

the changing
CockburnCoast

Appendices -
Coastal Planning Strategy

June 2008



Cockburn coast draft district structure plan

Coastal Planning Strategy

Coastal Planning Strategy

"Our Cockburn coast"

1.	Introduction	1
1.1	Coastal planning strategy vision	3
1.2	Role of the coastal planning strategy	4
1.3	Coastal planning strategy objectives	4
2.	Policy context and other studies	4
2.1	State Planning Policy No. 2.6 State Coastal Planning Policy	4
2.2	State Planning Policy No. 2 Environmental and Natural Resources Policy	5
2.3	State Environmental (Cockburn Sound) Policy 2005	5
2.4	Environmental management plan for Cockburn Sound	5
2.5	Perth coastal planning strategy	6
2.6	Fremantle boat launching facility study	6
2.7	Fremantle Harbours Policy	6
2.8	Local Planning Policy - Cockburn Sound Catchment Policy	7
2.9	Coogee Beach Structure Plan	7
2.10	Draft North Coogee foreshore management plan	8
3.	Planning Context	9
3.1	Key Planning Issues	9
3.2	Land tenure and vesting	9
3.3	Regional coastal context	9
3.4	Implications for coastal management	13
3.5	History of human use and impacts	15
4.	Environmental and coastal processes context	18
4.1	Site location	18
4.2	Climate	19
4.3	Wind	19
4.4	Landform and topography	19
4.5	Soils and geology	21
4.6	Foreshore reserve - Catherine Point and C Y O'Connor reserves	21
4.7	Coastal Processes and sea wall assessment	21
4.8	Site contamination	26
5.	Heritage Context	26
5.1	Indigenous heritage	26
5.2	European heritage	27
6.	Current access and recreation opportunities	29
6.1	Coastal recreation potential and demand	29
6.2	Implications for coastal management	32

6.3	Opportunities and constraints	32
6.4	Specific management sectors	33
7.	Coastal management issues and strategies	36
7.1	Potential impacts and management issues	37
7.2	Management strategies	37
8.	Recommendations	45
8.1	Power station sector	45
8.2	C Y O'Connor sector	46
8.3	North Coogee sector	46
8.4	Foreshore Management Plan	47
9.	References	48

Tables

Table 1: Coastal infrastructure within the Cockburn coast district structure plan project area	16
Table 2: Reclamation, beach renourishment and dune creation within the Cockburn coast district structure plan project area	17
Table 3: Dredging within the Cockburn coast district structure plan project area	17
Table 4: Historic structures with Owen Anchorage which are no longer functional	18
Table 5: Registered Aboriginal sites within the study area	27
Table 6: Expected activities along the Cockburn coast district structure plan coastline and foreshore	31
Table 7: Recommendations for structural works	42

Figures

Figure 1: Aerial of project area boundary	2
Figure 2: Topology Map	21
Figure 3: Physical coastal setback line	25
Figure 4: Foreshore management sectors	34

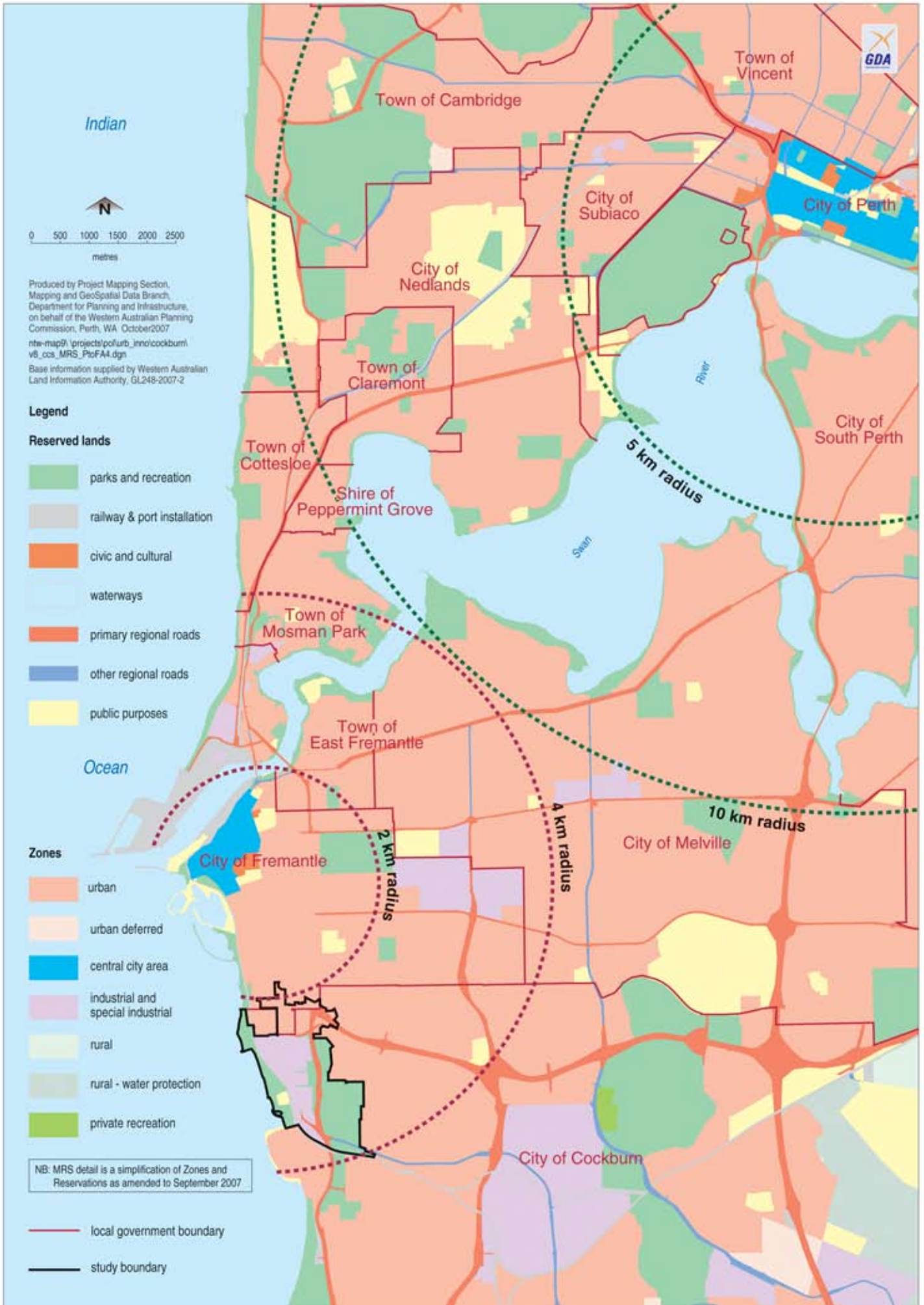
Coastal Planning Strategy

'Our Cockburn Coast'

1. Introduction

The City of Cockburn has more than 13 kilometres of coastline, and is arguably the city's greatest recreational asset providing for a wide range of beach experiences and recreational opportunities to the local and broader regional community. The coastline also has a significant regional economic and employment function with major boat building companies located within the Australian Marine Complex.

The City of Cockburn is experiencing considerable growth, with the population set to increase to 114 000 in the year 2021. This will have implications for the long-term management and use of the coastline. A key initiative to planning for the Cockburn coastline is the adoption of a "coastal node" approach to providing recreational areas for local and regional coastal users. South Beach, Port Coogee, Coogee Beach and Woodman Point nodes are a connected network of regional, district and local recreational nodes which provide the local and regional coastal user with a diverse choice of passive and active recreational opportunities. Figure 1 details the Cockburn coast project area boundary.



MRS (Perth to Fremantle)

The Cockburn coast draft district structure plan area includes 2.3 kilometres of foreshore extending from Island Street groyne to the northern Port Coogee breakwater. It is recognised that this part of the coastline has a rich history of shipwrecks, racehorses, old industrial buildings, and Nyoongar cultural traditions.

“The Cockburn coast landscape of faded sea walls, a red brick chimney stack, vacant spaces, a mesh of old wire and rusted fences lay as monuments to a bygone industrial era, reminding us what the Cockburn coast used to be.”

The Cockburn coast draft district structure plan is a response to the Minister for Planning and Infrastructure’s call "to transform the Cockburn coast from an area once populated with industry to a world-class residential and recreational precinct". Urban development in accordance with the Cockburn coast district structure plan will result in approximately 10 800 people living in the project area over the next eight to 20 years.

The big challenge in returning a forgotten industrial coastal strip back to the community is to engage in coastal recreational and tourism planning that responsibly addresses community needs and aspirations without compromising environmental and cultural values.

The Cockburn coast project area is “book ended” to the north and the south by urban redevelopment projects on former industrial land.

To the north at the South Beach development, plans for a mixed use residential development have been approved, with remediation and development works underway on land, which adjoins the North Coogee foreshore area. Port Coogee, to the south, is a 300 public pen marina and residential development.

The planning and revitalisation of former industrial land at South Beach and Port Coogee brings into focus the challenge of managing the foreshore reserve in response to increasing numbers of people, locally and regionally, seeking to use the coastline for a range of new experiences and recreational activities.

In regards to the Cockburn coast foreshore area, the increased demand for beach usage associated with urban development and improved access to the foreshore requires a specific management plan to address the social and recreational needs of both local and regional beach users, whilst respecting and safeguarding the cultural and environmental integrity of the foreshore.

The Cockburn coast district structure plan coastal planning strategy should be read in conjunction with following key documents:

- Cockburn coast district structure plan report;
- Cockburn coast coastal processes assessment report; and
- Cockburn coast urban water management overview.

1.1 Coastal planning strategy vision

The vision for the coastal planning strategy is to significantly improve the function of the foreshore as a social, environmental and cultural resource, scenic attraction, recreation facility, and in doing so contribute to the regional and local community.

1.2 Role of the coastal planning strategy

This coastal planning strategy is intended to be a strategic and flexible document that complements the district structure plan and provides guidance to the proposed redevelopment authority, City of Cockburn and the Western Australian Planning Commission (WAPC) for the future development of detailed foreshore management plans.

1.3 Coastal planning strategy objectives

The objectives for the coastal planning strategy are to:

- outline and describe key environmental, cultural, social and infrastructure elements;
- identify major issues and trends, and provide strategic direction on the opportunities and constraints for recreational and tourism uses, infrastructure and developments;
- identify issues that will require management;
- develop management recommendations and an implementation framework to guide a future foreshore management plan; and
- provide guidance on designated recreation nodes and entry points to the foreshore.

2. Policy context and other studies

2.1 State Planning Policy No. 2.6 State Coastal Planning Policy

This policy requires strategic plans to guide local planning, development setbacks for protection against coastal processes such as erosion and storms, and the provision of coastal foreshore reserves.

Implementation is through local government town planning schemes, and regional and local strategies.

The objectives of this policy are to:

- protect, conserve and enhance coastal values, particularly in areas of landscape, nature conservation, indigenous and cultural significance;
- provide for public foreshore areas and access to these on the coast;
- ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities; and
- ensure that the location of coastal facilities and development takes into account coastal processes including erosion, accretion, storm surge, tides, wave conditions, sea level change and biophysical criteria.

2.2 State Planning Policy No. 2 Environmental and Natural Resources Policy

This policy defines the principles and considerations that represent good and responsible planning in terms of environmental and natural resources issues within the framework of the State Planning Strategy.

The objectives of the policy are:

- to integrate environment and natural resource management with broader land use planning and decision making;
- to protect, conserve and enhance the natural environment; and
- to promote and assist in the wise and sustainable use and management of natural resources.

The policy recognises that the implementation of the planning decisions can have an impact on the environment and other natural resources. The policy requires planning and associated decision-making to be compatible with the policy requirement, and for the policy to be further supplemented by more detailed planning policies on particular resource matter that require additional information and guidance.

2.3 State Environmental (Cockburn Sound) Policy 2005

This policy establishes the basis on which Cockburn Sound and the environment of adjacent land is to be protected.

The purposes of this policy are:

- to declare, protect and maintain the environmental values of Cockburn Sound;
- to abate pollutants and restrict activities that diminish the environmental values of Cockburn Sound;
- to establish a program to protect and enhance environmental quality to support the environmental values of Cockburn Sound;
- to give effect to the environmental quality objectives and the environmental quality criteria for Cockburn Sound; and
- to give effect to the Environmental Management Plan for Cockburn Sound.

