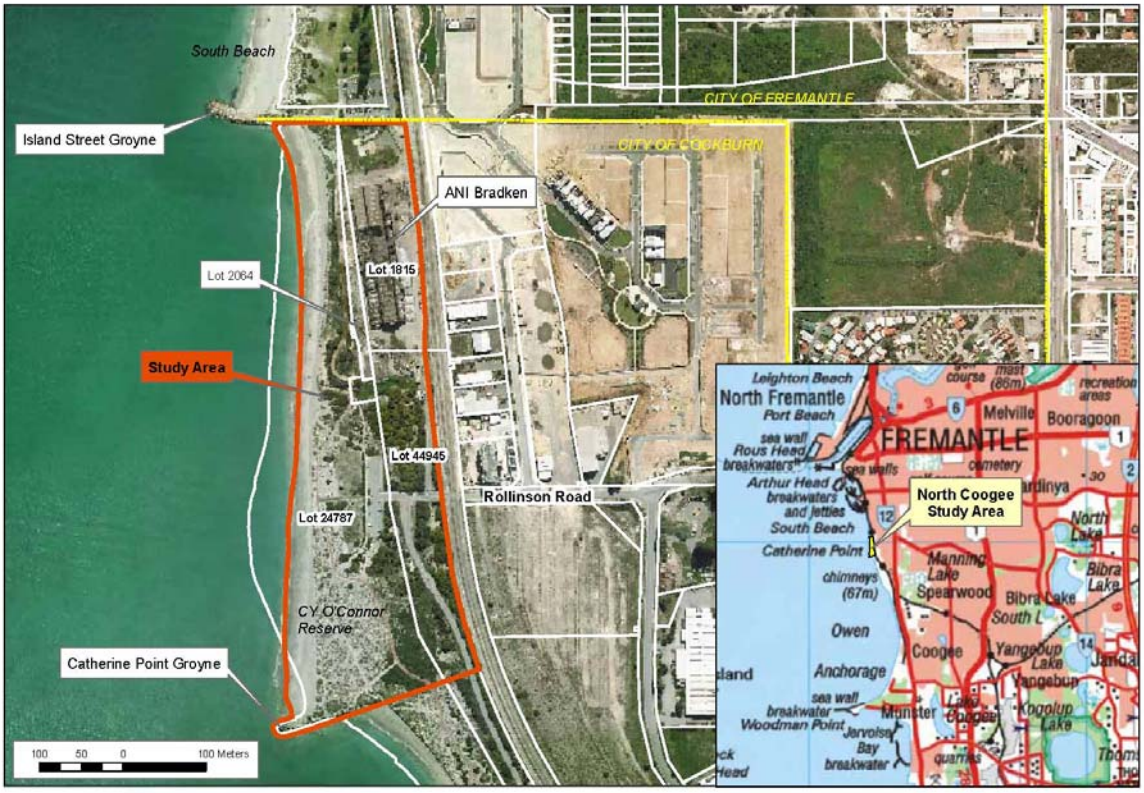

Figure 1: Study Area

1.4 Key Issues

The major issues to be addressed at this site are:

- the link between adjacent sites, especially to the ANI site and South Beach developments;
- the aesthetic and public safety issues associated with the eroding artificial cliffs at the rear of the central section of beach;
- the time required for the beach to develop a new dynamic equilibrium as a result of the extension of the Island Street groyne and potential extension of the Catherine Point groyne;
- the preservation and interpretation of heritage values;
- the rehabilitation of a highly modified site;
- the control of access to the beach; and
- the use of the beach.

2.0 Planning and Environment Context

North Coogee Foreshore Management Plan

2.1 Land Tenure and Vesting

The land tenure and vesting of the land in the study area includes (Figure 1):

- public open space and public access ways within Lot 1815 Island Street, South Fremantle will be vested with the City of Cockburn;
- part of the C.Y.O'Connor Reserve, 24787R McTaggart Cove, North Coogee, is an A Class Reserve vested with the City of Cockburn;
- part of the foreshore reserve 44945R Bennett Avenue, North Coogee, is an freehold A Class Reserve owned by the West Australian Planning Commission, zoned as regional reserve; and
- Lot 2064 Robb Road, North Coogee is currently Unallocated Crown Land but will be vested with the City of Cockburn.

All land within the study area except Lot 1815 is zoned Parks and Recreation under both the Metropolitan Regions Scheme and City of Cockburn's Town Planning Scheme. Lot 1815 is zoned Urban.

2.2 Coastal Management Policies and Principles

This FMP has been prepared in accordance with the following policies and documents:

- Coastal Planning and Management in Western Australia: A Government Position Paper (1983);
- Country Coastal Planning Policy (1987);
- Draft Perth Metropolitan Region Coastal Development Policy (1988);
- Coastal Planning and Development in Western Australia: Towards a Policy Framework (1996) (Draft Report); and
- State Coastal Planning Policy (2003).

The FMP has been prepared in accordance with the following Coastal Development Principles:

- development should be separated from the coast by a foreshore reserve;
- development should provide public access to the foreshore;
- development should not cast shadows on the beach or increase wind velocities by means of the Venturi effect;
- development should be fully serviced such as sewerage and drainage; and
- development should not affect physical coastal processes.

The FMP has been prepared in accordance with the following Coastal Protection, Conservation and Resource Enhancement Principles:

- permanent structures should be located on stable landforms;
- views of the coast should either be protected or enhanced;
- developments should be set back from headlands, ridgelines, cliffs and beaches;
- permanent structures should be set back from the coast in accordance with the stability of the coast; and
- coastal developments shall not degrade the quality of coastal waters.

2.3 Urban Context

Two major urban developments abut the North Coogee foreshore, these are:

South Beach Development

Stockland and LandCorp are undertaking a significant land development which directly adjoins the study area and is comprised of single residential, group housing and an apartment complex. The development has been staged and a number of stages have been released for purchase. The development has been planned and designed to integrate with the beach environment and the existing urban character.

Within the Foreshore Management Plan study area is Stage 4 of the South Beach development which consists of four apartment complexes. The apartment complexes are separated by public open space and public access ways which facilitates linkage from public car parking areas at the rear of the apartment buildings to the foreshore.

Improvement Plan 33

In May 2006, the Western Australian Planning Commission (WAPC) established a Cockburn Coastal planning committee to consider planning development in preparation of a district structure plan whereby industrial lands could be developed for urban purposes. The committee provided for proper negotiated outcomes with existing land owners. The project is referred to as *Improvement Plan 33* (IP33). It lies immediately south east of the FMP study area and includes the foreshore and land holdings south to Port Coogee; the area north of the railway line through Spearwood, to approximately Island and Healy Streets; and to the eastern most boundary of Beeliar Regional Park including Manning Park. It is anticipated that a District Structure Plan (DPS) will be advertised for comment. The IP33 committee has representation from the City of Cockburn and has kept a watching brief with the FMP working group. Advice regarding conceptual and technical matters was exchanged between the two groups to ensure that anticipated outcomes are aligned.

2.4 Site Remediation

Historically there has been a concentration of industrial activity in the North Coogee area. Industrial development included the Robb Jetty Abattoir, Westrail Marshalling Yard, ANI Bradken Foundry and GOSH Leather Works. The industries in this area have had a number of environmental impacts including:

- direct modification of the environment and loss of biological resources;
- contamination of groundwater and soil;
- direct effluent disposal into Owen Anchorage; and
- reduction in aesthetic values.

With the relocation of some of the industry from this region of the coast comes a reduction in some of the environmental impacts and the need to remediate others. Recently, land in the North Coogee area has undergone subdivision for urban purposes.

The foreshore and public reserve areas of North Coogee are currently undergoing an environmental improvement through landscape works. Furthermore, removal of the Robb Jetty Abattoir has been the single most important factor in reducing effluent outfalls in this area, and therefore, reducing impacts on the water quality in Owen Anchorage.

The City of Cockburn resolved to investigate the dune area after concerns were raised regarding the quality of the fill material that was exposed after a storm. Concerns had been raised that this fill material may pose a threat to users of the beach. Following consultation with government regulators and the community, a Sampling and Analysis Plan (SAP) was prepared and submitted to the Department of Environment (DoE) in November 2003.

ENV Australia (2006) was commissioned by the City of Cockburn to conduct a detailed site investigation of the dune area immediately behind the C. Y. O'Connor beach and fronting the former ANI Bradken Foundry site in Hamilton Hill. The study area is within the C. Y. O'Connor foreshore reserve.

ENV prepared a Site Investigation and Management Plan (SIMP) (2006) that incorporated the Sampling Analysis Plan and additional sections on human health and ecological risk assessment; a proposed site environmental management and remediation strategy; and a community consultation program. The objectives of the assessment were to define the nature and extent of any contaminants that may be present so that any risk the contaminants posed to current users of the land and the environment could be defined. The results of this investigation are detailed in the Site Investigation and Management Plan (ENV, 2006). ENV found contamination levels to not be of a health risk to humans, but may be of an environmental risk to sedentary or localised organisms. The presence of rubble may also pose a risk to humans. The SIMP is available for public viewing at the Spearwood and Fremantle Libraries and the City of Cockburn website.

With regard to the physical safety of the dune area, it is noted that the City of Cockburn has implemented an active management program to address physical dangers posed by the dunes, including regular inspections and earthworks as required (ENV, 2006). Details of the program can be obtained from the City of Cockburn. A remediation was proposed for the site that will comply with the following basic conditions:

- all soils in the upper one metre of the dunes and the beach interface will meet relevant health, environmental and aesthetic requirements;
- no soil will be disposed of to landfill, consistent with Principle 1 of the DoE (2000) Guidance Statement for Remediation Hierarchy for Contaminated Land No 17; and

- it is anticipated that environmental management will be required during the works to control nuisance dust. This will involve fencing with shade cloth and the watering of the dunes and resulting stockpiles using a reticulated watering system that will draw its water from an off-site established upgradient bore currently used to water public open space areas.

The dunes area immediately to the west of the former ANI site has been heavily impacted upon by human activities in the past. The dunes have been filled with material to well above the level of adjacent land and planted with a range of non-endemic species. The area also has suffered periods of erosion through time. The material within the dunes contains rubbish that poses a potential hazard to beach users should it be eroded onto the beach proper (ENV, 2006).

This section is to be rehabilitated with the objective of removing the hazard posed by the rubbish in the dunes and establishing a natural regional open space for the use of the community. The proposed rehabilitation is part of the redevelopment of the broader area (ENV, 2006).

2.5 Environmental Approvals

The City of Cockburn has prepared and submitted an application to the Environmental Protection Authority (EPA) under Section 38 (1) of the *Environmental Protection Act 1986* including the public consultation program, for rehabilitation of a contaminated section of coastal dunes immediately west of the ANI site.

ENV Australia investigations found contamination levels to not be of a health risk to humans, but may be of an environmental risk to sedentary or localised organisms. The presence of rubble may also pose a risk to humans.

The approval being sought is for the removal of rubbish from the fill within the dunes and reworking and covering the dune face with imported clean beach sand. The dune face will then be treated in accordance with the FMP and landscaped with native species.

3.0 Biophysical and Social Environment

North Coogee Foreshore Management Plan

3.1 Introduction

The City of Cockburn contains some of the most beautiful coastlines in the metropolitan area. The offshore areas of Cockburn Sound and Owen Anchorage are large expanses of water protected by the chain of islands, stacks and reefs that comprise part of the Garden Island Ridge System. The limestone outcrops of these submerged and emergent geomorphic features offer a diverse range of habitat for marine biota, both flora and fauna, while also offering a relatively close and safe destination for recreational activities for the general public. The diversity of habitat also offers a variety of opportunities for amateur and professional fishing.

The North Coogee Foreshore can be considered the gateway to these water bodies. Stockland and LandCorp have the responsibility to embrace the study site's opportunities for use by Cockburn residents and visitors to the area, particularly in relation to the adjacent development. They have unique recreational and aesthetic values and are an asset to the community.

3.2 Climate

The climate of the Perth Region is described as 'Mediterranean' with hot dry summers and cool wet winters. Weather patterns in the study area are influenced by a Subtropical High Pressure Belt which is a series of discrete anticyclones that encircle the Earth at mid latitudes (40°S in January to about 30°S degrees in July) (DEP, 1996). The size and intensity of the pressure systems within the belt and its latitudinal position affects the wind speed, direction, temperature and rainfall in the south west of Australia.

Between October and April easterly airflows predominate, with differential heating and cooling of the land and sea areas causing a diurnal cycle. Easterly winds occur in the early morning period followed by the onshore sea breezes from the south and south west.

From May to September the position of the high pressure belt causes winds from a westerly direction. Often the high pressure cells are displaced by low pressure systems which may bring storm force winds and rain from the north west, west and south west.

The wind patterns have an influence on coastal processes through the generation of ocean waves and currents as well as feeding dune systems with wind blown beach sand.

3.3 Geomorphology and Soils

The three dune systems of the Swan Coastal Plain are the Quindalup, Spearwood and Bassendean Systems. The site is situated on the Quindalup Dune System. The Quindalup sands are made up of shell fragments, variable amounts of quartz and minor amounts of feldspar (DCE, 1980). As a result of high levels of shell lime and calcium carbonate, sands are reasonably alkaline.

The surface of the site is highly modified. A seawall was constructed in 1953 to protect the ANI Bradken Foundry. Subsequently, the beach has significantly accreted due to the construction of the Island Street and Catherine Point groynes that trap sand moving along the coast. The extent of vegetation has now moved some 40 to 70 metres seaward of the 1953 seawall and the 1961 development of the Point Catherine groyne.

Inland from the present foredune and swale, the dunes remain substantially artificial with the natural ridge and swale dune system levelled, leaving a platform at the northern and central section of the site. This is consistent with most of the developed land between the Fremantle Harbour and Rollinson Road.

3.4 Topography

The natural ridge and swale topography of the site has been levelled, forming flattened plains at the northern and central section. This is a result of previous land uses such as livestock yards, industrial activities, sand quarrying and waste disposal (McDonald, 2003).

3.5 Shoreline Movement and Stability

3.5.1 Regional Processes

The coastline in Western Australia is subject to natural changes caused by seasonal climatic effects which in turn influences the movement of sand. The beach sand cycle has been described by Oma *et. al.* (1992) as the following:

- in summer, an increase in sand (or a seaward movement) on beaches in response to low energy waves;
- onshore winds transport beach sand onto the foredunes where it is trapped by dune vegetation;
- winter storms and summer cyclones may generate high energy swells and wind waves which erode the beach or foredunes causing a landward movement of the coastline;
- in winter, sand is usually deposited by waves to form longshore bars offshore during a storm and is returned to the beach during calmer periods; and
- an imbalance in the beach sand cycle can cause a particular area of coastline to be either eroding (nett loss of sediment) or accreting (nett gain of sediment).

3.5.2 Site Processes

Foreshore stability was examined by MP Rogers and Associates (MRA, 2001) and the Department of Transport to determine the setbacks for the proposed development of the ANI site by South Beach Pty Ltd. A detailed analysis of shoreline movement is presented in the MRA (2001) report. In addition to this report, MRA (2007) completed a review of recent coastal monitoring data collected for South Beach for the City of Cockburn. This assessment involved a site survey, assessment of shoreline movement from aerial photography and an updated analysis of sediment movement and predicted beach angle at North Coogee.

