Vertebrate Fauna Survey – Lot 211 Quinns Road, Mindarie

Version 2. February 2020

Prepared for:

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DISCLAIMER

Front Cover: Fauna habitat in the project area

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EXECUTIVE SUMMARY

The City of Wanneroo requested a Level 1 vertebrate fauna survey for an area of 14.6ha, situated at Lot 211 Quinns Road, Mindarie as part of its evaluation to determine the long-term development options for the site. This land is currently owned freehold by the City of Wanneroo and includes the former Quinns Rocks Caravan Park and includes the Quinns Mindarie Surf Life Saving Club facilities and the Portofinos Restaurant, Café and Function venue. The eastern and southern boundary of Lot 211 is part of the Bush Forever Site 397.

There are three broad fauna habitats in the project area:

- coastal low heath on sand and karst limestone;
- mixed open and closed shrubland and heath on sand and limestone; and
- highly disturbed, cleared habitat or planted vegetation.

Some of the site is highly disturbed, cleared, contains buildings and bituminised car parks and provides no habitat value for vertebrate fauna.

It is probable that Quenda (Priority 4) and Black-striped Snake (Priority 3) are present in the project area. Carnaby's Black-Cockatoo (Endangered) would infrequently forage in the Parrot Bush in the project area, but this bush is not considered high quality foraging habitat, and they would not roost or nest in the area. The Osprey will be regularly seen flying over the site but there is a very low probability that the Peregrine Falcon would be seen near project area. There was evidence of rabbits, cats and foxes in the project area.

1 INTRODUCTION

1.1 Background

The City of Wanneroo requested a Level 1 vertebrate fauna survey for an area of 14.6ha, situated at Lot 211 Quinns Road, Mindarie. This area is bound by the Indian Ocean to its west, Quinns Road to the north, Seaham Way and Kinsale Drive to the east and bushland to the south (Figure 1). This land is currently owned freehold by the City of Wanneroo and includes the former Quinns Rocks Caravan Park and includes the Quinns Mindarie Surf Life Saving Club facilities and the Portofinos Restaurant, Café and Function venue. The eastern and southern boundary of Lot 211 is part of the Bush Forever Site 397.

The City of Wanneroo requested a Level 1 vertebrate fauna assessment as part of its evaluation to determine the long-term development options for the site.

1.2 Project objectives and scope of works

Terrestrial Ecosystems was commissioned by the City of Wanneroo to undertake a Level 1 vertebrate fauna survey of the project area to support an environmental impact assessment which has been provided as a separate report (Terrestrial Ecosystems and One Tree Botanical 2020). The methodology broadly follows that described in the Environmental Protection Authority (EPA) *Technical Guidance Terrestrial Fauna Surveys* (EPA 2016b) and the *Technical Guidance - Sampling methods for terrestrial vertebrate fauna* (EPA 2016a).

A Level 1 fauna survey involves undertaking a desktop review and reconnaissance site visit. The objectives of this fauna survey were to:

- provide an indication of the vertebrate fauna assemblage (reptiles, amphibians, mammals and birds) in and near the project area, so that potential impacts on the fauna and fauna assemblage might be adequately assessed; and
- describe the major vertebrate fauna habitats present.

To achieve these objectives, Terrestrial Ecosystems:

- reviewed Terrestrial Ecosystems' database [includes Atlas of Living Australia and Department of Biodiversity, Conservation and Attractions (DBCA) records in NatureMap] to identify potential vertebrate fauna within the area;
- searched the DBCA's NatureMap for Threatened and Priority Species;
- searched the Commonwealth Governments database of fauna of national environmental significance to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* or international migratory bird agreements (JAMBA/CAMBA);
- undertook a site reconnaissance survey;
- reviewed previous fauna surveys conducted near the project area in similar habitat types; and
- discussed the likelihood of *EPBC Act 1999* and *Biodiversity Conservation* (*BC*) *Act 2016* listed species being present in the project area.