2.4 Environmental management plan for Cockburn Sound

The environmental management plan for Cockburn Sound details a five-point plan of action towards implementing the State Environmental Policy and coordinating environmental planning and management of Cockburn Sound and its catchment:

- protecting the environmental values of Cockburn Sound;
- facilitating multiple use of Cockburn Sound and its foreshore;
- integrating management of the land and marine environments;
- coordinating research and investigations; and
- monitoring and reporting on performance.

2.5 Perth coastal planning strategy

Providing a regional overview, with strategic planning and policy guidance, the Perth coastal planning strategy is currently being finalised by the Department for Planning and Infrastructure.

Prepared in consultation with the community, the strategy addresses existing environmental and planning conditions, land uses and features to be promoted, and community views on opportunities, challenges and fears, on a precinct basis along the metropolitan coastline.

The majority of the foreshore area within the Cockburn coast structure plan area is addressed by the O'Connor precinct (Precinct 36).

2.6 Fremantle boat launching facility study

Currently being undertaken, the Fremantle boat launching facility study is investigating the potential for a new boat launching facility within Fremantle and the surrounding area.

The study included the review of five locations including:

- Cottesloe;
- Rouse Head;
- Fremantle Harbours;
- Catherine Point; and
- North Port Coogee (South Fremantle power station).

Catherine Point and the South Fremantle power station are both within the Cockburn coast structure plan area. Neither of these options has been comprehensively ruled out, however it is understood that Fremantle Harbour may be the most desirable option at this stage.

2.7 Fremantle Harbours Policy

The Department for Planning and Infrastructure has undertaken a Fremantle boat launching facility study which investigated the potential for a new boat launching and marina facilities within Fremantle and the surrounding area to cater for growth in commercial (including tourism-charter vessels) and recreational boating. It is against this background that the Minister for Planning and Infrastructure instructed that a policy be produced to address these issues and the requirement for expansion to the year 2037.

In October 2007, Minister for Planning and Infrastructure, Alannah MacTiernan, launched three options for future growth of the boat harbours, including the Fishing Boat, Success and Challenger harbours, were unveiled and public comment was invited.

The different scenarios were based on the outcome of community consultation and developed under the guidance of a committee which included representatives of the local fishing industry, the tourism industry, City of Fremantle, Fremantle Chamber of Commerce, Fremantle Sailing Club and the State Government.

Two of these called for the transformation and expansion of Challenger Boat Harbour - introducing a waterfront residential village and extensive parklands linked to Fremantle's city centre.

More information and opportunities to comment on the Fremantle Boat Harbours Policy and the scenarios for future development is available at <http://www.dpi.wa.gov.au/fremantleharbour>.

2.8 Local Government Planning Policy – Cockburn Sound Catchment Policy

At a local level, three local governments fall within the Cockburn Sound catchment: the City of Cockburn, the Town of Kwinana and the City of Rockingham. The Cockburn Sound Management Council initiated a working group in early 2002 to determine the most appropriate mechanisms to effectively manage new or proposed land uses within the catchment that may have the potential to add to or exacerbate nutrient loading and other contamination issues.

The purpose of this policy is to protect and improve the marine waters of Cockburn Sound by minimising contaminant inputs (particularly nutrients) from diffuse land use sources.

Specifically, the objectives of the policy are:

- to ensure changes to land uses that have the potential to cause nutrient contamination to surface or groundwater are compatible with long-term protection and improvement of water quality within the Cockburn Sound Catchment;
- to ensure such land uses and development within the catchment take into account potential nutrient and other contamination issues, and includes specified protection measures (such as appropriate conditions) where a risk is identified;
- where appropriate, to maintain or increase native local vegetation in the Cockburn Sound catchment area including wetland areas to assist in natural nutrient attenuation and uptake; and
- to ensure an efficient and consistent process for local government and proponents, when dealing with land use proposals within the Cockburn Sound catchment.

2.9 Coogee Beach Structure Plan

The Coogee Beach Structure Plan has been prepared to guide future planning and development of Coogee Beach and management of the coast.

The structure plan has brought together a number of coastal-related development proposals and establishes an overall picture of that portion of the coastal zone from the southern end of the proposed Port Coogee Marina to Poore Grove. The three major development proposals associated with the plan are:

- Port Coogee Marina (southern portion - adopted by Council 16/3/04);
- Coogee Cafe / Kiosk Development; and
- Coogee Beach Surf Life Saving Club premises.

It also identifies some issues raised by current and previous plans and studies and includes a number of possible solutions in relation to:

- connection with the proposed Port Coogee Marina development;
- construction of a cafe / kiosk;
- expansion of the car parking areas;
- closure of the existing shop;
- new vehicle accesses from Cockburn Road;
- the caravan park;
- reuse of the unused railway reserve;
- development of the Surf Life Saving Club;
- pedestrian / cyclist network;
- access to the beach; and
- rehabilitation / protection of the foredune and important vegetation.

2.10 Draft North Coogee foreshore management plan

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 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 foreshore management plan were made in the 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 objectives of this foreshore management plan are to:

- describe relevant aspects of environmental, cultural, social and infrastructure importance;
- integrate the adjacent built environment, particularly the proposed ANI Bradken former industrial site in South Fremantle into a 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 plan 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 to enhance the area's natural, cultural and recreational values.

3. Planning context

3.1 Key planning issues

The key planning issues identified include:

- strong pedestrian, cycling and road connectivity between Port Coogee and South Beach developments;
- the control of access to the foreshore;
- the use of the beach and foreshore reserve;
- preservation and interpretation of heritage and environmental values; and
- aesthetics and public safety.

3.2 Land tenure and vesting

The land tenure and vesting of the land within and abutting the Cockburn coast foreshore reserve includes the following:

- public open space Lot 1815 Island Street, South Fremantle will be vested in the City of Cockburn;
- C Y O'Connor Reserve – 24787R McTaggart Cove, North Coogee is an A-Class Reserve vested in the City of Cockburn;
- part of the foreshore reserve 44945R Bennett Avenue, North Coogee is a freehold A-Class Reserve owned by the WAPC, zoned as regional reserve;
- Lot 2064 Robb Road, North Coogee is currently unallocated Crown land but will be vested with the City of Cockburn;
- Lot 2110, North Coogee is owned by the WAPC, zoned as regional reserve;
- part of the foreshore reserve Lot 2161 is Crown land under lease to Verve Energy;
- Lot 1 Robb Road is owned by Western Power (switchyard site) and is zoned as public purpose; and
- Lots 2 and 3 Robb Road are owned by Verve Energy (South Fremantle power station site) and is zoned parks and recreation.

3.3 Regional coastal context

3.3.1 South Beach development

The South Beach residential development project has remediated more than 20 hectares of land previously used for industrial purposes. The South Beach development is located approximately 2.5 kilometres south of the Fremantle city centre, adjoining the North Coogee foreshore between the Island Street groyne and Point Catherine.

The South Beach development has a projected population of approximately 1200 people. As a part of rezoning the land (Amendment 1008/33) under the Metropolitan Region Scheme (MRS), a foreshore management plan was required to be prepared and implemented to ensure that the coastal redevelopment proceeds in a manner that is beneficial to the area's natural and social environment.

The South Beach residential and commercial development, by developers Stockland and LandCorp, has acted as a catalyst in the creation of a new coastal recreational node at North Coogee.

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.

3.3.2 Proposed North Coogee recreational node

The following list details the proposed activities to be accommodated within the North Coogee 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 draft North Coogee foreshore management plan proposes that the 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.

3.3.3 Port Coogee marina development

Port Coogee marina is located approximately 4.5 kilometres south of Fremantle. The total project area is approximately 86 hectares and has a projected population of approximately 3500 residents plus tourism accommodation.

The marina will be a significant social focal point to the regional community and tourists. It will be a place where people will want to visit to enjoy a diverse range of recreational and entertainment opportunities presented by its unique marina waterfront.

The Port Coogee marina development offers the following key regional recreational features:

- a marina village to accommodate, water-based businesses, such as retail stores, café's / restaurants;
- community purpose facilities;
- the 300-boat pen marina with a public jetty;
- public promenades and boardwalks for people to walk along the waterfront;
- boating, fishing, diving, sailing, snorkelling, swimming and canoeing opportunities;
- disabled access fishing and viewing platforms on the groynes;
- public boat tie-up and berths;
- waterfront linear parks, which form part of a five-hectare network of open space area that provides for

- walking, jogging and cycling recreational needs;
- public parking for people travelling to Port Coogee;
- “Omeo Sanctuary” as part of the WA Maritime Museum’s “Wreck Access and Outreach Program”. The proposal includes marking out the wreck site to prevent fishing and boating activity, displaying the anchors from the Omeo on site and placing interpretive signage underwater for divers;
- formalising public access to Coogee Beach to the south;
- creating a protected new beach to the north of the northern breakwater; and
- creating a 200 metre long and 30 metre wide beach within marina.

Port Coogee is being constructed by Australand Holdings Limited in accordance with the following:

1. Port Catherine Project Agreement No. 2;
2. Port Catherine MRS Amendment 1010/33; and
3. Port Coogee local structure plan and detailed area plans.

3.3.4 Coogee Beach

Coogee Beach is highly valued by the local community for its environmental and recreational values. The beach attracts regional recreational users and is identified in various coastal reports as a major beach activity node.

In 2004, the City of Cockburn finalised the Coogee Beach Structure Plan covering the foreshore west of Cockburn Road and land a further 100 metres east of Cockburn Road between Port Coogee and Poore Grove.

The structure plan provides for the realignment of Cockburn Road westwards, construction of the Coogee café/kiosk, development of the Surf Life Saving Club, improved access to the Port Coogee development to the immediate north and within the site itself and a number of other improvements to the recreational facilities within the area.

Key features of the Coogee Beach area include:

- Coogee Jetty;
- swimming pontoons;
- Coogee Beach Caravan Park;
- grassed activity areas; and
- a playground area.

The following activities are catered for in the Coogee Beach area:

- fishing;
- swimming;
- picnicking;
- cycling;
- playground use;
- relaxing;
- walking; and
- surf life saving.

3.3.5 Woodman Point

The Woodman Point Regional Park covers an area of 272.5 hectares and is managed by the Department of Environment and Conservation in collaboration with the City of Cockburn and the Department of Sport and Recreation as, primarily, a recreation and conservation reserve.

Within its boundaries are several key recreational sites including:

- John Graham Recreational reserve;
- Woodman Point Headland;
- Woodman Point Recreational Camp
- Jervoise Bay boat launching area;
- O’Kane Court;
- Poores Grove; and
- Jervoise Bay Sailing Club.

Woodman Point Regional Park also includes two caravan parks.

In a 2005 visitors survey of the Woodman Point Regional Park calculated that it attracted 353 300 visitors. This visitor total was down from the 2001 visitor estimate of 500 751, however the difference was attributed to the cold weather during the surveying period (Colmar and Brunton 2005).

The John Graham Recreational Reserve and the Jervoise Bay boat launching ramp recorded the highest level of visitor numbers.

The coastal recreational activities popular at Woodman Point include:

- fishing;
- picnicking/barbeques;
- playground use;
- relaxation;
- walking;
- jogging;
- swimming;
- snorkelling;
- scuba diving;
- boat/jet ski launching; and
- golf.

The dominant recreational activity at the Woodman Point Headland was fishing and walking. At the John Graham Recreational Reserve the provision of community facilities such as grassed areas, toilets, children’s playground and barbeques promotes the use of the reserve by families.

In addition there is high usage of the Ammunition Jetty by swimmers, recreational fishing and scuba diving.

The Woodman Point Recreational Camp caters for approximately 12 000 people annually in programs organised by the Department of Sport and Recreation. The planned activities include surf lifesaving, kayaking, snorkelling and fishing (Colmar and Brunton 2005).