Over the last century the coastline between Fremantle Harbour and Woodman Point has been highly modified by the construction of man-made groynes. The Catherine Point groyne was constructed around 1960 / 61 and extended by 70 metres in 1964. The Island Street groyne was constructed in 1963 and extended by 60 metres in 1996. These two groynes have trapped sand moving onshore from Success Bank resulting in the accretion of sediment on the North Coogee Foreshore. Aerial photography from 1961 to 2004 illustrates the history of shoreline movement at the site. Between the 1960s and 1980s the shoreline accreted in response to the construction of the Catherine Point groyne and in the mid 1990s it eroded up to 60 metres along some sections of the coastline. Overall however, the shoreline has accreted between 40 and 70 metres since 1961 to the present day (MRA, 2007) (Figure 2).

MP Rogers and Associates (2007) estimated that about 40,000 cubic metres of sand is supplied to the Owen Anchorage from Success Bank. Of this amount about two thirds is distributed north of Catherine Point and 4,000 cubic metres is trapped between the groyne at Catherine Point and Island Street groyne. This figure is an estimate based on surveys of the coastal vegetation line conducted in November 2006 by MRA (2007). These figures are subject to annual variation. From the review of aerial photography, it is expected that shoreline accretion is the long term trend at North Coogee Foreshore.

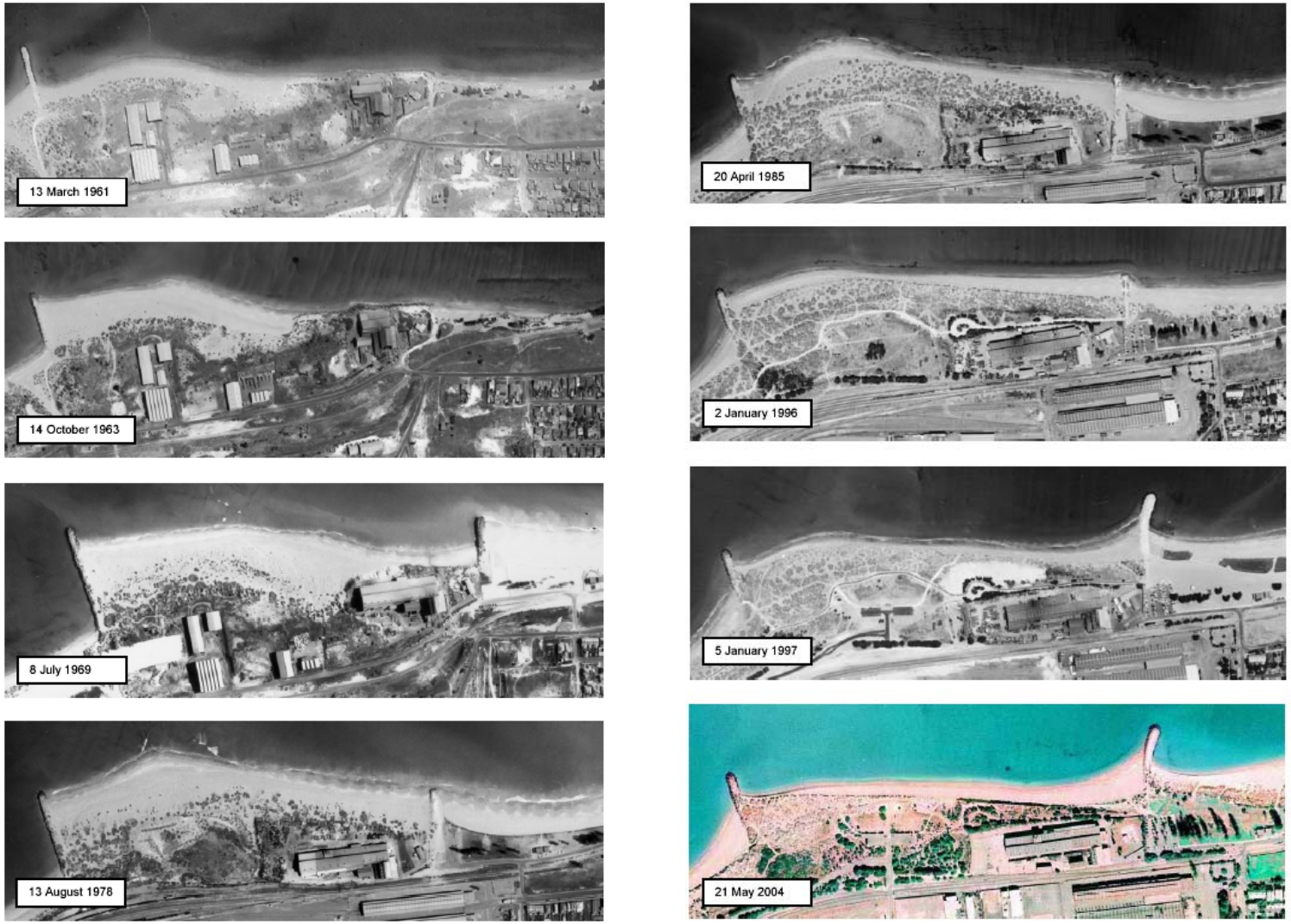

Figure 2: History of shoreline movement at North Coogee (Rogers, 2006).

3.6 Vegetation and Flora

3.6.1 Vegetation

As a result of the many changes to the coastline over the past century there has been a loss of the original vegetation cover, much of which has been replaced by exotic vegetation species. The composition of the vegetation that occurred prior to loss has not been documented, however at nearby Woodman Point there are still remnants in relatively good condition which give an indication of the vegetation types that would have occurred around the Coogee area.

The vegetation at Woodman Point has been well documented by Powell and Emberson (1981). They recognised four community types in order of distance from the coast.

1. Foredune Community

The foredunes are dominated by a plant cover of Hairy Spinifex (*Spinifex hirsutus)* and Sea Rocket (*Cakile maritime)*. On the windward side of the dunes which experience harsh conditions it is generally sparsely covered and also consists of Hairy Spinifex (*Spinifex hirsutus)* and Sea Rocket (*Cakile maritime)*. On the leeward side vegetation cover is thicker comprising of Hairy Spinifex (*Spinifex hirsutus), Long Leaved Spinifex (Spinifex longifolius)*, Coastal Saw-sedge (*Lepidosperma gladiatum*), and Coastal Daisy Bush (*Olearia axillaris*).

2. Cypress Belt

The Cypress belt occurring further inland consists of a dense thicket of Rottnest Island Pine (*Callitris preissii*) interspersed with Chenille Honey-Myrtle (*Melaleuca huegelii*). This occurs with little or no understorey. This community is one of the most extensive vegetation formations at Woodman Point and contributes to the distinctive character of the area.

3. Tuart Woodland and Forest

This community occurs on the inland edge of the Cypress belt and in parts of the forest where tree canopies meet, whilst in other parts where the trees are more widely spaced, it forms woodland with an understorey of small shrubs.

4. Heath/Scrub

The Heath/Scrub occurs in isolated patches in parts of the Cypress belt and Tuart Woodland. In more windswept, shallower soils the heath is dominant and consists of *Melaleuca acerosa*, Southern Diplolaena (*Diplolaena dampieri)*, Grey Cottonhead (*Conostylis candicans)* and native grasses such as *Austrostipa sp*. In more sheltered areas scrub is dominant and consists of *Acacia rostellifera*, Sweet Quandong (*Santalum acuminatum)* and Busket Bush (*Spyridium globulosum)*.

Anecdotal evidence from older Cockburn residents indicates that Tuarts and taller trees were present in the area but have subsequently disappeared. Vegetation communities found at North Coogee Foreshore are difficult to distinguish. There are two broad associations which occur in response to both the geomorphology and disturbance to the area. These are:

1. Foredune Community

The windward side of the foredune is dominated by Long Leaved Spinifex *(Spinifex longifolius)*, Hairy Spinifex (*Spinifex hirsutus)*, Sea Rocket (*Cakile maritime)* and Sea Spinach (*Tetragona decumbens)*. Both Spinifex species dominate in the harsh environment.

On the leeward side of the dunes, greater plant diversity is found. The dominant species include Hairy Spinifex (*Spinifex hirsutus)*, Long Leaved Spinifex *(Spinifex longifolius)*, Sea Spinach (*Tetragona decumbens)*, Sea Rocket (*Cakile maritime)*, *Acanthocarpus preissii*, Coastal Daisy (*Olearia axillaris)*, thick leaved Fan Flower (*Scaevola crassifolia)*, *Pelargonium capitatum*, Brome Grass *(Bromus species*) and Rye Grass *(Lolium rigidum)*. In deeper swales further inland there is an occasional stand of low heath comprised of *Acacia rostellifera*, Coastal Daisy (*Olearia axillaris)* and Pyp Grass *(Ehrharta villosa*).

The City of Cockburn has undertaken dunes restoration programs over the past few years on the foredunes which has consisted of tubestock planting and weed control.

2. Inland Community

Inland from the dunes the landform has been modified and revegetated with both native and introduced species. The main species include Tuart *(Eucalyptus gomphocephala*), Peppermint *(Agonis flexuosa*), Coastal Moort *(Eucalyptus platypus var. heterophylla*), *Casuarina species*, *Melaleuca nesophila*, One-sided Bottlebrush (*Calothamnus quadrifidus)*, Rottnest Island Pine *(Callitris preissii*), Rottnest Island Tea Tree *(Melaleuca lanceolata*) and Coastal Daisy (*Olearia axillaris)*, *Acacia rostellifera* and Orange Wattle (*Acacia saligna)*. Weeds include; Petty Spurge (*Euphorbia peplus*), Feathertop (*Pennisetum villosum*), Brome Grass (*Bromus sp*.), Rye Grass (*Lolium rigidum*) and Bearded Oat (*Avena barbata*).

Adjacent to the railway line, stands of relatively mature Rottnest Island Tea-tree (*Melaleuca lanceolata*) occur.

3.7 Fauna and Fauna Habitat

3.7.1 Avifauna

Coastal areas contain a rich array of habitats for avifauna. Bird species likely to be found in areas such as Woodman Point and Mt Brown area include the Western Warbler, Rufous Whistler, Sacred Kingfisher, Grey Fantail and Port Lincoln Parrot.

3.7.2 Reptiles

Little is known of the current reptilian fauna of the Cockburn coast, and in particular Woodman Point which has had limited monitoring of its faunal complement. Dugites, however, are commonly seen in the coastal dunes in this area with some sightings also occurring on the beach itself.

The priority 4 listed species, *Lerista lineata* (Lined Burrowing Skink) occurs in coastal dune systems along the Swan Coastal Plain, particularly south of the Swan River (CALM,

Threatened Fauna information). A study by Bamford (1997) at Port Catherine noted that areas such as Manning Park would be capable of supporting large populations of this species and that the other priority 4 species likely to occur in the area is the Black-striped Snake (*Neelaps calanotus*).

3.7.3 Mammals

The study area provides little suitable habitat for terrestrial mammal fauna recorded by the Australian Heritage Commission (1998) in the Beeliar Regional Park such as the Grey Kangaroo (*Macropus fuliginosus*), Southern Brown Bandicoot (*Isoodon obesulus)*, Black-gloved Wallaby (*Macropus irma*) and Brush-tailed Possum (*Trichosurus vulpecula*).

The mammals that potentially move through the study area would be those noted by Bamford (1997) at Port Catherine which include several bat species such as the White Striped Bat (*Tadarida australis*), the Lesser Long Eared Bat (*Nyctophilus geoffroyi*) and Gould's Wattle Bat (*Chalinolobus gouldii*).

Halpern, Glick and Maunsell (1997a) in assessing the Cockburn coast stated that feral species such as the fox, cat, house mouse and rabbit dominate the area. Further fauna surveys are necessary to ascertain the presence of other species associated with the Cockburn coast.

3.8 Cultural Heritage

3.8.1 Aboriginal Heritage

There is evidence to suggest strong Aboriginal connections with the Cockburn coast, particularly around the beaches of Coogee and Woodman Point which have served as important places for social interaction and recreation for local families as well as visitors from country areas.

Families would meet on the beaches, often in large groups, to camp and fish during summer. Cobbler fishing was popular, especially around the jetties, with mussels also collected around Woodman Point and in seaweed washed up on the beach. Catches were cooked on campfires on the beach and fresh water could be found by digging wells in the sand 100 feet from the beach. Cards were a popular pastime, especially at night with games played under the light of Tilly lamps. Groups would often camp for many days, although local families would usually go home for the night to return the next day.

A strong spirit of community was reported. Although camping on the beaches is no longer permitted, social and recreational connections remain strong, with these areas still popular among local families for fishing and swimming (McDonald, 2003).

The Aboriginal association with the North Coogee area has been formally researched by Shipley (1995a) in an ethnographical and archaeological survey. McDonald, Hale & Associates (2003) were commissioned by LandCorp to undertake a desktop investigation

into the ethnographic and archaeological Aboriginal heritage of the South Beach Village project area. This was done to advise on the need for Section 18 (*Aboriginal Heritage Act 1972)* approvals. The public disclosure of detailed information regarding Aboriginal Sites is not permitted under the general licensing agreement for access to the Aboriginal Sites Register but an indication of the types of sites they are is given in Table 1.

Table 1: Registered Aboriginal sites within the study area (Register of Aboriginal Sites)

Location of Aboriginal Site	Site Name	Site ID	Status	Site Type
Within the study area and extending south	Robb Jetty Camp	9222	Permanent Register	Man-made structures
Adjacent	Indian Ocean Site	4758	Permanent Register	Mythological

Another site known as the Smelters Camp, which was thought to be located near the present day junction of Cockburn and Rockingham Roads, has been determined by McDonald (2003) to be the same camping area as the Robb Jetty Camp.

Ethnographic Data suggests that the Indian Ocean Site bounds the length of the foreshore and therefore would be directly impacted upon by proposals to remediate and rehabilitate the coastal dunes adjacent to the development area. This site is the focus of two Aboriginal narratives about the creation of Cockburn Sound and the Offshore Islands, particularly Rottnest (McDonald, 2003).

The Robb Jetty Camp at Catherine Point is located in the sand hills south of South Beach and overlapping with the ANI Property (Lot 1815 Island Street). It is recognised as an Aboriginal camping site and to have been populated since approximately 1910. The campsite is approximately 1.2kms long by 100m wide and contains discrete camp areas along its length, which were probably used by Aboriginal people who worked at the nearby abattoir and jetty (Shipley, 1995a; McDonald, 2003).

In 1995 McDonald was commissioned by the Department of Commerce and Trade (DOCAT) to undertake an archaeological investigation around the area of the Robb Jetty Camp (Shipley, 1995b). No archaeological sites or artefacts were recorded from this survey which was attributed to the mobile nature of the sand dunes. Another subsequent survey was undertaken by Archae-Aus but also uncovered no surface Aboriginal cultural material (Jackson, 1996). This result was also attributed to the mobile nature of coastal sand dunes, as the present dunes were totally eroded in 1950 and gradually deposited with new fill material such as waste from the foundry and other rubbish since the early 1960's.

The following are recommendations made from the McDonald (2003) desktop study:

- to re-map the Robb Jetty Camp to exclude the ANI site (as Aboriginal consultants could not recall anybody camping within the boundaries of the foundry property;
- to conduct further consultation with the Nyoongar community and lodge a Section 18 application for both the Robb Jetty Camp and Indian Ocean sites;
- to seek Ministerial consent to use the land where the Indian Ocean site is located for the remediation and rehabilitation of coastal dunes; and

- that the proponents are to continue to liaise with Aboriginal consultants with respect to:
    a) remediation and rehabilitation of the landscape and foreshore; and
    b) the commemoration of the area's Aboriginal heritage.