2 EXISTING ENVIRONMENT

2.1 Location of project area

The project area is within the Swan Coastal Plain 2 (SWA2) Interim Biogeographic Regionalisation of Australia (IBRA) subregion. This subregion is a low lying coastal plain, once vegetated by Banksia and Tuart on sandy soils, with *Casuarina obesa* on outwash plains and paperbark in swampy areas (Mitchell *et al*. 2002). The subregion is part of the West Botanical Province which has high species richness and diversity in flora and vegetation. The area is located within Bush Forever (site 397) , which has been identified as regionally significant bushland for protection by reservation or within a statutory planning framework (Department of Planning 2000).

2.2 Landforms and soils

The project area is located on a transition between the Quindalup and Spearwood Dunes. Unusually, the Spearwood Dunes extend all the way to the coast at the south end of the project area.

The project area is in the Quindalup Dunes, which includes calcareous sands formed into parabolic dunes and beach ridge plains (Churchward and McArthur 1980, Gozzard 2007). These dunes are Holocene in age (McArthur and Bettenay 1974).

2.3 Land use history

The dominant land uses in the IBRA subregion are urban, rural residential, industrial, cultivation, forestry plantations, grazing and conservation areas. The greater Perth metropolitan area now extends almost from Mandurah to Alkimos, with towns further north at Yanchep and Two Rocks and east over the Darling Scarp. The project area is surrounded by urban development to the north, east and south, with the coastal vegetation of the project area extending south inland from the beach to the Mindarie Marina.

2.4 Climate

The project area is characterised as warm Mediterranean (Mitchell *et al*. 2002). Lancelin, which is approximately 70km to the north, and similarly situated on the coast, has an annual rainfall of approximately 853mm, although this varies considerably from year-to-year. The highest mean maximum and minimum temperatures in Lancelin are in January to March (Bureau of Meteorology 2019). The lowest mean daily maximum and minimum temperatures occur in July (Chart 1). Rainfall predominantly occurs between May and August and winter rains result from low pressure cells moving in an easterly direction.

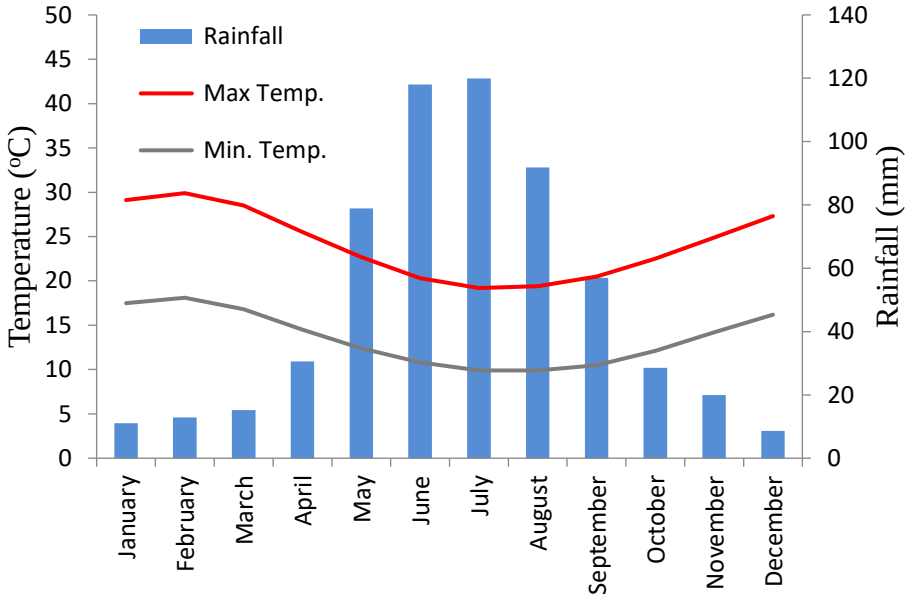

Chart 1. Climatic averages for Lancelin

2.5 Regional biological fauna context of project area

The frogs, reptiles, mammals and birds in the vicinity of the project area have been surveyed for other environmental assessments and research purposes and are therefore known. Fauna surveys and assessments undertaken in the vicinity of the project area that have been reviewed for this assessment include:

