

City of Rockingham

Foreshore Management Plan

2024



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Acknowledgement of Country

**Rockingham, ngala kaaditj moondang-ak
kaaradjiny nidja boodja, Binjareb wer
Whadjuk Nyoongar moort, wer baalabang
kalyogool dandjoo boodja, kep wer moort.**

The City of Rockingham acknowledges the Traditional Owners and Custodians of this land, the Binjareb and Whadjuk Nyoongar* peoples and their continuing connection to the land, waters and community. We pay our respects to all members of Aboriginal communities and their cultures, and to Elders past, present and emerging.

The City's third Reconciliation Action Plan (RAP) 2021-2023 was released in March 2021. It aims to grow a community that demonstrates strong relationships, champions mutual respect and creates opportunities with local Aboriginal communities.

*While Nyoongar is identified as a single, spoken language there are up to 14 different dialects and variations in both pronunciation and in the spelling of many words such as: Nyoongar, Whadjuk and Binjareb. Additionally where the City uses the term Aboriginal it is intended to encompass all Aboriginal and Torres Strait Islander people. The City has utilised the services of the Noongar Boodjar Language Cultural Aboriginal Corporation for the translations present in this document.

1 Introduction

1 Introduction

1.1 Background

The City of Rockingham (the City) has approximately 37 km of coastline, encompassing a range of local and regional foreshore reserves, which deliver a variety of recreation, conservation and commercial activities. These reserves are a vital component of the City’s natural capital, underpinning its identity, prosperity and lifestyle.

The Foreshore Management Plan (the Plan) outlines the City’s continued commitment to the preservation of these environments, providing a framework for the ongoing use and management of the City’s foreshore reserves.

The Plan addresses both environmental and land use factors, with due consideration for physical coastal processes, and the conservation of diverse coastal habitats, which act as a regional corridor for the movement of flora and fauna.

In addition to these factors, the Plan acknowledges the challenges associated with managing a dynamic coastal environment, together with the need to balance environmental, social and economic values to ensure the long term sustainable use and management of the City’s unique coastline.

1.2 Vision

This Plan addresses the following aspiration contained in the City’s Strategic Community Plan 2023-2033.

Aspiration 2: Natural Environment

- Protection of natural environment
- Sustainable natural green spaces

1.4 Objectives

This Plan is driven by the following overarching objective as outlined in the City’s Strategic Community Plan 2023–2033:

- Preserve and enhance biodiversity

1.3 Purpose

The purpose of this Plan is to provide an overview of the ecological values of the City’s foreshore reserves, with particular focus on the enhancement of these areas over the next five years.

1.5 Study area

This Plan encompasses approximately 37 kilometres of coastline, including all beaches and foreshore reserves in the City of Rockingham municipality. This Plan divides the study area into five management sectors based on their respective conservation, recreation and land-use planning values.

The location of these management sectors can be seen in Figure 1.

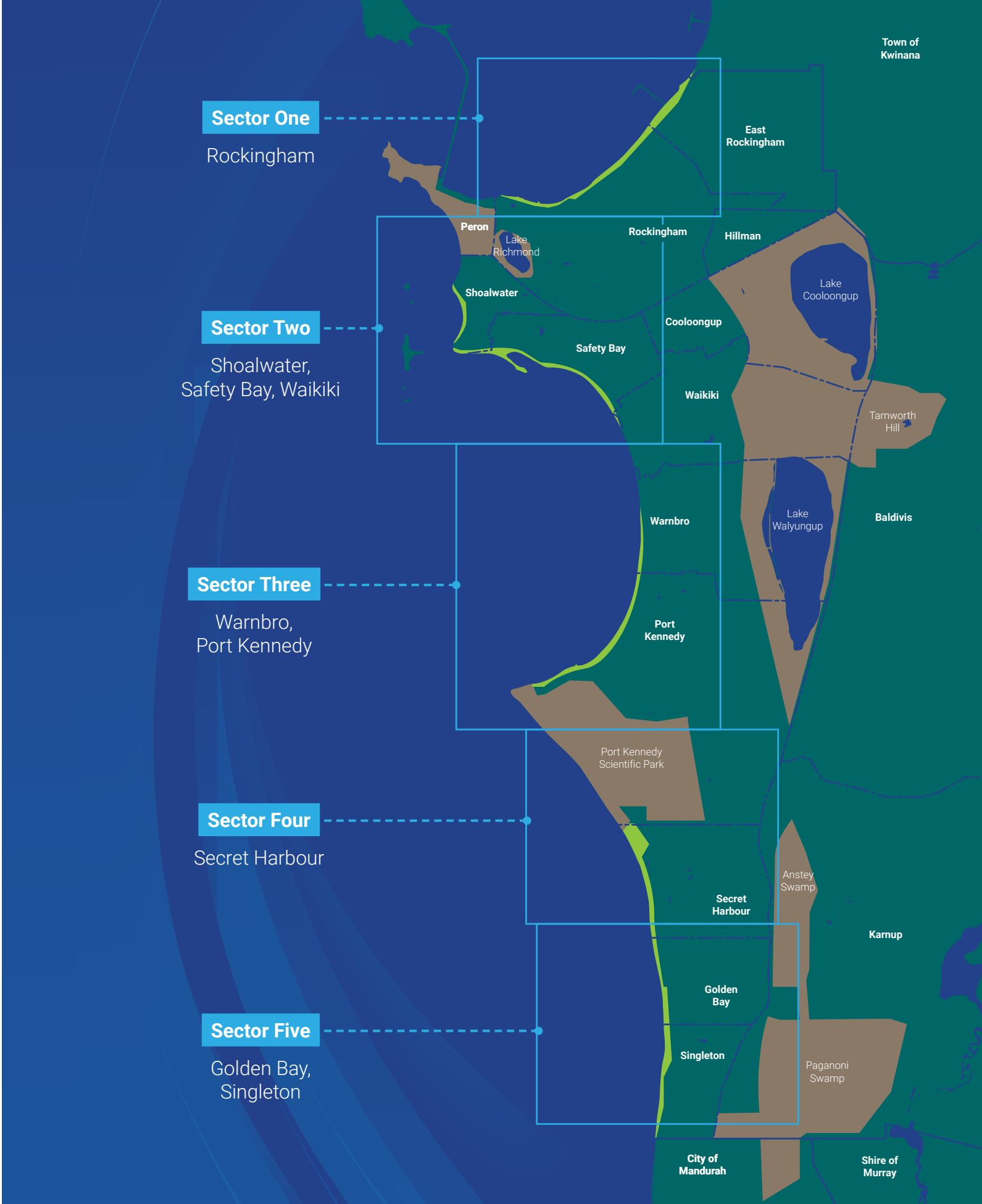


Figure 1 – Foreshore management sectors

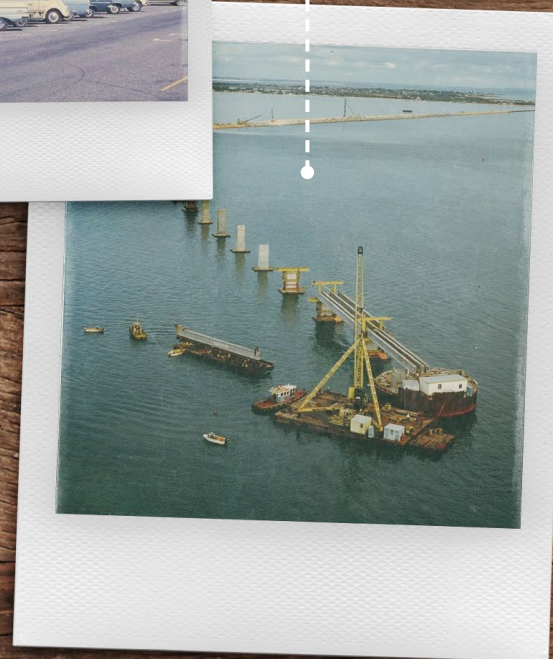
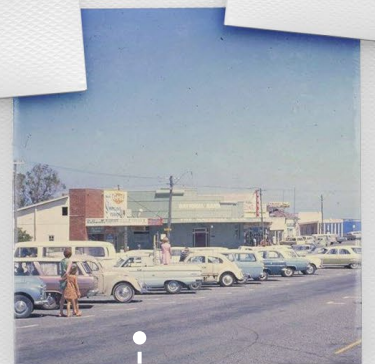
- Rockingham Boundary
- Suburb
- DBCA Reserve
- Foreshore Reserve
- Sectors

1.6 Social context – Historical uses of the City of Rockingham coastline

• Rockingham Jetty



• Mangles Bay Garden Island Causeway



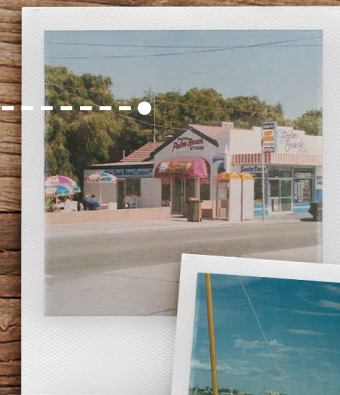
• Penguin Island Jetty and Ferry



• Palm Beach Jetty



• Palm Beach Store



• Shoalwater View of Penguin Island



• Mersey Point Store



• Rockingham Railway Terrace

• Safety Bay Jetty and boat ramp



Images courtesy of Rockingham Campus Community Library, Rockingham Historical Society and Museum, Lost Rockingham Facebook, Peter Wachmer and Matt Gill

1.7 Legislative and policy framework

Effective management of the coastal environment is reliant on the successful integration of a suite of legislation, policies and guidelines which are regulated at a federal, state and local level. In this regard, the following were given particular consideration during the development of this Plan:

- State Planning Policy 2.6 Coastal Planning Policy Guidelines (Western Australian Planning Commission, 2020)
- WA Coastal Zone Strategy (Government of Western Australia, 2021)
- Shoalwater Islands Marine Park Management Plan (Department of Environment and Conservation, 2007)
- Rockingham Lakes Regional Park Management Plan (Department of Environment and Conservation, et. al. 2010)
- State Environmental (Cockburn Sound) Policy (Environmental Protection Authority, 2015)
- Coastal Planning and Management Manual (Government of Western Australia, et. al. 2003)
- Peron Naturaliste Partnership Strategic Plan 2020-2022 (Peron Naturalist Partnership, 2020)

1.8 Other City of Rockingham plans

This Plan focuses on measures for the enhancement of ecological values across the City’s foreshore reserve. This Plan should be read and applied in conjunction with other City documentation to ensure that any development within the reserves complements these values. This includes but is not limited to the following:

- City of Rockingham Coastal Hazard Risk Management and Adaptation Plan (2019)
- Safety Bay Shoalwater Foreshore Master Plan Report (2019)
- Rockingham Beach Foreshore Master Plan (2015)
- City of Rockingham Bushfire Management Plan (2018-2022)
- City of Rockingham Greening Plan (2017)
- City of Rockingham Sediment Management Plan (in development)
- City of Rockingham Coastal Facilities Strategy (2021-2025)
- City of Rockingham Beach Access Plan (2023)
- City of Rockingham Infrastructure Asset Management Plan (2019)
- City of Rockingham Strategic Boating Plan (2023-2036)

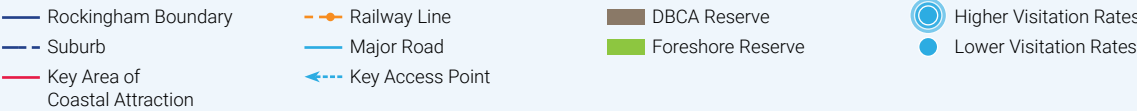
1.9 Plan preparation

To inform the development of the previous Foreshore Management Plan (2016), a community survey was undertaken with the aim of identifying key values and usage of the City’s foreshore reserves, including demographics, beach visitation levels, preferred methods of transport, the average amount of time per visit, favoured activities and recommendations for improvement, which together highlight the varying character of beaches along the City’s coastline and provide direction for the ongoing use and management of these reserves. Primary areas of coastal attraction together with relative visitation levels at the City’s beaches can be seen in Figure 2.

In addition detailed environmental assessments of the City’s foreshore reserves were undertaken in 2021 to inform this plan (Natural Area Holdings, 2022) and the previous Foreshore Management Plan. The assessments undertaken in each sector included a desktop assessment, a detailed flora and vegetation survey, a detailed vertebrate survey, and an infrastructure assessment. The results of these assessments have enabled the City to identify management actions required to maximise conservation outcomes across the study area.



Figure 2 – Areas of coastal attraction and visitation



2 Biophysical Features



2 Biophysical features

2.1 Climate

The south west of Western Australia has a warm Mediterranean climate with hot, dry summers and cool, wet winters. The closest long-term Bureau of Meteorology (BoM) weather station with a complete dataset is the Garden Island HSF, located within the City. The mean daily maximum temperature for Rockingham is 28°C in summer and 18°C in winter. The mean annual rainfall is 610.4 mm, mostly falling from May to October.

2.2 Geology and landform

The Interim Biogeographical Regionalisation for Australia (IBRA) Version 7 recognises 89 geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The City's foreshore reserves are situated on the Swan Coastal Plain bioregion, which is a long coastal strip that extends from Dunsborough in the south to Gingin in the north.

The area is dominated by the Quindalup dune system, which is a relatively recent landform characterised by a series of low sand dunes made up of marine sands and aeolian (windblown) soils. The Quindalup dunes are underlain by the Safety Bay sand formation which comprises calcareous soils derived from Tamala limestone (Semeniuk 1989).

For the majority of the Swan Coastal Plain, the Quindalup dune system occurs as a thin stretch adjacent to the ocean; however within the City, the dunes form a wide plain known as the Rockingham – Becher Plain (Semeniuk 1989). This plain consists of a series of multiple, parallel, linear sand ridges that are stranded former beach ridges, providing an important example of Holocene sedimentation and stratigraphic evolution. The foreshore has site elevations ranging from 0 m to 20 m AHD (Australian Height Datum), with higher dunes generally found in the Point Peron area (up to 10 m), Waikiki (up to 20 m), Warnbro (up to 15 m), Port Kennedy (up to 15 m), and Secret Harbour (up to 10 m).

2.3 Hydrology

No formally mapped natural drainage lines or wetland areas occur within the foreshore. However, a number of wetlands recorded on the Swan Coastal Plain dataset occur in close proximity, these include:

- Lake Richmond (Conservation category)
- Point Becher Wetlands (Conservation category)
- Peelhurst Wetland (Multiple Use category)
- Secret Swamp (Conservation category)
- Unknown 6297 (Conservation category)

All sectors are located along the coast of the Indian Ocean and depth to groundwater ranges from 0 m to 19 m. Groundwater in the region comprises of unconfined, semi-confined and confined aquifers that exist as separate layered systems. The aquifers, in order of increasing depth, include:

- The Superficial and Rockingham Sand Aquifers (unconfined)
- The Leederville Aquifer (semi-confined to confined)
- The Yarragadee Aquifer (confined).



Figure 3 – Wetlands of the Swan Coastal Plain

— Suburb
— Wetlands

2.4 Vegetation

The regionally mapped vegetation complex that occurs along the City's foreshore is the Quindalup complex, which is associated with the Quindalup dune system. The complex can be divided into two alliances, one associated with beach and foredune areas, and the other with mobile and stable dune formations. Flora and vegetation present within the dunes vary according to soil, drainage and topographical conditions.

Two regionally significant Bush Forever sites managed by the Department of Biodiversity Conservation and Attractions are located in proximity to the City's foreshore reserves. Point Peron is recognised as Bush Forever Site 355 and Port Kennedy Scientific Park as Bush Forever Site 377, with the Quindalup vegetation complex present in both.

The extent of the Quindalup complex remaining on the Swan Coastal Plain is just over 60%, which has increased since 2013.

2.4.1 Vegetation types

Vegetation types are determined based on dominant over, middle and understorey species. Six vegetation types were identified within the foreshore reserves.







2.4.2 Review of TEC mapping

A review of relevant databases identified seven listed Threatened Ecological Communities (TEC) that could potentially occur within 5 km of the Rockingham Foreshore. However following the survey in 2021 none were determined to occur. Tuart trees were recorded in Sector 1 however the size and condition does not meet conservation listing criteria for this TEC.

Sedgelands in Holocene Dune Swales was also recorded as occurring within 10 km of the site, and had previously been recorded in Golden Bay, however observations of this area during the survey indicated that the areas previously mapped as TEC were primarily monocultures (*Lepidosperma gladiatum*) with weeds present and did not occur in the habitat listed in the Sedgelands in Holocene Dune Swales Recovery Plan (Department of Environment and Conservation 2011).



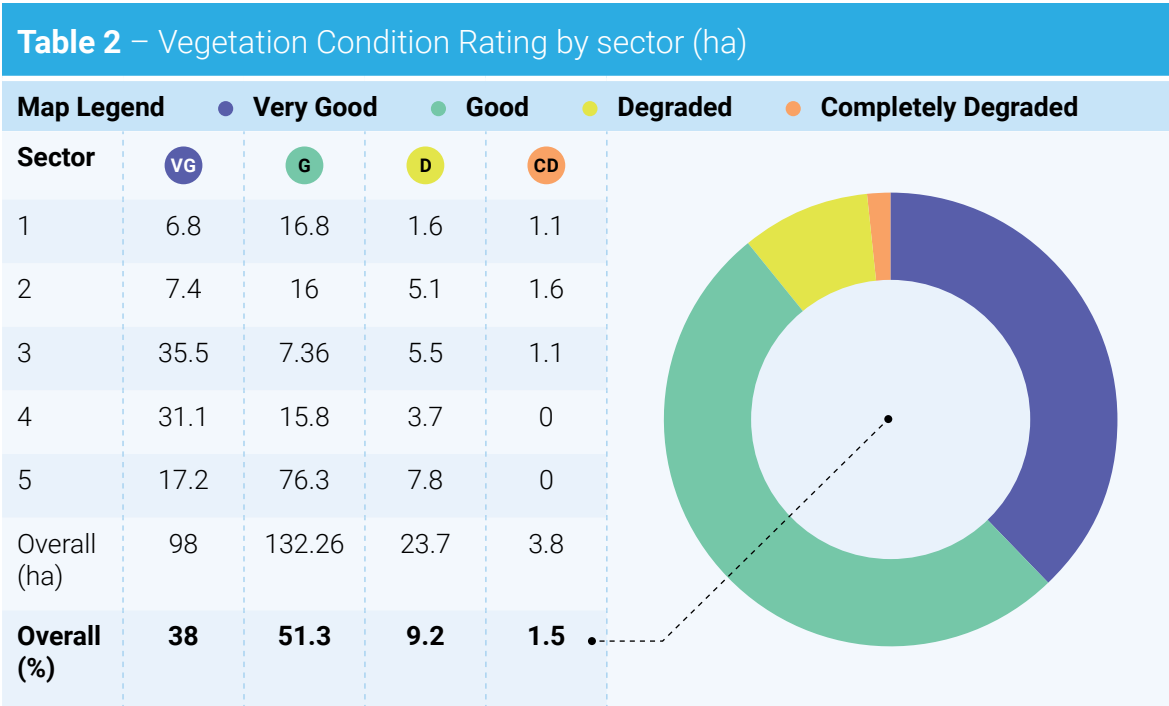
Table 1 – Foreshore Vegetation Types

Name	Description	Photograph	Sector				
			1	2	3	4	5
Acacia rostellifera Shrubland	Shrubland of <i>Acacia rostellifera</i> over sparse native low shrubs and introduced herbs and grasses.		●	●	●	●	●
Lepidosperma gladiatum Sedgeland	A sedgeland of <i>Lepidosperma gladiatum</i> with sparse native and introduced herbs.		●	●			
Mixed coastal shrubland	A mixed shrubland comprising of <i>Olearia axillaris</i> , <i>Rhagodia baccata</i> , <i>Lepidosperma gladiatum</i> , <i>Scaevola crassifolia</i> , <i>Acacia rostellifera</i> , and <i>Acacia cyclops</i> ; over introduced herbs and grasses. Native shrubs vary in dominance across the Foreshore Reserve.		●	●	●	●	●
No native vegetation/landscaped lawns	No native vegetation present, areas consisting of landscaped lawns, carparks and infrastructure.		●	●			●
Spinifex grassland*	Grassland dominated by <i>Spinifex longifolia</i> with patches of <i>Spinifex hirsutus</i> and containing sparse native shrubs of <i>Olearia axillaris</i> and <i>Scaevola incrassate</i> over introduced herbs and grasses.		●	●		●	●
Tuart open woodland	Overstorey of Tuart (<i>Eucalyptus gomphocephala</i>) over a middle storey of mixed native coastal shrubs including <i>Olearia axillaris</i> , <i>Rhagodia baccata</i> , <i>Lepidosperma gladiatum</i> and an understorey of sparse introduced herbs.		●				

*were also recorded in the Foreshore Management Plan 2016.