The proponents liaised with an Aboriginal consultant prior to the 2009 release of this Management Plan.

3.8.2 European Cultural Heritage

The North Coogee foreshore and adjacent lands have figured prominently in the history of the region dating back to the early settlement of the Swan River Colony.

Settlement and Industry Development

In 1930, Captain George Robb landed at Catherine Point and established a 2,000 acre land grant. The establishment of industry and slaughter house facilities to serve the metropolitan region and the goldfields was well established by the end of the 1800's. Cattle from the Kimberley region was transported by ship then off loaded onto the beach at Catherine Point and penned in holding yards in the Coogee and Hamilton Hill area prior to processing. In 1898, the railway was extended from Fremantle to Robbs Jetty and the abattoir complex was expanded (Berson, 1978). In order to accommodate an increasing demand for meat, building additions which included the chimney were constructed during the 1920's.

Shipwrecks

During the early days of the Swan River Colony *The James*, a 195 tonne brig, arrived in 1930 following a journey from Ireland. *The James* with 12 crew and 75 passengers, arrived at the Swan Colony and was moored at Owen Anchorage. The brig was blown ashore without the loss of lives and was wrecked. The wreck was then re-discovered in 1975 in shallow water out from the South Fremantle Power Station and one of the three canons was recovered and restored.

The Diana, a three masted schooner of 224 ton, arrived in Fremantle in 1878 after a voyage from Port Natal. After stranding on Parmelia Beach, *The Diana* was refloated and anchored at Owen Anchorage. Following a heavy gale the anchor cables broke and *The Diana* was beached and badly damaged. In 1975, the wreck was re-discovered about 75 metres south-east of the Power Station.

C. Y. O'Connor

C. Y. O'Connor, the engineer responsible for the construction of the Fremantle Harbour and the water pipeline to Kalgoorlie, committed suicide on the beach near Robb Jetty in 1902. In 1999 a bronze sculpture entitled *Horse and Rider* was completed by Tony Jones to commemorate O'Connor's life and work. The horse and rider theme was chosen as O'Connor was often seen riding along the beach with members of his family. The artwork also confirms the strong tradition of horses associated with North Coogee Beach (DOCAT).

Horse Racing and Exercising

Horse racing in Western Australia was first established in 1833 on the South Beach to Coogee foreshore during the early days of the Swan River Colony. The first horses used in the races were Timor bred ponies and it was not until 1836 that thoroughbreds were introduced. In the years that followed, the Fremantle area supported numerous stables with up to 400 horses under training.

As residential development expanded in the Fremantle area and with the opening of the Belmont Racecourse, the stabling of horses in the area has declined and limited beach training is now carried out.

During the war period the 10th Lighthorse Brigade trained their horses at South Beach.

As a result of the heritage significance of the horse association with the beach the C. Y. O'Connor horse beach exercise area is an Interim Listing on the State Register of Heritage Places.

Freshwater Well

According to anecdotal information, during the early part of the 20th century a freshwater well located near the foreshore at the end of the former ANI site supplied water, via a small timber jetty, to people boating to Garden Island. Apparently the water was in abundant supply and very good quality, much better than you could get on the Island (T. Paterson, pers.com.).

3.9 Access and Recreation

3.9.1 Recreation

There are number of passive and active recreation activities associated with the foreshore which include:

- swimming,
- walking;
- dog exercising;
- cycling (dual use path);
- fishing;
- sun bathing;
- enjoying the views; and
- windsurfing.

Windsurfing is particularly popular at Catherine Point where the combination of strong winds and chaotic wave action due to a shallow sand bar creates a challenging ride.

3.9.2 Access

Access to the foreshore is served via two local roads and a dual use path. The northern end of the study area is accessed via South Terrace which links to a major car park at South Beach. To the south, the road access is via Rollinson Road which terminates at a small car park within the study area.

Access for bicyclists and pedestrians is facilitated via a regional dual use path which links Fremantle to Woodman's Point and passes through the western edge of the study area.

3.10 Community Consultation

On December 18 2006, a Community and Stakeholder Design Workshop was held at the City of Cockburn as part of the development of the Foreshore Management Plan.

The format of the workshop consisted of:

- Background Information;
- Questions and Answers;
- Values, Uses and Constraints;
- Vision and Concepts; and
- Other Feedback.

The key themes which emerged from the workshop were a desire for:

- low key foreshore activity but recognising regional and local population growth;
- some grassed areas probably near the existing car park or south of the new development;
- a questioning of the groyne extension;
- a separation of the regional and local cycling and walking paths;
- limited access to existing paths generally with some localised changes possibly required;
- celebrating the site's heritage using public art at key locations;
- possible inclusion of an Interpretive Centre with a focus on horses, dogs, heritage and education;
- universal access and opportunities for the frail or people with disabilities to access the beach;
- native WA coastal vegetation for renewal planting;
- continuing to allow dogs and horses access to the beach; and
- preserving views and sight lines to the islands and offshore attractions.

A full description of the workshop proceedings and outcomes is given in Appendix 6.

Subsequent to the public workshop, a meeting was held with the City of Cockburn Elected Members in January 2007 to review the outcomes of the public workshop and to determine if

there were additional items that needed to be considered in the Foreshore Management Plan. The Councillors identified the following items for consideration in the plan:

- stronger recreational focus for the area;
- additional recreation facilities, for example, playground, barbeques, shelters and water park theme;
- indoor toilet and shower;
- jetty;
- site for hiring recreational equipment, for example, kayaks; and
- formal lawn terracing of the foreshore in front of the ANI site (subject to engineering feasibility).

4.0 Concept Plan

North Coogee Foreshore Management Plan

The developers, Stockland and LandCorp, see the increase of residential and commercial development behind the North Coogee Foreshore as the catalyst to create a new node of recreation along the coast. This new node at North Coogee sits within a chain of regional nodal foreshore developments including South Beach, the Robb Jetty Parkland, Port Catherine, Coogee Beach and Woodman Point. The concept for the foreshore development is to achieve a balance between the desire to enhance the area's natural resource potential and the desire to provide recreation opportunities that will cater to a broad range of visitors and neighbours. The objective of the concept design is to provide foreshore recreational facilities at North Coogee that satisfies the recreational needs of the Cockburn and Fremantle region. For the Concept Plan and Sections refer to Appendix 9.

4.1 Design Intent

The design intent is to enhance the area's natural, cultural and recreational values; as well as provide some ecological function to the reserve.

The landscape values that give any particular location a "sense of place" are usually revealed during community consultation. The community consultation process for this project was no different. These values are discussed in detail in Appendix 6. The natural value is the preservation and enhancement of the natural and stable coastal environment. The cultural value is the preservation and enhancement of specific historical events on the site and the expression of contemporary cultural values. The recreational value is to allow for the widest variety of beach and ocean activities, walking and cycling on a coastal link, social interaction that relates to the new urban development, and access both day and night for all ages and abilities.

4.2 Site Planning

In order to balance the ecological requirements with the landscape values, careful site planning is needed. Typically the coastal zone is made up of a series of distinct environments (beach, foredunes, swales, secondary dunes, and tertiary dunes) broadly parallel to the shoreline. These distinct environments differ dramatically in their ability to tolerate use. The resilience of a foreshore environment to public use and building is dependant on its ability to recover ecologically from the use. The beach is the most resilient to intensive recreation and the least resilient to building. The only major threats to the beach are pollution and the interruption of the system that supplies its sand. The foredune is the least resilient to heavy use or even minor traffic. The swale behind the foredune is reasonably resilient but can be degraded easily. The windward side and crest of the secondary dune system is not resilient to use but the lee side is well stabilised and therefore the most resilient (Seddon, 2004). It is important in the site planning of the foreshore to avoid the less resilient zones and provide recreational facilities only in the most resilient

zones. It is also important not to breach the protective foredune and lee and crest of the secondary dune so that the stable zone remains stable. An understanding of the ability for the foreshore to withstand use is the basis of the design concept. The site planning principles for this design are to:

- locate built recreational facilities to the eastern side of the site;
- avoid building permanent structures on the beach and foredune;
- provide limited and defined beach access paths perpendicular, where possible, to the southwest prevailing winds;
- protect recreation areas from the coastal influences of changing winds, wave, current, and tidal conditions with new dunes; and
- establish dune vegetation appropriate to the Quindalup Dune System.

In view of site planning principles and coastal engineering considerations, an assessment of the idea put forward by the City of Cockburn's Elected Members of formally terracing of the dune area west of the former ANI site, was undertaken. The coastal engineering firm MP Rogers and Associates (2007) examined this proposal and concluded that terracing is not appropriate for the following reasons:

- The northern section can experience large amounts of wind blown sand, which will result in the natural formation of dunes that provide a buffer to erosion.
- This northern section is very narrow and acts as a 'pinch point' for any potential erosion. Subsequently, there is little room for terracing and being located at the 'pinch point' puts the terracing at risk if further erosion occurs.
- Due to the high risk of erosion at this 'pinch point' the design of terracing would need to allow for storm attack which usually means larger and more expensive structures.

4.3 Access and Circulation Patterns

The concept design provides access for regional and local users. Regional users would arrive on the north-south DUP that is connected to the regional coastal nodes, park in the car park at the end of Rollinson Road, or park in the South Beach car park. Adjacent local neighbourhoods are provided with east-west access. All users are provided with defined beach access paths.

4.3.1 Dual Use Path

The primary dune provides opportunities for both conservation through the protection and re-establishment of native flora; and recreation through the development of a lineal dual use path (DUP) that links together essential elements of the regional coastal landscape. The proposed DUP is roughly in the location and elevations of the pre-remediation path.

4.3.2 Commuter Cycle Path

To eliminate the conflict on the existing DUP between the recreational and commuter cyclists, a commuter cyclist path is proposed along the eastern edge of the foreshore

connecting the South Beach Reserve to Robb Road. This same path serves as an emergency access path to the future residential development on the former ANI Bradken site, as well as a maintenance access path to the foreshore.

4.3.3 Boardwalk

A boardwalk along the oceanfront face of the residential development connects the proposed café on the South Beach corner of the development with the adjacent parkland.

4.3.4 Pedestrian Rail Crossing

Two pedestrian rail crossings will be pursued with WAGR to allow direct public access to the beach from the new residential neighbourhood to the east of the railway line. Three public access ways and recreation space west of the railway line, provide access to and through the residential development. These access ways intersect with the boardwalk and connect to the DUP via sand tracks through the new vegetated dunes.

4.3.5 Beach Access Paths

It is possible to protect the primary dune system by limiting the opportunities for access to the beach and by creating discrete paths perpendicular to the prevailing south west winds. The sand paths are fenced to control access and the dune vegetation prevents the sand from moving or the paths from being blown out. The concept design allows for beach access paths that are perpendicular to the prevailing winds where possible and take advantage of the existing access paths where appropriate. All other existing primary dune paths will be closed with brushing and revegetated.

4.3.6 Universal Access to Groyne

Universal access to the end of the Catherine Point groyne will allow all ages and abilities to reach the shaded picnic area in the dunes and the shaded fishing shelter and fish cleaning tables at the end of the groyne. The groyne access and the associated facilities will be considered as a secondary project.

4.3.7 Lookout and Stair

There is an existing desired access at the South Beach end of the foreshore at its narrowest and most environmentally sensitive location. Because of the narrow width of the dune in this location, seasonal accretion and erosion of sand is dramatic. Accretion is the accumulation of sand whereas erosion is the loss of sand. The balance of the two is constantly changing in response to changing wind, wave, current and tidal conditions. Infrastructure in this zone is most at risk (Western Australian Planning Commission, 2002).

The concept plan proposes a wooden observation deck and stair that is tucked behind the narrow dune to accommodate this existing desired access. The stair will need to be

engineered to accommodate sand movement, but may still present a hazard as the sand moves in its seasonal pattern.

4.4 Recreation Nodes

The Community members and representatives requested that the following activities be accommodated within the foreshore reserve:

- barbecuing;
- picnicking in the shade at tables;
- relaxing in the shade;
- playing pick-up sport games;
- playing on play equipment;
- toileting;
- showering;
- learning about site history;
- exercising dogs, horses, and owners;
- setting up for wind surfing and sea kayaking;
- fishing;
- resting on seats;
- swimming;
- going to a café or restaurant;
- cycling;
- walking;
- socialising with community;
- going to the beach at night and
- experiencing the natural beauty.

The proposed parkland and beach provide the spaces for social interaction for visitors and neighbours. Two parkland areas are proposed, one at the end of Rollinson Road adjacent to the existing car park, and the other at the southern end of the residential development at the former ANI site. New vegetated dune formations are created to support the design language of each of the parklands, as well as provide protection from the coastal environmental processes.

4.5 Park Structures and Furniture

The permanent structures and facilities that allow people to enjoy the ocean for an extended length of time are located behind the new vegetated dune formations in the parklands so that they are protected from degradation by the changing wind, wave, current and tidal conditions (State Planning Commission,1988).

4.5.1 Toilet and Shower

The parklands are served by a toilet and shower facility located between them, and the adjacent Rollinson Road car park.

4.5.2 Car Park

The car park at Rollinson Road is doubled in size and Robb Road is redirected to align with the emergency access path. In the future the car park can be expanded again in the area south of the ANI development site.

4.5.3 Picnic Shelters

Long picnic shelters adjacent to barbecues are provided in the parklands so that picnickers can find shade any time during the day, and large gatherings can occur. Smaller picnic facilities are provided at the relative high point off of the DUP in the centre of the foreshore site, and at the intersection of several beach access paths at the Catherine Point groyne.

4.5.4 Seats

Seats in shady locations are placed throughout the foreshore, both in the park and along the pathways. The shade is provided by shade structures as well as future trees. The seats provide a resting spot for travellers as well as the opportunity to enjoy long views out into the ocean.

4.5.5 Artworks and Interpretive Signage

Artworks with interpretive signage offer opportunities to interpret the history of the foreshore. The artworks proposed are both integrated and stand alone artworks. Integrated artwork provides content and craft to park furnishings that is beyond that found in typical construction and furniture. One integrated artwork recommended for the foreshore is a themed accessible playground described in 4.5.6 below.

Along with the artworks, it is proposed the interpretive signage be provided in locations in which the story can be told in shade and comfort.

During the remediation works for the development on the former ANI site, limestone armour rocks of an old seawall were located. As part of the remediation works, a new seawall is to be built. The new seawall, as well as a portion of the historic seawall, falls within the boundary of Reserve 24787 – the State Registered South Beach Horse Area. The Heritage Council of Western Australia requires interpretation of the history of the seawall to be developed and implemented with the foreshore works. A commitment to interpret this history in the form of artwork and/ or interpretive signage forms part of this concept plan.

It is anticipated that an artwork will be developed to interpret the Indigenous cultural heritage of the site. The recommendations of the Section 18 approval will guide the form and progress of this artwork.

4.5.6 Accessible Playground

One of the many histories of the site can provide the theme for the playground. The theme provides the opportunity to give content to the play as well as provide for all ages and abilities.

4.5.7 Jetty and Floating Pontoon

In order to optimise as many activities as possible for beachgoers, the City of Cockburn elected members have identified that a jetty and floating pontoon located between Island Street Groyne and Catherine Point Groyne will provide appropriate additional experiences. The jetty is envisaged to be similar in size to the Coogee Beach Jetty and provide opportunities for swimming, fishing and the jetty experience. The floating pontoon is envisaged to be similar to the pontoons at Coogee Beach and equally as popular.