- Alan Tingay & Associates (1991) *Response to Draft north-west corridor structure plan, Department of Planning & Urban Development (February 1991), Yanchep Structure Plan, Vertebrate Fauna Survey*. Perth.
- Alan Tingay & Associates (1996) *Alkimos - Eglington Vertebrate Fauna Survey, October 1996*. Perth.
- Alan Tingay & Associates (1998) *Yanchep Sun City, Environmental Assessment for the Rezoning of lots 201 and 202 Breakwater Drive, Two Rocks to Rural Community*. Perth.
- Alan Tingay & Associates (1999a) *Pt Lot 2 Burns Beach, Vertebrate Fauna*. Perth.
- Alan Tingay & Associates (1999b) *Shire of Wanneroo, Town Planning Scheme No. 1, Amendment 787, Yanchep - Two Rocks, Environmental Review*. Perth.
- Alan Tingay & Associates (1999c) *Shire of Wanneroo, Town Planning Scheme No. 1, Amendment 837 - Yanchep / Two Rocks, Environmental Review*. Perth.
- Alan Tingay & Associates (2002) *Review of Two Rocks - Yanchep Foreshore Management Plan. Perth.*
- ATA Environmental (1991) *Yanchep Structure Plan Vertebrate Fauna Survey*, Unpublished report for Tokyu Corporation, Perth.
- ATA Environmental (2005). *Metropolitan Region Scheme Amendment 1029/33. Alkimos-Eglinton Flora, Vegetation and Fauna Baseline Information. Interpretation Report*. Perth.
- ATA Environmental (2007) *Vertebrate Fauna Assessment St Andrews Estate (Southern Precinct), Yanchep*, Unpublished report for Yanchep Sun City Pty Ltd, Perth.
- ATA Environmental (2008) *Vertebrate Fauna Assessment Lot 3 Romeo Road, Alkimos, Unpublished report for Northern Corridor Developments Limited*. Perth.
- ATA Environmental (2008) *Vertebrate Fauna Assessment Lot 3 Romeo Road, Alkimos*. Perth.
- Bamford Consulting Ecologists (1998) *Report on a Vertebrate Survey at Burns Beach*. Perth.
- Bamford Consulting Ecologists (2005) *Alkimos Proposed Wastewater Treatment Plant: Fauna Assessment*, Unpublished report for Water Corporation, Perth.
- Bamford Consulting Ecologists (2005) *Alkimos Proposed Wastewater Treatment Plant: Fauna Assessment*. Perth.
- Biota Environmental Sciences (2000) *Lot 52 Burns Beach Road Fauna Survey*. Perth.
- Department of Conservation and Land Management. (1993) *Fauna studies in water supply Reserve 34537, adjacent to Neerabup National Park*. Perth.
- ENV Australia (2006) *Lots 1005 and 1006 Alkimos Fauna Habitat Assessment*. Perth.