2.4.3 Vegetation condition

Vegetation condition was assessed using the Keighery scale (Appendix B), with 89.3% of the foreshore vegetation being classified as Good or Very Good. The majority of Sectors 1, 2 and 5 were in good condition and the majority of sectors 3 and 4 were in Very Good condition. A summary of the vegetation condition rating is provided in 2.



2.4.4 Comparison with 2015 fauna survey




Overall, vegetation condition has remained consistent from the 2015 foreshore assessment when 89.3% of the foreshore reserve vegetation was classified as Good, Very Good or Excellent. However no vegetation was classified as Excellent in the most recent survey, down from 4.2% in 2015.

2.5 Flora

2.5.1 Conservation significant flora

No threatened or priority flora species or communities listed under the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* or the *Biodiversity Conservation (BC) Act 2016* were recorded within the Foreshore Reserve sectors.

Three species of regionally significant flora defined by the City of Rockingham (2012) were present including *Callitris preissii* (Rottnest Island Pine), *Diplolaena dampieri* (Southern Diplolaena) and *Lomandra maritima*. Rottnest Island Pine and Southern Diplolaena are listed as regionally significant flora of the metropolitan region within Bush Forever Volume 2 (Government of Western Australia, 2000).

Table 3 – Conservation Significant Flora Recorded Along the Foreshore							
Name	Description	Photograph	Sector				
			1	2	3	4	5
Callitris preissii	Distribution restricted to small, isolated populations in the Quindalup Dune System.		●	●	●	●	●
Rottnest Island Pine							
Diplolaena dampieri	At the northern end of its range in the Perth metropolitan area.		●			●	
Southern Diplolaena							
Lomandra maritima	Habitat for the Priority 4 listed graceful sun moth (Synemon gratiosa).				●		

2.5.2 Weeds

A total of 39 introduced species from 19 families were identified during the 2021 survey. Weeds were defined into three categories, these included grasses, woody weeds and herbaceous weeds, a high number of herbaceous weeds were found in Sectors 1 and 2. *Euphorbia terracina* (Geraldton Carnation Weed) and *Euphorbia paralias* (Sea Spurge) were found in all sectors surveyed.

Results of the 2021 survey showed an increase in the presence of woody and herbaceous weed species across all sectors. The majority of weeds across all sectors fell into the Department of Biodiversity Conservation and Attraction (DBCA) cover class of 6-75%. It was noted that weed species present in Sectors 1 and 2 were towards the higher end of this cover class when compared to other sectors. Weed mapping is provided for each of the sectors in this plan below.

Four weed suites were mapped for all sectors and were classified according to treatment as outlined in Section 10.2.

2.5.3 Significant weeds

No declared pests or Weeds of National Significance (WoNS) were recorded during the 2021 assessments, including the Declared Pest and WoNS *Lantana camara* that was noted during the 2011 assessment.

2.5.4 Comparison with 2015 survey





Several more locations were found to contain the regionally significant species *Callitris preissii* and *Diplolaena dampieri* during the 2021 survey than had been recorded in 2015. Areas of *Lomandra maritima* were of similar extent to the 2015 survey.

While an assessment of the success of weed control could not be undertaken due to a lack of quantitative data from 2015, results of the 2021 survey showed an increase in the presence of woody and herbaceous weed species throughout all sectors.

2.6 Fauna

2.6.1 Fauna habitats

Fauna habitat across all sectors was found to be of good quality with high value habitat coastal available. The Foreshore reserves provide an important ecological linkage across the coastline and into adjacent reserves including the two bush forever sites.

Table 4 – Fauna Habitat							
Name	Description	Photograph	Sector				
			1	2	3	4	5
Coastal shrubs and heathland	Dense shrublands and understorey vegetation provide shelter and resources for mammals, reptiles and amphibians. Dense shrub also provides canopy for bird species particularly honeyeaters and wrens.		●	●	●	●	●
Sedgeland	Sedgelands in dune swales provide damper habitat and refuge for amphibians and reptiles.		●	●			
Tall shrubland	Larger trees provide habitat for nesting bird species, the Tuarts in Sector 1 in particular have the potential to contain hollows for bird species in the future.		●	●	●	●	●
Open woodland	Open areas in the middle of denser vegetation provide important hunting habitat for birds of prey.		●				
No habitat value			●	●			●

2.6.2 Fauna assemblage

A total of 54 species were recorded during the detailed fauna assessment undertaken in November 2021. This consisted of two amphibian species, 24 birds, nine mammals, and 19 reptiles, including seven introduced mammal species. No volant mammals (bats) were recorded in any of the sectors in the 2021 survey.

A full list of the species recorded in each sector and across the entire study area is available in Appendix C.

2.6.2.1 Mammal assemblage

Two native mammal species were recorded in the study area comprising the Southern Brown Bandicoot (*Isodon obesulus fusciventer*) and the Western Grey Kangaroo (*Macropus fuliginosus melanops*). The most frequently recorded mammal was the Southern Brown Bandicoot with 38 individuals recorded.

Introduced fauna observed during the survey are discussed in section 2.7.4.

Figure 4 – Mammals recorded in the study area

Southern Brown Bandicoot
Isodon obesulus fusciventer



Ecology
Priority 4 ground dwelling marsupial. The species has disappeared from most of its former range due to land clearing, changed fire regimes and the introduction of domestic and feral animals. It is mostly nocturnal, however is sometimes active during the day, when it searches for invertebrates, fungi and subterranean plant material to feed upon.

Distribution
Patchy throughout its range, where it occurs from just north of Perth to east of Esperance.

Habitat
Sandy soil supporting dense vegetation in the lower stratum.

Western Grey Kangaroo
Macropus fuliginosus melanops



Ecology
One of the largest marsupial species, the Western Grey Kangaroo is common throughout forests and grassland across southern Australia. Though it is classified as of least concern habitat is under threat due to land clearing and changed fire regimes.

Distribution
Common from south of Shark Bay through coastal Western Australia and South Australia into western Victoria as well as the Murray–Darling basin in New South Wales and Queensland.

Habitat
Forrest and grasslands.

2.6.2.2 Reptile assemblage

Nineteen reptile species were recorded in the study area. This included the gecko *Strophurus spinigerus* (Diplodactylidae), three species of flap-footed lizard (Pygopodidae), two species of dragon (Agamidae), ten species of skink (Scincidae), two species of front-fanged snake (Elapidae) and one species of blind snake (Typhlopidae).

The most common species recorded were the skinks (*Lerista lineata*, *Ctenotus ayustralis* and *Tiliqua rugosa*) followed by the Western Heath Dragon (*Ctenophorus adelaidensis*).

Figure 5 – Most common reptiles recorded in the study area

• **Perth Lined Slider**
Lerista lineata



Ecology
Priority 3 species. Slender skink, with broad black upper lateral strips and prominent black lines on its back. Distinguished from similar *Lerista* species by the number of digits on its limbs. The restricted distribution of this species places it at risk of further habitat loss from development along the Swan Coastal Plain.

Distribution
Occurs in a small coastal area between Perth and Mandurah and on Rottnest Island, and in isolated populations at Woodleigh and Busselton.

Habitat
Favours sandy coastal heath and shrubland.

Western Heath Dragon
Ctenophorus adelaidensis

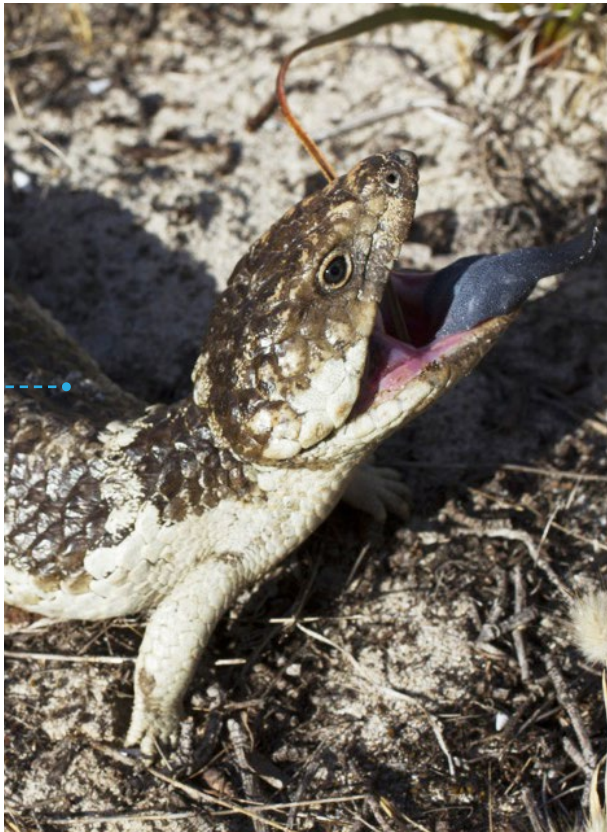


Ecology
Small species of dragon, with short limbs and tail. It is grey coloured, with a broad vertebral stripe edged by triangular blotches. Breeding would most likely occur over summer, like other similar species. It is relatively slow compared to most other species of *Ctenophorus*.

Distribution
Distributed along coastal and adjacent areas from Kalbarri to Perth.

Habitat
Sandplains with heath or banksia.

• **Bobtail**
Tiliqua rugosa



Ecology
Robust, broad angular head, short blunt tail and large 'shingle' like scales. It is omnivorous, feeding on vegetation, invertebrates and small vertebrates. It is viviparous, typically producing one or two live young. Breeding occurs in spring, and gestation is approximately five to six months. Breeding pairs mate for life. It is one of the world's largest skinks.

Distribution
Occurs in the southwest extending through SA into central VIC, NSW and QLD.

Habitat
Occurs in most open habitats, from woodlands to shrublands and coastal dunes.

2.6.2.3 Amphibian assemblage

Two amphibian species were recorded from the study area: The Moaning Frog (*Heleioporus eyrie*) and the Western Banjo Frog (*Limnodynastes dorsalis*). The most common was the Moaning Frog with 14 records.

Figure 6 – Amphibian species recorded in the study area

Western Banjo Frog
Limnodynastes dorsalis



Ecology
A large robust ground-dwelling frog. Grey or dark green with numerous irregular dark brown blotches and a thin pale yellow line running long the centre of the back.

Distribution
Southwest from Kalbarri throughout the wheatbelt and southwest forests east to Cape Arid. Most abundant in coastal plain wetlands.

Habitat
Permanent and temporary water including dams, swaps, wetlands and streams.

Moaning Frog
Heleioporus eyrie

Ecology
Ground dwelling species with robust body and short limbs. Moaning frogs are distinguishable by their call.

Distribution
Predominantly coastal extending from the Irwin River in the north south east to Mt. Barren.

Habitat
Swampy areas and sandy soils with flowing water during the breeding season. At other times move into surrounding bushland to forage.



2.6.2.4 Avifauna assemblage

Twenty-two native avifauna species were recorded in the study area. Commonly sighted species included the Australian Magpie (*Gymnorhina tibicen*), Galah (*Eolophus roseicapilla*), Little Corella (*Cacatua sanguinea*), Australian Raven (*Corvus coronoides*), the Silver Gull (*Larus novaehollandiae*) and Willie Wagtail (*Rhipidura leucophrys*).

The Splendid Fairy-Wren was the next most commonly recorded species with six records. Six species were recorded once each throughout the study area these were the Buttonquail (*Turnix sp.*), White Checked Honeyeater (*Phylidonyris niger*), Australian Kestrel (*Falco cenchroides*), Grey Butcherbird (*Cracticus torquatus*) and the White Bellied Sea-eagle (*Haliiaetus leucogaster*).

Introduced fauna observed during the survey are discussed in section 2.7.4.

Figure 7 – Examples of avifauna species recorded in the study area

Splendid Fairy-wren
Malurus splendens



Ecology
Males of this species have a distinctive blue colour, and females are mostly light brown with a slight blue tail. It feeds on invertebrates, foraging through vegetation and on the ground. Nests are a loose dome built of spider webs, dry grass, leaves, flowers and fine bark. It lays two to four eggs during September to mid January. Breeding males sometimes carry colourful petals as a form of display.

Distribution
In WA there are two populations, one near the Pilbara and one in the southwest. It also occurs through eastern Australia.

Habitat
Dense shrubland, woodlands and forest undergrowth.

Australian Kestrel *Falco cenchroides*

Ecology

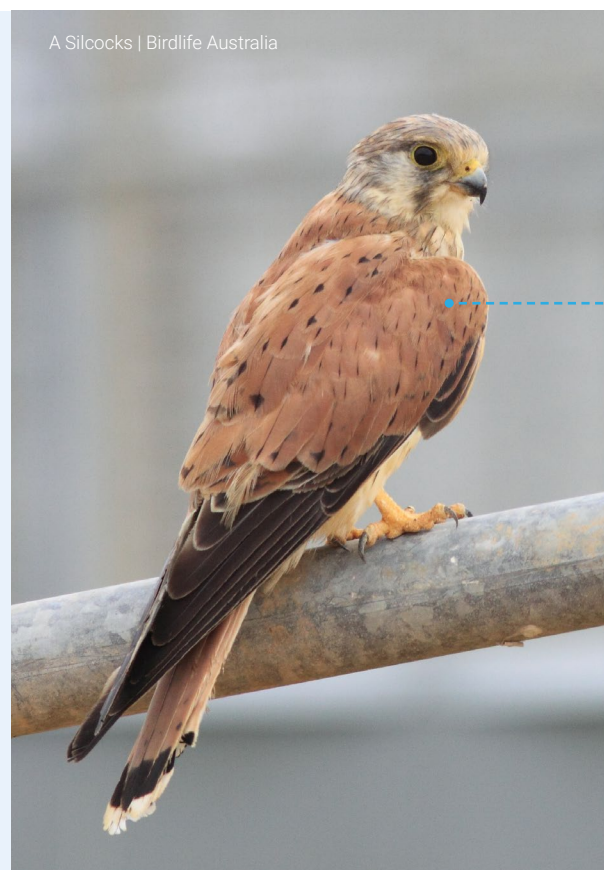
Relatively small bird of prey, wings and back a rufous brown colour, tail barred with black. It feeds on small invertebrates, reptiles and small rodents. It nests in tree hollows, cliffs, caves and termite mounds. A clutch of two to six eggs is laid in July to October. It is a successful species, owing to its varied preference for food, nesting sites and habitat.

Distribution

Occurs throughout Australia and many islands, excluding the far southwest of WA.

Habitat

Sparsely wooded areas, open agricultural areas and waterway areas in deserts.



White Bellied Sea eagle *Haliaeetus leucogaster*



Ecology

Large raptor with long broad wings and a short wedge shaped tail. The wingspan is 180-220 cm and plumage is white and black.

Distribution

Distributed along the coastline of Australia and offshore islands. Distribution shifts in response to climatic conditions with decreased inland occupancy during times of drought.

Habitat

Coastal lowlands and around terrestrial wetlands. Habitat is characterised by the presence of open water.

2.6.3 Conservation significant fauna

Native fauna species that are rare, threatened with extinction, or have high conservation value, are specifically protected by law under the state *BC Act*. In addition some of these species are listed for their protection under the *EPBC Act*. The statutory framework relative to matters of conservation significance can be viewed in Appendix A.

The following two species of conservation significance were recorded during the 2021 survey:

- **Quenda/Southern Brown Bandicoot**
Isodon obesulus fusciventer, which is listed as a Priority 4 species under the *BC Act* and Vulnerable under the *EPBC ACT*.
- **Perth Slider/Lined Skink**
Lerista lineata, which is listed as a Priority 3 species under the *BC Act*.

A further seven conservation significant species were identified from the desktop study as having potential to occur within the study area. These were:

- Common Sandpiper (IA and MI)
Actitis hypoleucos
- Sanderling (IA and MI)
Calidris alba
- Great Knot (CR and MI)
Calidris tenuirostris
- Peregrin Falcon (OS)
Falco peregrinus
- Caspian Tern (MI)
Hydroprogne caspia
- Grey Plover (MI)
Pluvialis squatarola
- Black Striped Snake (Priority 3)
Neelaps calonotos

Further information regarding the species recorded can be found in Appendix C.

2.6.4 Introduced fauna

The following introduced fauna species were observed during the field surveys:

- Laughing Turtle Dove
(*Spilopelia senegalensis*)
- Rock Dove (Domestic Pigeon)
(*Columba livia*)
- Domestic cat (*Felis catus*)
- Dog (*Canis familiaris familiaris*)*
- Guinea pig (*Cavia porcellus*)**
- Red fox (*Vulpes vulpes*)
- Black rat (*Rattus rattus*)
- Rabbit (*Oryctolagus caniculus*)
- House mouse (*Mus musculus*)

*Domestic dogs were observed being walked on a lead or off lead in designated areas.

**A single guinea pig was observed in Sector 5 presumed to be an escaped pet.

2.6.5 Comparison with 2015 survey

2.6.5.1 Fauna habitat

Overall fauna habitat condition was found to have improved with the improvement of vegetation condition within the site (Natural Area Holdings, 2022).