4.6 Planting

The approach to planting is, with one exception, to use all native dune species that are indigenous to the area. The exception is the use of the culturally significant species of the Norfolk Island Pine in association with the new residential development. Two planting strategies will be employed. One strategy is to juxtapose the form, texture, colour, sound and fragrance of individual species in a way that displays their horticultural value and supports the design vocabulary of each of the parklands. The other is to plant the dunes in a naturalistic arrangement so that the existing natural beauty of the foreshore can be preserved, enhanced and stabilized. The Perth WA coastal tree species that will be used are the Rottnest Island Tea Tree, the Sheoak, and the Peppermint, and they will contribute to the distinctive character of the Foreshore Reserve.

The preservation and framing of views to Cockburn Sound, and Garden, Carnac and Rottnest Islands will be achieved through planting design.

4.7 Staging of Works

For the Staging of Works refer to the Plans in Appendix 9.

4.7.1 Stage 1 – 2008 / 2009

Stage 1 is the foreshore development of the area immediately to the west of the ANI site development. This involves the fencing and planting of new dune formations, construction of beach access paths, access paths to the ANI site development, and a dual-use path.

The artworks that interpret the history of the site will be developed for this area.

4.7.2 Stage 2 – 2009 / 2010

Stage 2 includes the western portion of the parkland at the end of Rollinson Road. This park provides a lawn area protected from the wind to set up for windsurfing and kayaking, and includes site furniture, outdoor shower facilities, drink fountains and shade tree groves. Constructed paths provide access from the Rollinson Road car park to the dual-use path. This dunal landscape adjacent the parkland will continue the design from Stage 1. This involves the creation of protective dunes, beach fencing, new beach access paths and rehabilitation planting.

The extension of the Catherine Point groyne is scheduled to occur in this stage. The extension works include a universal access boardwalk and picnic shelter.

4.7.3 Stage 3 – 2010+

The Stage 3 development primarily deals with vehicular access and parking issues. The car park at the end of Rollinson Road will be expanded and realigned to curve around the adjacent parkland. This provides more space for recreation facilities between the car park and the coast. The improved car park will require an upgrade to the northern end of Robb Road. This road will align with a new commuter cycle path to allow a more direct route for cyclists along the eastern edge of the site.

The parkland at the end of Rollinson road will be expanded as part of the Stage 3 works. This park includes shelters and picnic tables; lighting; barbecues; site furniture and shade trees.

4.7.4 Stage 4 – 2010+

Stage 4 will include the parkland south of the existing parkland; new vegetated dune formations; and a realignment of the dual use path. The parkland includes the building of the toilet and indoor shower facility to serve both parklands; shelters and picnic tables; barbecues; benches and shade trees; protective vegetated dune formations; and a themed accessible playground.

4.7.5 Stage 5 – Ongoing Maintenance

The dune rehabilitation; and maintenance and monitoring of the existing dunes along the foreshore has begun by the City of Cockburn, and will be ongoing. Dune rehabilitation include brushing, laying fine brush or tritter, tubestock planting, seeding, minor earthworks, fence repair, and beach access paths. Maintenance and monitoring include plant replacement, weed eradication and review of the success of the works.

Stage 5 involves the possible construction of the jetty, installation of the floating pontoon, and construction of fishing shelter and cleaning tables, pending further investigation.

5.0 Plan for Management

North Coogee Foreshore Management Plan

5.1 Weed Control Strategy

5.1.1 Objectives

The objectives for weed control are to:

- minimise the fire risk associated with any weed species;
- minimise health risks associated with any weed species;
- identify and control existing weeds with the highest priority for control;
- minimise the introduction of additional weed species;
- minimise competition of weeds with native plants;
- minimise any detrimental effects of the weed control programme on the native biota; and
- integrate the weed control programme with overall site management.

5.1.2 Background

A weed can be defined as “a plant growing where it is not wanted” (Dixon and Keighery, 1990). Various levels of weed invasion occur over many parts of the North Coogee coast. These weeds have an adverse affect on the area’s biological values and ecological integrity because they:

- compete with native plant species;
- reduce establishment of native plant species;
- change the natural fire regime because of their differing flammability and responses to fire;
- enrich the soil by adding nutrients;
- they may limit the availability of nutrients in the soil; and
- change the food sources and habitats available to wildlife and therefore change wildlife populations.

There are currently 31 weed species (Appendix 2) found in the study area, which represents 62 percent of the known flora of the area.

The weeds have been classified into three categories (Table 2) to assist in determining control priorities (Appendix 4).

Table 2: Weed Categories

Weed Categories	Description
Major	These weeds are the most serious threat to the vegetation, often difficult to control with high invasion rates.
Nuisance	Generally pose a threat to vegetation but are not classified in the above category.
Minor	Weeds that have little known effect are generally less competitive and are not yet serious.

There are four species of **Major** weeds, eight species are **Nuisance** weeds and 19 are **Minor** weeds. Ten of the weeds are grasses, three are bulbous species and four are woody (tree or shrub) weeds. None of the weeds are 'declared' agricultural weeds required to be controlled under the Agriculture and Related Resource Protection Act, 1976.

The weed invasion along the North Coogee coastal area has resulted from the following disturbance factors:

- trampling;
- off road vehicles;
- increased fire frequency;
- dumping of garden waste;
- planting of exotics; and
- movement of exotic seed.

5.1.3 Strategy

The long term control of weeds depends on removing or reducing the disturbance factors listed above. The weed control program should be undertaken as part of a process of dune and bush regeneration and not considered as an isolated event. The weed control program can be done in three stages; primary, secondary and maintenance (Table 3). Weed control that follows these stages will assist in maintaining a low level of weeds at the site and therefore establish a better habitat for native species.

Table 3: Stages of Weed Control

Stage	Methods
Primary weeding	The first time weeds are removed from an area.
Secondary weeding	Revisiting the site and removing weeds that have regrown. These visits are essential, otherwise efforts in primary weeding will be undone. The timing of this phase depends on the level of reinvasion.
Maintenance	The frequency of weed control for a site will eventually reduce to one or two visits per year. The proportion of time spent on the three stages of weed control varies between and within sites.

General methods of weed control are described in Appendix 3. Species specific control methods for the major and nuisance weeds found at North Coogee are described in Appendix 4.

5.1.4 Recommendations

1. The proponents undertake a weed survey and conduct a weed control program at North Coogee in accordance with the objectives.
2. Ensure that the public is informed and notified prior to and during weed spraying in the study area.
3. Ensure weed control contractors have adequate experience working in coastal environments.

5.2 Ecological Restoration

5.2.1 Objectives

The objectives for foreshore restoration are to:

- minimise the impact of activities that could result in degradation to vegetation communities through the use of appropriate management strategies;
- improve the overall condition of the vegetation; and
- optimise use of resources by prioritising areas for restoration.

5.2.2 Background

Rehabilitation involves restoring the vegetation and habitats through means of reinforcing and reinstating the system's ongoing natural regenerative processes. This involves:

- assisted natural regeneration through reducing or eliminating disturbance factors, removal of inhibitors to natural regeneration such as weeds; and
- the reconstruction of the ecosystem in highly disturbed areas where the potential for natural regeneration has been markedly reduced or lost.

Table 4: Situations for applying alternate Bushland rehabilitation techniques

Term	Description of applicable areas	Applicable areas in terms of Bushland Condition	Percent of Foreshore Reserve	Actions
Assisted natural regeneration	Remnants retain regenerative capacity or where a reconstructed community regains its regenerative capacity.	Fair – Good or Very Good – Excellent	<10%	Remove weeds and disturbance factors.
Reconstruction	Remnants are seriously depleted – e.g. where only some overstorey is left or there is no remnant vegetation left.	Very Poor – Poor	>90%	Replant, spread topsoil and direct seed.

Assisted natural regeneration following the Bradley method should be undertaken in bushland in *Fair – Good* condition or better, which is less than 5% of the bushland.

Replanting and reconstruction is required in the *Poor* to *Very Poor* condition bushland as the exclusion of further disturbance will not lead to significant regeneration in these areas.

Therefore areas of the foreshore requiring reconstruction should take precedence over areas requiring assisted natural regeneration. As a general rule maintaining good condition bushland should be a higher priority than revegetation, but considerations such as creating linkages between bushland or improving amenity or consolidating areas of bushland may justify variances to this rule on occasion.

5.2.3 Strategy

The social and environmental factors considered in setting priorities for foreshore restoration are outlined in Table 5.

Table 5: Site Characteristics Considered in Prioritising Restoration

Priority	Social Characteristics	Environmental Characteristics
High	• High degree of public access • Highly visible • Focal point of public area • Extensive views from site • Wide range of activities facilitated • Unique activities • Extensive interpretation opportunities • Public liability risks • Provides protection for infrastructure (e.g. coastal erosion) or public (e.g. industry buffer)	• Good – Excellent foreshore condition • Flora, fauna or vegetation uncommon in the study area • Rare or significant species at a regional scale • Significant degrading factors present (e.g. disease, changes in hydrology, noxious weeds, large perimeter to area ratio, adjacent areas in much poorer condition) • Significant degrading activities present (e.g. informal tracks being used, site remediation activities) • Restoration currently being undertaken in area
Medium	• Limited public access • Moderate visitation rates • Limited interpretation opportunities • Non-focal point in public area • Moderate visibility • Moderate views from site	• Vegetation is or may degrade slowly • Fair-Good foreshore condition • Vegetation common on site • Restoration already scheduled for area
Low	• No or limited public access • Low visitation rates • Not visible from accessible areas • No views from site • Little or no opportunities for interpretation	• Poor to Very Poor foreshore condition • Vegetation not degrading or unlikely to degrade either due to no degrading impacts or poor condition of bushland • Common vegetation in study area and region • No restoration being undertaken in area

Using Table 5, the proposed development stages for the site (Appendix 9) can be prioritised as shown below.

Table 6: Site Characteristics Considered in Prioritising Restoration

Development Stages	Priority
Stage 1	High
Stage 2	Medium
Stage 3	High
Stage 4	Medium
Stage 5	Low

Revegetation can be undertaken by planting tubestock seedlings or direct seeding, although in most coastal situations, planting tubestock seedlings is the preferred method for initial site revegetation.

Planting tubestock seedlings provides an immediate effect, and so is useful in areas which have been extensively cleared as part of a major weed control program (although total

clearing is never recommended) or after a fire when the native plant community is non-existent. Areas which are typically steep, unstable and subject to wind erosion, direct seeding is not recommended as seeds are likely to be covered by moving sand or blown away.

Direct seeding can be a useful technique in the reconstruction areas if weeds can be suppressed. While direct seeding often has a lower survivorship and slower initial growth, it has distinct advantages in that a more 'natural' arrangement and composition of plants can be undertaken. Although direct-seeded seedlings might seem to grow more slowly, by the second year, the height of these seedlings may surpass that of tubestock. In ensuing years, the difference in performance widens. Good site preparation is critical to successful direct seeding projects. Trial plots are also very useful to determine the best preparation, conditions and local requirements of the revegetation species.

In degraded areas which are relatively protected and not affected by wind erosion, a combination of seedling planting and direct seeding of species with good germination rates is desirable in order to achieve a good density, diversity and resilience of vegetation. While planting tubestock provides an immediate visual sign of revegetation works and is easier to establish in highly degraded and exposed areas, seedlings from direct seeding may have greater long term growth and resilience.
Regardless of whether revegetating using tubestock seedlings, by direct seeding or a combination of both, the main factors determining success are:

- site preparation;
- time of planting and sowing;
- species selection / seed viability;
- planting methods; and
- maintenance of the site.

Site Preparation

Weed Control
The most important factor in a successful revegetation program is weed control. The vast majority of revegetation projects fail due to poor weed control. Experience from revegetation sites has shown that, unless weed control is excellent, revegetation, particularly direct seeding, will fail.

Matting, Mulch or Brushing
Exposed areas require a covering of brush material, mulch or matting. Brushing, mulching or matting protects the young plants and bare surfaces from erosive wind, sand blasting, and sand creep; and helps to conserve soil moisture while creating a suitable environment for seed germination and establishment of young plants. Stabilising should incorporate strategic wind fencing, matting materials and intensive planting of dune stabilising species such as Spinifex longifolius along the front of foredunes.

Matting is used in areas with highly unstable dunes where new vegetation may not be able to establish unless the potential for soil movement is mitigated through stabilization with matting or netting of some type.

Brushing has the added advantage of acting as a reservoir for wind blown sand and is a deterrent to pedestrians. The presence of brush controls sand movement by impeding the surface wind flow, trapping sand and sheltering plants. Melaleuca and pine prunings are ideal brush materials as they retain leaves for long periods, increasing their ability to trap sand and protect the surface. Brushing material should not to be used where there is a risk of erosion onto the strand due to issues of public risk and liability through injury to beach users. Brushing should be limited to less than 150mm deep, be openly spaced, not contain leaf material (fire risk), be free of seed material to prevent weed introduction, be aligned with prevailing wind direction, and be less than 2cm in diameter to enable more rapid decomposition and aid soil making.

Mulching with locally available materials, which could include seaweed, will also stabilise sandy surfaces. No wood chips should be used due to lack of ability to decompose in the nitrogen depleted dune sands. Mulch has a much lower capacity than brush to trap sand, and will not protect seedlings from sand blasting or wind once pore spaces have been filled. This technique is best used where sand drift and sand blasting are not an issue, in sheltered sites and dune swales. Thick layers of mulch can help retain soil moisture for seedlings whilst denying weed seeds access to light and thereby restricting their growth. Following the application of manual and herbicide weed control, weed-free mulch can be spread around seedlings in bare areas to help reduce weed growth. A light cover of mulch (1-2 cm deep) is recommended over the direct seeded areas. If there are large quantities of mulch available, then 5-10 cm is optimum for areas planted with seedlings. Care must be taken in sourcing mulch to ensure that it is not contaminated with weed seeds or disease.

An alternative, which could be explored if the results of mulching are unsatisfactory, is part way between the mulching and brushing: tritter. Tritter consists of guillotined brush material, which means that brush can lie flatter and interlock more, without as much pore space. Tritter would involve a higher cost than mulching.

Timing of Planting

To maximise survival rates the seedling must be disease-free, sun-hardened, have well-developed roots; not be root bound, and be planted to the correct depth following the break of the wet season. It is preferable for planting to occur as early after the break of season as practicable, when the soil is thoroughly moist and follow-up rain expected. The longer the plants have to establish an adequate root system in the ground before the dry season the higher the success rate.

Species Selection / Seed Viability

Coloniser Species for Highly Degraded Sites

Seedling establishment is largely determined by rainfall and soil moisture over the first few years after planting. However, not all plant species will establish equally well in the exposed conditions of highly degraded or unstable areas.

Therefore, hardy and relatively short-lived colonizer species could be planted in bare areas in the first year of rehabilitation. In the second and subsequent years, these initial plants would provide some shading in which the less hardy species could establish more easily.

Primary colonising species are hardy plants adapted to sand blasting, inundation, salt spray and strong winds. The main native colonising species for foredunes of the North Coogee foreshore is *Spinifex longifolius*. *S. longifolius* can be propagated from seed, which ripens between November and January. Seed can either be threshed or scattered across the sand surface before brushing, or the whole seed head is sown on a 50 to 75 cm grid or closer with 1-2 cm of the spines protruding. Alternatively, seed heads can be germinated in pots in the dry season and sprouted heads planted out early in the wet season. Care should be taken when stabilising dunes with brushing so that seeds are not smothered.