- GHD (2014a) *Mitchell Freeway extension: Burns Beach Rd to Romeo Rd Level 2 Flora & Level 1 Fauna Assessment*. Unpublished report for Main Roads Western Australia, Perth.
- GHD (2014b) *Neerabup Road Extension Level 2 Fauna Survey*, Unpublished report for Main Roads Western Australia. Perth.
- Gole, C.A. (2003) *Bird Survey in selected Perth Metropolitan Reserves. A Joint Biodiversity Conservation Project between Birds Australia WA and Perth Biodiversity Project*, Unpublished report Birds Australia and Perth Biodiversity Project, Perth.
- Harvey, M. S., Dell, J., How, R. A. and Waldock, J. M. (1997) *Ground Fauna of Bushland Remnants on the Ridge Hill Shelf and Pinjarra Plain Landforms, Perth*, Report to the Australian Heritage commission NEP Grant N95/49.
- Kitchener, D.J., Chapman, A. and Barron, G. (1978). Mammals of the Northern Swan Coastal Plain. *Faunal Studies of the Northern Swan Coastal Plain*. Unpublished report for the Western Australian Museum and Department of Conservation and Environment. Perth.
- Ninox Wildlife Consulting (1990) *Eglinton Beach Resort an appraisal of the vertebrate fauna*. Perth.
- Storr, G.M., Harold G. and Barron, G. (1978a) The amphibians and reptiles of the northern Swan Coastal Plain. *Faunal Studies of the Northern Swan Coastal Plain*. Western Australian Museum, unpublished report, Perth.
- Storr, G.M., Johnstone, R.E. and Harold, G. (1978b) Birds of the northern Swan Coastal Plain, Western Australia. *Faunal Studies of the Northern Swan Coastal Plain*. Western Australian Museum, Unpublished report. Perth.
- Terrestrial Ecosystems (2005) *Terrestrial Vertebrate Fauna Species Likely to be found in the Alkimos-Eglinton Area, with a comment on Significant Fauna Species and the Impacts of the Proposed Disturbance*. Unpublished report for ATA Environmental, Dilhorn House, 2 Bulwer St, Perth, WA, 6000. Perth.
- Terrestrial Ecosystems (2018) *City of Wanneroo Black-Cockatoo Habitat Survey*. Perth.
- Terrestrial Ecosystems (2020a)*Vertebrate Fauna Survey - Two Rocks Beach Access, Two Rocks*. Unpublished report for the City of Wanneroo.
- Terrestrial Ecosystems (2020b) *Vertebrate fauna survey – Yanchep Lagoon, Yanchep*. Unpublished report for the City of Wanneroo.
- Valentine, I.E., Wilson, B.A., Reaveley, A., Huang, N., Johnson, B. and Brown, P.R. (2009) *Patterns of Ground-dwelling Vertebrate Biodiversity in the Gnangara Sustainability Strategy Study Area*, Unpublished report for the Department of Environment and Conservation. Perth.
- Western Australian Museum (1978). *Faunal Studies of the Northern Swan Coastal Plain*. Western Australian Museum. Perth.

Data in the Atlas of Living Australia and Western Australian Museum has also been added to the information contained in Appendix B, and the compilation of the species lists for the project area.

Few of these reports contain survey data for vertebrate fauna on the dune system close to the coast where there are few trees. Reports providing useful data included ATA Environmental (1991, 2007, 2008), Biota Environmental Sciences (2000),Valentine *et al.* (2009), GHD (2014b), Gole (2003) and Bamford Consulting Ecologists (2005). Data from these reports are provided in Appendix B along with data from the Western Australian Museum, NatureMap and Atlas of Living Australia. Some of the data from consultants' fauna surveys are deposited in government databases, so it is possible there is some duplication of data in Appendix B.

2.5.1 Fauna species at risk

Mitchell *et al.* (2002) reported multiple vertebrate fauna species at risk in the subregion. However, some of these species have not been recorded near the project area for many years (e.g. *Myrmecobius fasciatus, Pseudocheirus occidentalis, Setonix brachyurus*), although, species such as *Calyptorhynchus latirostris, Calyptorhynchus banksii naso, Isoodon fusciventer* and *Neelaps calonotos* are still present, and regularly encountered. There is a very low probability that the Peregrine Falcon would be seen in the project area.

3 METHODOLOGY

3.1 Database searches

A review of the *EPBC* list of protected species was undertaken to identify species of conservation interest to the Commonwealth Government. The search area was a linear shaped polygon along the coastal strip using the following coordinates 31.62306ºS 115.664565ºE, 31.622462ºS 115.683520ºE, 31.77026ºS 115.751361ºE, 31.77026ºS 115.731262ºE (Appendix A). In addition, a desktop search of the Terrestrial Ecosystems' fauna survey database was used to develop an appreciation of the vertebrate fauna assemblages in relevant sections of the bioregion near the project area. The DBCA threatened and priority species database was searched via the records in NatureMap.