The Department of Environment and Conservation is currently involved in the development of the final version of the Woodman Point Management Plan following the analysis of public submissions received on the draft plan. (Cockburn Sound Management Council [2007] *The State of Owen Anchorage A Pressure State Response Report*)

3.3.6 Cockburn coast draft district structure plan

Key elements of the plan

- A contemporary, diverse and sustainable coastal urban community demonstrating best practice energy efficient and water sensitive design.
- A multi-layered movement network designed to meet the significant demand generated by emerging communities south of Fremantle, including Bus Rapid Transit, local area transit, cycleways, pedestrian pathways, and new district and local road connections.
- A vibrant and dynamic new waterfront activity centre focused on the South Fremantle power station which, when combined with the new Port Coogee marina development, will create a regionally significant coastal node for Perth's southern suburbs.
- A predominance of residential development, complemented by a mix of retail, office, commercial and service commercial activities reflecting the inherent mixed-use character of Fremantle.
- A new town centre, local neighbourhood centres, local parks, school and other community facilities necessary to support a new community of approximately 10,500 residents.
- Development and built form that acknowledges, responds to and, to the extent possible, integrates with existing environmental and topographical features, including Beeliar Regional Park, the limestone ridgeline, the coastal foreshore reserve and the Indian Ocean.
- Development that embraces Aboriginal and European heritage.

3.4 Implications for coastal management

New coastal recreation nodes at North Coogee, South Fremantle power station and Port Coogee will create a chain of regional activity nodes down the Cockburn coastline. Some of these changes and improvements have long been required to service the local population frequenting these nodes, while others such as Port Coogee will dramatically alter the coastal landscape.

A number of issues are common to these developments, which have been addressed in the management and planning documents associated with these sites. They are highlighted here to be considered in further planning exercises for existing and developing nodes, in particular those within the Cockburn coast area.

3.4.1 Access

This must be considered from a number of perspectives, but must be cognisant of the requirements of pedestrians, cyclists, vehicle access, public transport and recreational boating. Access to beach areas by the general public is justifiably sacred along the Perth coastline, with an emphasis required in future planning on improving access rather than restricting it through development.

The highly modified coastline also necessitates that access for maintenance purposes is accommodated. There are number of areas in the lee of major coastal structures in which it is critical that access be provided for equipment associated with sand bypassing and renourishment.

While access to the beach should be improved at identified activity nodes, it should be limited to the most stable beach areas so as to minimise detrimental impacts on the surrounding dune system and vegetation and to ensure maintenance of a certain level of public safety.

3.4.2 Mix of opportunities to relate with the coast

Not all beach users want to be contained to a beach within a built-up area, similarly, many users want to have access to the range of uses and activities that a more developed area can offer. It is therefore important that future planning offers a range of recreational opportunities and a hierarchy of nodes, varying from the urban coastal environment of Port Coogee to the more natural beach settings offered by Woodman Point, to cater for the requirements of recreational users.

The length of coastline within the district structure plan areas and the nature of the existing development and foreshore enables the structure plan and further detailed planning to explore a range of different beach experiences within the structure plan area.

3.4.3 Mix of facilities

Closely linked to the variety of opportunities to relate to the coast, the facilities offered within key coastal activity nodes must also be considered in detail. This deliberation must extend to the social and cultural requirements of the beach users, the context of the node and proximity to other surrounding facilities.

For Cockburn coast, planning for beach facilities must respond to the needs of those already using the foreshore, the incoming community and visitors from further afar. Facilities provided to the immediate south at Port Coogee and elsewhere along the Cockburn coastline must be acknowledged, with a focus on ensuring that the facilities to be provided, identified uses and future development are compatible.

3.4.4 Impact on the environment

When addressing use of the beach and future plans for the coastline, it is critical that the impact on the fragile coastal environment is minimised, particularly in regards to coastal processes, vegetation and the dune system.

The needs of the recreational beach users must be carefully balanced with the ecological values and requirements of the environment, with an underlying objective to protect, preserve and improve existing conditions.

For Cockburn coast, and in particular the proposed coastal nodes at South Fremantle power station and the western extent of Rollinson Road, these issues will need to be carefully considered to respond to the needs of local residents and those from further afar, and offer complementary experiences to those already available at Port Coogee, North Coogee, Coogee Beach and Woodman Point.

3.5 History of human use and impacts

The Cockburn coast draft district structure plan foreshore has a rich history of human use. Some uses include indigenous camping areas, horse training, public recreation, abattoirs and marshalling yards, power generation and industrial uses constructed in close proximity to the shoreline. Historically, public access to the foreshore south of the Island Street groyne was limited, primarily due to industrial uses.

The historical placement of infrastructure in close proximity to the shoreline has resulted in the need for coastal engineering works, which have altered the coastal processes. The majority of mitigation works have been placed as a result of the construction of the South Fremantle power station and development in the vicinity of Catherine Point and South Beach. The construction of the South Fremantle power station, including the two groynes forming the intake area, caused erosion to the south that required the construction of a rock revetment. An additional groyne (South Fremantle power station groyne 3) was constructed to the north to help reduce the rate of sedimentation of the intake area. South Fremantle power station groyne 3 has resulted in beach accretion to the north which has counteracted the downdrift erosion (to the south) of the Catherine Point groyne until the last six years. Historically, sea walls and timber groynes had also been installed to mitigate shoreline erosion impacts on the recreation facilities, freight railway, switchyard and the ANI Bradken foundry site.

Table 1: Coastal infrastructure within the Cockburn coast district structure plan project area

Location	Works	Year/s	Why constructed?
Island Street	Rock groyne	1962, ext. 1996	During three stages of South Beach restoration. The second stage was the construction of the Island Street groyne with nourishment north of the structure from offshore dredging [in 1964/65]. Constructed in 1962 to 107 m, extended 80 m in 1996. Additional rock revetment protection placed on south side of the groyne in 2006.
Catherine Point	Rock groyne	1959, ext. 1962	During three stages of South Beach restoration. The first stage was the proposed constructed to 107 m in 1959. Catherine Point groyne, with the beach behaviour to be observed over the next three years. Groyne extended 61 m in 1962 due to saturation of the beach.
South Fremantle power station	Groyne no. 3	1949, ext. 1960?	Constructed to reduce the quantity of sediment infilling the South Fremantle power station holding basin
South Fremantle power station	Groynes no. 1 and 2	1946/7	Constructed as a holding basin for the intake water. Groyne no.1 is to the south (~180 m long) with the discharge pipe cut through it. Groyne no. 2 is the northern (~165 m). Groynes were joined by a bridge. Rapidly filled with sediment and the intake pipe was extended offshore. Two walls constructed within the basin
South Fremantle power station	Rock revetment	1948, ext. 1949	Constructed in response to erosion to the south of the South Fremantle power station intake groynes. Originally ~45 m, extended to ~225 m
Port Coogee*	2 breakwaters	2006	Sheltering for Port Coogee harbour waters

Note: * Outside the Cockburn coast district structure plan study area

Additional dredging, nourishment and mitigation structures have been conducted in the structure plan project area and the wider Owen Anchorage.

Table 2: Reclamation, beach renourishment and dune creation within the Cockburn coast district structure plan project area

Location	Works	Year/s	Associated works	Volume (10 ³ m ³)
Scott Street to Island Street	Dune construction	1984-1986?	Dunes created, brushed and vegetated to restrict sand movement on to roads, car parks and the railway, with groyne maintenance prior to the America's Cup.	~31.8
Scott Street to Island Street	Nourishment and dune construction	1996	Extend land 60 m westward into water. With dune creation behind. As part of South Beach redevelopment	~120
Duoro Road to Island Street	Nourishment	1964-1965	During three stages of South Beach restoration. Nourishment occurred in combination with the construction of the Island Street groyne.	~61.2
South of Catherine Point	Temporary nourishment	2001	There was localised raising (1.5 m) of dunes south of Catherine Point in Mar 2001 due to sand storage from construction works. Assumed to be removed.	

Note: * Outside the Cockburn coast district structure plan study area

Table 3: Dredging within the Cockburn coast district structure plan project area

Location	Works	Year/s	Volumes removed (m ³)	Reason	Disposal location
250–500 m offshore of South Beach	Dredging	1996	~120k-160k	Beach nourishment as part of South Beach development	South Beach
100–400 m offshore of ANI Bradken sea wall to north of Duoro Road groyne	Dredging	1964-6	~120k	Beach nourishment as part of three stages of South Beach restoration	Island Street groyne to South Beach

Table 4: Historic structures within Owen Anchorage which are no longer functional

Location	Works	Year/s	Removal Year	Why Constructed?
Bradford Kendall	Tipped limestone sea wall and jetties	pre-1954	Superseded by onshore sediment supply	Bradford Kendall (now known as ANI Bradken) Foundry was established on high ground adjacent to beach. Tipped limestone wall to prevent further damage to the property.
Robb Road	Barge and boat wrecks	~1966-1971	Lost function ~1987-90	Barge and boat wreck that behaved as a semi-detached breakwater, sustaining sand to the north and reducing supply to the south.
Robb Road	Jetty	1892, ext. in 1910, 1943-44, lowered in 1947	~1972-1975	Constructed to unload munitions and stock for the abattoirs. Contained a stormwater drain. Remnant jetty piles still remain.
Omeo wreck*	Boat wreck	1894	Early 1960s lost function	Barque wreck that behaved as a semi-detached breakwater, forming a tombolo and sustaining sand to the north.

Note: * Outside the Cockburn coast district structure plan study area

The shoreline of the Cockburn coast is heavily modified from a natural state due to coastal engineering works and changes in onshore sediment supply. Coastal engineering work includes nourishment, construction and extension of groynes, revetments and nearshore dredging. The coastal processes in the area are complex, varying seasonally and interannually based on changing water levels, sediment supply rates, storminess and human modifications. The influence of the complex coastal processes and shoreline modifications are incorporated in the extrapolation of future long-term shoreline change trends as part of the setback study.

4. Environmental and coastal processes context

4.1 Site location

The area subject to the structure plan is located approximately 24 kilometres south-west of Perth and approximately four kilometres south of Fremantle.

This site for the most part is within the City of Cockburn. A small part of the site, north of Island and Healy Streets and including the former South Fremantle tip site, is within the City of Fremantle.

4.2 Climate

The Cockburn coast area has a Mediterranean climate with hot, dry summers and cool, wet winters, with an average annual maximum temperature of 24°C, varying between 31°C in summer and 18°C in winter. The average annual rainfall is 887 mm, of which the majority falls between May and October. The annual average pan evaporation is 1671 mm. Rainfall exceeds evaporation for four months of the year, between May and August.