Once coloniser species have been established it is possible to further diversify the site. Within minimal resource inputs, additional species can be added to the site either by planting, or direct seeding. These may include plants that do not compete well against weed species, such as native grasses and annuals.

Seed Viability

The success of direct seeding programs also depends on seed dormancy and viability, as well as knowledge of how these factors affect each species. Some seed will need scarification, or smoke or heat treatment before broadcasting. Certain species require a period of aging before their seeds will germinate, that is, fresh seeds will not have peak germination until the second season after seeding. Dormancy of some species can be overcome by one to two year's shelf storage, and some require burial over summer.

Specialist advice is required to assess seed viability and dormancy breaking, to ascertain appropriate species and quantities of seed needed.

Planting Methods

Planting

General recommendations for planting include:

- watering the plants prior to removing them from their pots;
- no fertilisers should be used at the time of planting;
- seedlings should not be staked for support. Free standing plants become more durable and strong;
- care should be taken to ensure that plants are not evenly spaced or planted in rows; and
- seedlings should be randomly clumped or spaced to achieve a natural effect.

The density of planting should reflect the density of each layer of the surrounding native plant communities. Planting densities need to account for attrition rates so that final plant density equates to benchmark densities. As a general rule, a loss of 33% of new plantings in good condition bushland restoration sites to 50% in poor condition bushland restoration sites can be expected.

Protection from Pests

The current population of rabbits within North Coogee foreshore has not been determined; therefore it is assumed that rabbits may pose a risk to restoration efforts.

Tree guards are useful in reducing grazing pressure on seedlings by rabbits and should be used in areas where rabbits are evident. They also offer protection from wind and sand erosion and assist with reducing evaporation and transpiration in the first summer. Tree-guards have become less regarded in recent times, however, due to their expense and increased labour requirements.

An alternative option is Pindone baiting stations which provide a means by which potential risks to non-target species may be reduced. This method is currently being trialled within coastal areas of the Town of Cambridge and Cottesloe. The effectiveness of this method varies according site condition; however Twigg and Lowe (2003) note that Pindone in bait stations usually reduces rabbit numbers by about 50 per cent but the result can be highly variable, ranging from little effect to kills of up to 80 per cent. This result can take 30-60 days to manifest as the poison does not cause acute death and it takes time for rabbits to become accustomed to taking the bait. Baiting is most effective during the dry season when natural feed is scarcer.

Native vegetation is also prone to attack from insects. Weather and climate influence, the development rate, survival, fitness, and level of activity of individual insects. In general these insects are native species and crucial for natural systems. They provide food sources for birds and mammals and can provide lifecycle links for flora and fauna. The damage caused by insects can actually be beneficial for coastal vegetation structure, promoting lateral branching, thereby providing foraging and perching habitat for birds. Generally, control of insect attack on revegetation is not required, and chemicals used for control can be toxic with limited benefit.

Monitoring and Maintenance of the Site

Monitoring of revegetation areas should be undertaken regularly for the purpose of reviewing the progress of ecological restoration in accordance with weed control; matting, mulch or brushing; coloniser species for highly degraded sites; seed viability; planting; and protection from pests. This will allow early detection of germinating weed species, monitoring of the success of plantings and maintenance of tree guards if these are used. The survival rate of the first planting should be monitored and the results used to determine the level of additional planting to be carried out in the second year.

Sourcing Plant Material

Ideally plant material should be sourced from near the site, with no more than one third of the available seed being collected from any individual plant and numerous “parent” plants used. This avoids issues of:

- inbreeding where too few “parents” are used and the seedlings produced lack vigour; and

- genetic pollution due to the introduction of dissimilar genetic material (from a different area) which can result in depressed vigour in the surrounding population.

Professional seed collection services can be contracted to assess the viability of seed collection in a given area, determine what seed is available, provide a plan for the timing of collection, produce a report on what to collect, where to collect and when to collect, as well as the quantities to collect. This can be an expensive option, but the service provided will ensure that local seed is available when required. It should be noted that seed collection services will require a minimum of one year advance notice to ensure that the appropriate seeds are available when required.

5.2.4 Recommendations

1. Prioritise and undertake restoration activities associated with the dune remediation to the west of the former ANI site (Stage 1 only).
2. Erect signage that is appropriate in location, size and information to inform the public of rehabilitation works.
3. Use only species sourced from local propagation stocks (seeds, cuttings, divisions) from the North Coogee foreshore dune communities where possible.
4. Stabilise erosion prone areas using strategic wind fencing, brushing, matting materials and intensive planting of dune stabilising species along the front of foredunes.
5. Monitor revegetated areas and signs of rabbit activity.

5.3 Fire Management

5.3.1 Objectives

The objectives of the fire control program for the foreshore reserve are to ensure:

- protection of human life;
- protection of property; and
- protection of ecological integrity and biological values.

5.3.2 Background

Given the separation of the foredunes from buildings and infrastructure, high levels of site visibility and access, the greatest impact from a fire in the study area is likely arise from loss of vegetation cover.

Fire has a significant negative impact on coastal areas, as the loss of vegetation can result in soil erosion and vegetation can be slow to recover due to its sparseness, low soil nutrients, low soil moisture and exposure to strong winds (WAPC, 2003). Fires can also open areas up to increase pedestrian traffic which in turn can result in further loss of vegetation. Access control and revegetation therefore needs to be considered if fires occur in the study area.

Areas most likely to sustain significant fires are those with high fuel loads. Areas of brushing will have high fuel loads (Oma, *et. al.*, 1992) as will as areas where vegetation is tall, dry and dense.

5.3.3 Strategy

The recommended strategy for fire control within the foreshore reserve should include the following:

- a FESA approved fire management plan;
- a reduction in ignition, either deliberate or accidental;
- a reduction in the levels of weed invasion;
- an assessment of fire risk areas such as adjoining properties and buildings;
- a quick response to spot fires so that they can be effectively suppressed; and
- a development of fire breaks at strategic locations.

Access for emergency fire fighting vehicles needs to be maintained along the constructed pathways through the study area. Vegetation taller than 0.5 metres should not be planted within one metre on either side of these access paths so if necessary, emergency vehicles can use them.

The establishment of fire breaks will vary according to locations and intended function. Fire breaks located along the boundary of the foreshore reserve should be a minimum of three metres wide and mechanically slashed on a regular basis. Internal fire breaks can be incorporated into the access path system and supplemented by the use of fire retardant plants such as *Carpobrotus* to minimise the spread of fires.

5.3.4 Recommendations

1. Aim to suppress and contain any fires within the study area as quickly as possible. Fire mop-up procedures should be instigated to prevent re-ignition.
2. Further develop liaison between the Fire and Emergency Services Authority (FESA) and the City of Cockburn with an aim to increase efficiency, vegetation protection and refinement strategies for the quick and effective control of fires.
3. Keep records of the date, time, duration, personnel attending and known cause of all fires within the study area.
4. Ensure that the FESA is aware of the management objectives for the study area and aim to protect the area's biological values and ecological functions when attending fires in the area.
5. Implement a weed control programme as per Section 5.1.
6. Establish fire breaks adjacent to all property boundaries and at strategic internal locations to FESA standard.

5.4 Cultural Heritage

5.4.1 Objectives

The objectives for cultural heritage are to:

- identify, encourage respect for, and preserve Aboriginal Australian and non-Aboriginal Australian cultural heritage;
- engender a spirit of care for the foreshore, and sense of ownership of the foreshore reserve amongst the community;
- increase public knowledge of the environmental, local and regional significance of the study area; and
- comply with the Aboriginal Heritage Act.

5.4.2 Background

The Aboriginal association with the North Coogee area has been recognised and the following sites identified:

- The Robb Jetty Camp; and
- The Indian Ocean Site which is adjacent to the study area.

The Robb Jetty Camp at Catherine Point is located in the sand hills south of South Beach. It is recognised as an Aboriginal camping site and as having been populated since approximately 1910. The campsite is approximately 1.2 kms long by 100 m wide and contains discrete camp areas along its length, which were probably used by Aboriginal people who worked at the nearby abattoir and jetty (Shipley, 1995a; McDonald, 2003).

The Indian Ocean Site bounds the length of the foreshore. This site is the focus of two Aboriginal narratives about the creation of Cockburn Sound and the Offshore Islands, particularly Rottnest (McDonald, 2003).

The North Coogee foreshore is part of a registered site with the Department of Indigenous Affairs.

The North Coogee foreshore and adjacent lands have figured prominently in the European history of the region dating back to the early settlement of the Swan River Colony.

Historically features include;

- Settlement and Industry Development;
- Shipwrecks;
- C. Y. O'Connor; and
- Horse use

As a result of the heritage significance of the horse association with the beach, the C. Y. O'Connor horse beach exercise area is on the Interim List of the State Register of Heritage Places.

5.4.3 Strategy

Signage

The interpretation of the cultural values of the North Coogee area can be achieved through appropriate signage thereby creating a memorable experience. The interpretation elements can extend beyond the conventional perception of signage, and into a more cohesive and total experience utilizing foreshore furniture, paving and other soft and hard landscaping elements. By incorporating interpretation signage into the design of structures, such as walls and paving, the potential exists for significant reduction in visual clutter, maintenance, and cost.

Interpretation helps to meet the demand for educational visitor experiences and encourages people to care about the places they visit. It should build on the experiences, and interests of the area, in order to enhance an understanding and enjoyment of the place.

The subjects for interpretation include:

- **Aboriginal heritage –any signs referring to Aboriginal heritage should be developed in consultation with the relevant Aboriginal people, to ensure facts are correct and cultural sensitivities are respected.**
- Non-Aboriginal heritage – the area has a rich European heritage.

Public Art

Public art should be incorporated in strategic ways into the North Coogee foreshore. The artworks should be both integrated and stand alone artworks, that interpret the history of the site. The Section 18 approval for the site provides recommendations for the interpretation of Aboriginal heritage and contemporary culture.

5.4.4 Recommendations

1. Incorporate public art in strategic ways in the foreshore through a community cultural development process.
2. Respond to any requirements for signage and public artwork arising from the Section 18.
3. Develop appropriate signage to interpret the cultural values of the site.

5.5 Access and Recreation

5.5.1 Objectives

The objectives for maintaining, rationalising or upgrading access and recreation within reserves are to:

- connect the new neighbourhoods to the foreshore;
- provide safe and adequate pedestrian access;
- protect the dunes from degradation;
- provide adequate car parking;
- provide adequate foreshore recreational facilities for both day and night use, and for all ages and abilities; and
- preserve and enhance the natural values of the foreshore.

These objectives need to be implemented with consideration to construction and maintenance costs.

5.5.2 Background

The Stockland and LandCorp developments will create new coastal neighbourhoods in North Coogee and this will increase the number of users of the foreshore. The provision of sufficient recreational facilities and access is required, balanced with the preservation of natural landscape values.

The design workshop on 18 December 2006, revealed the following community aspirations for access and recreation at the foreshore:

- improve access with additional cycle paths, make the area pram, wheelchair, and cycle friendly;
- regional link along railway with low speed pedestrian / cycle link internally;
- separate regional and local cycling and pedestrian movement;
- mixed views on parking. Some participants would like to see additional parking while others would not;
- do not allow vehicle access any further than car park;
- improve amenities in the area – including BBQ's, shade structures, children's play area, good access for all as (including wheelchairs), more grassed areas, toilets, bins, showers;
- introduce an Interpretive Centre;
- retain dog and horse exercise areas; and
- protect the dune alignment.

Swimming, dog and horse exercising, and fishing are among the activities occurring at North Coogee Beach. The beach is presently designated as a dog exercise area, unlike the adjacent beach within the City of Fremantle. The groyne at North Coogee is a popular

fishing spot. The increased patronage of the beach that will result from the South Beach Village redevelopment may increase conflicts between these user groups.

5.5.3 Strategy

The strategy for access at the foreshore is to:

- provide access to accommodate the increase in public use;
- provide fenced beach access paths perpendicular to the southwest winds;
- provide defined beach access paths to minimise degradation of vegetation;
- provide universal access to the new extension of the Catherine Point groyne;
- accommodate the direct access to the Catherine Point Reserve beach from the South Beach car park;
- provide public car parking along the new roadway on the east side of the former ANI development;
- provide three public access ways to and through the former ANI site development that connect to the dual use path;
- provide a commuter cyclist path separate from the recreational cyclist;
- provide emergency access to the former ANI development site;
- pursue the pedestrian rail crossings with the crossing at Rollinson Road as the first priority over a crossing at the former ANI development site;
- increase the size of the existing Rollinson Road car park in stages as needed; and
- provide access for Council works programs and fire-fighting.

The existing access track on the dune at the Island Street groyne is subject to sand accretion. The concept plan shows a timber lookout and stair but the final form that this access takes should be examined in conjunction with the management of this dune, and the access way for the groyne.

The strategy for recreation at the foreshore is to provide:

- two parklands with the facilities requested by the community;
- a toilet and shower facility serving the two;
- revegetated dunes to protect the parkland and to preserve and enhance the natural landscape values of the site;
- shade trees and structures with picnic tables in the dunes that take advantage of the long views of the ocean and islands;
- universal access, fishing shelters and fish cleaning structures at the second extension to the Catherine Point groyne; and
- manage any conflict between people, dogs and horses at the beach by providing time designations for each through clear, appropriate signage.

See appendix 9 for plan and sections of the Concept design.

5.5.4 Recommendations

1. Develop and implement the Concept Plan as presented in this report.
2. Implement the Concept Plan according to the timeframe on the Staging Plans.
3. Apply to WAGR for the pedestrian rail crossings.

5.6 Erosion Control

5.6.1 Objectives

The objectives for managing erosion at the site are:

- To minimise the impact of natural and human induced activities on the stability of the beach and dune sediments.
- To involve the community in the foreshore rehabilitation programme.

5.6.2 Background

Coastal Vegetation

Dune vegetation at the site has been degraded by unmanaged vehicle and human usage. This has resulted in loss of vegetation and the formation of small localised dune blowouts in the foredune system. Sand drift is occurring where the dune blowouts and vehicle tracks are aligned with the prevailing winds, transporting sand inland.

Foreshore Stability

Foreshore stability was examined by MP Rogers and Associates and the Department of Transport to determine the setbacks for the proposed development of the former ANI site by South Beach Pty Ltd (MRA, 2001). In addition, MRA (2007) completed a review of the coastal monitoring data for the South Beach area including the North Coogee Foreshore. Results of this survey indicate that the shoreline has slightly accreted over the past year (2006) and has remained relatively stable since 2004, also a small vegetated foredune has formed in this time. The conclusions of these detailed MRA reports (2001, 2007) in terms of shoreline change were as follows:

- the shoreline has been highly modified;
- there are significant seasonal variations in the beach position, alignment and profile but the long term trend is for accretion as sand moving onshore from Success Bank has been trapped by a series of groynes (Figure 2);
- the beachfront is still adjusting to the changes caused by the extension of the Island Street groyne in 1996;
- there has been some beach erosion since 1996 due to a number of successive stormy years and a one-off sand deficit due to the groyne extension; and
- the present short term trend for the erosion of the central section of the artificial dune/platform has resulted in small cliffs. There are signs that discourage access along the tops of these cliffs for safety reasons. These are not aesthetically

pleasing, as the imported materials exposed do not match the colour and form of the local sands.