Other more general texts were also used to provide supplementary information on vertebrate fauna in the bioregion, including Tyler *et al.* (2000) for frogs; Storr *et al.* (1983, 1990, 1999, 2002) for reptiles; Johnstone and Storr (1998, 2004) for birds; and Van Dyck and Strahan (2008) for mammals.

Collectively these sources of information were used to create lists of species expected to utilise the project area and broader subregion. It should be noted that these lists will include species that have been recorded in the general region but are possibly vagrants and they will not generally be found in the project area due to a lack of suitable habitat (e.g. water and shore birds). Vagrants can be recorded almost anywhere. Many of the records are historical and the species is no longer present in the area (e.g. Malleefowl). Many of the bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the general area but not in the project area. Also, the ecology of many of these species is often not well understood and it can sometimes be difficult to indicate those species whose specific habitat requirements are not present in the project area. Therefore, many species will be included in the lists produced from database searches but will not be present in the actual project area.

There are errors in most databases, including NatureMap, Atlas of Living Australia and the WAM collection. These errors occur because of a misidentification of individuals, taxonomic name changes and incorrect coordinates being entered into the database. Terrestrial Ecosystems was unable to verify the primary records, so it has used the information provided. Obvious errors have been removed but readers should appreciate that species lists and fauna surveys reported in the appendices may include these errors.

3.2 Site inspection and fauna habitat assessment

A site visit was undertaken on 29 and 30 August 2019 to assess fauna habitat types and condition in the project area. This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire.

The fauna habitat assessment had two foci:

- assessing fauna habitat types and their condition; and
- assessing the possible presence of and recording evidence of conservation significant fauna.

Dr Scott Thompson, who undertook the site assessment, stopped at multiple locations within the project area and recorded a suite of data about the fauna habitat and its condition. This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire. The following data were assessed at each location as part of the habitat assessment:

Observer's name	
Coordinates of the location as UTM (GDA94)	
Fire history – options	
○ > 5 years	
○ 1-5 years	
○ < 1 year	
Landform – options	
○ Beach	○ Lower slope
○ Clay plain	○ Mid slope
○ Cliff	○ Ridge
○ Creek line	○ River
○ Dam	○ Rocky outcrop / breakaway

○ Drainage line	○ Salt lake
○ Dune crest	○ Sand dune
○ Dune slope	○ Sand plain
○ Dune swale	○ Stony plain
○ Escarpment	○ Swamp
○ Flat	○ Undulating
○ Gorge	○ Upper slope
○ Gully	○ Wetland
○ Intertidal / mangrove	○ Water hole
○ Lake / lake edge	
Habitat quality – options	
○ *High quality fauna habitat* – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.	
○ *Very good fauna habitat* - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.	
○ *Good fauna habitat* – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.	
○ *Disturbed fauna habitat*– These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, containing weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.	
○ *Highly degraded fauna habitat* – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Fauna assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.	
*Habitat structur*e – combined into habitat description	
Upper stratum	
○ Tall open woodland	○ Scattered tall trees
○ Tall woodland	○ Scattered trees
○ Open woodland	○ Scattered low trees
○ Woodland	○ Low closed forest
○ Open forest	○ Low open forest
○ Closed forest	○ Low woodland
○ Tall closed forest	○ Low open woodland
○ Tall open forest	
Middle stratum	
○ Shrubland	○ Open heath
○ Tall shrubland	○ Low closed heath
○ Tall open shrubland	○ Low open heath
○ Low shrubland	○ Tall closed scrub
○ Scattered low shrubs	○ Tall open scrub
○ Low open shrubland	○ Scattered tall shrubs
○ Scattered tall shrubs	○ Open shrubland
○ Closed heath	○ Scattered shrubs
Lower stratum	
○ Closed hummock grassland	○ Closed tussock grassland / sedgeland / herbland
○ Mid-dense hummock grassland	○ Tussock grass land / sedgeland / herbland
○ Hummock grassland	○ Open tussock grassland / sedgeland / herbland
○ Open hummock grassland	○ Scattered tussock / grasses / sedges / herbs
○ Scattered hummock grassland	○ Very open tussock grassland / herbland
Soil Type – options	
○ Sand	○ Silty loam