4.3 Wind

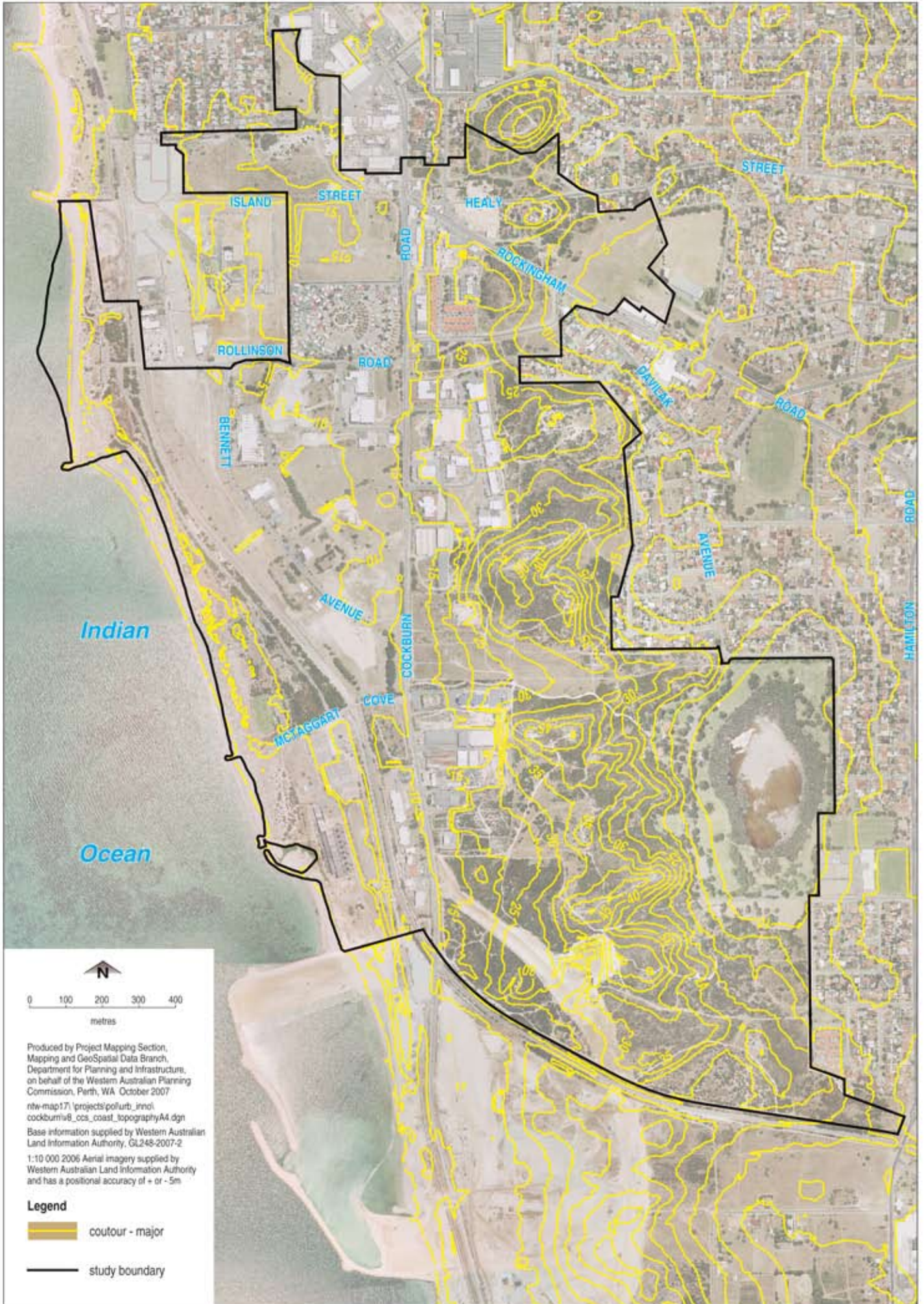
Summer is characterised by predominately south-easterly winds in the morning and from the south-west in the afternoon, which is the local sea breeze. During winter, winds generally consist of westerlies associated with passing cold fronts and storms, followed by west and south-westerlies, interspersed with calm or north-easterlies during calm periods. In addition there are storm events that swing from north-westerly to a south-south westerly direction.

4.4 Landform and topography

The site is dominated by the parallel features of the coastline and a ridgeline, which rises approximately 1.5 kilometres inland from the coast. The Cockburn coastline forms the west boundary of the site. The undeveloped coastal reserve area consists of an elevated primary dune approximately 5m AHD with a swale and secondary dune in some sections. The land that extends behind dunes is relatively flat over much of the Cockburn coast until the ridge (City of Cockburn 2001).

The topography of the land west of Cockburn Road generally ranges between 6m AHD and 8m AHD. The area around the old South Fremantle tip site (now in part supporting the Fremantle Holiday Village) rises to an elevation of approximately 20m AHD and the land behind the South Fremantle power station is mapped at an elevation of 12m AHD (Perth Groundwater Atlas, 2004).

The land rises and falls gently in sections to the east of Cockburn Road to 15-20m AHD, ultimately forming the 'Spearwood Ridge' which runs in a north-south direction and peaks at 40m AHD to 50m AHD (Perth Groundwater Atlas, 2004). The terrain drops steeply to the east of 'Spearwood Ridge' down to the gentler slopes around the Manning Lake. Figure 2 details the topology of the project area.



Topography

4.5 Soils and geology

Mapping by the Geological Survey of Western Australia (1986) indicates that the surface geology for the majority of the site consists of Safety Bay Sand, which is described as being white, medium-grained, rounded quartz and shell debris, well sorted, of aeolian origin (Figure 2). This surface geological unit is mapped over the site west of Cockburn Road.

East of Cockburn Road the surface geology is mapped as Tamala Limestone overlain by Safety Bay Sand. This geological unit is associated with the ridgeline which extends in a north-south orientation parallel with the coast. East of the ridgeline within Manning Park Reserve a small area is mapped as containing sand derived from Tamala Limestone, surrounding sandy silt associated with Manning Lake.

4.6 Foreshore reserve - Catherine Point and C Y O'Connor reserves

The majority of remnant foreshore vegetation is located within the Point Catherine and C Y O'Connor reserves. The foreshore reserve includes approximately 29 hectares of coastal dune and immediate hinterland along the Cockburn coast foreshore.

Vegetation communities represented within the foreshore reserve, particularly at Point Catherine Reserve are dune coastal heath. *Spinifex longifolia*, *Spinifex hirsutus*, *Leipidosperma gladiatum* and *Scavolea crossifolia* dominate these communities (City of Cockburn 2001).

Approximately 70 per cent of the foreshore reserve vegetation is considered to be in very good or excellent condition. The remaining 30 per cent is in good condition (City of Cockburn 2001).

4.7 Coastal processes and sea wall assessment

The behaviour of the Cockburn coast shoreline is controlled by the human modifications, in combination with seasonal and inter-annual variation in sediment transport rates and sediment supply. The sediment transport rates are mainly governed by the sediment supply, seasonal variation in wave conditions and wind-driven currents, and the rate of saturation and bypassing of the structures.

The Cockburn coast is partially sheltered from ocean wave action by the reefs and islands between Garden and Rottnest islands, and the broad shallows of Success and Parmelia banks. These features act to modify the prevailing wave directions on a local scale, enhancing the significance of north-west winter storms compared with the more frequent south-west storms. During summer and early autumn, the prevailing wave conditions are south-south-westerly wind waves, generated by strong sea breezes blowing along the length of the coastal lagoon from Cockburn Sound to Owen Anchorage.

Seasonal switching of the prevailing wave directions causes corresponding reversals in the direction of sediment transport and a corresponding rotation in the alignment of pocket beaches. The seasonal switching also influences the magnitude of the bypassing of Island Street groyne to the north, Catherine Point groyne to the south, power station groyne 3 in both directions and power station groyne 2 to the south. Additional seasonal sediment transport occurs due to aeolian (wind-driven) transport.

Historically, the study area as a whole has experienced net accretion, with periods of strong local erosion. The main source of material of the net accretion is the landward propagation from Success Bank, feeding the Catherine Point salient. It has been suggested that this supply has been artificially enhanced through the onshore transport of dredge material disposed during early excavations of Success Channel.

The structure of Cockburn coast is, in effect, two linear sections meeting at Catherine Point. From here, the coast runs north and south-south-east. This change in orientation, in combination with the wave climate, suggests a separation in the direction of net sediment transport. Along shore movement away from this zone in both directions has been indicated by wave and sediment transport modelling (MRA 2005b). Finer sediment cells are located within these two larger sediment cells. The sediment cells are constrained between fixed structures with varied levels of sediment bypassing.



For the coast north of Catherine Point, northwards transport over summer and autumn generally exceeds the southerly reversal during winter. South of Catherine Point, the angle of the shore enhances southward transport and reduces the effect of sea breeze wind waves, causing a net southwards sediment transport. These basic patterns of movement have been complicated through the construction of a number of groynes in both sections of coast.

Any further modifications to the coastline have the potential to significantly alter the sediment budget, and the behaviour of the shoreline. The net sediment budget could potentially be altered by modifications to structures, beach nourishment programmes and the reduction/increase in onshore sediment supply from Success Bank due to climate change. Any proposed development should be sufficiently setback from the present shoreline to minimise the need for further modification works that could alter sediment transport processes.

A setback limit for physical processes was determined following the State Planning Policy No. 2.6: State Coastal Planning Policy.

The setback guidelines for physical processes are based upon a 100-year planning time frame and include the following three distance allowances: acute erosion due to extreme storm sequences (S1), chronic erosion/accretion as per historic trends (S2), and an allowance for sea level change trends (S3). The calculated setback line is presented as an initial constraint for strategic planning and any modification of existing coastal structures (or construction of additional structures) would require reassessment of coastal setbacks in the vicinity of these changes. The present study presents a site-specific setback study for the Cockburn coast shoreline that attempts to account for historic works and incorporates previously approved setbacks.

The three distance allowances were applied to six segments across the Cockburn coast. The segments were delineated based on the influence of structures on coastal processes and behaviour, available datasets, whether the shoreline was a hard structure, and incorporating the ANI Bradken approved setback.

The SBEACH model was used to predict the response of the Cockburn coast shoreline to an extreme storm sequence. Beach profile data from four transects obtained from Cockburn Cement Limited was used together with scaled storm data obtained from the Department for Planning and Infrastructure as inputs for the modelling work. The average of the maximum horizontal recession observed at the mean sea level contour for the profiles south of Catherine Point groyne is 30 metres (S1). The maximum horizontal recession north of Catherine Point groyne is 15 metres.

The State Planning Policy No. 2.6 allowance for chronic erosion setback (S2) is typically determined using information on the historical trend of shoreline position. The vegetation line plots from 1942–2005 demonstrated a net accretionary trend on the shoreline. The future shoreline trends are masked by the accretionary influence of structures. Further investigation was required to account for the change in mitigation structures, dredging/nourishment and changes in the sediment supply.

Three scenarios were considered in the estimation of the S2 allowance to account for historic works, changes in sediment supply and potential future changes to sediment supply and structures:

- no works with current environmental trends (including decreased sediment supply);
- no works with no further sediment supply from Success Bank; and
- proposed 110 metre extension of the Catherine Point groyne in combination with no sediment supply from Success Bank.

The second scenario was selected to generate the setback allowance for physical processes as it was the most conservative response of the first two options. The final option was provided as a preliminary examination of the potential changes if the 110 metre proposed extension of the Catherine Point groyne was approved.

The influence of historic works with a cessation of sediment supply from Success Bank altered the shoreline change rates. The accretionary shoreline change rates for three of the four applicable segments switched to an erosive trend under this scenario. The erosive trend for the shoreline south of Catherine Point groyne was

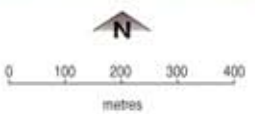
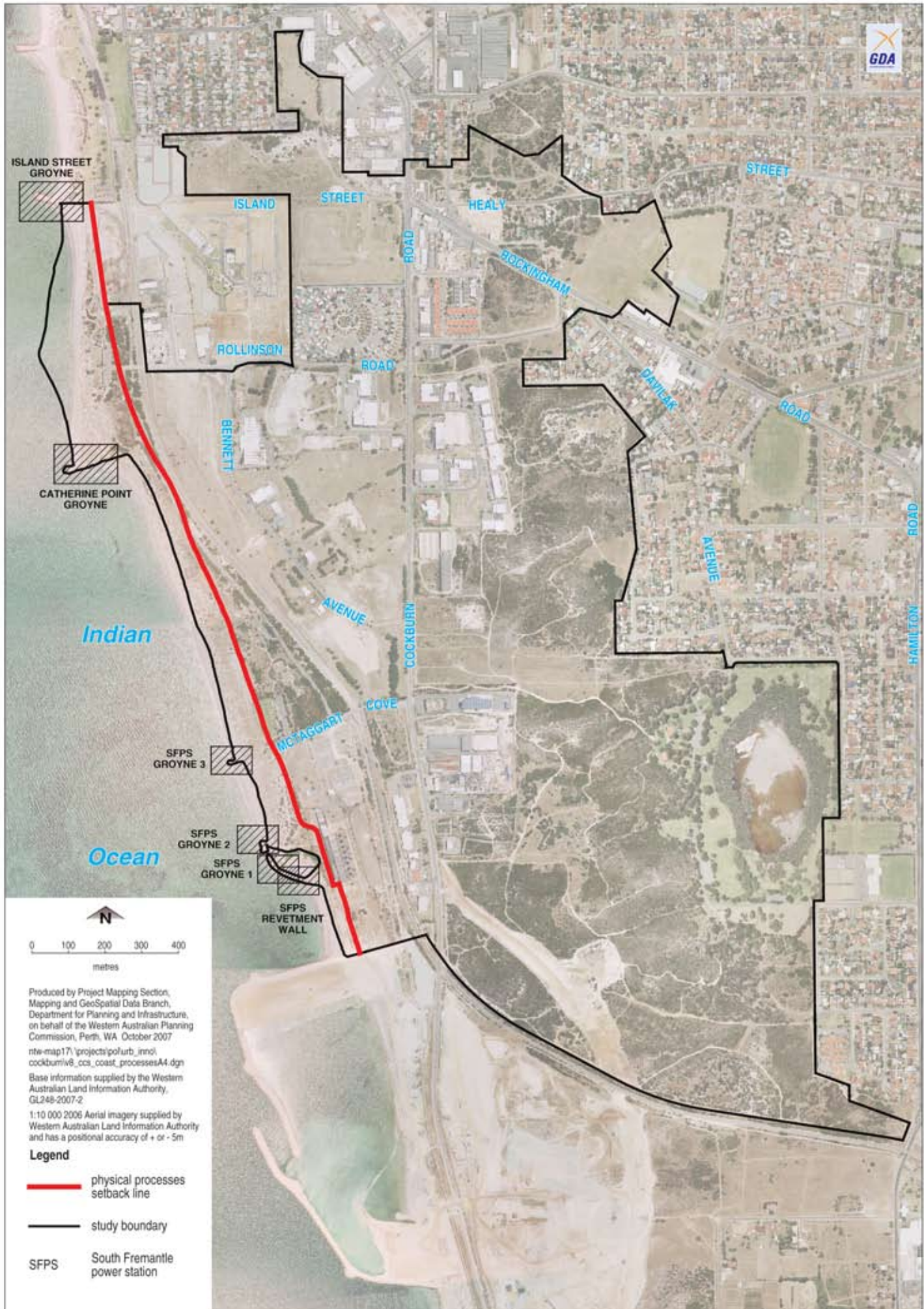
less than 0.2 m/yr. In accordance with State Planning Policy No. 2.6, a safety allowance of 20 metres was applied for component S2. Revision of the S2 allowance is required if modifications are proposed to existing structures.