The conclusions of the MRA reports (2001, 2007) regarding groyne extension were:

- the position of the groyne controls shoreline movement by altering wave direction and sediment transport;
- the proposed groyne extension is expected to extend the shoreline position in a westerly direction based on the estimate that two thirds of sediment supply from Success Bank is distributed north of Catherine Point (MRA, 2007) (Figure 3). Therefore a groyne extension is expected to retain the majority of this sediment supply;
- initially this sediment retention may result in an erosion risk up to 15 metres over the first 200 metres south of the groyne. This would continue until the groyne becomes saturated and once again allows sediment transport to the south;
- the protection and sediment supply from Success Bank and the Catherine Point and Island Street groynes provide a stable coastline at North Coogee. These combined factors present an opportunity for man-made structures to cause further accretion should it be required.
- a smaller groyne extension of 30 metres at Catherine Point is appropriate (initially it was suggested to extend the groyne in two 55 metre stages) given the favourable monitoring results and the uncertainty of offshore sediment supply; and
- a smaller groyne extension would also become saturated earlier and therefore erosion to the south of the groyne would not continue for as long.

Figure 3: Initial estimated shoreline position if the Catherine Point Groyne is extended by 110 metres (MRA, 2006). Note, it has been recently estimated that a shorter groyne extension of 30m is appropriate to extend the beach (MRA, 2007).

A cost estimate of the Catherine Point groyne extension with a boardwalk is provided in the MRA (2007) report.

5.6.3 Strategy

Vegetation is a key factor in dune stability and therefore the maintenance of dune vegetation and their processes is an essential part of dune management. There are three basic principles of coastal foreshore management (Chapman, 1989):

- minimising disturbance to the dunes;
- access management; and
- dune restoration.

At North Coogee the degradation of vegetation cover has resulted from uncontrolled access through the dune and swale foreshore area. Thus rehabilitation measures need to follow the three principles of coastal foreshore management to address the degradation. The following two stages will be required:

1. Construction of fences to minimise disturbance to the dunes and control access to the beach (Principle 1 and 2); and
2. Rehabilitation of degraded dunes by provision of brush matting, wind and sand screens and extensive re-planting of the dunes with appropriate flora species (Principle 3).

It is useful to divide coastal plants into three categories based on performance, growth, habit and zone of colonisation (Chapman, 1989) (Table 7) to assist with effective dune rehabilitation. Examples of plant species for rehabilitation are provided in Appendix 5.

Table 7: Categories of coastal dune vegetation (adapted from Chapman, 1989)

Species Category	Species Characteristics
Primary colonisers	• rapid rate of growth; • ability to withstand sandblast; • ability to survive sand burial; • creeping form enabling rapid colonisation of bare areas; and • readily propagates from seed or vegetative material.
Secondary species	• moderate to fast growth rate; • ability to withstand exposure to wind; • rapid seedling development and maturation; • a habit which is effective in providing a wind break for tertiary species; and • seed survival mechanisms, e.g. sophisticated dispersal and germination mechanisms.
Tertiary species	• low fertility requirements; • ability to adapt to single closed canopy; and • low moisture demands.

The support of the local community and relevant user groups of the foreshore reserve will be an important consideration if effective management of the foreshore reserve is to be achieved. Initial community involvement occurred through a design workshop (18 December 2006) and these views have been incorporated into the development of the Concept Plan.

5.6.4 Recommendations

1. Implement a vegetation rehabilitation and access management program within the foreshore reserve.
2. Encourage community involvement in the rehabilitation programme.
3. Continue to review the current monitoring data and the length of the groyne extension (MRA, 2001, 2007).
4. If the groyne extension proceeds, it should be done in stages to monitor the shoreline position (MRA, 2001, 2007).
5. Implement a monitoring program following the groyne extension to assess shoreline movement to the north and south of the groyne (MRA, 2001, 2007).

5.7 Feral and Domestic Animal Control

5.7.1 Objectives

The objective is to suppress feral animal numbers to:

- minimise predation pressure on native animals by cats; and
- minimise grazing pressure on native plants and seedlings by rabbits.

5.7.2 Background

The alternative options for control of feral animals need careful consideration. The most effective pest control programs are those which integrate several techniques (exclusion fencing, baiting and trapping), control several species (foxes and rabbits) and cover a large area (WA Ag Dept, 2004).

In allocating resources to feral animal control consideration needs to be given to the re-invasion of a site by feral animals and the maintenance costs of options such as exclusion fencing.

Rabbits

Rabbits have been recorded at the site in the recent past (by the City of Cockburn). Rabbits can have significant impacts on the seedlings that have been planted and the regeneration of species after fire, if they became established in the reserve.

Cats

The issue of controlling cats in urban bushland is complicated by the different categories of cats. The Biodiversity Group of Environment Australia (1999) defines the following three categories of cats:

- *Feral cats* are those that live and reproduce in the wild, eg. forests, woodlands, grasslands and wetlands, and survive by hunting or scavenging. None of their needs are satisfied intentionally by people. (Feral cats differ little in appearance from their domestic counterparts except in being generally more robust when in good condition (NRME, 2003)).
- *Stray cats* are those found in and around cities, towns and rural properties. They may depend on some resources provided by humans, but are not owned.
- *Domestic cats* are those owned by an individual, a household, a business or corporation. Most of their needs are supplied by their owners.

Feral cats which maintain stable home ranges, the sizes of which depends upon the availability of suitable den sites and food availability, but can range from 4 to 8 square kilometers (NRME, 2003). On this basis it could be assumed that stray and domestic cats will be in greater numbers and have a greater impact on the native animals in an urban environment such as the North Coogee Foreshore.

5.7.3 Strategy

Cats

The *Threat Abatement Plan for Predation by Feral Cats* by Environment Australia (1999a) states that:

> *The responsibility for managing domestic cats ultimately rests with their owners. State, territory and local governments are supporting initiatives aimed at encouraging responsible pet ownership, including developing appropriate legislation, education and awareness programs, and management plans to address local problems with domestic and stray cats. Victoria has enacted the* Domestic (Feral and Nuisance) Animals Act 1994 *which requires cat owners to register their animals and gives councils the power to set fees and take remedial action when landowners experience problems with wandering cats. New South Wales has initiated the development of legislation to promote responsible ownership and improved welfare of companion animals.*

Trapping and baiting of cats are limited in their effectiveness (and would be politically undesirable) and fencing is the only feasible method of control when special areas need protection from cats (NRME, 2003). However, the fencing required to exclude cats is generally not deemed to be appropriate for areas of small urban bushland due the visual impact and/or the financial burden.

Providing a continuous canopy and a thick understorey of shrubs maybe the most effective method of reducing the impact of predation upon native animals and this will be undertaken as part of the revegetation of the site.

Rabbits

Monitoring for the impact of rabbit grazing on native vegetation should be ongoing and if significant impacts are observed then this should be managed in the form of tree guards, fencing, baiting (poisoning) and/or warren destruction. Of these options, the placement of tree guards is likely to be the most cost effective with the least amount of public resistance.

5.7.4 Recommendations

1. Monitor foreshore reserve to determine the impact of rabbits; and
2. Implement a community awareness campaign to inform residents who own domestic animals of their responsibilities in regard to control of pets.

5.8 Interpretation and Education

5.8.1 Objectives

The objectives for interpretation and education of the foreshore are to:

- engender a spirit of care for the area, and sense of ownership of the foreshore amongst the community;
- increase the level and quality of information available to the community on the landscape, ecology and history of the foreshore; and
- inform the local community of the current and proposed management objectives and structure proposed for the area and encourage public participation in the management and maintenance of the public open space.

5.8.2 Background

It is important to provide experiences that are interesting and meaningful to local residents and visitors by enabling them to make connections between their own experiences and that which is presented, providing an understanding about the meaning and significance within a place.

Public interpretation of a foreshore's physical, biological and historical resources is a valuable aid in conserving and protecting the foreshore environment. Awareness of the inherent and intrinsic values of the foreshore by the public encourages a sense of ownership and thus promotes more involvement in its conservation.

Subjects for interpretation may include:

- Aboriginal Australian heritage;
- Non-Aboriginal Australian heritage;
- coastal dynamics; and
- coastal environmental values.

A general concern and desire for the conservation of coastal vegetation and ecological systems has been expressed by the Aboriginal Elders. Also important is the recognition of the traditional, cultural and social linkages with the coast and hinterland. The customs and knowledge of local Aboriginal people can provide an insight into their way of life and play an important role in the broader education on non-Aboriginal people.

Ways of assisting this through the implementation of this Strategy include recognition of contemporary Aboriginal cultural and social values through interpretive facilities and projects; protection of important vegetation and use of species with food and medicinal values, such as Quandongs, in revegetation projects; involvement of the local Aboriginal community in coastal planning and relevant projects and providing employment opportunities in works programs where possible.

At North Coogee, there is potential for a ground level viewing platform with some interpretation of the Aboriginal links to the site, provided that the issues related to cliff safety are resolved. The theme of the interpretation could be based on Aboriginal families meeting on the beaches, often in large groups, to camp and fish during summer.

5.8.3 Strategy

Interpretation

Interpretation helps to meet the demand for educational visitor experiences and encourages people to care about the places they visit. It should build on the experiences, and interests of the area, in order to enhance an understanding and enjoyment of the place.

The development of an interpretation plan should preferably be based around a theme, as this provides continuity in the stories which reinforces people's memories of the facts and stories presented. Interpretation should provide easily understood concepts built around a theme such as:

- contemporary Aboriginal and Non-Aboriginal cultural values;
- the indigenous heritage of the region and North Coogee Foreshore;
- the coastal environment as a home for a range of aquatic and terrestrial species;
- changes in the foreshore over time, with reference being made to land-use, changes to the landscape; or
- the importance of foreshore reserves.

Education

Educating the public and especially the local community surrounding the site about the foreshores conservation value and historic value, could help encourage participation in its management, increase awareness of its sensitivity and reduce any possible anti-social behaviour.

Some methods to achieve this are;

- educational programs for local schools;
- planting days;
- guided tours and talks; and
- brochures/pamphlets about the coastal environment.

Signs

On-site information is essential in creating an understanding of its unique features as well as educating the public on the importance of its conservation. By creating signs that are attractive and informative it can help raise this awareness and enhance the values wanting to be instilled by the public on the foreshore.

There are four main types of signs erected within reserves. These include:

- directional (provide information as to where facilities etc. are located)
- regulatory (inform the public about what activities are permitted);
- interpretative (provide information about animals, birds and history etc for the site); and
- entrance (indicate the name of the reserve and the managing authority).

In positioning signs along paths, careful consideration should be given to the location of the signs. Such considerations include; places near to what they describe, near significant

views, places of historical interest or places of educational significance. The text could be accompanied with images and a diagram showing what it is that is being interpreted.

The development of an interpretation plan should preferably be based around a theme as this provides continuity in the stories which reinforces people's memories of the facts and stories presented, or about contemporary cultural values.

5.8.4 Recommendations

1. Develop a Signage and Interpretation Plan for North Coogee foreshore.
2. Implement the Signage and Interpretation Plan.
3. Liaise with Aboriginal custodians regarding education and interpretation of the cultural values of the North Coogee Foreshore.

6.0 Implementation Programme

North Coogee Foreshore Management Plan

6.1 Management Plan Review

The management plan should be reviewed and modified as necessary by the City of Cockburn after five years, at the end of 2012. The works programme will need to be reviewed every year and appropriate financial allocations made to ensure ongoing management is undertaken. Key Performance Indicators (KPI's) should be developed in accordance with the outcomes of the monitoring program relating to weed control; ecological restoration; fire management; cultural heritage; access and recreation; erosion control; feral and domestic animal control; and interpretation and education. The KPI's should be developed in collaboration with Stockland and LandCorp.

6.2 Implementation Recommendations

The Table 8 identifies the recommendations, assigned responsibilities and timeframe.

6.3 Funding

6.3.1 Developer Contribution

A commitment by the adjacent development proponents to the revegetation of the foreshore and other landscaping measure has been made. The extent of funding is subject to negotiation and agreement with the City of Cockburn and the development proponents.

6.3.2 Coastcare / Coastwest Grants

The Commonwealth Government through Coastcare and the State Government through Coastwest are continuing the commitment towards funding grants for coastal zone work. It is likely that the City of Cockburn will continue to pursue funding under these arrangements and several opportunities for coastal zone work have been identified in this report.

Listed below are several useful websites for identifying potential funding. Additional funding sources are listed in Appendix 8.

- Grants for Australia's environment & heritage – A guide: This guide provides an overview of the full range of grants available from the Department of the Environment and Heritage.
  Website: http://www.deh.gov.au/programs/publications/guide/

- Grantslink: A federal government website where you can search for grants in several ways. Website: http://www.grantslink.gov.au/
- Grants Directory: A compilation of grants and assistance programs available to communities and local governments in regional and metropolitan WA. Includes programs provided by the WA and Commonwealth Governments as well as private sector organizations. Website: http://grantsdirectory.dlgrd.wa.gov.au/

6.4 Community Involvement

Community involvement in the management of the North Coogee foreshore should be encouraged in the implementation of this management plan. An appropriate division of tasks between various community groups and the developers and the City will enable the most efficient use of available resources and volunteer efforts. Tasks to which volunteers could contribute are: weed control, ecological restoration, monitoring and educational activities.

The community groups should not be seen as a free labour source and should be recognised for their skills and valuable contributions to the area. Part of this recognition could be through provision of funds for training of volunteers. Liaison between volunteers and the City is important to ensure co-operation at all times. This is best achieved on a day to day level through an appointed City liaison officer.