○	Loamy sand	○	Sand clay loam
○	Clayey sand	○	Clay
○	Clay loam	○	Peat / organic
○	Silty clay loam	○	Stony
○	Sandy loam		
Soil colour - options			
○	Black	○	Red
○	Brown	○	White
○	Grey	○	Yellow
○	Orange		
Surface stones – options			
○	None	○	Boulders (>250mm)
○	Pebbles (0-50mm)	○	Rocks
○	Cobbles (51-250)		

3.3 Survey and reporting staff

Dr Scott Thompson undertook the site investigation and fauna habitat assessment. Drs Graham and Scott Thompson prepared the report and Dr Scott Thompson reviewed the report before it was sent to the client. Both senior scientists have appropriate relevant post-graduate qualifications, extensive experience in conducting fauna assessments on the Swan Coastal Plain, have published research articles on biodiversity, fauna assemblages, conservation significant species, trapping techniques and temporal variations in trapped fauna assemblages and are therefore appropriately trained and experienced for the task of preparing this assessment.

3.4 Taxonomy and nomenclature

Taxonomy and nomenclature for fauna species used in this report are generally based on the WA Museum species list except for bats, which follow Churchill (2008) and birds which follow Christidis and Boles (2008). Terrestrial Ecosystems' has presumed that the identifications referred to in the appendices or in reports used to provide local and regional comparative data are correct and we have only corrected obvious records where the nomenclature was known to be incorrect.

3.5 Limitations

This Level 1 fauna risk assessment is based on information contained in the Commonwealth Government database and other published and unpublished fauna survey data for the bioregion and a site visit. It is acknowledged that multiple surveys conducted in different seasons, repeated over several years are necessary to fully appreciate the fauna assemblage in the project area.

The EPA's (2016a) *Technical Guidance Terrestrial Fauna Surveys* suggested that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 1.

Table 1. Fauna survey limitations and constraints

Possible limitations	Constraint (yes/no); significant, moderate or negligible	Comment
Competency and experience of the consultant carrying out this assessment	No	The environmental scientists that undertook the site assessment, drafted and reviewed this report are familiar with the vertebrate fauna of this bioregion.
Scope	No	All aspects of the scope of works have been addressed.
Proportion of fauna identified, recorded and/or collected	No	Not applicable.
Accuracy of previous survey work	Yes, negligible	Terrestrial Ecosystems has reported fauna survey data recorded by various authors but is not able to vouch for the accuracy of much of this information. It is acknowledged that the taxonomy of Western Australian vertebrates is continually being revised and the nomenclature of some of the species listed in the appendices may have changed since publication by the authors.
Sources of information	Yes, negligible	Vertebrate fauna information was available from on-line databases and unpublished and published reports of surveys conducted in the bioregion in a variety of habitat types. Many of these surveys employed a low level of trapping effort which significantly impacts on the capacity of these data to represent the fauna assemblages in the areas surveyed.
Proportion of the task achieved	No	All tasks completed.
Timing/weather/ season/ cycle	N/A	Weather was fine during the site visit.
Disturbances which affected results of the survey	No	Disturbance areas throughout the project area have been factored into this assessment.
Intensity of survey effort	N/A	
Completeness	No	All aspects of this assessment have been completed.
Resources	No	Adequate resources were available.
Remoteness and/or access problems	No	All areas could be accessed.
Availability of contextual information on the region	No	Fauna survey data are scant for the coastal dune habitats, and specifically fauna habitats accessed in the project area.