In accordance with the State Planning Policy No. 2.6, the allowance for sea level rise (S3) is based on global sea level trends presented by the Intergovernmental Panel on Climate Change and the Bruun Rule. A sea level rise of 3.8 mm/yr is applied for the next 100 years, corresponding to an S3 allowance of 38 metres.

The required setback for coastal processes varied across the Cockburn coast shoreline. The previously approved setback was applied in the vicinity of the ANI Bradken site. The calculated setback between the ANI Bradken site and the Catherine Point groyne would generate a shoreline position controlled by the ANI Bradken sea wall, presently under reconstruction.

Three setback distances were determined for the separate beaches between the northern South Fremantle power station intake groyne and Catherine Point groyne, with a mean setback of 88 metres. The setback limit immediately south of Catherine Point groyne is dependent on the works undertaken to mitigate the erosion adjacent to the South Beach redevelopment. Any construction seaward of the railway line will require mitigation works and a maintenance allowance.

The setback applied at the South Fremantle power station was aligned with the western boundary of the present building. A revetment wall exists between the South Fremantle power station and Port Coogee, hence the setback limit in this area was determined from an assessment of the overtopping rates. Figure 3 identifies the physical coastal set back line.



Produced by Project Mapping Section,
Mapping and GeoSpatial Data Branch,
Department for Planning and Infrastructure,
on behalf of the Western Australian Planning
Commission, Perth, WA October 2007
ntie-map17\projects\pol\urb_inno\
cockburniv8_ccs_coast_processesA4.dgn
Base information supplied by the Western
Australian Land Information Authority,
GL248-2007-2
1:10 000 2006 Aerial imagery supplied by
Western Australian Land Information Authority
and has a positional accuracy of + or - 5m

- Legend**
- physical processes setback line
 - study boundary
 - SFPS South Fremantle power station

Physical processes setback line and structures

A structure assessment was conducted on the six functioning coastal structures within the Cockburn coast study area. The structures include five rock groynes and one revetment. Four of the structures are directly associated with the South Fremantle power station precinct. Overall, the structures examined along the study area are in fair condition. Damage to the structures is commensurate with their age, which is generally around 60 years. It is not recommended to remove the existing structures as the coastal alignment is integrally linked with the structural performance.

4.8 Site contamination

Historically the predominant land use in the Cockburn coast district structure plan project area has been industrial, with a clustering of industries such as abattoir, marshalling yards, tanneries and the South Fremantle power station. These historical industries did have a significant environmental impact including, soil and groundwater contamination, and reduction in the aesthetics of the land and waterscape.

The relocation of industries from the structure plan area, ceasing the direct effluent disposal into Cockburn Sound and the removal of the Robb Jetty abattoir has reduced the environmental impacts on the coastal environment. Discharges into the marine environment, should be avoided. Discharge of contamination into the groundwater or marine waters has the potential to degrade the local water quality and interfere with recreational use and amenity of an area.

The State's *Contaminated Sites Act 2003* came into effect in December 2006. This Act covers land, water (including groundwater) or a site having a substance present in or on that land, water or site at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value. Under the Act, it is the responsibility of the owner, occupier, or the polluter (where applicable) of an actual or suspected contaminated site to report, investigate and—where necessary—remediate (clean up) the site. The *Contaminated Sites Act 2003* encompasses State waters—which generally extends offshore to three nautical miles (approximately 5.6 kilometres)—and therefore includes marine sediments and groundwater up to three nautical miles offshore.

5. Heritage context

5.1 Indigenous heritage

The Cockburn coastal strip is an area steeped in indigenous tradition. Until the arrival of European explorers and settlers, the land was inhabited by the Whadjuk, one of the Nyoongar peoples.

The Whadjuk occupied the Swan Coastal area, with the Swan and Canning rivers forming natural divisions between four principal Whadjuk groups. The area south of the Swan River and west of the Canning River – which includes the Cockburn coastal strip – was inhabited primarily by the Beeliar group of the Whadjuk.

Stretching from South Beach to Port Coogee, including Beeliar Regional Park, the Cockburn coastal area today has spiritual, social and cultural significance.

5.1.1 Robb Jetty camp and Indian Ocean sites

Site 3707 (Rob Jetty camp) was first reported by O'Connor, Bodney and Little (1985) as a camping area located in the sandhills to the south of South Beach in the vicinity of Catherine Point, where camps were situated between the Bradford Kendall Pty Ltd Iron Foundry and Robb Jetty. According to O'Connor *et al* (1985) early records indicate that the area was used as a camp area and was still in use by Aboriginal people from outside the metropolitan area at the time of recording. Like other long-established fringe camps, O'Connor *et al* considered the area likely to have been a traditional camping area.

The site is on the permanent register and the file has "open" access. The register indicates that the site is currently mapped as being approximately 1.2 kilometres long, its width no greater than 100 metres.

O'Connor *et al* note that the area is known to have been used for Aboriginal camping from about 1910, and that, "although Perth metropolitan Aboriginal people no longer camp here, it was noticed that Aboriginal visitors from the Kalgoorlie region were living among the sandhills".

Although recently reassessed as "not a site" under the *Aboriginal Heritage Act (1972)*, the Indian Ocean area between the high water mark of the coastlines of Garden Island, Carnac Island and Rottneest Island, and the corresponding mainland, has mythological significance. The Indian Ocean is the focus of two Nyoongar stories about the creation of Cockburn Sound and offshore islands.

Table 5: Registered Aboriginal sites within the study area

Location of Aboriginal Site	Site Name	Site ID	Status	Site Type
Within the Cockburn coast district structure plan project area	Robb Jetty	9222	Permanent register	Man-made structures

Coastal planning implications

The following recommendation is made:

- to conduct further consultation with the Nyoongar community with respect to remediation and rehabilitation of the landscape and foreshore and the commemoration of the area's Aboriginal heritage.

5.2 European heritage

5.2.1 Settlement and industrial heritage

In January 1830, the ship the Leda, commanded by Captain George Robb, arrived at Owens Anchorage, just South of Catherine Point. Robb had been granted a 2000-acre spread of land and, intending to establish a farm, he brought with him stock, grain and building materials. By the turn of the century, spurred on in no small part by the gold rush, Cockburn's potential as an industrial area was well and truly recognised.

One of the most significant industries – which continued into relatively recent times – revolved around the Robb Jetty abattoir. The slaughterhouses of Forrest, Emanuel & Co, and Conner, Doherty and Durack literally fed the metropolitan area and Goldfields.

Another industry to take root during the heady gold-rush days was the manufacture of explosives for use in mining. Shortly after the turn of the century, an explosives magazine was built in the sand hills next to the abattoir.

Then, in 1901, the Fremantle smelting works was established south of Island Street, South Fremantle. The pollution from these works sparked complaints from nearby residents. It marked the dawn of the industrial age of the north Cockburn coastal strip, and foul smoke from the smelting works was soon accompanied by a host of other polluting emissions.

It was not long before calls came to extend the existing Fremantle to Robb Jetty railway down to Woodman Point as more and more industrial activities, including the Lime Kilns, were established along the coast. The railway extension occurred in 1903.

By 1915, shops began to spring up along Rockingham Road in north Cockburn and larger estates at Hamilton Hill, were subdivided into smaller lots as the demand for more housing in the area grew. South Beach became a focal point for families wishing to escape the summer heat, and the Newmarket Hotel (1912) became a popular watering hole (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape (Australia) Pty Ltd).

5.2.2 Shipwrecks and Robb Jetty

James Shipwreck- Owen Anchorage, Spearwood

Located adjacent to the South Fremantle power station, close to James Rocks, the James Shipwreck can be found about 50 metres from shore, only 2-3 metres under water. It is the earliest post-settlement wreck of a merchant vessel found in Western Australia (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape (Australia) Pty Ltd).

Diana Shipwreck - Owen Anchorage, Spearwood

Located 100 metres from shore, the 233-ton schooner was wrecked on 16 July 1878 after losing its mooring cables during a storm. It is a good example of a typical three-masted schooner employed in coastal trade (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape Australia Pty Ltd).

Robb Jetty

The original jetty was the focal point of the settlement of the northern Cockburn coast and had a long association with the meat trade. The jetty was the first obvious landmark in the area.

5.2.3 C Y O'Connor - South Beach, Hamilton Hill

The bronze statue entitled Horse and Rider, which depicts a man on a horse, is a moving dedication to one of the state's most visionary figureheads, C Y O'Connor. He is best known for his visionary scheme to establish a water pipeline from Perth to Kalgoorlie (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape).

5.2.4 South Fremantle power station - Robb Street, Coogee

The final notable achievement during the early industrial era was the construction of the South Fremantle power station, which was officially opened in 1951 to supply the South-West with electricity. Although now stripped of all plant equipment and services, the structure provides a fine example of design for an industrial process. The South Fremantle power station, which was closed in 1985, is now listed as an interim entry on the register of heritage places (Site 3381).

5.2.5 Horse racing and exercising

In the early days of the Swan River Colony, the first horse race was held on the foreshore between South Beach and Coogee in 1833. 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 declined. Limited beach training is now carried out, however the continued use of South Beach for horse-related uses has been secured through the permanent listing of the South Beach horse exercise area on the register of heritage places (Site 16120) (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape).

During the war period the 10th Light Horse 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 has a permanent listing on the State register of heritage places.

6. Current access and recreation opportunities

6.1 Coastal recreation potential and demand

The projected increase in the population of the City of Cockburn has implications for the use of the foreshore reserve. Estimates have put the population potential at 114 000 for the City of Cockburn and this will result in higher levels of recreational demand. Beach-use studies by Blackweir and Beckley (2004) provide an indication of the current usage patterns for the region. Results provide an important insight into the average numbers of people using the beaches in the vicinity of Coogee. The key coastal nodes identified include:

- South Beach – 106.1 (average number of people per day over three months November - January 2003/04);
- Coogee Beach – 61.4; and
- Woodman Point Beach – 70.3.

The main activities undertaken include:

- sunbathing;
- swimming;
- walking;
- surf skiing;
- fishing; and
- windsurfing.



If these beaches were to be developed in accordance with a “Cottesloe” or “City Beach” models, it can be expected that there would be significant beach usage. Over the same 2004 study period, Cottesloe had an average of 276.5 people on the beach over the morning observations for the three-month period. City Beach had an average of 168.3 people (Blackweir and Beckley 2004).

Planning for this significant increase in beach use involves considering what activities are currently undertaken, what infrastructure is likely to be required in the future to support these activities and what new facilities may be planned adjacent to the beach

that could impact on these activities. The location of these facilities needs to be closely aligned to information coming from coastal process studies.

In planning for the Cockburn coast foreshore area it is important to understand the nature of the beach and its potential to be a focus for people both locally and regionally.