2.6.5.2 Fauna assemblage

The results from the 2015 survey cannot be directly compared with the results from this survey as the 2015 survey only included three sectors. Sectors 1 and 2 were not surveyed in 2015 as they were less likely to support a diverse fauna assemblage (City of Rockingham, 2016), however in 2021 Sector 1 recorded the majority of quenda (58%).

Amphibian assemblage is similar, although the Sand Frog (*Heleioporus psammophilus*) was recorded in 2015 but not in 2021. It is considered that the sand frog may be a misidentification as this species is not generally found in the Rockingham area (Natural Area Holdings, 2022).

A far greater number of bird species was recorded in 2015 compared to 2021, this is likely due to the high mobility of birds. In addition a large number of birds were recorded from around a lake in 2015 that was not included in the survey area for 2021.

Reptile and introduced fauna assemblages were largely consistent across the two surveys.

2.7 Conservation areas

2.7.1 Bush Forever

Two bush forever sites managed by DBCA are located in close proximity to the foreshore reserve areas. Point Peron (Bush Forever Site 355) is located in Sector 2 and Port Kennedy (Bush Forever Site 377) is located across Sectors 3 and 4.

2.7.2 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are classes or areas of native vegetation where the exemptions for clearing of native vegetation under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 do not apply because they contain areas of high environmental value (or relevant buffers). The majority of the City’s foreshore reserves are classified as ESAs with the exception of a section of coastline from Safety Bay to Port Kennedy in Sectors 2 and 3.

2.7.3 Ecological linkages

The foreshore reserves in Rockingham provide an important ecological linkage across the coastline and into adjacent reserves. This increases the available habitat for fauna and increases genetic diversity. The continuous vegetation allows for fauna movement into surrounding areas.

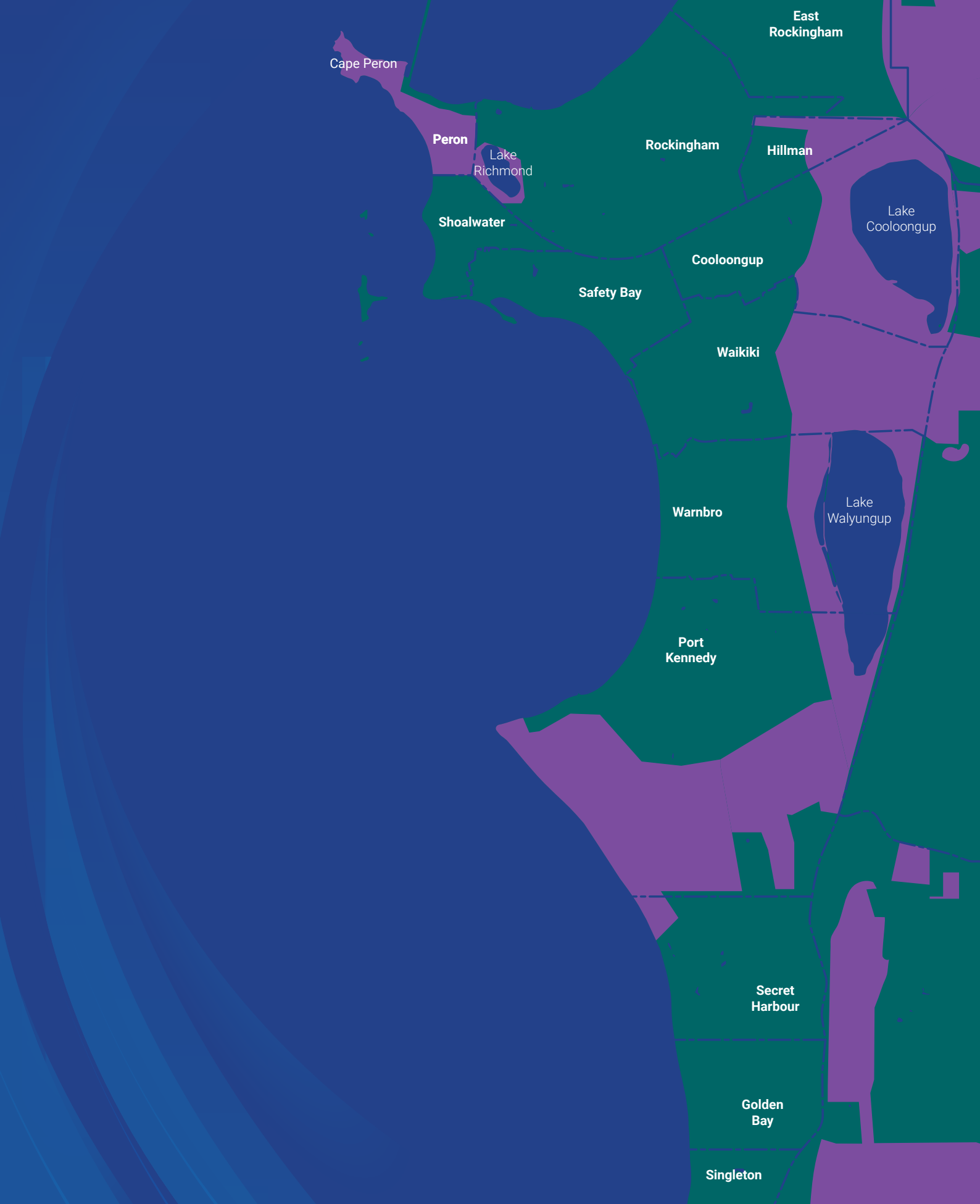


Figure 8 – Bush Forever sites and environmentally sensitive areas

— Rockingham Boundary
— Suburb
■ Bush Forever Sites

2.8 Heritage

2.8.1 Aboriginal heritage

The City of Rockingham sits on the boundary of the Whadjuk and Binjareb Nyoongar countries. Given the many plentiful resources in the area particularly around the lakes system, the land and water has sustained many people over many thousands of years.

In Western Australia, the *Aboriginal Heritage Act 1972* (the *AH Act*) provides a framework for the recognition, conservation and preservation of Aboriginal Cultural Heritage while recognising the fundamental importance of Aboriginal cultural heritage to Aboriginal people.

The Department of Planning, Lands and Heritage maintain the Register of Places and Objects, however all sites are protected under the Act whether or not they have been registered with the Department.

Access to departmental information on registered Aboriginal sites and other heritage places is made available via the Aboriginal Heritage Inquiry System.

Within the City of Rockingham there are 10 Registered Sites and 38 Other Heritage Places.



Figure 9 – Local Aboriginal Heritage Sites

- Suburb
- ACH Register Place
- Aboriginal Cultural Heritage Register
- DBCA Reserve

2.8.2 European heritage

The Heritage Council and the State Heritage Office manage an online database called inHerit. inHerit contains comprehensive information about cultural heritage places listed in heritage inventories at all tiers of Government as well as non-government lists and surveys. A search of the inHerit database identified that the foreshore area does not contain any known state or federal European heritage sites. A full list of the European heritage sites within the City of Rockingham can be found in the City's Municipal Heritage Inventory 2018.



2.9 Infrastructure assessment

Well maintained and appropriately located infrastructure plays an important role in ensuring recreational uses do not adversely impact upon conservation values. An assessment of the amenities in the foreshore reserves was undertaken in 2021 and the results are shown in Table 7.

A separate survey was undertaken in 2022 to inform the City of Rockingham Beach Access Path Plan (Tredwell Management, 2023) which provided recommendations for each beach access location throughout the City, including upgrades or closure. Beach access was not a consideration of the infrastructure assessment and therefore has not been discussed in detail this Plan, noting future infrastructure upgrades along the foreshore would consider both this Plan and the Beach Access Path Plan.

Table 5 – Infrastructure Assessment

Amenity	Sector				
	1	2	3	4	5
Signs Poor	12	9	23	1	1
Signs Good	54	70	55	12	34
Bench seat Poor	-	-	1	-	-
Bench seat Good	1	13	1	1	4
Bike rack Good	-	1	4	-	-
Bin Poor	1	1	2	1	-
Bin Good	11	20	11	8	18
Lookout	-	-	-	1	2
Stairs	-	8	-	-	-
Ramp	-	2	-	-	-
Shower/fountain Good	8	5	1	6	2
Memorial	1	-	1	-	-
Seawall	-	1	-	-	-
Toy library	-	1	-	-	-

2.9.1 Service level provision

It is important that infrastructure provided along the foreshore is compatible with the coastal environment and consistent with respect to style and function. The City's Infrastructure Asset Management Plan outlines detailed information relating to the City's service level provision in this environment and therefore, such information is not provided in this Plan.

The City's Beach Access Path Plan outlines information relating to the provision of an effective and efficient network of beach access paths and ongoing maintenance requirements and therefore such information is not provided in this Plan.

An aerial photograph of a coastal area. In the foreground, there's a parking lot with several cars parked. A paved road runs along the beach. A small pier or dock extends into the water. The water is a mix of deep blue and lighter turquoise, indicating varying depths and possibly some submerged vegetation or sandbars. A large, irregularly shaped sandy area is visible in the middle ground, surrounded by water. In the background, more land with some vegetation is visible, and a few small boats are scattered in the distance.

3

Management Considerations

3 Management considerations

3.1 Climate change

Australia’s climate is changing and these changes are caused by extra heat in the climatic system due to increased greenhouse gases in the atmosphere. This is primarily due to human activity such as the burning of fossil fuels, agriculture and land clearing. The evidence of this is supported by extensive scientific research from across the world (DCCEEW, 2022).

Many of the impacts of climate change pose risks to human and ecological systems, through more frequent and severe heat waves, coastal inundation from sea level rise, disruptions to rainfall patterns and other effects. Most of the severe risks of climate change can be mitigated if greenhouse gas emissions are reduced to the point they are no longer accumulating in the atmosphere (DCCEEW, 2022).

The City’s coastal zone is already subject to the impacts of coastal hazards, such as erosion and inundation, and it is expected that the

vulnerability of these areas may increase in the future due to climate change and sea level rise.

The Western Australian Planning Commission recommend that an allowance for sea level rise be accounted for during coastal planning, as it is generally accepted that a 1 cm rise in mean sea level will result in a loss of approximately 1 m of beach, with a rise of 0.9 m predicted by 2110 (WAPC, 2013). The State Planning Policy 2.6 (SPP 2.6) provides a number of management options for coastal management relative to coastal vulnerability risks including:

- 1. Planned retreat (e.g. building setbacks)
- 2. Accommodation (e.g. raising vulnerable infrastructure above predicted flood levels)
- 3. Protection (e.g. through construction of seawalls and other revetment strategies)

3.2 Coastal vulnerability

Effective coastal management must take into account the dynamic nature and vulnerability of the nearshore environment. As discussed in Section 2.4, the interaction of coastal processes results in varying levels of erosion and accretion (accretion is the accumulation of sand on beaches whereas erosion refers to its loss) which have significant impact on the nearshore environment and particularly on coastal infrastructure.

A number of studies of the Rockingham coast have revealed a relatively fixed pattern of sediment transport, with sand entering from the south under the effects of the dominant prevailing wind. The Department of Transport have estimated that approximately 100,000 m³ of sand enters the Rockingham coast from the south every year.

Accretion can result in jetties and boat ramps becoming inaccessible and erosion can undermine roads footpaths and car parks. In the shorter term, impacts of accretion can be managed by sand excavation and impacts of erosion can be managed through sand nourishment, which involves bringing in sand to build up the beach in affected areas. Long term solutions typically involve relocation, removal or revetment of affected infrastructure.

In accordance with SPP 2.6 the City of Rockingham developed a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) in 2019. SPP 2.6 provides the following hierarchy for consideration of risk management and adaptation options:

- | | |
|-------------------------------|----------------|
| 1. Avoid | 3. Accommodate |
| 2. Planned or Managed Retreat | 4. Protect |

The CHRMAP identified that the majority of the City’s coastline is predicted to become vulnerable to coastal hazards over the next 100 years.



The City’s CHRMAP provides a framework for adapting to coastal hazards over the next 100 years, while prioritising adaptation and management actions over the next 10 years. The objective of the CHRMAP is to:

- ensure that development of coastal facilities considers coastal processes
- guide the identification of appropriate areas for the sustainable use of the coast
- provides for public coastal foreshore reserves
- protect, conserve and enhance coastal zone values.

This Plan provides an overview of the ecological values of the City’s foreshore reserves, with focus on the enhancement of these areas. Matters relating to coastal vulnerability, erosion and inundation related to sea level rise, and increased frequency and intensity of storm events is addressed in the CHRMAP and therefore has not been provided in this Plan.

3.3 Fire management

Fire impacts on native vegetation in a variety of ways, depending on the scale of the fire and the type vegetation. The impacts of fire on vegetation can be very complex with both positive and negative effects. Bushfire Prone Areas (BPA) are areas that have been identified as being subject, or likely to be subject to bushfire attack (Department of Fires and Emergency Services, ND). BPAs are designated as bushfire prone by the Fire and Emergency Services Commissioner under section 18P of the *Fire and Emergency Services Act 1998*. Under the current mapping 93% of Western Australia’s land area is designated as a BPA (Department of Fires and Emergency Services, ND).

In these areas, effective bushfire risk management requires detailed consideration of all the ecological, social and resourcing factors associated with this issue. The City’s Bushfire Risk Management Plan (BRMP) is currently under review. The BRMP is a strategic document that identifies assets at risk from bushfire and their priority for treatment, therefore such actions are not detailed in this Plan. However any bushfire mitigation on coastal reserves must consider environmental values (including reference to this Plan) and ensure a balance of protection of people and property and impacts to the ecological viability of the coastal reserves.

3.4 Conservation of flora and fauna

Urban expansion on the Swan Coastal Plain and associated clearing of vegetation has led to significant habitat fragmentation and degradation of native flora and fauna. As a consequence of this loss, remaining intact habitat on the Swan Coastal Plain is regionally significant for conservation. Small habitat remnants are much more susceptible to disturbance from episodic natural or anthropogenic events. In particular, this is likely to be the case for a coastal environment like the foreshore, where the habitat is bordered west and east by uninhabitable marine and urban environments. Maintaining continuity in this type of habitat corridor, including linkages

with larger blocks of remnant habitat in the locality, is particularly important so that ecological assemblage and genetic diversity are maintained over a wider area in the event that smaller areas are degraded or destroyed. This plan aims to provide directions and recommendations for the management of the City’s coastal habitat. In particular, the recommendations are concerned with the protection and enhancement of native flora and fauna populations through the removal of threatening processes. These threatening processes and the corresponding management objectives are discussed in detail in Section 4 of this Plan.

3.4.1 Acacia

A number of Acacia species, commonly known as wattles, occur within the City’s foreshore reserves. *Acacia rostellifera* is the species encountered most frequently, with *Acacia cyclops* and *Acacia saligna* also present, but as individuals rather than stands of trees.

These acacias are a valuable part of the ecosystem as they minimise erosion impacts by stabilising the dunes while also providing foraging and breeding habitat for native fauna, particularly small birds. These strands of acacia form small stepping stones of habitat which enables the movement of native bird species along the coastline, offering protected areas for birds to forage and nest, which other low lying coastal species do not allow. This is particularly important to provide protection from predators in a relatively exposed environment and to maintain the connectivity of fauna populations along the coast.

However, while these species are indigenous to the region and provide many benefits, the City recognises that acacia (particularly *A.rostellifera*), has a tendency to become locally dominant, outcompete other species and form large strands of vegetation. This may be undesirable and reduce the visual amenity in some areas, particularly as acacias only live for 15-20 years resulting in areas of dead wood within the foreshore.

The extent of acacia along the City’s coastline was mapped in 2015 and results were compared in the 2021 survey. The extent of *A. rostellifera* decreased in Sectors 1, 2 and 4 and increased in Sectors 3 and 5. The use of *A. rostellifera* in revegetation is no longer recommended.

3.5 Wrack

The City’s coastal waters support a range of marine habitat types, including regionally significant seagrass meadows which primarily consist of *Posidonia spp*, *Amphibolis spp* and *Halophila ovalis*, which are a vital component of the marine food web and provide essential habitat for many coastal species. This seagrass, along with other aquatic vegetation, deposits on the beach and forms banks known as wrack, particularly in protected areas such as Palm Beach and Safety Bay. As wrack breaks down it can smell unpleasant but it is this decomposition process which releases nutrients such as carbon and nitrogen back into the ecosystem, which are important for coastal productivity. While it can be undesirable, the removal of wrack is not permitted under Western Australia’s Conservation and Land Management Act 1984 and therefore is not undertaken by the City.

3.6 Future development

The Department of Planning, Lands and Heritage have developed the WA Coastal Zone Strategy (2021), which provides a framework for coastal planning and management within Western Australia. The strategy compliments the State Planning Policy No. 2.6 State Coastal Planning Policy which guides development and land-use in the coastal zone.

Future development on or near the coast in the City must now also consider the CHRMAP, including consideration of future erosion and inundation due to sea level rise.

4

Threatening Processes

4 Threatening processes

A key objective of this Plan is to protect and enhance conservation values through the removal of threatening processes. The processes that threaten biodiversity conservation can vary according to the unique biophysical characteristics of the region. As such, the actions identified in this section of the Plan are specifically targeted to coastal environments and will be progressively implemented to address the following threatening processes.

4.1 Coastal development

The majority of the Foreshore area is reserved under the Metropolitan Region Scheme for Parks and Recreation. Typically only development commensurate with the intent of the zoning (conservation and recreation) will be considered. Applications for planning approval will be determined by the Western Australian Planning Commission (WAPC) on advice of the City of Rockingham. Any proposed development in this area will need to address the future impact of the development on coastal values.

4.2 Coastal hazards

The two main coastal processes that are considered hazards are erosion and inundation. The CHRMAP identifies areas that could potentially be impacted by these hazards over the next 100 years, and provides options for adaptation. As such this information is not included in this Plan given the timescales of impacts to the coast and the objectives of this Plan which focus on improving the environmental value of the coastline over shorter timescales (i.e. five years).

4.3 Weeds

Invasive species represent the biggest threat to biodiversity after habitat loss. Weeds are plants that grow where they are not wanted and where they may have an environmental or economic impact. Weeds can impact on natural values by:

- out-competing native species for nutrients, water space and sunlight
- reducing the natural diversity by smothering native plants or preventing them from growing back
- reducing habitat for native animals
- altering fire regimes.

Dynamic and sensitive environments such as the foreshore should utilise an integrated approach to weed management, which involves a combination of mechanical and chemical systems coupled with revegetation to increase ecosystem resilience and long term viability.

4.4 Feral animals

There are a number of introduced fauna species that are likely to occur within the foreshore and these animals can have potential impacts on native species including:

- predation on native fauna species and grazing of native plants
- competition with native fauna for food and shelter
- destroying habitat
- spreading diseases
- land degradation including dune erosion and destruction of vegetation.