Table 8: Recommendations

	RECOMMENDATIONS	RESPONSIBILITY AND TIMING				
		Stage 1 2009	**Stage 2 2009 / 2010**	**Stage 3 2010+**	**Stage 4 2010+**	**Stage 5 Ongoing maintenance**
1	**Weed Control Strategy**					
1.1	The proponents undertake a weed survey and conduct a weed control program at North Coogee in accordance with the objectives.	Stockland (S), LandCorp(L) 2008 – 10	C 2008 – 09 / ongoing	C 2007 – 10	C	City of Cockburn (C) ongoing
1.2	Ensure that the public is informed and notified prior to and during weed spraying in the study area.	S, L 2008 – 10	C 2008 – 09 / ongoing	C 2007 – 10	C	C ongoing
1.3	Ensure weed control contractors have adequate experience working in natural coastal environments.	S, L 2008 – 10	C 2008 – 09 / ongoing	C 2007 – 09	C	C ongoing
2	**Ecological Restoration**					
2.1	Prioritise and undertake restoration activities associated with the dune remediation to the west of the former ANI site (Stage 1 only).	S, L 2009 – 10	NA	NA	NA	NA
2.2	Erect signage that is appropriate in location, size and information to inform the public of rehabilitation works.	S, L 2009 – 10	C 2008 – 09	C 2009 – 10	C	C ongoing
2.3	Use only species sourced from local propagation stocks (seeds, cuttings, divisions) from the Perth Metro coastline communities.	S, L 2009 – 10	C 2009 – 09 / ongoing	C 2007 – 09	C	ongoing
2.4	Stabilising to incorporate strategic wind fencing, brushing, car park, matting materials and intensive planting of dune stabilising species along the front of foredunes.	S, L 2009 – 10	C 2008 – 09 / ongoing	C 2007 – 09	C	C ongoing

	RECOMMENDATIONS	RESPONSIBILITY AND TIMING				
		Stage 1 2009	**Stage 2 2009 / 2010**	**Stage 3 2010+**	**Stage 4 2010+**	**Stage 5 Ongoing maintenance**
2.5	Monitor revegetated areas and signs of rabbit activity.	S, L 2009 – 10	C 2009 – 10 / ongoing	C 2007 – 09	C	C ongoing
3	**Fire Management**					
3.1	Aim to suppress and contain any fires within the study area as quickly as possible. Fire mop-up procedures should be instigated to prevent re-ignition.	C / FESA Ongoing	C / FESA ongoing	C / FESA ongoing	C / FESA ongoing	C / FESA ongoing
3.2	Further develop liaison between the Fire and Emergency Services Authority (FESA) and the City of Cockburn with an aim to increase efficiency, vegetation protection and refinement of strategies for the quick and effective control of fires.	C Ongoing	C ongoing	C ongoing	C ongoing	C ongoing
3.3	Keep records of the date, time, duration, personnel attending and known cause of all fires within the study area.	C Ongoing	C ongoing	C ongoing	C ongoing	C ongoing
3.4	Ensure that the FESA is aware of the management objectives for the study area and aim to protect the area's biological values and ecological functions when attending fires in the area.	C Ongoing	C ongoing	C ongoing	C ongoing	C ongoing
3.5	Implement a weed control programme as per Section 5.1.	S. L 2009 – 10	C ongoing	C ongoing	C ongoing	C ongoing
3.6	Establish fire breaks adjacent to all property boundaries and at strategic internal locations to FESA standard.	C ongoing	C ongoing	C ongoing	C ongoing	C ongoing
4	**Cultural Heritage**					
4.1	Incorporate public art in strategic ways in the foreshore through a community cultural development process.	S, L	C	C	NA	NA

	RECOMMENDATIONS	RESPONSIBILITY AND TIMING				
		Stage 1 2009	**Stage 2 2009 / 2010**	**Stage 3 2010+**	**Stage 4 2010+**	**Stage 5 Ongoing maintenance**
4.2	Respond to any requirements for signage and public artwork arising from the Section 18.	S,L 2009 – 10	C	NA	NA	NA
4.3	Develop appropriate signage to interpret the cultural values of the site.	NA	C 2009 – 10	C 2009	NA	NA
5	**Access and Recreation**					
5.1	Develop and implement Concept Plan as presented in this report.	S, L	C	C	C	C
5.2	Implement the Concept Plan according to the timeframe on the Staging Plans.	S, L	C	C	C	C
5.3	Apply to WAGR for the pedestrian rail crossings.	NA	C 2009	NA	NA	NA
6	**Erosion Control**					
6.1	Implement a vegetation rehabilitation and access management program within the foreshore reserve.	S. L 2007 – 10	C ongoing	C ongoing	NA	C ongoing
6.2	Encourage community involvement in the rehabilitation programme.	NA	C 2009 – 10	C 20010 – 11	NA	C ongoing
6.3	Continue to review the current monitoring data and the length of the groyne extension.	NA	C	NA	C	C ongoing
6.4	If the groyne extension proceeds, it should be done in stages to monitor the shoreline position.	NA	C	C	C	C
6.5	Implement a monitoring program following the groyne extension to assess shoreline movement to the north and south of the groyne.	NA	C 2009 – 10 / ongoing	NA	NA	NA

	RECOMMENDATIONS	RESPONSIBILITY AND TIMING				
		Stage 1 2009	**Stage 2 2009 / 2010**	**Stage 3 2010+**	**Stage 4 2010+**	**Stage 5 Ongoing maintenance**
7	**Feral and Domestic Animal Control**					
7.1	Monitor foreshore reserve to determine the impact of rabbits.	C ongoing	C ongoing	C ongoing	NA	C ongoing
7.3	Implement a community awareness campaign to inform residents who own domestic animals of their responsibilities in regard to control of pets.	C ongoing	C ongoing	C ongoing	NA	C ongoing
8	**Interpretation and Education**					
8.1	Develop a Signage and Interpretation Plan for North Coogee foreshore.	S, L, C 2009	C	C	NA	C
8.2	Implement the Signage and Interpretation Plan.	S, L, C	C	C	NA	C
8.3	Liaise with Aboriginal custodians regarding education and interpretation of the cultural values of the North Coogee foreshore.	S, L, C	C	C	NA	C

Key

C - City of Cockburn

L - LandCorp

S - Stockland

7.0 References

North Coogee Foreshore Management Plan

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Appendix One:
Plant Species List at North Coogee

North Coogee Foreshore Management Plan

Family	Species	Common Name
AGAVACEAE	**Agave amen cana*	Agave
AIZOACEAE	**Carpobrotus edulis*	Pigface
AIZOACEAE	**Tetragonia decumbens*	Sea Spinach
APIACEAE	**Foeniculum vulgare*	Fennel
ASPHODELACEAE	**Asphodelus fistulosus*	Wild Onion
ASTERACEAE	**Arctotheca calendula*	Capeweed
ASTERACEAE	*Olearia axillaris*	Coastal Daisy
ASTERACEAE	*Senecio lautus*	Variable Groundsel
BRASSICACEAE	**Cakile maritima*	Sea Rocket
BRASSICACEAE	**Raphanus raphanistrum*	Wild Radish
CASUARINACEAE	*#Casuarina sp 1*	
CASUARINACEAE	*#Casuarina sp 2*	
CHENOPODIACEAE	*Atriplex isatidea*	Coast Saltbush
CHENOPODIACEAE	*Rhagodia baccata*	Seaberry Saltbush
CUPRESSACEAE	*#Callitris preissii*	Rottnest Island Pine
EUPHORBIACEAE	**Euphorbia terracina*	Geraldton Carnation Weed
EUPHORBIACEAE	**Euphorbia peplus*	Petty Spurge
EUPHORBIACEAE	**Ricinus communis*	Castor Oil Bush
GERANIACEAE	**Pelargonium capitatum*	Rose Pelargonium
GOODENIACEAE	*Scaevola crassifolia*	
IRIDACEAE	**Romulea rosea*	Guildford Grass
LILIACEAE	**Trachyandra divaricata*	
MIMOSACEAE	*Acacia cyclops*	Coastal Wattle
MIMOSACEAE	*Acacia saligna*	Orange Wattle
MIMOSACEAE	*Acacia rostellifera*	
MIMOSACEAE	*Acanthocarpus preissii*	Prickle Lily
MYRTACEAE	*#Araucaria heterophylla*	Norfolk Island Pine
MYRTACEAE	*#Calothamnus quadrifidus*	One-Sided Bottlebrush
MYRTACEAE	*#Eucalyptus platypus var. heterophylla*	Coastal Mort
MYRTACEAE	**Leptospermum laevigatum*	Coast Teatree
MYRTACEAE	*#Melaleuca lanceolata*	Rottnest Teatree
MYRTACEAE	*#Melaleuca nesophila*	
ONAGRACEAE	**Oenothera drummondii*	Evening Primrose
PAPILIONACEAE	*Hardenbergia comptoniana*	Native Wisteria
PAPILIONACEAE	**Lupinus cosentinii*	Sandplain Lupin
PAPILIONACEAE	**Trifolium campestre*	Hop Clover
POACEAE	**Arundo donax*	Giant Reed
POACEAE	**Avena barbata*	Bearded Oat
POACEAE	**Briza maxima*	Blowfly Grass
POACEAE	**Cynodon dactylon*	Couch
POACEAE	**Ehrharta calycina*	Veldt Grass
POACEAE	**Ehrharta villosa*	Pyp Grass
POACEAE	**Hordeum lepidotum*	Barley Grass
POACEAE	**Lagurus ovatus*	Hare's Tail Grass
POACEAE	**Pennisetum villosum*	Feathertop
POACEAE	*Spinifex hirsutus*	Hairy Spinifex
POACEAE	*Spinifex longifolius*	Long Leaved Spinifex
POACEAE	**Stenotaphrum secundatum*	Buffalo Grass
PRIMULACEAE	**Anagallis arvensis*	Pimpernel
SOLANACEAE	**Lycium ferocissimum*	African Boxthorn
SOLANACEAE	**Nicotiana glauca*	Tree Tobacco

* Weed species # Naturalised but not local species

Appendix Two:
Weed Species at North Coogee

North Coogee Foreshore Management Plan

Botanical names	Common Names	Type
Major Weeds		
Pelargonium capitatum	Rose Pelargonium	Perennial Herb
Leptospermum laevigatum	Coast Teatree	Tree
Agave americana	Agave	Succulent Perennial
Lycium ferocissimum	African Boxthorn	Shrub
Nuisance Weeds		
Foeniculum vulgare	Fennel	Perennial
Arundo donax	Giant Reed	Perennial
Ehrharta calycina	Veldt Grass	Grass
Euphorbia terracina	Geraldton Carnation Weed	Annual
Lupinus cosentinii	Sandplain Lupin	Annual
Ricinus communis	Castor Oil Bush	Shrub
Nicotiana glauca	Tree Tobacco	Tree
Ehrharta villosa	Pyp Grass	Grass
Minor Weeds		
Trachyandra divaricata	Onion Weed	Bulb
Tetragonia decumbens	Sea Spinach	Herb
Cakile maritima	Sea Rocket	Herb
Oenothera drummondii	Evening Primrose	Herb
Anagallis arvensis	Pimpernel	Annual
Arctotheca calendula	Capeweed	Perennial
Asphodelus fistulosus	Wild Onion	Bulb
Euphorbia peplus	Petty Spurge	Annual
Avena barbata	Bearded Oat	Grass
Briza maxima	Blowfly Grass	Grass
Lagurus ovatus	Hare's Tail Grass	Grass
Cynodon dactylon	Couch	Grass
Pennisetum villosum	Feathertop	Grass
Romulea rosea	Guildford Grass	Bulbous Grass
Stenotaphrum secundatum	Buffalo grass	Grass
Trifolium campestre	Hop Clover	Annual
Carpobrotus edulis	Pigface	Perennial
Hordeum leporinum	Barley Grass	Grass
Raphanus raphanistrum	Wild Radish	Annual

Herbicide Treatment	• via mist spray; • via an applicator: wick, brush, sponges; and • via stem injection and frilling (good for tree or shrub weeds such as Geraldton Wax). • A systematic non-selective herbicide, e.g. Glyphosate (Roundup®) useful for controlling most weeds especially bulbous species. This herbicide should not be sprayed in areas containing native species as it will also kill them. • A selective herbicide, e.g. Fluazifop (Fusilade®) that does not affect non-grass native species. A dye should be added to the herbicide to mark areas sprayed.
Hand Weeding **Competition**	• Start from the least weed infested area and work to the most infested, usually from the core outwards. • Minimise soil disturbance when removing weeds. • Only remove weeds at the rate that the Native plants grow and colonise an area. Do not over weed an area, which creates large bare soil patches that will be recolonised by weed species. • Revegetation of a disturbed area with Native species results in shading and direct competition for water and nutrients and can effectively reduce weed biomass.

Appendix Four:
Control Methods for Major and Nuisance Weeds
North Coogee Foreshore Management Plan

Weed Species	**Common Name**	Control Method
Pelargonium capitatum	Rose Pelargonium	Glyphosate with wetting agent
Leptospermum laevigatum	Coast Teatree	Paint cut stump when actively growing. Apply Roundup/Glyph straight after cutting. Remove tops which may have seeds still attached. Check following years for new growth
Agave americana	Agave	Difficult to control using herbicides. Generally best to pull or dig out. Wear protective clothing/goggles, sap irritates skin. Wash off straight away.
Lycium ferocissimum	African Boxthorn	Paint cut stump when actively growing with Roundup/Glyphosate.
Foeniculum vulgare	Fennel	Glyphosate/ Roundup at flowering time.
Arundo donax	Giant Reed	Cut down, spray regrowth when 0.5 - 1.0 m high, thoroughly wetting foliage use Glyphosate 360, 100m1 in 10L water + wetter (dilution 1 percent). Repeat application maybe necessary.
Ehrharta calycina	Veldt Grass	Easy to control Fus. 4 L ha. Spot spray at 2 L to run off. Heavy infestations may require mop up spray the following year.
Euphorbia terracina	Geraldton Carnation Weed	Spray seed 200, 10-15mL in 10 L water + 0.25% wetter, in early winter.
Lupinus cosentinii	Sandplain Lupin	Pull out seedlings. In areas with no native plants spot spray large colonies with Glyph 2% solution to run off. Plant natives to quickly fill in these large bare areas. Do not store in mounds.
Ricinus communis	Castor Oil Bush	Paint cut stump when actively growing. Apply Roundup/Glyph straight after cutting. Remove tops which may have seeds still attached. Check following years for new seedlings. Can with care, use Garlon, Grazon or Velpar.
Nicotiana glauca	Tree Tobacco	Paint cut stump when actively growing. Apply Roundup/Glyph straight after cutting. Remove tops which may have seeds still attached. Check following years for new seedlings. Can with care, use Garlon, Grazon or Velpar.
Ehrharta villosa	Pyp Grass	No specific data. Try Fusilade.

Ecoscape (1997)

Appendix Five:
Plants for Rehabilitation

North Coogee Foreshore Management Plan

Species	1st Dune	2nd Dune	3rd Dune	Propagate from (C)cutting or (S)seed		Seed collection time	Comments	Tubestock source
Acacia cochlearis		X	X		S	Nov-Dec		Site seed collection
Acacia cyclops			X		S	Nov-Dec		
Acacia lasiocarpa			X		S			Site seed collection
Acacia rostellifera			X		S	Nov-Dec		
Acacia sclerosperma subsp. sclerosperma		X	X		S			Site seed collection
Acanthocarpus preissii		X	X		S	Dec-Jan		
Agonis flexuosa			X		S			Site seed collection
Allocasuarina lehmanniana			X		S			Site seed collection
Alyxia buxifolia			X	C				Lesch Community Nursery + Carramar
Angianthus cunninghamii	X	X			S			
Anthocercis littorea			X		S			
Atriplex cinerea	X	X			S			Site seed collection
Atriplex isatidea		X	X		S			
Baumea preissii		X			S			
Callitris preissii			X		S	All year		
Calothamnus quadrifidus			X		S	All year		
Carpobrotus virescens		X	X		S	Dec		
Clematis linearifolia			X		S			
Conostylis candicans		X	X		S	Nov		
Diplolaena dampieri			X		S			
Eremophila glabra		X	X	C				WFSoc
Ficinia nodosa		X	X		S			
Grevillea crithmifolia			X		S			Site seed collection
Grevillea preissii			X	C				WFSoc

Species	1st Dune	2nd Dune	3rd Dune	Propagate from (C)cutting or (S)seed		Seed collection time	Comments	Tubestock source
Hakea prostrata			X		S			Site seed collection
Hardenbergia comptoniana			X		S	Nov-Dec		
Hemiandra pungens		X			S			
Lepidosperma gladiatum		X	X		S	Dec		
Lepidosperma pubisquameum		X	X	C			Division or transplant only	
Leucophyta brownii		X	X	C				
Melaleuca huegelii			X		S	All year		
Melaleuca lanceolata			X		S			
Melaleuca systena syn. Melaleuca acerosa			X		S	All year		
Myoporum insulare			X	C				WFSoc + Carramar
Olearia axillaris	X	X	X		S			
Ozothamnus cordatus		X	X		S			
Rhagodia baccata			X		S			
Santalum acuminatum			X		S		Direct into ground with cracked seed best	
Scaevola crassifolia		X	X	C				MOTT
Spinifex hirsutus	X	X		C		Transplant runners directly May to July		
Spinifex longifolius	X	X	X		S	Dec	Sow directly into dunes in May/June or use tubestock	
Sporobolus virginicus	X	X			S			
Spyridium globulosum			X		S			
Templetonia retusa		X	X		S	Nov-Dec		
Threlkeldia diffusa	X				S			Site seed collection

All planting should take place following the onset of winter rains.