In simple terms, the Cockburn coast, the coastline and beaches may be divided into locations of regional and/or district significance, such as North Coogee, Port Coogee, Coogee Beach and Woodman Point and those of local significance. Regional and district beaches are those which are likely to be the focus of use by residents of the surrounding region, rather than local coastal residents. Local beaches are used more by people within walking or cycling distance of the beach. Regional beaches require increased facilities and a physical environment suitable for a wide range of activities. They also require appropriate levels of road access connecting to the primary road network and development planned adjacent to them should be commensurate with their regional significance. Local beaches will have fewer amenities and are often suited to a more specific activity such as dog exercise or fishing.

In order to plan for recreational activities, it is necessary to determine which activities are likely to occur and the associated facilities needed to support these activities.

Key recreational activities can be categorised according to where they are performed. That is water-focused, beach-focused or those activities occurring within the foreshore reserve.

Table 6: Expected activities along the Cockburn coast district structure plan coastline and foreshore

Water focused	Beach focused	Foreshore reserve
Windsurfing	Fishing	Picnicking
Swimming	Horse exercise	Walking
Wading	Walking	Jogging
Surf skiing	Jogging	Cycling
Scuba diving	Dog exercise	Viewing scenery
Snorkelling	Sunbathing	Café/restaurants
Horse swimming	Sport (beach volleyball)	Playgrounds
	Relaxing	

Many of these activities do not require provision of support facilities beyond amenities for human comfort.

Activities which will require facilities include:

- cycling – dual use paths, bike racks, water facilities at stopping points and toilet facilities;
- fishing – water facilities and fish cleaning tables;
- picnicking – tables, seats, shelters, café, toilets, barbeques, water supplies and bins;
- dog and horse exercise – water facilities and bins; and
- themed playgrounds

To allow any of these activities, access roads and paths will be necessary. Associated facilities include car parking, dual use paths and bicycle racks. Beaches expected to attract large numbers of people will also require toilets, showers, change rooms, café and possibly hire facilities.

6.2 Implications for coastal management

- Allowance must be made for the provision of facilities including dual use paths, bike racks, tables, barbeques, bins, toilets, playgrounds and change rooms.
- Location of facilities should be related to physical condition to ensure appropriate placement and public safety.
- Encouragement or discouragement of beach use should be associated with the physical suitability and capability of each area to support the various recreational activities.
- Although some recreational activities can be complementary, other activities are not; for example, family use of the beach and horse and dog exercising.

6.3 Opportunities and constraints

The physical condition existing along the Cockburn coastline, together with the aspects of the planned human environment, present a variety of opportunities and constraints for coastal development and recreation. Given the expected high demand for recreational activities within particular areas of the foreshore reserve in the future it is necessary to recognise these opportunities and constraints to ensure that the environmental capability and capacity of the coastline is not exceeded.

6.3.1 Opportunities

There are numerous opportunities for recreational pursuits and associated facilities, including:

- rehabilitation and stabilisation of foredunes;
- nodal development for regional facilities at and adjacent to the South Fremantle power station;
- development of open space areas south of the South Fremantle power station for passive/family-orientated recreation with associated amenities such as toilets, car parks, picnic areas and playgrounds;
- improve pedestrian and cycling links with South Beach and Port Coogee;
- improve east-west links across the railway reserve and connect people with the foreshore;
- rebuilding the former Robb Jetty;
- preserving seagrass meadows which provide a natural habitat and food source for fish and crustaceans; and
- identifying and preserving and increasing public awareness regarding Aboriginal and European cultural heritage.

6.3.2 Constraints

There are a number of constraints associated with the site, including:

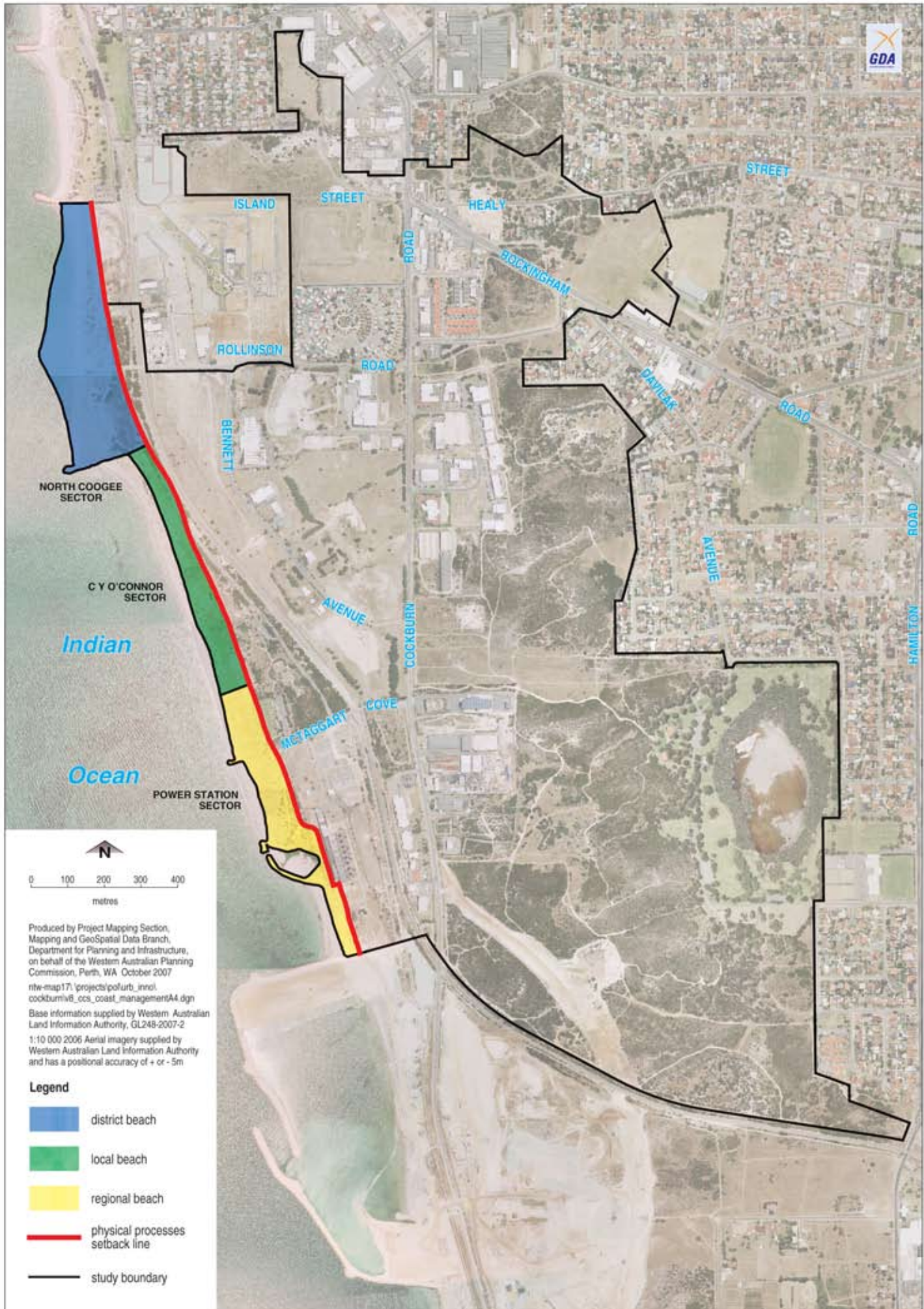
- existing railway reserve constrains east-west foreshore access;
- lack of signage;
- climate change, including changes to storm frequency and intensity, and its impact on coastal ecology, beach and dune stability and beach width;
- the potential for poor-quality groundwater to impact upon the near shore areas due to past industrial use;

- the need to plan for engineered erosion mitigation works in the vicinity of the railway line immediately south of Catherine Point groyne;
- accounting for potential heritage listing of the groynes if any changes are proposed to the structures. This is likely to require additional time to obtain the necessary approvals;
- maintenance of aging rock groynes;
- the need for conservative planning allowances to incorporate a factor of safety for the level of uncertainty in the coastal processes. This is due to complex process-structure feedback effects exacerbated by extensive human modification to the sediment regime in Owen Anchorage. Any new coastal engineering structures recommended as part of future coastal plans and development applications will require a conservative approach;
- management of public concern regarding a broad range of coastal issues. Examples where public concern may be raised include the grey sands on the beach, beach scarping due to seasonal rotation and/or retreat, and the shoreline retreat from a previously accreting state; and
- the need for careful management of mechanical bypassing of beach sand from the north of Port Coogee to the south. The beach north of Port Coogee will widen as the net southwards sediment transport is impounded onto the newly-created northern breakwater of Port Coogee. This is likely to be a popular summer beach as it will be sheltered from south-westerly waves by the Port Coogee breakwaters. However, we note that sediment trapped on this beach will be mechanically bypassed to nourish the beach to the south of Port Coogee. This may involve the use of heavy machinery. There is also the potential for wrack to accumulate on the beach under certain weather conditions, where it may be trapped between the South Fremantle power station groyne and the breakwater.

6.4 Specific management sectors

Three distinct areas of the Cockburn coast foreshore have been identified, characterised by the nature of existing heritage buildings, type of beach setting and the opportunity to offer a range of beach experiences (see Figure 4):

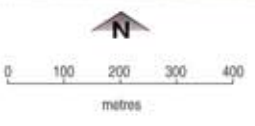
- South Fremantle power station sector – incorporating the power station and adjacent switchyard, plus the foreshore area to the immediate north of McTaggart Cove;
- C Y O'Connor sector – which includes the natural beach area between Catherine Point groyne and the South Fremantle power station sector; and
- North Coogee sector – located at the western extent of Rollinson Road between the ANI Bradken site and the Cockburn coast structure plan area.



NORTH COOGEE SECTOR
C Y O'CONNOR SECTOR

POWER STATION SECTOR

Indian
Ocean



Produced by Project Mapping Section,
Mapping and GeoSpatial Data Branch,
Department for Planning and Infrastructure,
on behalf of the Western Australian Planning
Commission, Perth, WA October 2007
rtw-map17:\projects\pol\urb_inno1
cockburn\vb_ccs_coast_managementA4.dgn
Base information supplied by Western Australian
Land Information Authority, GL248-2007-2
1:10 000 2006 Aerial imagery supplied by
Western Australian Land Information Authority
and has a positional accuracy of + or - 5m

- Legend**
-  district beach
 -  local beach
 -  regional beach
 -  physical processes setback line
 -  study boundary

Coastal management sectors

6.4.1 Power station sector

A revitalised South Fremantle power station with community and recreational facilities and the open space southwards towards Port Coogee is highly suited as the focus of a regional coastal node.

Opportunities

- The beach and foreshore is protected by the Port Coogee breakwater and South Fremantle power station sea walls and groynes therefore it is suitable for foreshore, beach and water based activities.
- Redesign the cooling pond lagoons for a rock pool. However it should be acknowledged that a rock pool option is a high-cost option. Other options which could be considered for the South Fremantle power station lagoon include shifting the structures into another alignment (such as remove the southern power station groyne 1), or to fill in the pool area.
- Themed playground and grassed areas.
- Continued pedestrian and cycle paths.
- Preservation of the natural environment.
- Commercial activities such as shops, cafés and restaurants as part of the South Fremantle power station.
- Themed art displays and signage celebrating the indigenous and European history and culture.

Constraints

- Removal of beach sand as a part of the Port Coogee sand by-passing management plan.
- Potential for seagrass wrack build-up between the South Fremantle power station groynes and northern Port Coogee breakwater.
- On-going maintenance of the South Fremantle power station rock groynes.

6.4.2 C Y O'Connor sector

Opportunities

- This section of beach is suited to water-based and beach recreation activities such as swimming, walking, dog and horse exercise, fishing and sun bathing.
- Rebuilding or interpretation of the former Robb Jetty.
- Formalise and control beach access.
- Stabilise, protect and rehabilitate foreshore reserve.
- Themed art displays and signage celebrating the indigenous and European history and culture.

Constraints

- Rebuilding Robb Jetty would be expensive and would only be used for recreational purposes, not for boat mooring. A more economical alternative would be to extend a jetty from one of South Fremantle power station groynes rather than reinstate Robb Jetty. The existing remnant Robb Jetty could be promoted as a dive site.
- The foreshore reserve immediately south of Catherine Point groyne is eroding, decreasing the amenity of the area and potentially threatening the freight rail line. It is likely that any alteration to the Catherine Point groyne will further erode this

section of the foreshore and result in engineering mitigation works to protect the railway reserve. The potential for erosion prohibits recreational facilities in this section of the foreshore reserve.