Introduced fauna species that pose a threat in the foreshore reserves include:

- European rabbit (*Oryctolagus cuniculus*): grazes on native vegetation, may impact on revegetation efforts as well as leading to dune erosion.
- European red fox (*Vulpes vulpes*): preys on native fauna species, competes with native fauna for food, habitat and other resources.
- Feral cat (*Felis catus*): preys on native fauna species, competes with native fauna for food, habitat and other resources.
- European bee (*Apis mellifera*): competition with native fauna species for tree habitat.

Rabbits, foxes and feral cats are listed under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* as key threatening process to the conservation of biodiversity in Australia. To manage feral animal populations the City engages a suitably trained and licenced contractor, who utilises methods in accordance with the relevant state government regulations and animal ethics requirements.



4.5 Inappropriate access

Inappropriate access such as the use of undefined tracks through the dunes can result in habitat loss through the trampling of vegetation. Trampling can damage vegetation, change plant composition, reduce plant cover and may result in the spread of weeds. This loss of vegetation can also lead to dune erosion which is exacerbated by unauthorised access of 4WDs and motorbikes.

The City of Rockingham Beach Access Path Plan (2023) provides a framework for the rationalisation of the existing path network to identify where paths may be closed and rehabilitated, where paths require maintenance and/or upgrades and where new paths may be required.

Figure 10 – Inappropriate access and erosion management Penguin Island, from early 1970s [left] to 2015 [right] (historical photo courtesy of the Wachmer family)



4.6 Vandalism and rubbish dumping

Vandalism can include destruction of property and facilities as well as damage to native vegetation, through tree poisoning, campfires and illegal clearing. Dumping of large amounts of rubbish in most of the foreshore reserves is uncommon as access is generally well regulated and the reserves are well used. However, rubbish dumping is an issue in some of the more isolated foreshore areas including parts of Sector 3, 4 and 5. Dumping of rubbish can spread weeds and diseases, can reduce the visual amenity of the reserves and can constitute a fire hazard. Littering is also a common problem along the foreshore, particularly those areas of high visitation, such as Sectors 1 and 2.

Large scale rubbish dumping and vandalism can be managed through restricting unauthorised access into the foreshore reserve and maximising visual surveillance where possible through environmental design techniques, while littering is best managed through ensuring adequate provision of rubbish bins, litter removal and education.

5

Sector One

Rockingham



5 Sector One – Rockingham

5.1 Environmental attributes

5.1.1 Vegetation condition

Figure 11 – Map Legend

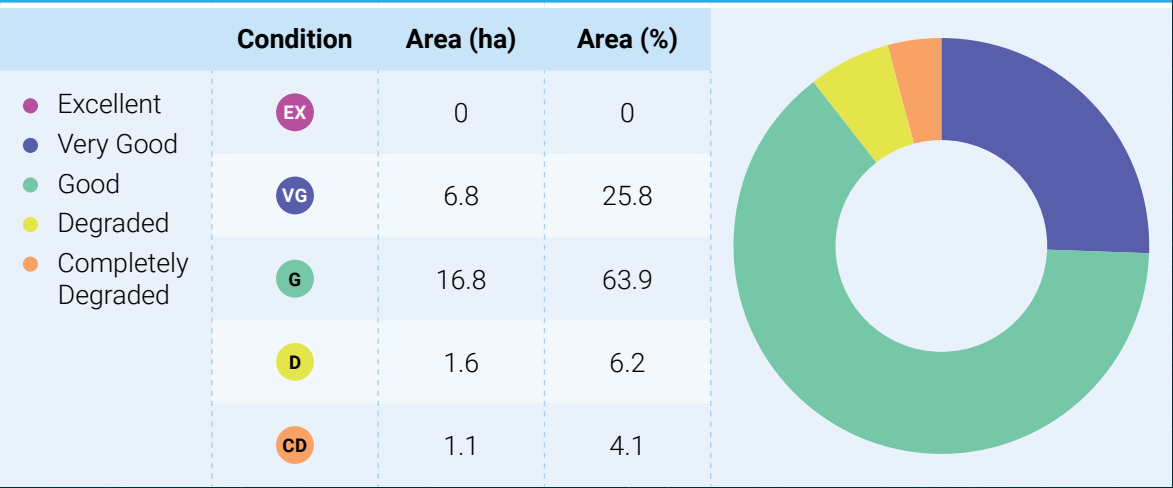


Figure 12 – Map Legend



Acacia rostellifera
Shrubland



Acanthocarpus preissii
Open Heath



Tetragonia decumbens
Herbland



Scaevola crassifolia
Mixed Shrubland



Lepidosperma gladiatum
Sedgeland

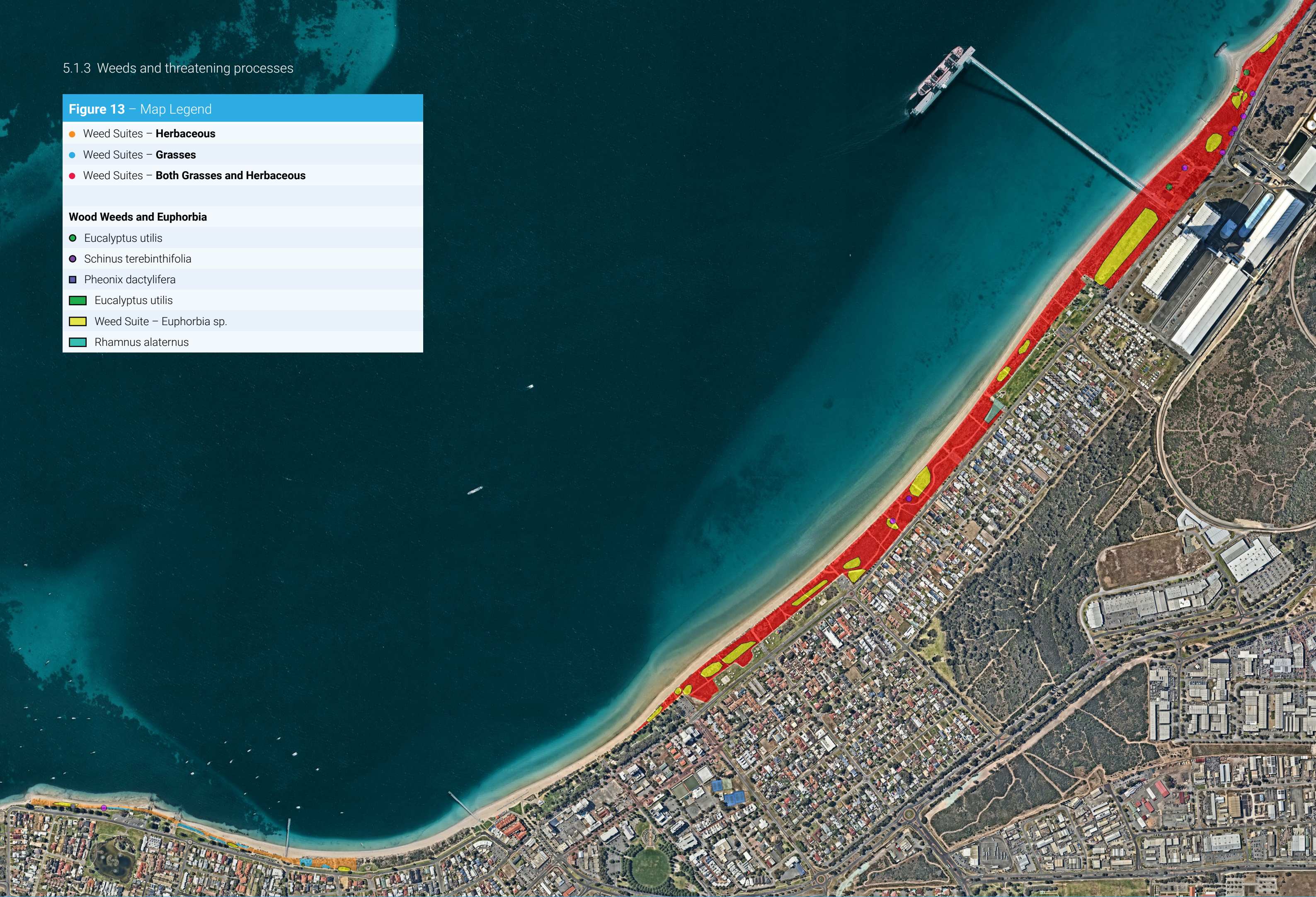
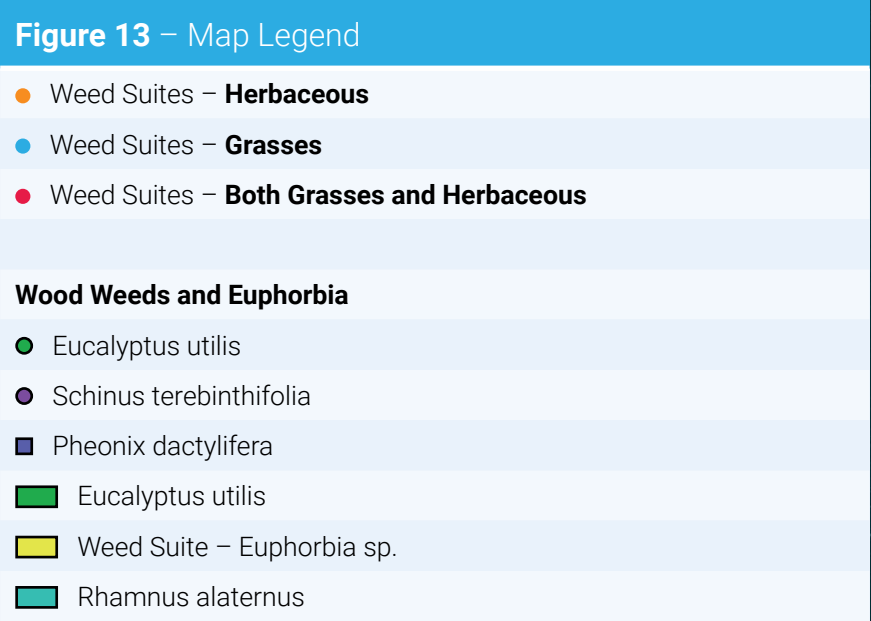


Spinifex
Grassland



Tetragonia decumbens
and *Cenchrus cladestinus*
Herbland

- *Acacia rostellifera* **Shrubland**
- *Scaevola crassifolia* **Mixed Shrubland**
- *Acanthocarpus preissii* **Open Heath**
- *Lepidosperma gladiatum* **Sedgeland**
- *Tetragonia decumbens* **Herbland**
- *Spinifex* **Grassland**
- *Tetragonia decumbens* and *Cenchrus cladestinus* **Herbland**



5.1.4 Native fauna

There were 12 native bird, one native mammal and ten native reptile species recorded within Sector 1. This included the Quenda (*Isoodon fusciventer*) (Priority 4) and Perth slider (*Lerista lineata*) (Priority 3). One third of the female quenda identified from trapping were carrying pouch young. All Quenda were in good health. A full list of species recorded during the field survey is provided in Appendix C.

5.1.5 Introduced fauna

The European rabbit (*Oryctolagus cuniculus*) and house mouse (*Mus musculus*) were captured on motion cameras and via trapping. The impact of feral animals on the flora and fauna in this sector should continue to be monitored and control undertaken accordingly.

5.1.6 Reserve infrastructure

Infrastructure and amenities within Sector 1 included:

Table 6 - Signage		
Signage Type	Number Overall	Poor Condition
Beach	5	5
General	61	7

Table 7 – Amenities and other infrastructure		
Amenity	Number Overall	Poor Condition
Bench seat	1	0
Bins	12	1
Horse shower	1	0
Shower	3	0
Shower and water fountain	3	0

A total of three sections where the fence was either broken or in poor condition.

5.2 Volunteer snapshot – Friends of Point Peron

The Friends of Point Peron was founded in 2006 in response to concerns around rubbish and weeds on the Cape. Families adopted and maintained patches of bushland pulling out weeds, removing rubbish and planting seedlings. Since 2017 and with the support of the Parks and Wildlife branch of the Department of Biodiversity, Conservation and Attractions over 400 volunteers have taken part in cleaning up rubbish removing weeds and planting over 12,000 seedlings.

5.3 Management actions

Table 8 – Summary of Management Actions for Sector 1		
Major Threats/Issues	Management action	Priority
Introduced fauna	Regular control for European rabbits	Medium
Revegetation	Incorporate Tuart trees in revegetation activities in the Tuart Open Woodland	Medium
Weeds	Treatment and removal of woody weeds	High
	Treatment and removal of introduced grasses and herbaceous weeds	High



6

Sector Two

Shoalwater, Safety Bay, and Waikiki



6 Sector Two – Shoalwater, Safety Bay, Waikiki

6.1 Environmental attributes

6.1.1 Vegetation condition

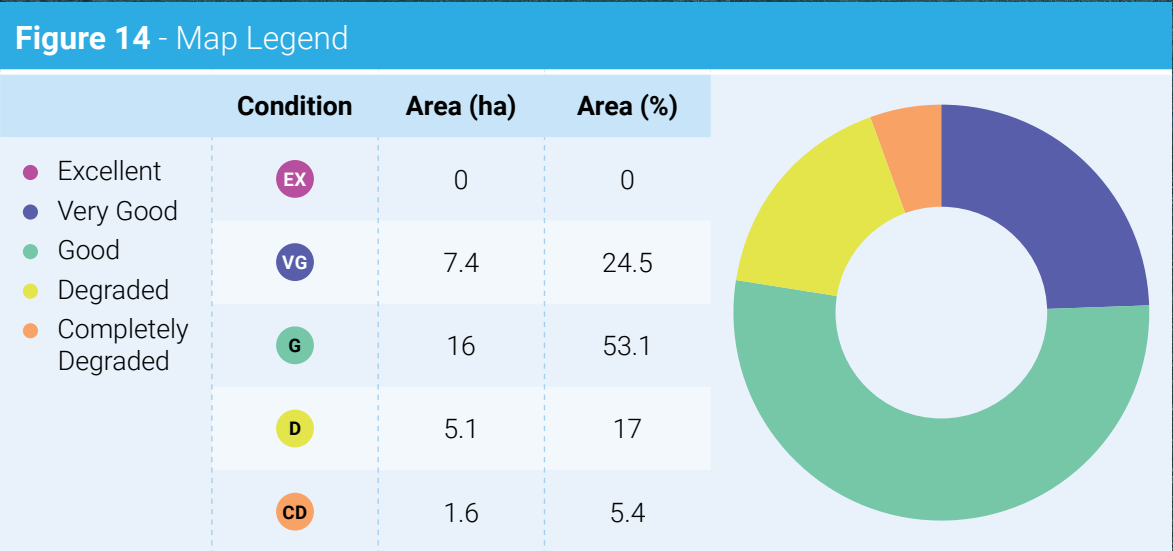











Figure 15 - Map Legend

- | | |
|--|---|
|  <i>Acacia rostellifera</i> Shrubland |  <i>Olearia axillaris</i> Shrubland |
|  <i>Scaevola crassifolia</i> Mixed Shrubland |  <i>Nitraria billardierei</i> Shrubland |
|  <i>Acanthocarpus preissii</i> Open Heath |  <i>Spinifex</i> Grassland |
|  <i>Lepidosperma gladiatum</i> Sedgeland |  Tall Shrubland |
|  <i>Ficinia nodosa</i> Sedgeland | |



Acacia rostellifera
Shrubland



Acanthocarpus preissii
Open Heath



Scaevola crassifolia
Mixed Shrubland



Lepidosperma gladiatum
Sedgeland



Ficinia nodosa
Sedgeland



Olearia axillaris
Shrubland



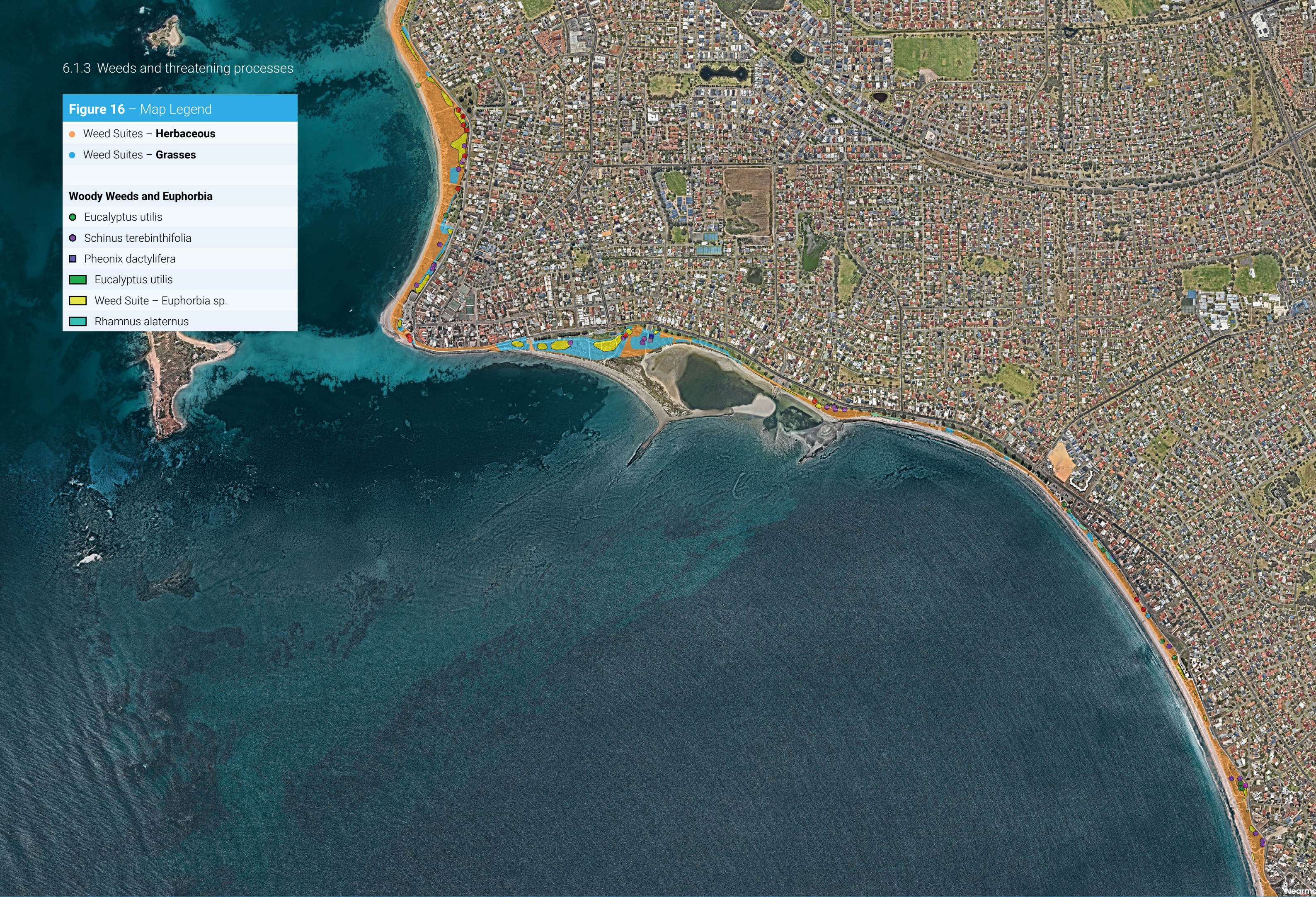
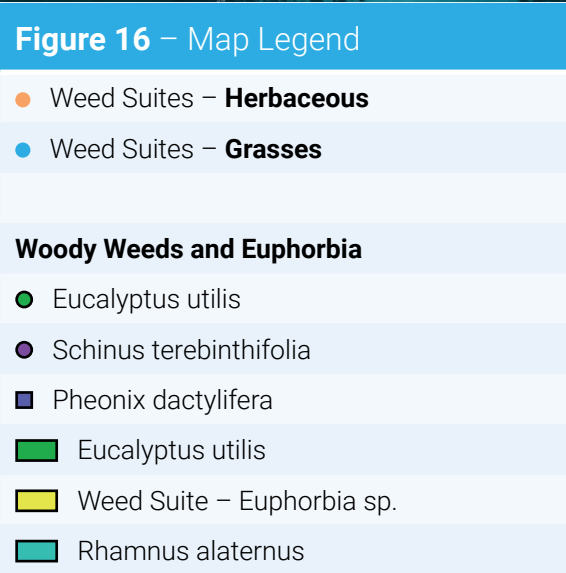
Nitraria billardierei
Shrubland



Tall Shrubland



Spinifex
Grassland



6.1.4 Native fauna

A total of 24 native fauna were recorded in Sector 2 including 11 native birds, one mammal and 12 reptile species. This included the Quenda (*Isoodon fusciventer*) (Priority 4) and Perth slider (*Lerista lineata*) (Priority 3). One female quenda was carrying pouch young and all were in good health. A full list of species recorded during the field survey is provided in Appendix C.