7.1.1 Background Information

A Community and Stakeholder Design Workshop was held at the City of Cockburn on 18 December 2006 to which a number of stakeholders were invited. The key issue identified was the growth occurring within the region and the need to develop the North Coogee Foreshore Master Plan to guide future use of the foreshore. The main objective of this workshop was to obtain community input to the development of the North Coogee Foreshore Management Plan.

The format of the workshop followed several stages:

- Background Information;
- Questions and Answers;
- Values, Uses and Constraints;
- Vision and Concepts; and
- Other Feedback.

John Halleen, Project Manager for Cockburn Coast explained the Cockburn Coast District Structure Plan. John presented the key challenges of developing the Structure Plan and the Consultation Strategy timeline. John concluded noting the challenges facing the project including:

- acknowledging the business investments already made;
- working with industry to manage change and impacts;
- attempting to resolve Government, landowner and community aspirations;
- creating strong north-south and east-west transport routes, focusing on public transport and alternative travel modes;
- reuse of the South Fremantle Power Station;
- creating a business case for the relocation of the switchyard;
- incorporating the rich history of the area; and
- creating a mix of lifestyles, housing types, demographics and experiences.

Scott Bird of ENV Australia explained the environmental considerations relating to the foreshore in the area. Scott included background information in his presentation as well as the environmental assessment that had been performed to assess the areas suitability for the proposed plan. Scott noted that ENV has:

- assessed the material within the coastal dunes;
- performed a risk assessment that concluded the material could remain in situ;
- proposed the removal of surface rubble and rubbish;
- recommended a 1 metre cover of material over dune surface; and

- provided relevant information to the Department for Environment and Conservation for endorsement.

Trent Hunt of MP Rogers Pty Ltd explained the coastal processes relating to this section of coastline. Trent presented the history of the site from 1961 to 2004 and highlighted the movement of Success Bank and explained the coastal process. The MP Rogers' recommendations are as follows:

- extend the groyne in stages to monitor shoreline changes;
- review monitoring data; and
- review the need for and length of the groyne extension.

David Kaesehagen of Ecoscape Pty Ltd presented the context and scope of the project noting that:

- The North Coogee Foreshore project area is around 8.5 hectares and is bounded by South Beach groyne, Catherine Point groyne, the railway line and the ocean.
- This stretch of coast is a significant part of the metropolitan coastline.
- It offers views to offshore islands.
- It experiences only low energy waves.
- It is an historically popular area.
- It is a registered site with the Department of Indigenous Affairs.
- It is included on the interim official Register of Heritage Places.
- It is currently used by horse racing community and has association with numerous champion horses and outstanding trainers and jockeys.

7.1.2 Questions and Answers

The group was given time to ask questions to clarify points raised above. Questions and answers are as follows:

Q. There are lots of considerations for the Cockburn Coast. Why are the landowner's views so important?

A. Don't have precedence over the views of the community but it is their land and we are working with them to reflect their past and future investments and aspirations and incorporating the Cockburn Coast dialogue.

Q. The erosion and contamination of the beach is a key consideration. The beach accretes and erodes but the dunes do not. The groyne extension isn't working as expected and the proposed extension may not be successful. What is the impact for Fremantle beaches?

A. Beach does erode and accrete which impacts upon the dunes with erosion over a period of time. The dunes are coming back. The movement of Success Bank is seen as being central to the future form of the coast and the dunes. The groyne extension will hold the sediment and renew the beach.

Q. Experience shows movement of sand between higher tides and storm surges with sand moving up and down the coast over days. What is the level of confidence in the modelling?

A. Modelling has occurred periodically from 1976 to 1996 with annual measuring in different events. There is a high level of confidence in its validity and accuracy.

7.1.3 Values, Uses and Constraints

The group was asked to comment on the things they value about the foreshore including its uses and constraints. The main issues are stated below:

Values

- prevention of future erosion with a stable beach environment;
- accessible to anybody;
- the natural state of foreshore vegetation and landform;
- allowing the beach space to do its own thing and erode and accrete;
- bringing new experiences to the coast line;
- retaining the beach as a marvellous recreational facility for swimming, walking the dog, exercising horses, cycling;
- limited access to cars;
- functionality as coastal heath in an uncontrived way;
- functionality as a coastal link from Fremantle to Coogee for walking and cycling;
- views to the beach from the pathway and the proximity to the beach and low vegetation;
- interesting peaceful sea with islands and activity off shore;
- complex and vibrant seascape;
- people and activity, vibrancy;
- people friendliness;
- access for fishing and other beach uses;
- social amenity and appeal to people in an urban environment; and
- the site's history and public art.

Uses

- walking dogs;
- grassed areas for families;
- natural appeal as a low key beach;
- Rottnest type appeal – no access for cars just people and bikes;
- safe and secure with passive surveillance;
- able to enjoy the beach into the evening – walking with safety and able to see;
- South Beach as district modal beach. Not just continuity of all the same things. Something different and more natural and low key;
- wide variety of recreational opportunities, including restaurants and cafes;
- educational opportunities – interpretive and recognising the cultural and natural heritage of the site;
- recognising the Coastal Dialogue outcomes;
- offering access/facilities for windsurfers and sea kayakers; and
- access for all people – elderly, families, people with disabilities.

Constraints

- jellyfish and possible relationship to groynes;
- sea level rise and climate change;
- beach and coastal erosion with WA experiencing significant impacts;
- the narrow northern part of the site which is difficult to widen. The narrow foreshore reserve is a constraint in itself;
- the colour of the sand. The introduced material is a contributing factor due to mineralogy of the introduced fill. This may be due in part to groyne dredging pumped sand from off shore to fill the groynes. If the groyne is extended it will be naturally backfilled as a result of coastal processes; and
- design of the buildings at the ANI site provides an important landscaping interface.

7.1.4 Vision and Concepts

The workshop participants formed seven groups to discuss more specific details about the vision and concept of the plan. Each group was supplied with a large image of the project area and then asked to record details of changes they would like to make to the area.

Each group presented its plan to the whole group. The following key themes emerged:

- low key foreshore activity but recognising regional and local population growth;
- need for some grassed areas probably near the existing car park or south of the new development;
- the need for the groyne extension was questioned. Is there a better solution?;
- separation of the regional and local cycling and walking paths;
- limiting access to existing paths generally with some localised changes possibly required;
- celebrating the site's heritage using public art at key locations;
- possible inclusion of an Interpretive Centre with a focus on horses, dogs, heritage and education;
- offering universal access and opportunities for the frail or people with disabilities to access the beach;
- using native WA coastal vegetation for renewal planting;
- continue to allow dogs and horses access to the beach; and
- preserve views and sight lines to the islands and offshore attractions.

7.1.5 Other Feedback

Feedback was also received from the tables collectively and from individual participants. The main issues raised from the group discussions are as follows:

Site values, uses and constraints

Values

- the areas natural recreational amenities – swimming, fishing, dog and horse exercise area;
- current views;
- pristine beaches with no vehicle access; and
- new experiences.

Land uses on the foreshore

- continued cycle and pedestrian use with an exclusion of further vehicle use;
- grassed areas for families;
- preservation of natural environment; and
- variety of recreational opportunities.

Constraints

- coastal erosion.

Vision / Concept plan

Recreational land uses

- improve amenities to the area – including BBQ's, shade structures, children's play area, good access for all as well as wheelchairs, more grassed areas, toilets, bins, showers;
- introduce an Interpretive Centre;
- keep dog and horse beach; and
- protection of dune alignment.

Access

- improve access with additional cycle paths, make the area pram, wheelchair, and cycle friendly;
- regional link along railway with low speed pedestrian / cycle link internally;
- separate regional and local cycling and pedestrian movement;
- mixed views on parking. Some participants would like to see additional parking while others would not; and
- do not allow vehicle access any further than car park.

Landscaping

- mixed views, some would like improvement to landscaping others would like the landscape to be left as it is;
- keep natural balance of vegetation;
- preserve views and sight lines;
- include Norfolk pines, Sheoak and Peppermints; and
- preserve coastal heath – opportunities near Pt Catherine groyne and further south.

Heritage site recognition

- themed public art displays all down the coast – recognise Aboriginal history.

Other comments made:

- vandalism is a concern;
- groyne extension is very risky and the results are unpredictable;
- we question the need for the groyne extension if at all;
- extending the southern groyne may not be needed;
- don't spend any more money on it;
- mixed views on the inclusion of limestone walls. Some participants would like to see limestone walls others would not; and
- restrict dog access to dunes but keep access to beach.

Appendix Seven:
Workshop Participants - Dec 18 2006

North Coogee Foreshore Management Plan

NAME		NAME		NAME
Adele Carles		Cr. John Strachan		Libby Hocking
Andrew Ross		Daryll Smith		Mary Jenkins
Andrew Sullivan		Dee Randall		Mayor Stephen Lee
Barbara Quinn		Fred Yasso		Mike Kenny
Biddy Myers		Gabriel Hodgson		Norm Randall
Byorn Jonshagen		Geoff Sach		Robyn Colledge
Carol Reeves-Fowkes		Glen Diggins		Robyn Scherr
Carolyn Beal		Hugh Needham		Stewart Dallas
Cathy Hall		John Longley		Terry Paterson
Cr. Julie Baker		John Watson		Vince Paparone
Cr. Kevin Allen		Juliet Albany		Zoe Inman
Debra Allen		Kirsty Mippy		CEO Stephen Cain

In addition to the workshop participants a number of consultant and project staff participated in the workshop as follows:

Name	Role	Agency
Linton Pike	Workshop facilitator	Estill and Associates
Paul Ferrante	Table facilitator	LandCorp
Joanne Smith	Table facilitator	City of Cockburn
Michael Littleton	Table facilitator	City of Cockburn
Daniel Arndt	Table facilitator	City of Cockburn
Mary Warinner	Table facilitator and project consultant	Ecoscape
David Kaesehagen	Table facilitator and project consultant	Ecoscape
Andy Armstrong	Table facilitator and Stockland representative	Stockland
Trent Hunt	Project Consultant	MP Rogers Pty Ltd
Mick Rogers	Project Consultant	MP Rogers Pty Ltd
Scott Bird	Environmental consultant	ENV Australia Pty Ltd
John Halleen	Project Manager – Cockburn Coast Project	Dept for Planning and Infrastructure

Appendix Eight:
Potential Sources of Funding

North Coogee Foreshore Management Plan

NAME OF GRANT/ ORGANISATION	WHO CAN APPLY?	REWARD	TIMING OF GRANTS	ELIGIBILITY CRITERIA, BACKGROUND, CONTACTS…
Alcoa Foundation	Community Groups			Conservation and Sustainability is one of the areas of excellence that can gain funding. www.alcoa.com/global/en/community/info_page/guidelines.asp
ANZ Staff Foundation	Not-for-profit organisations and Income Tax Exempt Charities	Usually less than $30,000	Annually	The ANZ Staff Foundation aims to fund projects which: - Offer long term solutions to the problem of unemployment, especially in rural areas - Assist communities to conserve resources and protect the environment Ph: 1800 808 910 Email: charitabletrusts@anz.com Condition: Must provide opportunities for ANZ staff participation as volunteers
Commonwealth Environmental Education Grants Program	Local & State governments, community groups, schools, NGOs	$3,000-$45,000		Projects should contribute to the priority areas identified by the National Education Council, including: - develop strategies to assist in the incorporation of ecologically sustainable development principles into teaching programs and campus activities; - encourage business and industry to develop practices consistent with ecologically sustainable development; - develop resources and consistent approaches to environmental education in the community that reflect sound environmental knowledge and practice. www.deh.gov.au/education/programs/ or Environmental Education Section Ph (02) 6274 1290
Envirofund (Programme of Natural Heritage Trust)	Community groups	Up to $50,000	Two rounds per year. February and October.	Funding for support of local projects aimed at conserving biodiversity and promoting sustainable resource use (including revegetation, weed, stock and feral animal control, protective fencing and community education). Expect cash or in kind contribution to project from proponent. Un-incorporated community groups may be sponsored by incorporated groups or local government. Website : www.nht.gov.au/envirofund Ph: 1800 303 863 E-mail: envirofund@daff.gov.au

NAME OF GRANT/ ORGANISATION	WHO CAN APPLY?	REWARD	TIMING OF GRANTS	ELIGIBILITY CRITERIA, BACKGROUND, CONTACTS…
Environmental Education Grants Program (Environment Australia)	Organisations & individuals (Includes schools, community groups)	About $30,000	2007 closing date not determined	Funding for organisations and individuals involved in activities, which support the achievement of Commonwealth Government environment and heritage objectives, in particular the adoption of ecological sustainable development principles throughout Australian society. Funded activities should perform at least one, but preferably more than one, of the key components of environmental education in support of ecological sustainability: *raising awareness; *acquiring new perspectives; *developing knowledge, values and skills; and *changing behaviour. Ph : (02) 6274 1290 Email: ee@erin.gov.au Website: www.biodiversity.ea.gov.au/education/programs
The George Alexander Foundation	Groups endorsed by the ATO as deductible gift recipients	Total annual funding pool $350,000	Three rounds in 2007. Feb., June & Oct.	Funding Purpose: priority interests are the environment and education. Has an emphasis on helping talented young people, especially those experiencing economic disadvantage, to achieve educational and employment goals. Contact: 9650 3188, www.gafoundation.org.au admin@gafoundation.org.au
Indigenous Heritage Program (DEH)	Indigenous organisations and individuals, not-for-profit bodies, local government	$5,000-100,000	Annually. Applications usually close Feb / Mar.	Funding available for on-ground protection and conservation of Indigenous heritage. Website: www.deh.gov.au/heritage/programs/ihp E-mail: ihp_grants@deh.gov.au Ph: 02 6274 1651
Indigenous Start-up and Incentive Land Care Grants	Indigenous groups or landholders	Up to $20,000	Two rounds per year.	Designed to assist Aboriginal people and communities to perform on-ground Landcare activities http://www.dia.wa.gov.au/DIA/Funding/Land/default.aspx Contact Senior Land Management Ph: 9235 8000
Sharing Australia's Stories	Community groups, schools, individuals and LGA	Up to $50,000	Annual cycle.	Provide opportunities for all Australians to show how their stories have contributed to the great events and themes that have shaped our nation. It must be about a place, community, activity, event, tradition, institution or a family or person; tell the story of an aspect of Australia's natural heritage that has been important in shaping the flora, fauna or landscapes of the continent and involve activities such as publishing brochures, books, guides or websites or developing events, displays, exhibitions or signage. For more information: http://www.deh.gov.au/heritage/programs/index.html#sharing Contact: ph 1800 653 004 or storiesgrants@deh.gov.au

Appendix Nine:
Concept Plan, Sections and Staging

North Coogee Foreshore Management Plan