- Planning for engineered erosion mitigation works in the vicinity of the railway line immediately south of Catherine Point groyne will be required.

6.4.3 North Coogee sector

North Coogee is an important recreational node and a key coastal link between the cities of Fremantle and Cockburn.

Opportunities

- Community centre.
- Smaller scale café/restaurant and kiosk facilities.
- Public changing facilities.
- Themed playground and grassed areas.
- Continued pedestrian and cycle paths.
- Preservation of natural environment.
- Retaining the beach for horse and dog exercise.
- Themed art displays and signage celebrating the indigenous and European history and culture.
- Facilities for windsurfers and surf skis.

Constraints

- Coastal erosion.
- Management of the ongoing horse uses with other public uses.

7. Coastal management issues and strategies

Building on the physical environment and human use set out in the preceding chapters, together with an appreciation of the opportunities and constraints, there is a basis to integrate social, cultural and environmental values and identify management issues relevant to the district structure plan coastline. Importantly this chapter establishes the management strategies that will enable the objectives of the coastal planning strategy to be achieved.

The objectives for the Coastal Planning Strategy are to:

- outline and describe key environmental, cultural, social and infrastructure elements;
- identify major issues and trends, and provide strategic direction on the
- opportunities and constraints for recreational and tourism uses, infrastructure and developments;
- identify issues that will require management;
- develop management recommendations and a implementation framework to guide a future Foreshore Management Plan; and
- provide guidance on designated recreation nodes and entry points to the foreshore.
-

7.1 Potential impacts and management issues

- Landscape values.
- Erosion and coastal protection.
- Foreshore rehabilitation.
- Fire management.
- Recreation nodes and public access.
- Signage and education.
- Recognition of indigenous and European heritage.

7.2 Management strategies

7.2.1 Heritage

The Cockburn coast's rich Aboriginal and European heritage is acknowledged. The future foreshore management plan should complement the draft North Coogee Foreshore Management Plan with an interpretation of the cultural and heritage values of the Cockburn coast area achieved through signage, artwork and the revitalisation of the South Fremantle power station building. The foreshore reserves are of importance to this strategic platform as they have the potential to provide for a community focus and offer recreational opportunities. The reserves can reflect community identity, contribute to sense of place, and also provide opportunity for community stewardship of reserves.

7.2.2 Interpretive 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 utilising 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. (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape (Australia) Pty Ltd).

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; and
- European heritage – the area has a rich European heritage.

7.2.3 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. A previous stand-alone artwork which celebrated the first horse race in Western Australia that occurred on the beach was designed by Anne Neil and entitled "Clear the Course". The work was installed originally at C Y O'Connor Park, but was destroyed by vandals and removed by the City of Cockburn. The proposal is that the work be built again out of aluminium bronze rather than iron so that it is stronger, and be located in the new dune at the Rollinson Road parkland where there will be adequate public surveillance.

The public art should tell the story of Cockburn coast and complement other public art works, including the C Y O'Connor statue and the steel cattle gates located within the foreshore reserve that allude to the site's former use as an abattoir. (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape (Australia) Pty Ltd).

7.2.4 Education

Creating a sense of place involves a conscious decision to do so. Putting these words into action, the Cockburn coast needs to present itself as a readable story, engaging people in its past, its traditions, its significant places, old buildings and beauty. The future is about being authentic to this story and it begins with fostering sense of place elements in the development framework.

Sustainable communities don't happen by accident; they begin by authentic place-making and design with a sense of place.

Complementing the draft North Coogee Foreshore Management Plan subjects for educational opportunities may include:

1. Aboriginal heritage;
2. European heritage;
3. coastal dynamics; and
4. coastal environmental values.

“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 of 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.” (Draft North Coogee Foreshore Management Plan, prepared by Ecoscape (Australia) Pty Ltd).

Educational opportunities relating to coastal processes may also be explored. As a highly modified coastline, there is an opportunity to provide public information on complex relationship between physical processes, coastal mitigation structures and the foreshore.

7.2.5 Horse exercise

The use of the coastline as a designated horse exercise area is a unique characteristic of the Cockburn coast. However, increased use of the beach may increase conflicts between horse trainers and recreational beach users. In light of this a foreshore management plan needs to provide a strategy that designates times and appropriate locations for each use and is reinforced through appropriate signage.

7.2.6 Fencing

Access to the foreshore reserve will be channelled and controlled to prevent dune and vegetation destabilisation. The key feature to achieve this will be the dual-use path network, limited public pathways to the beach and fencing.

7.2.7 Rehabilitation

The vegetation of coastal areas plays an important role in dune stabilisation, however it can be readily disturbed by human activities and by strong winds. Rehabilitation and

revegetation works are important components of effective foreshore management. Restoring native vegetation on coastal dunes enhances stability and minimises further erosion, enhances ecological values and linkage, and limits areas where nuisance species and weeds may become established and proliferate. The first stage of a successful rehabilitation program is to eliminate the disturbance factors such as uncontrolled access and weed growth. Therefore, fencing and weed control may need to precede, or be undertaken in conjunction with, revegetation works.

The following actions comprise the major rehabilitation works proposed for the foreshore reserve:

- access track rationalisation;
- dune stabilisation;
- weed control;
- brushing;
- Direct seeding and tube stock planting;
- monitoring; and
- ongoing maintenance.

7.2.8 Fire management

Coastal areas can be vulnerable to fire outbreaks and the subsequent loss of vegetation can result in soil erosion. Further, dune vegetation can take considerable time to recover due to the low soil nutrients, exposure to strong winds and low moisture.

It is recommended in line with the draft North Coogee Foreshore Management Plan that the foreshore management plan should include the following:

- a FESA approved fire management plan;
- reduce level of weeds;
- assess fire risk areas such as adjoining buildings; and
- develop fire breaks at strategic locations.

7.2.9 Physical setback

Assessment of the physical setback at the Cockburn coast allows for protection of the potentially fragile coastal environments, especially at sites prone to storm damage and erosion. This greatly assists in planning of facilities and encouraging appropriate usage of the foreshore area as well as providing an indication where issues such as erosion and storm damage could arise.

A setback line for physical processes has been established through the district structure planning process. However, modifications or additions to the existing engineering works along the Cockburn coast foreshore area, as a result of further planning exercises, will require the review of the setback line.

Active management within the foreshore may be necessary in areas where the foreshore area and setback to development is considered too narrow to account for storm erosion and longer term erosion trends.

7.2.10 Sand by-passing

It is expected that a beach will form between Port Coogee and the South Fremantle power station over the first three to five years of the northern breakwater construction. This beach will also be subject to fluctuations in response to seasonal and inter-annual changes in the weather and sea.

Coastal engineering studies have concluded that the Port Coogee marina will have an impact on Coogee Beach unless sand is taken from the northern side and placed on Coogee Beach. This process is commonly termed “sand by-passing”. Without sand by-passing there could be some erosion of the northern end of Coogee Beach.

The management of the interruption to the coastal processes will be to by-pass approximately 15 000m³ of sand from the beach north of Port Coogee to Coogee Beach over a three to five year period.

It is proposed to use sand by-passing equipment similar to that developed for the work at the Mandurah and the Dawesville Channel. This type of machinery is known as a “slurrytrak”.

During the sand by-passing operations parts of the beach immediately north of the northern breakwater would be closed during working times to manage the public safety. It may take several weeks for the beach to return to natural slopes following the sand by-passing works.

The local residents and the broader community will need to be advised of these restrictions on beach use. The sand by-passing is proposed to occur in late winter. There is a long-term marine water quality monitoring program associated with the sand by-passing operations.

The management of coastal process at Port Coogee has an impact on the beach immediately north of the northern breakwater in terms of foreshore access during times of sand by-passing and in terms of requiring additional beach and foreshore space for mechanical works to be conducted safely.

The foreshore management plan will need to detail a comprehensive response to the future management of the Port Coogee sand by-passing operations to ensure that the sand by-passing works do not produce detrimental effects on the marine environment and public safety.

Specific objectives for consideration include:

- regular monitoring of sand quality, water quality and turbidity at the intake and discharge points, including monitoring of discharge plume behaviour during the first three months of operation;
- ensuring the dredging subcontractor complies with the Port Coogee EPA environmental conditions during sand by-passing and nourishment works;
- minimising the event of an environmental accident or emergency that could cause environmental harm and to effectively respond to any emergencies that may occur;
- planning the sand by-passing operations to minimise the risk of an environmental accident or emergency; and
- ensuring public safety.

7.2.11 Coastal protection

The foreshore reserve immediately south of Catherine Point groyne is eroding, decreasing the amenity of the area and potentially threatening the freight rail line. The main cause of this erosion is the Catherine Point groyne which has slowed the supply of sand to this part of the beach from the north and due to changes in the sediment supply. This has had a significant influence as well. It is likely that any alteration to the Catherine Point groyne will further erode this section of the foreshore and result in engineering mitigation works to protect the railway reserve. The setback line developed was for the scenario of no additional coastal engineering works. The setback line would require refining in the event of the placement of a sea wall with no additional beach renourishment, due to downdrift influences and also in the circumstances of Catherine Point groyne being extended.

Successful long-term coastal protection solutions seek to directly address and work with the natural physical processes responsible for the erosion problems, not just the effects of erosion. The foreshore management plan will need to include a detailed investigation into the function and impact of various coastal protection options required to mitigate the erosion. In addition, the community should be involved in deciding the long-term coastal protection method for this particular part of the beach and the rehabilitation program.

A key objective for managing the erosion at the site is to minimise the impact of human-induced activities on the stability of the foreshore reserve and to ensure sufficient setback is enforced to allow for further erosion.

7.2.12 Coastal structure assessment

The condition and function of the existing groyne and sea wall structures was undertaken by Oceanica and Damara (coastal engineering consultants) as part of the district structure plan. The key outcomes and recommendations included the following:

- there are currently six remaining structures between Island Street groyne and the newly constructed breakwater at Port Coogee;
- four are directly associated with the South Fremantle power station;
- two other groynes at Catherine Point and Island Street were constructed to stabilise the coast closer to Fremantle in conjunction with beach nourishment projects;
- the structures were built between 1946 and 1965, with Island Street and Catherine Point groynes extended in 1996; and
- the majority of the structures are more than 40 years old.

Table 7: Recommendations for structural works

Immediate attention	3–5 years	More than 10 years
Infilling of the running surface on Island Street groyne	Upgrade of South Fremantle power station groyne 2	Upgrade of the South Fremantle power station revetment
	Extension of South Fremantle power station groyne 3	Improvement at the shoreward end of Island Street groyne
	Repair Island Street groyne head	
	Repair of Catherine Point groyne and provision of scour protection at the head and along the south face, with annual monitoring	

It is not recommended to remove the existing structures as the coastal alignment is integrally linked with the structural performance.

7.2.13 Beach access

Access management is an important aspect of coastal management. The beach access across the train line should be managed according to recreational nodes. There are no suitable terrestrial features (such as a natural cutting or bridge) to minimise costs.

The beach access locations should be specified to minimise dune disruption. Beach access should also be focused to the areas where there will be the least beach scarping and widest beach. This is because the region has naturally narrow beaches, which may retreat further in future. Beach access should be focused on the more stable regions to the north of existing structures and south of Robb Jetty (which does not experience seasonal rotation). Signage should be placed to inform the public about the beach behaviour.

Detailed investigation into the type and function of pedestrian paths to and from the beach will be required as part of the foreshore management plan. Specifically, beach access options for each section of beach will need to be considered. Beach access options for consideration include piled walkways and non-fixed (log and chain) paths.

Regardless of the recommended option, paths should be clearly defined through the use of fencing and signage. If appropriate the paths should be aligned to the topography (ie, along lines of least topographic variation) and according to probable demand in response. The access paths should be orientated perpendicular to the prevailing wind conditions to minimise wind erosion risk. Steps or ramps may be required at the dune face fronting the beach and other areas where the gradient is steep in order to provide sustainable access to the beach, however this will be the subject of detailed investigation into beach access paths.