6.1.5 Introduced fauna

House mice (*Mus musculus*), a black rat (*Rattus rattus*) and a domestic cat were all recorded in Sector 2. Studies have found that domestic cats kill an estimated 230 million native Australian birds, reptiles and mammals each year in Australia (Legge, et al. 2020). Keeping domestic cats contained 24 hours a day is the only way to ensure they don't injure or kill wildlife. The impact of feral animals on the flora and fauna in this sector should continue to be monitored and control undertaken accordingly.

6.1.6 Reserve infrastructure

Infrastructure and amenities within Sector 2 included:

Table 9 - Signage		
Signage Type	Number Overall	Poor Condition
Beach	2	2
General	77	7

Table 10 – Amenities and other infrastructure		
Amenity	Number Overall	Poor Condition
Bench seat	13	0
Bike rack	1	0
Bins	21	1
Beach access ramps	2	0
Seawall	1	0
Set of stairs	8	0
Shower	4	0
Shower and water fountain	1	0
Toy library	1	0
Gate	1	1

- three sand paths showing signs of erosion
- two areas of broken fence and
- one track overgrown by vegetation.

6.2 Penguins

The City of Rockingham (City) has contributed funding towards population estimate studies of the Little Penguin (*Eudyptula minor*) colony between 2012 and 2023. In addition to providing ongoing estimates of population size, the research has allowed for a better understanding of the health, ecology and resilience of the colony.

The findings of the last population study, completed in 2023, showed an estimated decline of 94% of the overall population size since the initial baseline study was first undertaken in 2007. The rate of population decline also appears to be increasing as the estimated population had reduced by approximately 50% between 2007 and 2017, and reduced by a further 80% between 2017 and 2023.

Research suggests that the decline can be attributed to a range of anthropogenic (human led) and natural influences including:

- increased temperatures
- watercraft injury
- habitat disturbance

The Department of Biodiversity, Conservation and Attractions (DBCA) is responsible for the management of Penguin Island and the broader Shoalwater Islands Marine Park, and by extension, the resident colony of Little Penguins. DBCA is also responsible for the implementation of the Shoalwater Island Marine Park Management Plan 2007-2017 and the Shoalwater Island Nature Reserves Management Plan. The City continues to advocate for the Little Penguins as part of the Little Penguin Working Group.

Visitors to Penguin Island are reminded to keep to the designated pathways and that the island will be closed on days when the temperature exceeds 35 degrees. Boat users are reminded to watch out for penguins and to adhere to speed limits.



6.3 Management actions

Table 11 – Summary of Management Actions for Sector 2		
Major Threats/Issues	Management Action	Priority
Revegetation	Revegetation of priority areas as identified in Section 10.1	High
Weeds	Treatment and removal of woody weeds	High
	Treatment and removal of introduced grasses and herbaceous weeds	High

7 Sector Three

Warnbro, Port Kennedy



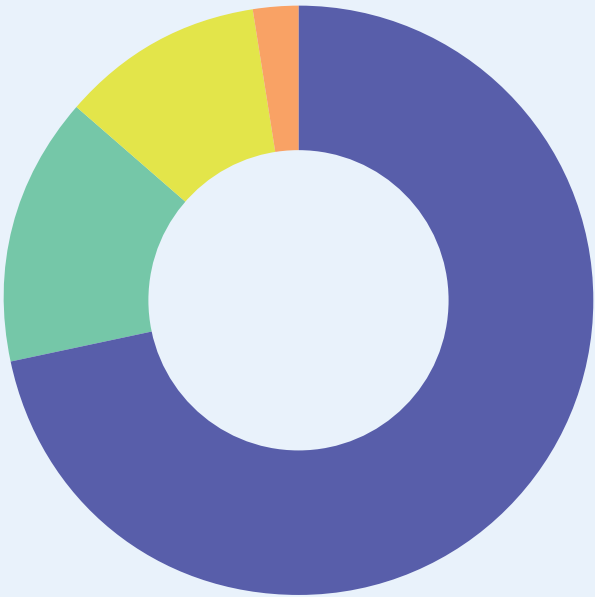
7 Sector Three – Warnbro, Port Kennedy

7.1 Environmental attributes

7.1.1 Vegetation condition

Figure 17 - Map Legend

	Condition	Area (ha)	Area (%)
Excellent	EX	0	0
Very Good	VG	35.5	71.9
Good	G	7.36	14.7
Degraded	D	5.5	11.1
Completely Degraded	CD	1.1	2.3



7.1.2 Vegetation type

Figure 18 - Map Legend

- Acacia rostellifera Shrubland
- Scaevola crassifolia Mixed Shrubland
- Acanthocarpus preissii Open Heath
- Lepidosperma gladiatum Sedgeland
- Lomandra maritima
- Spinifex Grassland
- Tall Shrubland
- Callitris presissii



Acacia rostellifera Shrubland



Acanthocarpus preissii Open Heath



Scaevola crassifolia Mixed Shrubland



Lepidosperma gladiatum Sedgeland

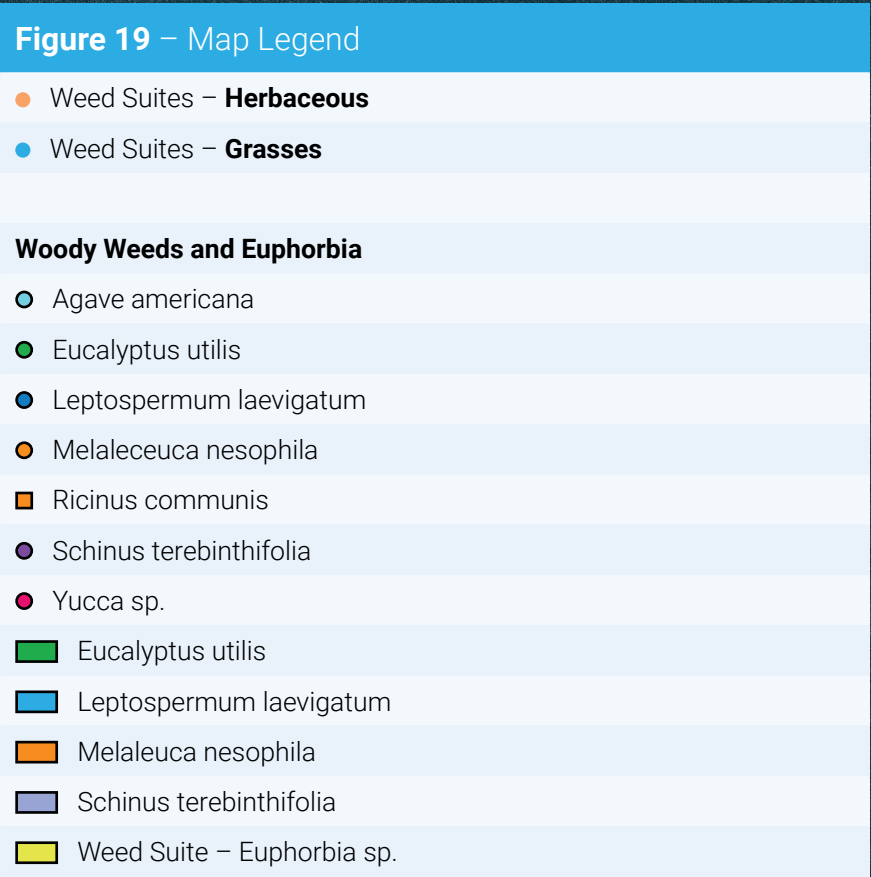


Spinifex Grassland



Tall Shrubland

7.1.3 Weeds and threatening processes



7.1.4 Native fauna

A total of 28 native fauna species were recorded in Sector 3 including two amphibians, 13 native birds, two mammals and 11 reptile species. This included the Quenda (*Isodon fusciventer*) (Priority 4) and Perth slider (*Lerista lineata*) (Priority 3). One female quenda was captured with two joeys out of the pouch. All quenda were in good health. A full list of species recorded during the field survey is provided in Appendix C.

7.1.5 Introduced fauna

Numerous introduced fauna were recorded in Sector 3 including house mice (*Mus musculus*), a Black Rat (*Rattus rattus*), Foxes (*Vulpes vulpes*) and a rabbit (*Oryctolagus cuniculus*). The impact of feral animals on the flora and fauna in this sector should continue to be monitored and control undertaken accordingly.

7.1.6 Reserve infrastructure

Infrastructure and amenities within Sector 3 included:

Table 12 - Signage		
Signage Type	Number Overall	Poor Condition
Beach	3	2
General	72	17
Old posts (no signs present)	5	5

Table 13 – Amenities and other infrastructure		
Amenity	Number Overall	Poor Condition
Bike rack	4	0
Bins	13	2
Memorial	1	0
Shower	1	0
Shower and water fountain	3	0

- five sections of fence broken and require repair
- two areas where the path is eroding
- two locations where the track is over grown with vegetation.

7.2 Volunteer snapshot – Kennedy Bay Coastcare

Kennedy Bay Coastcare is a community group that is rehabilitating a small coastal strip on the north of Long Point in Port Kennedy. For the past six years, the group has systematically removed invasive weed species and planted almost 20,000 appropriate dune plants.

In 2020, the group undertook a second terrestrial macroinvertebrate survey of the dune system with help from terrestrial macroinvertebrate expert David Knowles (of Spineless Wonders). With help from Perth NRM and the community, the group collected over 400 specimens. Of these, 100 were unique specimens from five classes, 14 orders and 51 families.

7.3 Management actions

Table 14 – Summary of Management Actions for Sector 3		
Major Threats/Issues	Management Action	Priority
Introduced fauna	Feral animal control for red fox and European rabbit	High
Revegetation	Revegetation of priority areas as identified in Section 10.1	High
Weeds	Treatment and removal of woody weeds	High



8 Sector Four
Secret Harbour

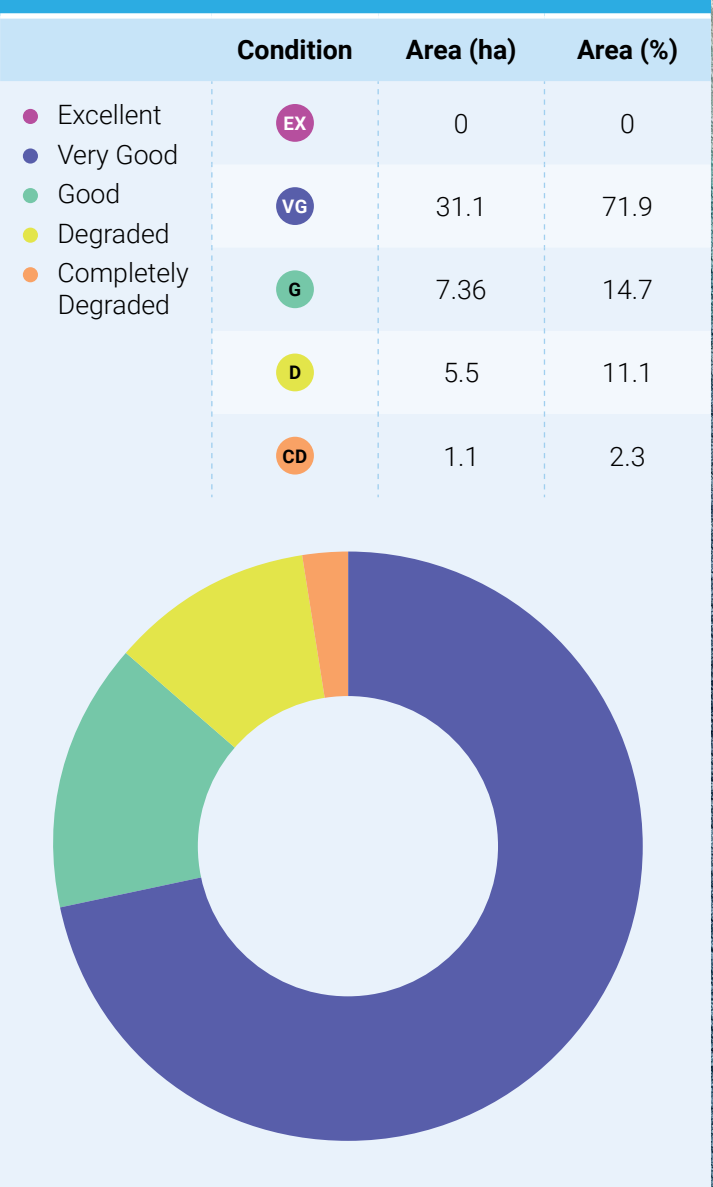


8 Sector Four – Secret Harbour

8.1 Environmental attributes

8.1.1 Vegetation condition

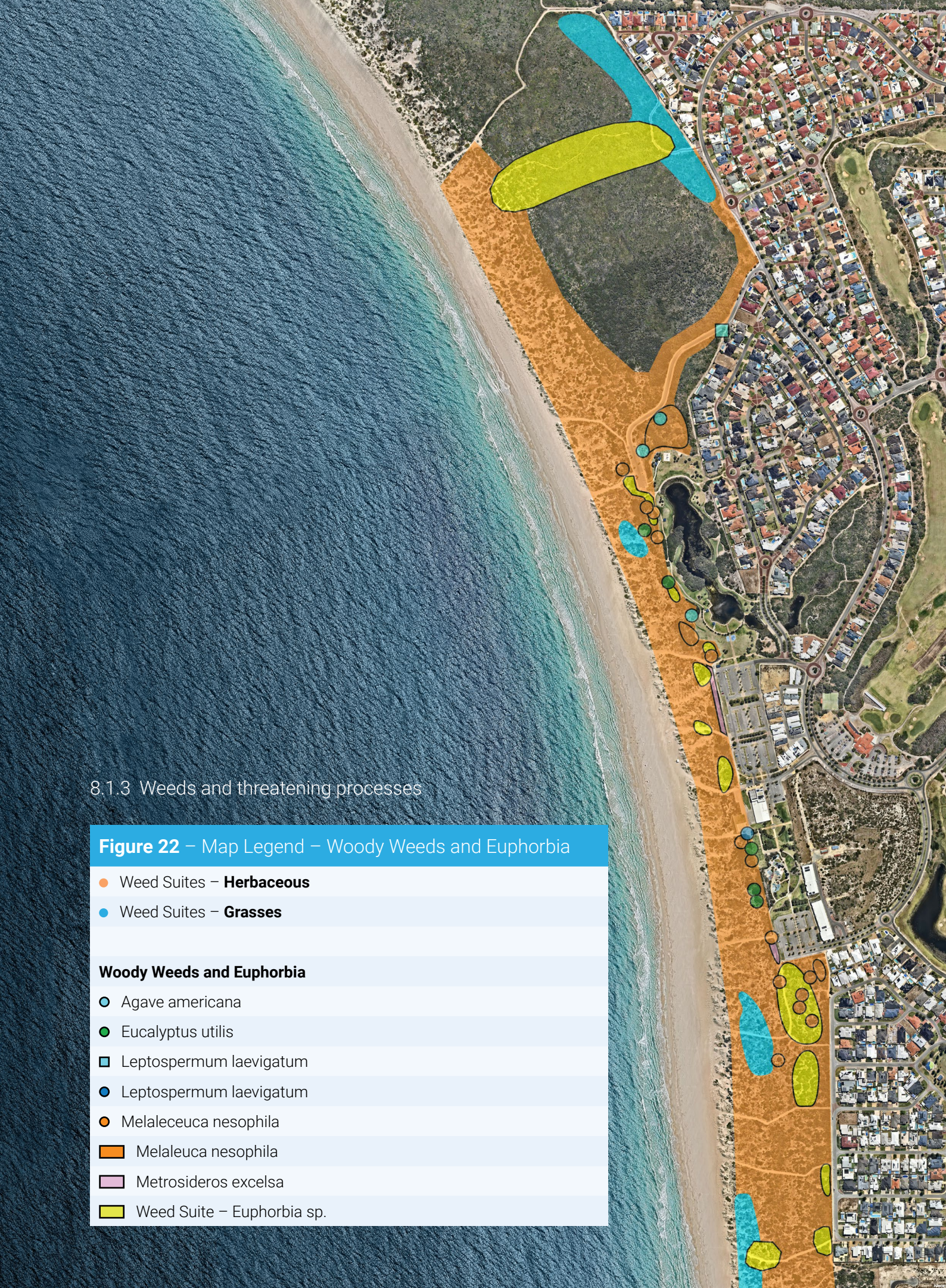
Figure 20 - Map Legend



8.1.2 Vegetation type

Figure 21 - Map Legend





8.1.3 Weeds and threatening processes

Figure 22 – Map Legend – Woody Weeds and Euphorbia

- Weed Suites – **Herbaceous**
- Weed Suites – **Grasses**

Woody Weeds and Euphorbia

- Agave americana
- Eucalyptus utilis
- Leptospermum laevigatum
- Leptospermum laevigatum
- Melaleuca nesophila
- Melaleuca nesophila
- Metrosideros excelsa
- Weed Suite – Euphorbia sp.

8.1.4 Native fauna

A total of 23 native fauna species were recorded in Sector 4 including one amphibian, eight birds, one mammal and 13 reptile species. This included the Quenda (*Isoodon fusciventer*) (Priority 4) and Perth slider (*Lerista lineata*) (Priority 3). All quenda were in good health. A full list of species recorded during the field survey is provided in Appendix C.

8.1.5 Introduced fauna

House mice (*Mus musculus*) and a domestic cat were all recorded in Sector 4. Studies have found that domestic cats kill an estimated 230 million native Australian birds, reptiles and mammals each year (Legge, et al. 2020). Keeping domestic cats contained 24 hours a day is the only way to ensure they don't injure or kill wildlife. The impact of feral animals on the flora and fauna in this sector should continue to be monitored and control undertaken accordingly.

8.1.6 Reserve infrastructure

Infrastructure and amenities within Sector 4 included:

Table 15 - Signage

Signage Type	Number Overall	Poor Condition
General	13	1

Table 16 – Amenities and other infrastructure

Amenity	Number Overall	Poor Condition
Bench seat	1	0
Boardwalk lookout	1	0
Bins	9	1
Drink fountain	1	0
Shower and water fountain	5	0

- two locations where the fence is broken and needs repair
- one location where the path is overgrown with vegetation.

8.2 Management actions

Table 17 – Summary of Management Actions for Sector 4

Major Threats/Issues	Management Action	Priority
Weeds	Treatment and removal of woody weeds	High

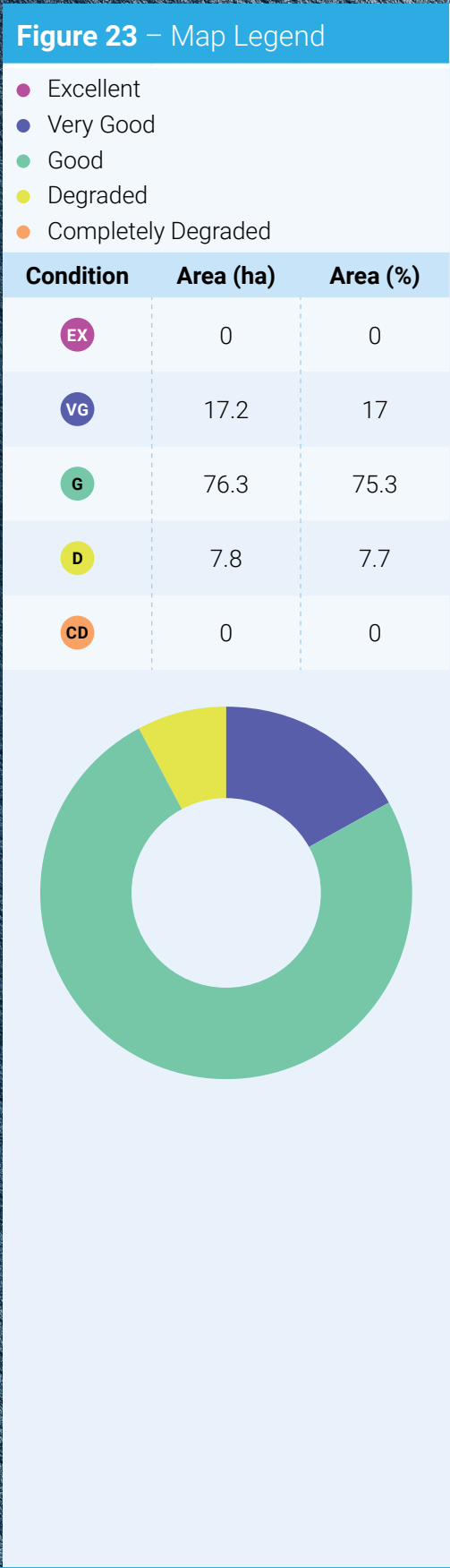
9 Sector Five

Golden Bay, Singleton

9 Sector 5 – Golden Bay, Singleton

9.1 Environmental attributes

9.1.1 Vegetation condition



9.1.2 Vegetation type

Figure 24 – Map Legend

- *Acacia rostellifera* **Shrubland**
- *Scaevola crassifolia* **Mixed Shrubland**
- *Olearia axillaris* **Shrubland**
- *Spinifex* **Grassland**
- **Tall Shrubland**
- **No native vegetation**



Acacia rostellifera
Shrubland



Spinifex
Grassland



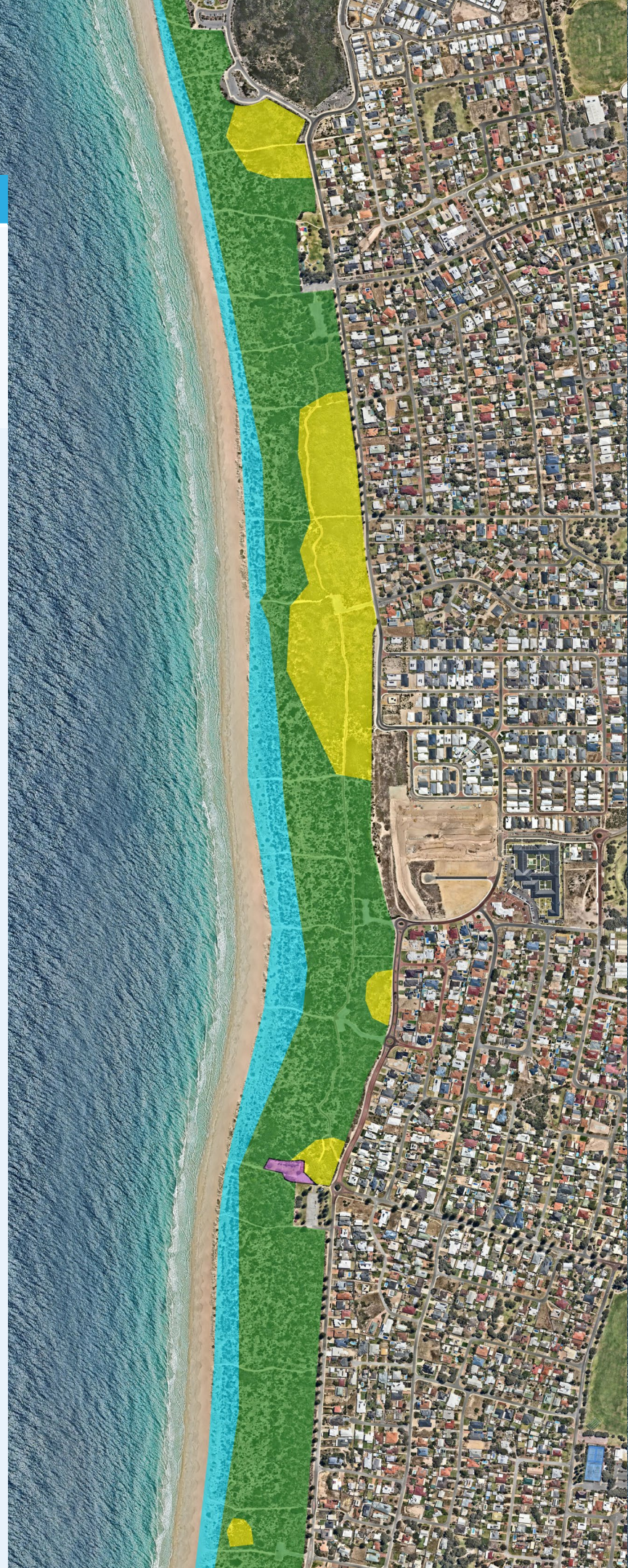
Scaevola crassifolia
Mixed Shrubland



Olearia axillaris
Shrubland



Tall Shrubland



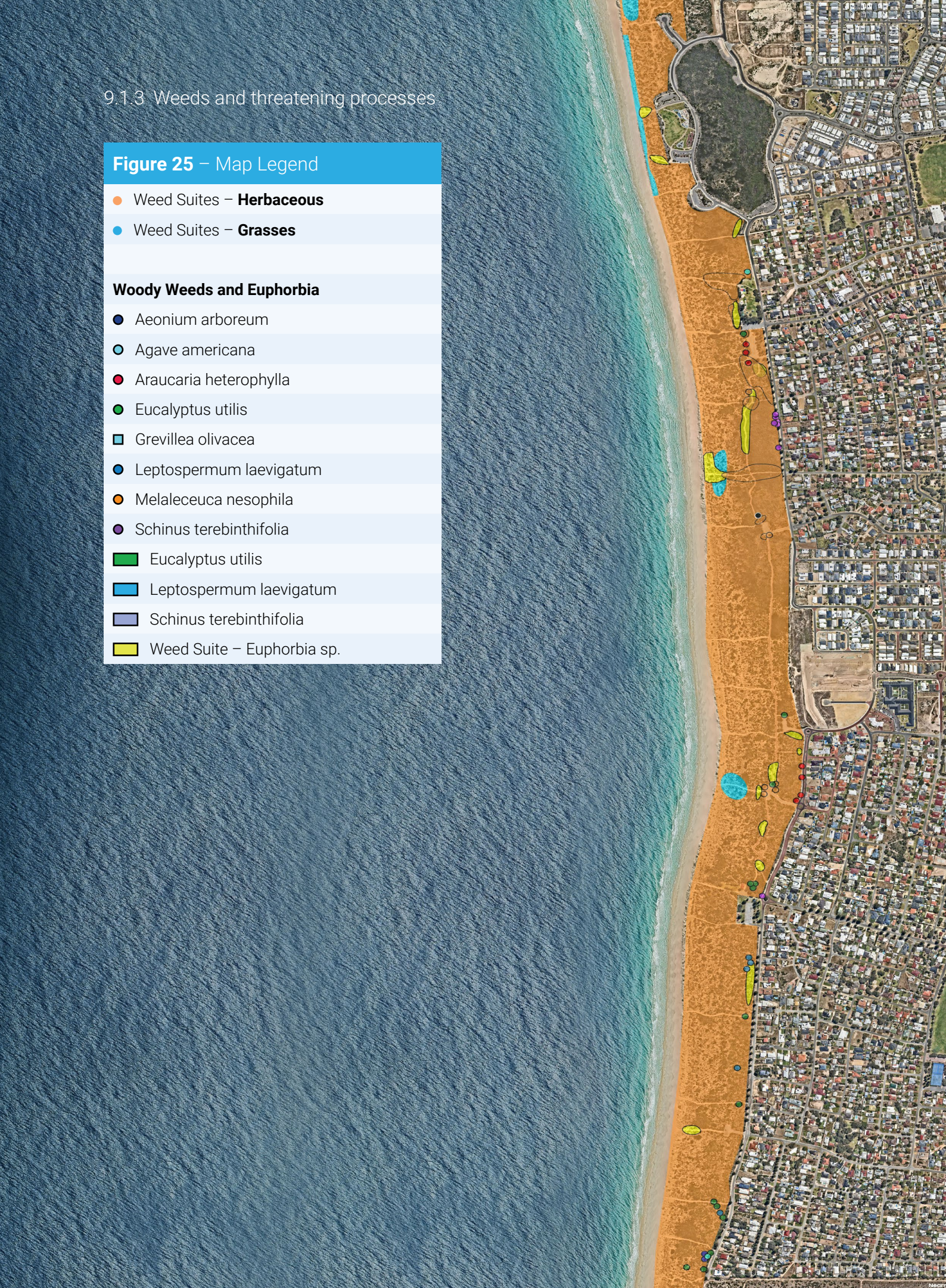
9.1.3 Weeds and threatening processes

Figure 25 – Map Legend

- Weed Suites – **Herbaceous**
- Weed Suites – **Grasses**

Woody Weeds and Euphorbia

- *Aeonium arboreum*
- *Agave americana*
- *Araucaria heterophylla*
- *Eucalyptus utilis*
- *Grevillea olivacea*
- *Leptospermum laevigatum*
- *Melaleuca nesophila*
- *Schinus terebinthifolia*
- *Eucalyptus utilis*
- *Leptospermum laevigatum*
- *Schinus terebinthifolia*
- **Weed Suite – Euphorbia sp.**



9.1.4 Native fauna

One native amphibian, 10 native birds, one native mammal and 13 native reptile species were recorded in Sector 5. This included the Perth Slider (*Lerista lineata*) (Priority 4). A full list of species recorded during the field survey is provided in Appendix C.

9.1.5 Introduced fauna

One house mouse (*Mus musculus*) and one fox (*Vulpes vulpes*) were recorded in the Sector. The impact of feral animals on the flora and fauna in this sector should continue to be monitored and control undertaken accordingly.

9.1.6 Reserve infrastructure

Infrastructure and amenities within Sector 5 included:

Table 18 - Signage		
Signage Type	Number Overall	Poor Condition
General	35	1

Table 19 – Amenities and other infrastructure		
Amenity	Number Overall	Poor Condition
Bench seat	4	0
Wooden lookout	2	0
Bins	18	0
Shower and water fountain	2	0

- one location where the path was nearly covered in sand limiting access
- two locations where the fence was in poor condition and required repair.

9.2 Management actions

Table 20 – Summary of Management Actions for Sector 5		
Major Threats/Issues	Management Action	Priority
Introduced fauna	Feral animal control for red fox and European rabbit	High
Weeds	Treatment and removal of woody weeds	High



10 Recommendations and Implementation

10 Recommendations and Implementation

10.1 Revegetation

No notable areas of revegetation were observed during the study however older revegetation was noted in Sector 1, with plants being well established.

Priority areas for revegetation have been identified within both, Sectors 2 and 3 (Figures 36 to 38), these areas have been identified due to minimal native vegetation within these areas. Instead they contained high weed presence and signs of human disturbances.

Additional areas for revegetation shall be identified in the future when weed control activities are implemented.

It is recommended that revegetation activities use the following strategies to increase success:

- Select revegetation species that are suitable to the local area.
- Seed and tubestock used for revegetation are locally sourced and tubestock are established and hardened off before planting.
- Acacia's should be used sparingly as they can take over creating monocultures.
- Revegetation should be undertaken in conjunction with weed control activities to ensure success of planting works. Erosion control should be taken into account in areas where weeds are dominant and are providing dune stability, revegetation should be completed in stages.
- Follow up maintenance should be undertaken to control weeds and remove tree guards once plants are successfully established.
- Revegetation may need to be undertaken with other erosion control methods such as jute matting and sand trap fencing to increase success of plantings in steeper dune areas.

Table 21 – Appropriate Species for Revegetation in Coastal Environments			
Scientific Name	Common Name	Form	Notes
<i>Acacia lasiocarpa</i>	Panjang	Shrub	
<i>Acanthocarpus preissii</i>	Prickle Lily	Herb	
<i>Atriplex cinerea</i>	Grey Saltbush	Shrub	
<i>Callitris preissii</i>	Rottnest Island Pine		Utilise in areas this regionally significant species where it naturally occurs - all sectors.
<i>Carpobrotus virescens</i>	Coastal Pigface	Herb	
<i>Clematis linearifolia</i>	Old Man's Beard	Vine	
<i>Conostylis candicans</i>	Grey Cottonhead	Shrub	
<i>Diplolaena dampieri</i>	Southern Diplolaena	Shrub	Utilise in areas this regionally significant species where it naturally occurs - Sectors 1 and 3.
<i>Eucalyptus gomphocephala</i>	Tuart	Tree	Utilise in the Tuart Woodland in Sector 1.

Table 22 – Continued			
Scientific Name	Common Name	Form	Notes
<i>Ficinia nodosa</i>	Knotted Club Rush	Sedge	
<i>Frankenia pauciflora</i>	Sea Heath	Shrub	
<i>Hardenbergia comptoniana</i>	Native wisteria	Herb	
<i>Hemiandra pungens</i>	Snakebush	Shrub	
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge	Sedge	
<i>Leucophyta brownii</i>	Cushion Bush	Shrub	
<i>Lomandra maritima</i>		Herb	These can be planted in clumps to provide habitat for the P4 Graceful Sun Moth.
<i>Myoporum insulare</i>	Blueberry Tree	Shrub	
<i>Nitraria billardiarei</i>	Nitre Bush	Shrub	
<i>Olearia axillaris</i>	Coastal Daisybush	Shrub	
<i>Rhagodia baccata</i>	Berry Saltbush	Herb	
<i>Scaevola crassifolia</i>	Thick-leaved FanFlower	Shrub	
<i>Scaevola nitida</i>	Shining Fan Flower	Shrub	
<i>Spinifex hirsutus</i>	Hairy Spinifex	Grass	
<i>Spinifex longifolius</i>	Beach Spinifex	Grass	
<i>Sporobolus virginicus</i>	Marine Couch	Grass	
<i>Spyridium globulosum</i>	Basket Bush	Shrub	
<i>Templetonia retusa</i>	Cockies Tongues	Shrub	
<i>Threlkeldia diffusa</i>	Coast Bone Fruit	Herb	



10.1.1 Priority Revegetation Areas

Figure 26 – Map Legend

● Priority Revegetation Areas

Figure 27 – Map Legend

● Priority Revegetation Areas



10.2 Weeds

Given the increase in coverage of woody weed species the treatment and removal of these from all sectors should be prioritised. As well as the treatment of introduced grasses and herbaceous weeds within Sectors 1 and 2. Weed control should be undertaken by suitably licenced, trained and qualified personnel through a combination of mechanical and chemical treatment methods.

As outlined in Table 24

Table 23 – Weed Treatment by Suite				
Treatment Number	Treatment Type	Suite	Targeted Species	Application Method and Comments
1	Non-selective (Glyphosate/ Glyphosate Biactive)	Herbaceous suite	Broadleaf weeds	Spot spray target species.
2	Grass selective herbicide (e.g. Fluazifop)	Selective grass spray areas	Annual and perennial grasses	Spot spray - selective grass spray (will affect native grass species).
3	Woody weeds (Triclopyr, Picloram, or Glyphosate)	Woody weeds	Woody weeds and trees	Cut and paint, basal bark or drill and fill. (Method is species dependant as some are prone to suckering e.g. <i>Schinus terebinthifolia</i>)
4	Manual removal/ hand weeding	Euphorbia suite/hand weeding areas	Carnation weeds (<i>Euphorbia</i> sp.), Fleabane (<i>Erigeron</i> sp.) and other similar species including woody weed seedlings when small	Gloves required due to caustic sap of Carnation weeds. Manual removal can also include slashing.

It is recommended that treatment works focus on the control of the 18 ‘high’ environmental impact species as identified in the Weed Prioritisation Process for the Swan Coastal Plain Region (Department of Biodiversity Conservation and Attractions, 2016). Suggested treatment methods and optimal timing of herbicide application is outlined in Table 25.