7.2.14 Dual use paths

Dual use paths are currently provided within the district structure plan area, adjacent to the foreshore reserve. The current dual use path is very well supported by the

surrounding Fremantle and Coogee communities. Dual use paths improve connectivity and construction of additional paths within the foreshore or along the abutting road is likely to enable increased use of the foreshore, linking coastal nodes and mobility throughout the entire length of the Cockburn coast.

7.2.15 Signage

Signage is an important factor in managing recreation use, and minimising the conflicts between recreation and conservation. There are a number of forms signage can take including:

- directional – to indicate location of paths and facilities and points of interest;
- interpretative – to describe environmental and cultural values and features, identify management issues and provide rationale for prohibitive measures (such as access and dog controls); and
- public safety – such as warnings of known hazards.

Signage should be suitably located and clearly visible but should not detract from the aesthetic appeal of the foreshore area.

7.2.16 Beach hierarchy

The coastal planning strategy directs the future planning and management of the coastal strip principally through determining the types of recreation uses likely to occur and providing guidance on the nature of facilities and its location. Activities may be acceptable at some locations but unsuitable due to the characteristics or values of a site at others. This approach allows for identification of regional coastal nodes and local beaches.

Regional coastal nodes are characterised as not only unique or desirable locations to the broader public, but with the capacity to sustain the resulting pressure. Conversely, a local beach has limited recreational attractions and a lower-order beach and foreshore use.

Integrating the different coastal nodes with pedestrian and dual use paths is a key planning element in providing a diverse range of coastal experiences.

7.2.17 Urban water management

The Cockburn coast water management overview has developed guidelines for implementation to reduce the environmental impact of urbanisation of Cockburn coast on the regional groundwater and wetlands of the area and to ensure that best practice is undertaken in terms of stormwater management and potable water conservation. The aim is to facilitate a consistent and integrated approach across of the development that manages the total water cycle in a sustainable manner. It is acknowledged that drainage is not a primary function of the foreshore reserve and in the absence of any justification, is generally not supported. In addition, in context of urban water management the foreshore reserve is not included as public open space.

Stormwater management - design principle

Reduction in the average annual loads of stormwater pollutants discharged by the development into the surface water and groundwater systems if it used traditional, directly connected stormwater drainage design.

Design objectives

As compared to a development that does not actively manage water quality:

- at least 60 per cent reduction in the average annual load of total suspended solids.;
- at least 80 per cent reduction in the average annual load of total phosphorus;
- at least 45 per cent reduction in the average annual load of total nitrogen; and
- at least 70 per cent reduction in the average annual load of gross pollutants.

Nutrients in stormwater can be treated through a system of swales and vegetated retention basins to reduce nutrient loads leaving the site.

Site-specific initiatives

The quality of stormwater itself is expected to not to change significantly as the chemical characteristics of stormwater from industrial areas is not significantly different from that from residential and other urban areas (Duncan, 2006). Treatment will still be required to remove nutrients from stormwater. Strategies that may be used include structural controls such as gross pollutant traps and swales, and non-structural controls such as street sweeping and limiting the use of fertilisers in public open space and domestic gardens.

Stormwater management strategies

The objective of the stormwater management strategy is to implement a water sensitive, integrated stormwater plan for built areas, roads and public open space. Stormwater management should be viewed as a series of linked components, including structural and non-structural components which collectively meet water quality and water conservation objectives in a sequential manner. These can include:

- measures for infiltration or storage on site, including soakwells, permeable paving and recycling systems;
- swales;
- infiltration and nutrient stripping basins;
- underground infiltration tanks; and
- non-structural measures to minimise nutrient and pollutant loads, such as street sweeping and education programs to limit fertiliser use.

The structural measures associated with water sensitive urban design (WSUD) can be located within road reserves or networked public open space. Locating such structures within the public open space provides the opportunity to create a landscaped area which provides a recreational use as well as drainage stripping. The public open space can have a multi-purpose function for drainage, recreational use and vegetation conservation. Public open space areas should be located appropriately so that they can provide a drainage function. A variety of stormwater practices can be used.

Flow compensation and nutrient attenuation

Cockburn coast's current system of fenced sumps is not considered to be appropriate for the residential development proposed in the area because of the aesthetic problems and potential safety risks. It is therefore proposed that the sumps are replaced with more aesthetic and water-sensitive features that remove the existing sumps and either make a feature of the stormwater through aesthetic design or hide the infrastructure and allow for more efficient use of the land, while reducing

pollutant loads. The aim of this section is to outline potential treatments for stormwater within the Cockburn coast area.

Land efficiency

Treating and infiltrating stormwater can require large areas of land. This area may have other uses, such as passive public open space that is used as a compensating basin. However, this may not be appropriate in the Cockburn coast area. One option for stormwater systems in urban areas is to minimise the amount of area required for stormwater purposes through technologies such as use of permeable paving, bottomless manholes and the construction of underground infiltration tanks.

The Town of Cottesloe is currently undertaking a retrofit project to replace its existing sumps with underground infiltration tanks. The Department of Water advises that this technology is also being used at Port Coogee.

Other options for reducing the amount of water entering stormwater collection points such as sumps include leaky pipes and bottomless manholes where infiltration is acceptable. These technologies are very suitable in the Cockburn coast area because of the high permeability of the local soils.

8. Recommendations

8.1 Power station sector

Classification: Regional coastal node with active and passive recreation.

The power station is anticipated to be a focal point for the local and regional community and tourists. The South Fremantle power station is an iconic coastal building set within the foreshore reserve. The revitalisation of the power station will be a unique regional attraction which will offer a diverse range of experiences including cafés, restaurants, shopping and community facilities.

South of the power station site a new beach is forming between the northern Port Coogee breakwater and the power station. It is anticipated that this beach will be popular for swimming due to its orientation, which will shelter beach users from the south-westerly winds in summer and offer protected waters.

The large number of local and regional visitors will create demand for car parking and other amenities such as toilets, beach showers, foot sprays, grassed areas, themed playgrounds, shaded tables and pedestrian paths. These facilities should be located in appropriate areas of the foreshore reserve south of the South Fremantle power station as part of the local structure planning process.

Key Management

The key management initiatives include:

- appropriate management of the open space interface with the foreshore reserve;
- upgrade of the South Fremantle power station groynes; and
- a comprehensive response (to be detailed in the foreshore management plan) to the future management of the Port Coogee sand by-passing operations to ensure that the sand by-passing works do not produce detrimental effects on the marine environment and public safety.

8.2 C Y O'Connor sector

Classification: Local beach with passive recreation use, horse exercise and conservation.

Conserve the natural features of the foreshore reserve and strictly control access to the beach through the provision of paths and fencing. Any car parking, drainage and public facilities should be located with due consideration of the foreshore stability.

Key Management

The key management initiative is to:

- undertake a detailed investigation into the function and impact of various coastal protection options required to mitigate the erosion. In addition, the community should be involved in deciding the long-term coastal protection method for this particular part of the beach and the rehabilitation program.

8.3 North Coogee sector

Classification: District coastal node with active and passive recreation.

A draft North Coogee Foreshore Management Plan has identified the major environmental issues that are relevant to the foreshore's natural, cultural and recreational values and recommended strategies that can be implemented to improve the amenity of the North Coogee foreshore. The draft North Coogee Foreshore Management Plan proposes two parklands and facilities such as barbeques, toilets, beach showers, themed playgrounds, and picnic areas.

The draft Cockburn coast district structure plan proposes community and commercial facilities west of the freight rail line, immediately south of Rollinson Road. This development will be at a lower order than the facilities of the South Fremantle power station sector, and will be responsive to ecological values of the dune vegetation. It is anticipated that restaurant/café/ kiosk and public changing facilities may be included within this area to complement the infrastructure outlined in the draft North Coogee Foreshore Management Plan.

Key Management

The key management initiative is to:

- augment the draft North Coogee Foreshore Management Plan with the future Cockburn coast foreshore management plan

8.4 Foreshore management plan

A key focus of the coastal planning strategy has been to identify issues that require management and develop recommendations to guide the development of the future foreshore management plan.

The strategy is the first step in developing the framework for managing the impacts of future urban development on the sensitive Cockburn coast foreshore. To this end, the coastal planning strategy is not the mechanism for providing definitive recommendations in relation to the coastline, but rather establishes the key items to be explored and addressed within a foreshore management plan for the structure plan area.

This foreshore management plan should be undertaken in conjunction with, or immediately following, the local structure planning for the Cockburn coast area. It is at the local structure planning stage that the finer-grained details relating to land use mix, built form, impact on the foreshore and the requirements of future residents will become more apparent.

The foreshore management plan will be expected to address the management issues and strategies as outlined in this document, and the requirements, guidelines and criteria established in Statement of Planning Policy 2.6 – State Coastal Planning Policy.

Responsibility for this management plan is dependent on the implementation model, however, it is anticipated that the need for a foreshore management plan will be a condition of the MRS amendment (if undertaken) or subsequent approval stages.

9. References

Cockburn coast - coastal planning strategy

1. Australian Heritage Commission (1998) Register of the National Estate Database, *Beeliar Regional Park and Adjacent Areas*. [Online] Available: <http://www.erin.gov.au/ahc.html> [Accessed 2003].
2. Australian Interaction Consultants (2007) *Cockburn coast district structure plan – Preliminary Investigation of Aboriginal Heritage*. Report prepared by Australian Interaction Consultants for the Department for Planning and Infrastructure.
3. Beckley, L.E. and Blackweir, D.G. 2005. Aerial survey of beach usage along the Perth metropolitan coast. *3rd WA State Coastal Conference, Busselton, Australia*.
4. Berson, M (1978) *Cockburn the making of a community*. Town of Cockburn, Western Australia.
5. CALM (2002) Woodman Point Regional Park: draft management plan (2002 – 2012). Prepared by the Conservation Commission of Western Australia, the Department of Conservation and Land Management, the Department of Sport and Recreation and the City of Cockburn.
6. City of Cockburn (2004) *Coogee Beach Structure Plan* (Internet Version). City of Cockburn. Available at: www.cockburn.wa.gov.au
7. Cockburn Sound Management Council (2007) *The State of Owen Anchorage A Pressure State Response Report*. Cockburn Sound Management Council
8. Colmar & Brunton (2001) *CALM Regional Parks Usage Survey 2001*. Prepared for the Department of Conservation and Land Management. Perth Western Australia.
9. Colmar & Brunton (2005) *2005 Regional Parks Usage Survey 2001*. Prepared for the Department of Conservation and Land Management. Perth Western Australia.
10. DEP (1996) *Southern Metropolitan Coastal Waters Study (1991 – 1994)*, Final Report No. 17, Department of Environmental Protection, Perth WA.
11. Ecoscape (2007) *Draft North Coogee Foreshore Management Plan*. Prepared by Ecoscape (Australia) Pty Ltd for Landcorp and Stockland.
12. ENV Australia (2007) *Cockburn coast district structure plan – Environmental Assessment*. Report prepared by ENV Australia for the Department for Planning and Infrastructure.
13. ENV Australia (2007) *Cockburn coast district structure plan – Urban Water Management Overview*. Report prepared by ENV Australia for the Department for Planning and Infrastructure.

14. Jervoise Bay: *Public Environmental Review*. Department of Commerce and Trade, LandCorp and Main Roads WA.
15. Coastal Zone Management Pty Ltd, Damara WA Pty Ltd and Oceanica (2007) *Cockburn coast district structure plan – Coastal Processes Assessment*. Report prepared by Oceanica for the Department for Planning and Infrastructure.
16. Yates Heritage Consultants (2007) *Cockburn coast district structure plan – Historic Sites Report*. Report prepared by Yates Heritage Consultants for the Department for Planning and Infrastructure.
17. Western Australian Planning Commission (2002) *Coastal Environments Western Australia*. Western Australian Planning Commission, Perth.
18. Western Australian Planning Commission (2003) *Coastal Planning and Management Manual*, Western Australian Planning Commission, Perth.
19. Western Australian Planning Commission (2003) *Statement of Planning Policy No. 2.6 – State Coastal Planning Policy*. Western Australian Planning Commission, Perth.
20. Western Australian Planning Commission (2003) *Statement of Planning Policy No. 2.0 – Environment and Natural Resources Policy*. Western Australian Planning Commission, Perth.