Table 24 – Treatment Recommendations for High and Medium Priority Weeds			
Scientific Name	Common Name	Treatment No.	Optimal Timing
High Priority			
<i>Ammophila arenaria</i>	Marram Grass	1	Sept-Nov
<i>Avena barbata</i>	Bearded Oat	2	June-Oct
<i>Bromus diandrus</i>	Great Brome	2	June-Aug
<i>Centranthus macrosiphon</i>	Pretty Betsy	1	July-Sept
<i>Cynodon dactylon</i>	Couch	2	Nov-Feb
<i>Ehrharta calycina</i>	Perennial Velt Grass	2	Nov-Feb
<i>Euphorbia terracina</i>	Geraldton Carnation Weed	4	June–Aug
<i>Ficus carica</i>	Common Fig	3	Dec-Feb
<i>Gazania linearis</i>	Gazania	1 or 4	Unspecified
<i>Lagurus ovatus</i>	Hare’s Tail Grass	2	June-Aug
<i>Leptospermum laevigatum</i>	Coast Tea Tree	3	July-Oct
<i>Lolium rigidum</i>	Wimmera Ryegrass	2	June-Oct
<i>Olea europaea</i>	Olive	3	Oct-May
<i>Pelargonium capitatum</i>	Rose Pelargonium	1 and/or 4	June–Oct
<i>Rhamnus alaternus</i>	Buckthorn	3	Mar-Nov
<i>Schinus terebinthifolia</i>	Brazilian peppertree	3	Unspecified
<i>Stenotaphrum secundatum</i>	Buffalo Grass	1 or 2	Nov-May
<i>Tetragonia decumbens</i>	Sea Spinach	1	Unspecified
Medium Priority			
<i>Agave americana</i>	Century Plant	3	Nov-Jan
<i>Ricinus communis</i>	Castor Oil Plant	1 or 3	Sept-Dec
<i>Trachyandra divaricata</i>	Dune Onion Weed	1	June-Aug

10.3 Implementation

Table 25 – Implementation				
2016 Actions	Status	New Actions	Priority	Cost
Objective: To maintain and improve the condition of vegetation within the foreshore reserve.				
Revegetation				
Undertake revegetation, focusing on areas of degraded vegetation condition (21.74 ha).	Ongoing	Undertake revegetation, focusing on priority areas in Sectors 2 and 3 (approx. 2.15 ha).	High	\$84,000
Undertake revegetation activities following disturbance events such as fire, erosion or extensive weed control to stabilise dunes.	Ongoing	Undertake revegetation activities following disturbance events such as fire, erosion or extensive weed control to stabilise dunes.	High	Costs will vary depending on frequency and scale of disturbance.
Ensure species used in revegetation are indigenous and consistent with existing vegetation types.	Ongoing	Revegetation to be undertaken as per recommendations outlined in Section 10.1 of this Plan.	High	N/A
Map of areas of revegetation undertaken within the foreshore reserve and upload data to the City's Intramaps system.	Not yet commenced	Map areas of revegetation undertake within the foreshore reserve and upload data to the City's Intramaps system.	Medium	N/A

Objective: To maintain and protect existing populations of native fauna and aim to improve species abundance and diversity.				
Native Fauna Management				
Undertake detailed fauna surveys to determine baseline species richness and evenness data within selected foreshore areas, particularly Sectors 3, 4 and 5.	Detailed fauna survey undertaken in 2021 across all 5 Sectors. Southern Brown Bandicoot and Lined Skink were both found in abundance across all sectors including Sectors 1 and 2 which were previously thought to not contain sufficient habitat.	Undertake detailed fauna surveys across all sectors every five years to provide an indication of population abundance and inform ongoing management actions.	High	\$70,000
Repeat detailed fauna surveys using the same methodology after five years and analyse changes.		Investigate opportunities to involve the community in recording bird sightings through citizen science programs.	Low	N/A
Undertake biannual population monitoring of a priority target species, such as the Southern Brown Bandicoot (Isoodon obesulus fusciventer) and/or Lined Skink (Lerista lineata), within the foreshore reserve to provide an indication of population abundance and viability over time.		Ensure fencing and infrastructure does not impede fauna movement. Educate community on the impacts of rubbish dumping on native fauna.	High Medium	N/A N/A

Objective: Minimise the impacts of invasive flora on native vegetation by reducing the overall extent and density of weed species.

Weeds				
Progressively undertake weed control activities outlined for each Sector in accordance with the detailed weed suite maps. Prioritise areas of Good and Very Good vegetation condition to prevent degradation and promote natural regeneration.	Ongoing	Progressively undertake weed control activities focusing on the 18 high impact species as outlined in Table 5 of this plan.	High	\$550,000
Undertake weed control after disturbance events such as fire and prior to revegetation activities.		Undertake weed control after disturbance events such as fire and prior to revegetation activities.	High	Costs will vary depending on frequency and scale of disturbance.
Support weed management with revegetation and erosion control to stabilise dunes and reduce the potential for reinfestation, particularly in areas of Degraded condition.		Support weed management with revegetation and erosion control to stabilise dunes and reduce the potential for reinfestation, particularly in areas of Degraded condition.	High	Costs are ongoing according to need.
Ensure weed control actions do not negatively impact native flora and fauna.		Ensure weed control actions do not negatively impact native flora and fauna.	High	N/A

Objective: Ensure consistent and active management of feral fauna populations to minimise the impacts on native flora and fauna.

Introduced Fauna				
Ensure feral animal control methods are suitable for use in an urban environment.	Annual feral animal control undertaken throughout the City.	Undertake feral animal control for the Red Fox (focusing on Sectors 3 and 5) and European rabbit (all Sectors) to limit impact on native fauna.	High	\$70,000 per annum
Optimise use of limited resources by undertaking monitoring to prioritise areas of high feral animal activity.		Prioritise areas of known fauna habitat, particularly to support Southern Brown Bandicoot populations.	High	N/A
Prioritise control in areas of Good, Very Good or Excellent vegetation condition to prevent degradation of habitat value.		Educate community on the <i>Cat Act 2011 (WA)</i> .	Medium	N/A
Prioritise areas of known fauna habitat, particularly to support Southern Brown Bandicoot populations in Sectors 3, 4 and 5.		Installation of educational signage alerting the community to effects of unsupervised domestic dogs.	Medium	\$5,000
		Educate the community on the impacts of dumping of pets into bushland and waterways.	Medium	N/A

Objective: Minimise the impact of vandalism and rubbish dumping on the environmental value and visual amenity of the foreshore reserves.

Infrastructure and Amenities

Ensure adequate provision of rubbish bins along the foreshore, particularly around parkland areas, boat ramps and picnic facilities.	Ongoing	Ensure adequate provision of rubbish bins along the foreshore, particularly around parkland areas, boat ramps and picnic facilities.	Medium	Costs are ongoing according to need.
Undertake regular removal of litter to minimise the transfer into the ocean.		Undertake regular rubbish collection within the bushland.	High	N/A
Ensure bins are emptied regularly.		Identify and remove graffiti.	Medium	Costs are ongoing according to need.
Ensure unauthorised access is restricted and aim to increase visual surveillance of foreshore areas where appropriate.	As per Beach Access Path Plan	Repair or replace damaged signage.	High	Costs are ongoing according to need.
Undertake mechanical beach cleaning as required in priority areas.	Ongoing	Regular inspections of fences to identify and repair damage.	Medium	Costs are ongoing according to need.
		Regular inspections of infrastructure and amenities – replace or repair as required.	Medium	Costs are ongoing according to need.

Objective: Encourage community understanding and stewardship of the foreshore environment through engagement and education.

Community Engagement

Offer volunteering opportunities through Conservation Volunteers Australia.	Ongoing	Offer volunteering opportunities through Perth NRM.	Medium	N/A
Use the City Chronicle and the City's Facebook page to communicate environmental activities being undertaken along the foreshore.	Ongoing	Use the City Chronicle and the City's Facebook page to communicate environmental activities being undertaken along the foreshore.	Medium	N/A
Support community involvement in coastal rehabilitation activities through initiatives such as Perth NRM Coastcare and the 'Adopt a Beach' program.	Ongoing	Support community involvement in coastal rehabilitation activities through initiatives such as Perth NRM Coastcare and the 'Adopt a Beach' program.	High	\$20,000 per annum

Objective: Minimise environmental degradation caused by inappropriate and unauthorised access into the foreshore reserves.

Inappropriate access

Reduce fragmentation by consolidating access tracks where appropriate.	City of Rockingham Beach Access Path Plan (2023) provides a framework for the rationalisation of the existing path network to identify where paths may be closed and rehabilitated, where paths require maintenance and/or upgrades and where new paths may be required. No further actions are required under this Plan.
Rehabilitate unauthorised tracks through weed control, revegetation and brushing.	
Ensure all areas of natural vegetation are fenced to restrict unauthorised access.	
Ensure areas of damaged or absent fencing are attended to in a timely manner, with old fencing upgraded to be consistent with surrounding fencing.	
Undertake regular maintenance of designated beach access paths and identify key areas that require upgrading/resurfacing.	

Objective: Ensure timely identification and management of erosion to minimise potential impacts on native vegetation, infrastructure and public safety.

Erosion

Utilise appropriate site specific stabilisation techniques.	The City of Rockingham CHRMAP (2019) and the Sediment Management Plan (in development) provide a framework for the management of coastal hazards including erosion, accretion and inundation. No further actions are required by this Plan.
Progressively implement erosion control for the 39 key erosion areas identified in Sectors 1-4 of this plan.	
Prioritise areas of medium to severe erosion adjoining recreational areas and coastal infrastructure.	
Ensure safety of foreshore users by stabilising and/or restricting access to significantly eroded areas.	

Objective: Provide appropriate interpretive, directional and regulatory signage along the City's foreshore.

Signage				
Initiate detailed design of specific signage content and source readily available materials in collaboration with a sign writer.	Ongoing	Progressively install signage as per the City of Rockingham Signage Strategy 2020.	Medium	\$30,000
Progressively install signage using the indicative signage typology and wayfinding plan outlined in Section 10 as a guide.				
Ensure all signage is resistant to graffiti.				
Prioritise installation in locations of high visitation and public amenity.				

Objective: Upgrade key recreational areas along the coastline to provide a range of sustainable experiences which are compatible with the surrounding environment.

Recreation	
Initiate detailed design and community consultation for Concept Areas 1, 2, 3 and 4 outlined in this plan.	Development and management of key recreational areas undertaken in accordance with: <ul style="list-style-type: none">Safety Bay Shoalwater Foreshore Master Plan Report (2019) andRockingham Beach Foreshore Master Plan (2015). No further actions are required under this Plan.
Construct Concept Areas 1, 2, 3 and 4.	

10.4 Key performance indicators

The evaluation of the following key performance indicators will provide a quantifiable measure of the delivery and efficacy of environmental management practices being undertaken in accordance with this Plan.

Parameter	Assessment Method	Performance Criteria	Frequency
Vegetation condition	10 m x 10 m monitoring quadrats (minimum of two per Sector) vegetation condition should be assessed according to the Keighery scale.	Vegetation condition ≥ baseline condition identified in this Plan.	Annually
	Comprehensive vegetation condition survey for all foreshore reserves according to the Keighery scale.	Vegetation condition ≥ baseline condition identified in this Plan.	As part of the Foreshore Management Plan review after five years.
Revegetation species representation	10 m x 10 m monitoring quadrats (minimum of one per revegetation area).	80-90% of species planted being evident in any area of 100 m² during monitoring compared to baseline data	Annually
Revegetation survival	10 m x 10 m monitoring quadrats (minimum of one per revegetation area).	Minimum 80% seedling survival rate after 12 months.	Annually
Weeds	10 m x 10 m monitoring quadrats (minimum of two per Sector).	Percentage weed coverage should be ≤ baseline data collected from first monitoring round.	Annually
	Comprehensive survey of dominant weed suites and priority weed species consistent with the survey approach demonstrated in this Plan.	Extent of weeds suites and priority weed species ≤ baseline identified in this Plan.	As part of the Foreshore Management Plan review after five years.

The GPS location of all monitoring quadrats should be noted and recorded on the City's Intramaps system, with the same quadrats to be used annually. Photo monitoring points should be established in all quadrats, with photographs to be taken as part of the annual quadrat assessments to visually document changes in vegetation composition over time.

An annual summary report should be prepared, to be saved in HPRM container PKR/46-02.



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Appendix A

Legislation, background information and conservation codes



Appendix A – Legislation, background information and conservation codes

Federal

Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance (MNES).

There are currently nine MNES protected under the EPBC Act, these include:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- water resources (that relate to coal seam gas development and large coal mining development).

State

Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 provides for the conservation and protection of biodiversity particularly threatened species and threatened ecological communities. It is administered by the Department of Biodiversity, Conservation and Attractions (DBCA). The Act also provides for the ecologically sustainable use of biodiversity components in Western Australia.

Biosecurity and Agriculture Management Act 2007

The Biosecurity and Agriculture Management Act 2007 (BAM Act) provides for the declaration of Declared Pests by the Department of Primary Industries and Regional Development (DPIRD) which are prohibited organisms or organisms for which a declaration under Section 22(2) is in force. The BAM Act replaces the repealed *Agriculture and Related Resources Protection Act 1976 (ARRP Act)*.

Environment Protection Act 1986

The Environment Protection Act 1986 provides for the prevention, control and avoidance of pollution and environmental harm. **It is administered by the Office of the Environmental Protection Authority (EPA) and includes the below regulation/s relevant to this plan:**

- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*

Vegetation and flora

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State WC Act is the primary wildlife conservation legislation in Western Australia. Areas of native vegetation may also be classified as Bush Forever by the Western Australian Planning Commission. Over 51,000 hectares are currently protected across 287 Bush Forever sites, which represent a minimum (where possible) of 10% of each of the 26 vegetation complexes on the Swan Coastal Plain. Areas of Bush Forever are afforded statutory definition under the Metropolitan Region Scheme Amendment for Bush Forever and Related Lands (MRS 1082/33).

- being representative of the range of a unit (particularly, a good local and/or regional example of a unit in ‘prime’ habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- a restricted distribution
- this may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Conservation significant flora and fauna

Species of significant or specially protected flora and fauna, are protected under both Federal and state legislation. Any activities that are deemed to have a significant impact on species that are recognised under the EPBC Act and/or the BC Act can warrant referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) (Federal) and/or the EPA.

At a state level flora and fauna can be listed as threatened under the BC Act under the following categories; critically endangered, endangered or vulnerable. Flora and fauna may also be listed as priority species by the DBCA. Conservation codes are assigned by the DBCA for Priority species to define the level of conservation significance. These are provided in Table A1 below.

Significant vegetation

Vegetation may be significant for a range of reasons, other than a statutory listing as a Threatened Ecological Community or because the extent is below a threshold level. **The Environmental Protection Authority (2004) states that significant vegetation may include vegetation that includes the following:**

- scarcity
- unusual species
- novel combinations of species
- a role as a refuge
- a role as a key habitat for threatened species or large population representing a significant proportion of the local to regional total population of a species

In addition at a state level there are 65 threatened ecological communities (TEC) and 390 priority ecological communities (PEC) and sub-communities in which vegetation type is either the defining feature or a significant component of the ecological community. 25 Western Australian TEC’s are also listed at a federal level under the EPBC Act.

Threatened flora and fauna may be listed at a federal level under the EPBC Act in one of the following categories:

- Extinct
- Extinct in the wild
- Critically endangered
- Endangered
- Vulnerable
- Conservation dependent.

Table A1 – Conservation codes and descriptions for DBCA priority listed species		
Code	Conservation Category	Description
1	Prioity One: Poorly-known taxa	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2	Prioity Two: Poorly-known taxa	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, state forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3	Prioity Three: Poorly-known taxa	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4	Prioity Four: Rare, Near Threatened and other taxa in need of monitoring	(a) Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5	Prioity Five: Conservation Dependent taxa	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.

Migratory species listed under the EPBC Act

The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA).

Introduced plants

Declared pests

The Department of Primary Industries and Regional Development (DPIRD) maintains a list of declared pests for Western Australia that have been declared under the BAM Act. If a pest is declared for the whole of the state or for particular Local Government Areas, all landholders are obliged to comply with the specific category of control. Declared pests are gazetted under categories, which define the action required. The category may apply to the whole of the State, districts, individual properties or even paddocks. **Among the factors considered in categorising declared pests are:**

- The impact of the plant on individuals, agricultural production and the community in general.
- Whether it is already established in the area.
- The feasibility and cost of possible control measures. Table A2 Department of Agriculture and Food (Western Australia) Categories for Declared Pests under the Biosecurity and Agriculture Management Act 2007.

Weeds of national significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. **The assessment of weeds of national significance (WoNS) is based on four major criteria:**

- invasiveness
- impacts
- potential for spread
- socio-economic and environmental values.

Australian state and territory governments have identified 36 WoNS.

Environmental weeds

“Environmental weeds are plants that establish themselves in natural ecosystems (marine, aquatic and terrestrial) and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade” (CALM 1999). The Environmental Weed Strategy for Western Australia (EWSWA) was published in 1999. This document provides direction and an approach to tackling environmental weeds in WA (CALM 1999). Following on from this strategy (in 2008), in an effort to address invasive weeds and implement an integrated approach to weed management on DBCA managed lands in WA, the Weed Prioritisation Process was developed. **A series of workshops were held in each of the nine DBCA regions with the purpose of scoring all weeds which occurred in each of the DBCA regions according to the following key attributes:**

- potential distribution and impact
- invasiveness
- current distribution
- feasibility of control
- weed management ability
- weed risk.

This process resulted in the following five ratings for each weed species:

- Very high (VH)
- High (H)
- Medium (M)
- Low (L)
- Negligible (N)

The suggested management actions for each species range from no action required (the weed species ranking is as low as to not warrant any investment in regional strategic management actions), through targeted control to reduce infestation or spread, to species requiring state-wide eradication. A total of 1,350 weeds were rated through this process as high, moderate, mild or low, with 34 weed species being rated as high. The prioritisation for individual weeds within a DBCA region should be treated as a guide and does not diminish any other requirements of land managers or developers e.g. Declared Plants requirements of the BAM Act or Ministerial requirements under Part IV of the EP Act.

Table A2 – Department of Agriculture and Food (Western Australia) Categories for Declared Pests under the Biosecurity and Agriculture Management Act 2007		
Control Code	Class	Description
C1	(Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the state.
C2	(Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	(Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

An aerial photograph of a coastal region. In the upper portion, a densely populated town with numerous houses and buildings is visible, situated along a shoreline. A large, calm lagoon or bay is located within the town's perimeter. The lower portion of the image shows a vast expanse of shallow water with varying shades of blue and green, indicating different seabed compositions and depths. A small, rocky island with some vegetation is visible in the lower center. The overall scene depicts a coastal environment with a mix of urban development and natural marine features.

Appendix B

Vegetation condition

Appendix B – Vegetation condition

Table B1 – Summary of Vegetation Condition Scale as developed by Keighery (1994) and as summarised in Bush Forever (Government of Western Australia 2000) Condition Scale Description

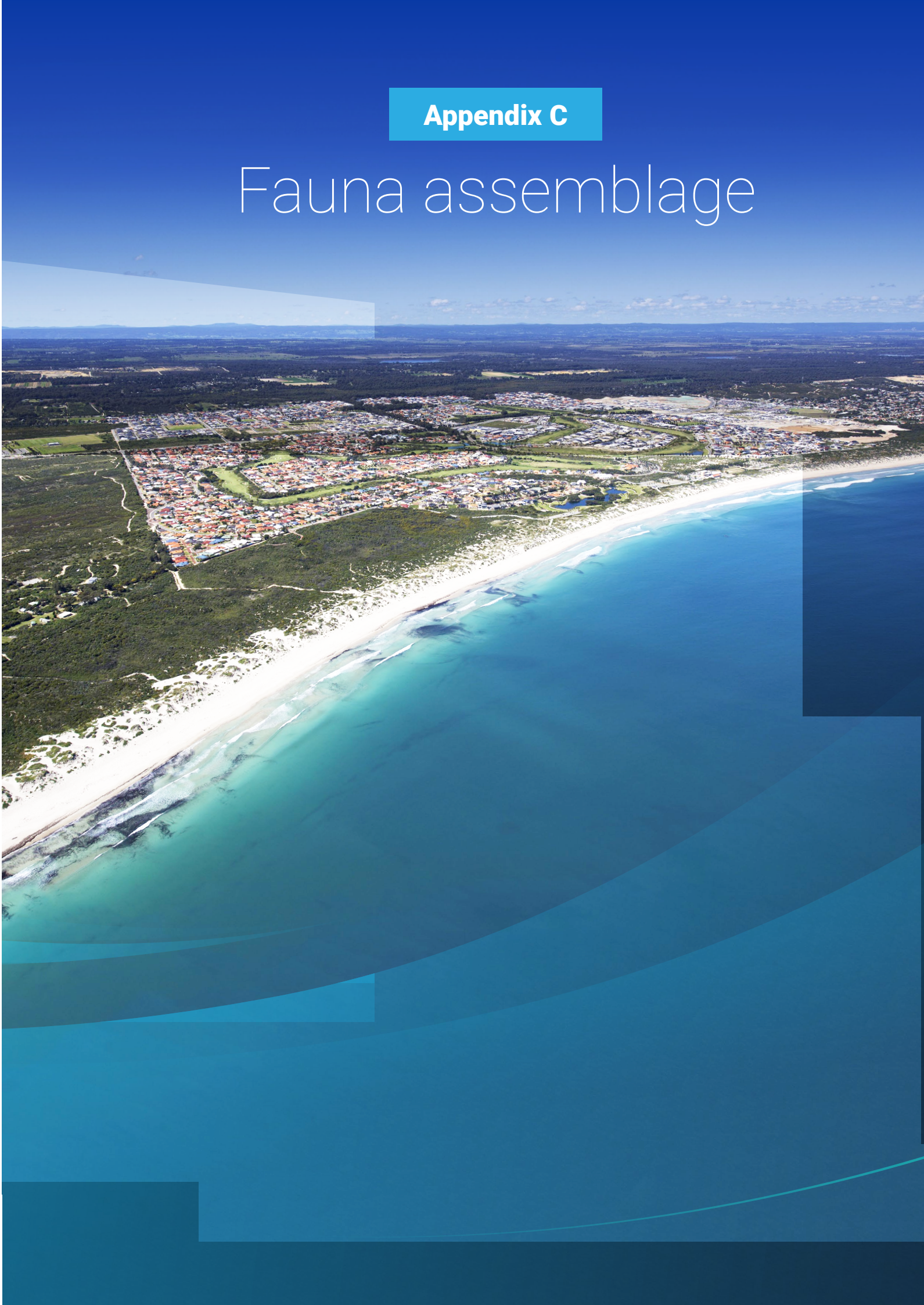
Control Code	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance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

Survey methodology

A basic and targeted flora and vegetation survey was conducted in accordance with *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (Environmental Protection Authority, 2016), and included a desktop review of literature and databases. Field surveys were undertaken over six days in November 2021.

Appendix C

Fauna assemblage



Appendix C – Fauna assemblage

Survey methodology

A detailed fauna survey was undertaken over 20 nights between November and December 2021 in accordance with Technical Guidance, Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA, 2020). This survey included installation of motion cameras, trapping and recording opportunistic sightings of fauna species.

Table C1 – Fauna Recorded During 2021 Survey									
Family	Species Name	Common Name	Count	Sector					
Amphibians				1	2	3	4	5	
Limnodynastidae	<i>Heleioporus eyrei</i>	Moaning Frog	14			X	X	X	
Limnodynastidae	<i>Limnodynastes dorsalis</i>	Western Banjo Frog	1			X			
Birds									
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	1		X				
Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian Darter	1		X				
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	4			X	X		
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird	1				X		
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	-	X	X	X	X	X	
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	-	X	X	X	X	X	
Columbidae	<i>Cacatua sanguinea</i>	Little Corella	-	X	X	X	X	X	
Columbidae	<i>Corvus coronoides</i>	Australian Raven	-	X	X	X	X	X	
Columbidae	<i>Spilopelia senegalensis</i>	Laughing Turtle Dove	-	X	X	X	X	X	
Columbidae	<i>Columba livia</i>	Rock Dove (Domestic Pigeon)	-	X	X	X	X	X	
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	2			X			
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	2	X					
Falconidae	<i>Falco cenchroides</i>	Australian Kestrel	1	X					

Haematopodidae	<i>Haematopus longirostris</i>	Pied-Oystercatcher	2					X	
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow	2	X					
Laridae	<i>Larus novaehollandiae</i>	Silver Gull	-	X	X	X	X	X	
Maluridae	<i>Malurus splendens</i>	Splendid Fairywren	6	X		X			
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	-	X	X	X	X	X	
Meliphagidae	<i>Phylidonyris niger</i>	White-cheeked Honeyeater	1		X				
Meliphagidae	<i>Gavicalis virescens</i>	Singing Honeyeater	2		X	X			
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican	4	X		X			
Psittaculidae	<i>Barnardius zonarius</i>	Australian Ringneck	4					X	X
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	-	X	X	X	X	X	
Turnicidae	<i>Turnix sp.</i>	Buttonquail	1			X			
Mammals									
Canidae	<i>Vulpes vulpes</i>	Red Fox	4				X		X
Canidae	<i>Canis familiaris familiaris</i>	Dog	-	X	X	X	X	X	
Caviidae	<i>Cavia porcellus</i>	Guinea Pig	1						X
Felidae	<i>Felis catus</i>	Domestic Cat	3		X			X	
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit	7	X		X			X
Macropodidae	<i>Macropus fuliginosus melanops</i>	Western Grey Kangaroo	4				X		X
Muridae	<i>Mus musculus</i>	House Mouse	33	X	X	X	X	X	
Muridae	<i>Rattus rattus</i>	Black Rat	2		X	X			
Peramelidae	<i>Isodon fusciventer (P4)</i>	Quenda	38	X	X	X	X		

Reptiles								
Agamidae	<i>Ctenophorus adelaidensis</i>	Western Heath Dragon	26	X	X	X	X	X
Agamidae	<i>Pogona minor minor</i>	Western Bearded Dragon	2	X				X
Diplodactylidae	<i>Strophurus spinigerus spinigerus</i>	South-western Spiny-tailed Gecko	2		X	X	X	X
Elapidae	<i>Pseudonaja affinis affinis</i>	Dugite	3	X			X	X
Elapidae	<i>Demansia psammophis reticulata</i>	Reticulated Whipsnake	8				X	X
Pygopodidae	<i>Aprasia repens</i>	Sand-plain Worm-lizard	1			X		
Pygopodidae	<i>Delma fraseri</i>	Fraser's Delma	1					X
Pygopodidae	<i>Lialis burtonis</i>	Burton's Legless Lizard	3	X	X		X	
Scincidae	<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink	1			X		
Scincidae	<i>Ctenotus australis</i>	Western Limestone Ctenotus	11	X	X			X
Scincidae	<i>Ctenotus fallens</i>	West-coast Laterite Ctenotus	48	X		X	X	X
Scincidae	<i>Hemiergis quadrilineatus</i>	Two-toed Earless Skink	13	X	X	X	X	X
Scincidae	<i>Lerista elegans</i>	Elegant Slider	4		X	X	X	
Scincidae	<i>Lerista lineata (P3)</i>	Perth Slider	54	X	X	X	X	X
Scincidae	<i>Menetia greyii</i>	Common Dwarf Skink	13	X	X	X	X	X
Scincidae	<i>Morethia obscura</i>	Shrubland Morethia Skink	20		X	X	X	X
Scincidae	<i>Tiliqua occipitalis</i>	Western Blue-tongue	2		X		X	
Scincidae	<i>Tiliqua rugosa rugosa</i>	Bobtail	29	X	X	X	X	X
Typhlopidae	<i>Anilius australis</i>	Southern Blind Snake	1		X			

Table C2 – Likelihood of Occurrence of Mammal Species in the Survey Area						
Family Species	Common Name	Conservation Status	Nature Map	2015 Survey	2021 Survey	Likelihood of Occurrence
Peramelidae						
<i>Isoodon obesulus fusciventer</i>	Quenda, Southern Brown Bandicoot	Priority 4	X	X	X	Recorded
Macropodidae						
<i>Macropus fuliginosus</i>	Western Grey Kangaroo			X	X	Recorded
Phalangeridae						
<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum		X			Unlikely to occur
Vespertilionidae						
<i>Chalinolobus gouldii Gould</i>	Gould's Wattled Bat		X	X		Recorded
<i>Austronomus australis</i>	White-striped Free-tailed Bat			X		Recorded
Muridae						
<i>Mus musculus</i>	House Mouse		X	X		Recorded
<i>Rattus fuscipes</i>	Western Bush Rat		X	X		May potentially occur
<i>*Rattus rattus</i>	Black Rat		X		X	Recorded
Leporidae						
<i>*Oryctolagus cuniculus</i>	Rabbit		X	X	X	Recorded
Caviidae						
<i>Cavia porcellus</i>	Guinea Pig				X	Recorded

Canidae						
<i>Vulpes vulpes</i>	Fox			X	X	Recorded
<i>*Canis familiaris</i>	Dog			X	X	Recorded
Felidae						
<i>*Felis catus</i>	Cat		X	X	X	Recorded

Table C3 – Likelihood of Occurrence of Reptile Species in the Survey Area

Family Species	Common Name	Conservation Status	Nature Map	2015 Survey	2021 Survey	Likelihood of Occurrence
Diplodactylidae						
<i>Strophurus spinigerus</i>	South-western Spiny-tailed gecko		X	X	X	Recorded
Pygopodidae						
<i>Aprasia repens</i>	Sand Plain Worm Lizard			X	X	Recorded
<i>Lialis burtonis</i>	Burtons Legless Lizard			X	X	Recorded
<i>Delma fraseri</i>	Fraser's Delma				X	Recorded
Agamidae						
<i>Ctenophorus adalaidensis</i>	Western Heath Dragon			X	X	Recorded
<i>Pogona minor</i>	Western Bearded Dragon		X	X	X	Recorded

Scincidae						
<i>Tiliqua occipitalis</i>	Western Blue Tongue		X	X	X	recorded
<i>Tiliqua rugosa</i>	Bobtail		X	X	X	Recorded
<i>Acritoscincus trilineatus</i>	South Western Cool Skink			X		Recorded
<i>Menetia greyii</i>	Common Dwarf Skink			X	X	Recorded
<i>Morethia lineoocellata</i>	Shrubland Morethia Skink			X	X	Recorded
<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink				X	Recorded
<i>Ctenotus australis</i>	Western Limestone Ctenotus		X		X	Recorded
<i>Ctenotus fallens</i>	West-coast Laterite Ctenotus			X	X	Recorded
<i>Hemiergis quadrilineata</i>	Two-toed Earless Skink		X		X	Recorded
<i>Lerista elegans</i>	Elegant Slider		X	X	X	Recorded
<i>Lerista lineata</i>	Perth Slider	Priority 3	X	X	X	Recorded
<i>Lerista lineopunctulata</i>	West Coast Line Spotted Lerista			X		Recorded
Typhlopidae						
<i>Aniliios australis</i>	Southern Blind Snake				X	Recorded

Elapidae						
<i>Pseudonaja affinis affinis</i>	Dugite		X	X	X	Recorded
<i>Demansia psammophis reticulata</i>	Reticulated Whipsnake		X		X	Recorded
<i>Notechis scutatus</i>	Tiger Snake		X	X		Recorded
<i>Parasuta gouldii</i>	Gould's Hooded Snake		X			May potentially occur
<i>Simoselaps bertholdi</i>	Southern Desert Banded Snake		X			Likely to occur
<i>Neelaps calonotos</i>	Black Striped Snake	Priority 3	X			Likely to occur

Table C4 – Likelihood of Occurrence of Amphibian Species in the Survey Area						
Family Species	Common Name	Conservation Status	Nature Map	2015 Survey	2021 Survey	Likelihood of Occurrence
Limnodynastidae						
<i>Heleioporus eyrei</i>	Moaning Frog		X		X	Recorded
<i>Limnodynastes dorsalis</i>	Western Banjo Frog		X	X	X	Recorded
<i>Heleioporus psammophilus</i>	Sand Frog			X		Recorded

Table C5 – Likelihood of Occurrence of Avifauna Species in the Survey Area						
Family Species	Common Name	Conservation Status	Nature Map	2015 Survey	2021 Survey	Likelihood of Occurrence
Accipitridae						
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle				X	Recorded
<i>Elanus axillaris</i>	Black-Sshouldered Kite		X	X		Recorded
<i>Haliastur sphenurus</i>	Whistling Kite		X			May Potentially occur
<i>Accipiter fasciatus</i>	Brown Goshawk		X			May Potentially occur
Acanthizidae						
<i>Sericornis frontalis</i>	White-browed Scrubwren		X	X		Recorded
<i>Gerygone fusca</i>	Western Gerygone		X	X		Recorded
<i>Acanthiza apicalis</i>	Inland Thornbill		X	X		Recorded
<i>Acanthiza inornata</i>	Western Thornbill					May Potentially occur
Anhingidae						
<i>Anhinga novaehollandiae</i>	Australasian Darter				X	Recorded
Anatidae						
<i>Cygnus atratus</i>	Black Swan		X	X		Recorded
<i>Anas superciliosa</i>	Pacific Black Duck		X	X		Recorded
<i>Aythya australis</i>	Hardhead			X		Recorded

Artamidae						
<i>Cracticus nigrogularis</i>	Pied Butcherbird				X	Recorded
<i>Cracticus torquatus</i>	Grey Butcherbird		X	X	X	Recorded
<i>Gymnorhina tibicen</i>	Australian Magpie		X	X	X	Recorded
<i>Strepera versicolor</i>	Grey Currawong		X			May potentially occur
Ardeidae						
<i>Ardea pacifica</i>	White-necked Heron		X			May potentially occur
<i>Ardea modesta</i>	Eastern Great Egret	Schedule 5	X			May potentially occur
<i>Egretta novaehollandiae</i>	White-faced Heron					Likely to occur
Cacatuidae						
<i>Eolophus roseicapilla</i>	Galah		X	X	X	Recorded
<i>Cacatua sanguinea</i>	Little Corella		X	X	X	Recorded
Columbidae						
<i>Corvus coronoides</i>	Australian Raven		X	X	X	Recorded
<i>Spilopelia senegalensis</i>	Laughing Turtle Dove		X	X	X	Recorded
<i>Columba livia</i>	Rock Dove (Domestic Pigeon)			X	X	Recorded
<i>Ocyphaps lophotes</i>	Crested Pigeon		X		X	Recorded

Campephagidae						
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		X	X	X	Recorded
Falconidae						
<i>Falco cenchroides</i>	Australian Kestrel		X	X	X	Recorded
Haematopodidae						
<i>Haematopus longirostris</i>	Pied-Oystercatcher		X	X	X	Recorded
Hirundinidae						
<i>Hirundo neoxena</i>	Welcome Swallow		X	X	X	Recorded
<i>Petrochelidon nigricans</i>	Tree Martin			X		Recorded
Laridae						
<i>Larus novaehollandiae</i>	Silver Gull		X	X	X	Recorded
<i>Hydroprogne caspia</i>	Caspian Tern	Schedule 5				Likely to occur
Maluridae						
<i>Malurus splendens</i>	Splendid Fairywren		X	X	X	Recorded
Meliphagidae						
<i>Acanthorhynchus superciliosus</i>	Western Spinebill		X			May potentially occur
<i>Lichenostomus virescens</i>	Singing Honeyeater			X		Recorded
<i>Anthochaera carunculata</i>	Red Wattlebird		X	X		Recorded
<i>Lichmera indistincta</i>	Brown Honeyeater		X	X		Recorded
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater		X	X		Recorded
<i>Phylidonyris niger</i>	White-cheeked Honeyeater			X		Recorded

Monarchidae						
<i>Grallina cyanoleuca</i>	Magpie-lark		X	X	X	Recorded
Meliphagidae						
<i>Phylidonyris niger</i>	White-cheeked Honeyeater				X	Recorded
<i>Gavicalis virescens</i>	Singing Honeyeater				X	Recorded
Pelecanidae						
<i>Pelecanus conspicillatus</i>	Australian Pelican		X		X	Recorded
Psittaculidae						
<i>Barnardius zonarius</i>	Australian Ringneck				X	Recorded
<i>Polytelis anthopeplus</i>	Regent Parrot		X	X		Recorded
<i>Purpureicephalus spurius</i>	Red-capped Parrot			X		Recorded
Podicipedidae						
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe		X	X		Recorded
<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe					May potentially occur
Phalacrocoracidae						
<i>Phalacrocorax carbo</i>	Great Cormorant		X			Likely to occur
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant		X			Likely to occur
Pachycephalidae						
<i>Pachycephala pectoralis</i>	Golden Whistler		X			May potentially occur
<i>Pachycephala rufiventris</i>	Rufous Whistler		X	X		Recorded
<i>Colluricincla harmonica</i>	Grey Shrike-thrush		X	X		Recorded

Rallidae						
<i>Porphyrio porphyrio</i>	Purple Swampphen		X	X		Recorded
<i>Gallinula tenebrosa</i>	Dusky Moorhen			X		Recorded
<i>Fulica atra</i>	Eurasian Coot		X	X		Recorded
Rhipiduridae						
<i>Rhipidura leucophrys</i>	Willie Wagtail		X	X	X	Recorded
<i>Rhipidura albiscapa</i>	Grey Fantail		X	X		Recorded
Scolopacidae						
<i>Actitis hypoleucos</i>	Common Sandpiper	Schedule 5	X	X		Recorded
<i>Calidris alba</i>	Sanderling	Schedule 5	X	X		Recorded
Sulidae						
<i>Morus serrator</i>	Australasian Gannet			X		Recorded
Timaliidae						
<i>Zosterops lateralis</i>	Silvereye		X	X		Recorded
Turnicidae						
<i>Turnix sp.</i>	Buttonquail				X	Recorded
Threskiornithidae						
<i>Threskiornis molucca</i>	Australian White Ibis		X			Likely to occur
<i>Threskiornis spinicollis</i>	Straw-necked Ibis		X			Likely to occur