4 RESULTS

4.1 Fauna habitat

Ninety-four habitat assessments were completed in the project area (Figure 2). There are three broad fauna habitats in the project area (Table 2), excluding developed areas (e.g. roads, housing lots, etc).

Table 2. Habitat types

Habitat category	Description	Area (ha)
Coastal low heath on sand and karst limestone	Low coastal heath on unconsolidated sandy low primary dunes. The quality of fauna habitat was variable.	1.08
Mixed open and closed shrubland and heath on sand and limestone	Mixed open or closed shrubs and heath on taller unconsolidated sandy dunes with limestone outcropping. The quality of fauna habitat was variable.	6.31
Highly disturbed, cleared habitat or planted vegetation	These are generally area that have little vegetation, or the native vegetation has largely been removed and the area supports weeds, or is a grassed area.	7.18

Some of the site is highly disturbed or cleared and provides no habitat value. Plates 1-6 provide representative images of the fauna habitat types and Plates 7 and 8 provide evidence of anthropogenic disturbance.

Plate 1. Coastal low heath on sand and karst limestone

Plate 2. Coastal low heath on sand and karst limestone

Plate 3. Mixed open and closed shrubland and heath on sand and limestone

Plate 4. Mixed open and closed shrubland and heath on sand and limestone

Plate 5. Highly disturbed, cleared habitat or planted vegetation

Plate 6. Highly disturbed, cleared habitat or planted vegetation

Plate 7. Anthropogenic disturbance

Plate 8. Anthropogenic disturbance

The condition of the fauna habitat varied from high quality, particularly in areas where the dense vegetation inhibits human access, to areas that are highly degraded. Highly degraded areas included beach access tracks, site of the former Quinns Rocks Caravan Park, the Quinns Mindarie Surf Life Saving Club facilities, the Portofinos Restaurant, Café and Function venue and the adjacent bituminised access road and car park.

4.1.1 Feral pests

There was evidence to indicate a relatively high density of rabbits, cats and foxes in the project area.

4.2 Bioregional vertebrate fauna assemblage

Appendix B provides a summary of the fauna survey data that are available near the project area. There are appreciable differences in the recorded fauna assemblages within and among fauna surveys shown in Appendix B. These differences are partially due to the low survey effort deployed by some of the surveys and they also reflect variations in soils and vegetation as well as temporal variations in the fauna assemblages.

Tables 3-6 provide a list of vertebrate species potentially found near the project area that have been compiled based on the fauna survey report results shown in Appendix B.

Table 3. Birds potentially found near the project area

Family	Species	Common Name
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk
	Accipiter fasciatus	Brown Goshawk
	Aquila audax	Wedge-tailed Eagle
	Circus approximans	Swamp Harrier
	Elanus axillaris	Black-shouldered Kite
	Haliastur sphenurus	Whistling Kite
	Hieraaetus morphnoides	Little Eagle
	Lophoictinia isura	Square-tailed Kite
Anatidae	*Tadorna tadornoides*	Australian Shelduck
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Casuariidae	*Dromaius novaehollandiae*	Emu
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull

Family	Species	Common Name
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis
Columbidae	*Columba livia*	Domestic Pigeon
	Ocyphaps lophotes	Crested Pigeon
	Phaps chalcoptera	Common Bronzewing
	Phaps elegans	Brush Bronzewing
	Spilopelia senegalensis	Laughing Turtle-dove
	Spilpopelia chinensis	Spotted Turtle-dove
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra
	Todiramphus sanctus	Sacred Kingfisher
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo
	Chalcites basalis	Horsfield's Bronze-cuckoo
	Chalcites lucidus	Shining Bronze-cuckoo
	Heteroscenes pallidus	Pallid Cuckoo
Falconidae	*Falco berigora*	Brown Falcon
Falconidae	*Falco cenchroides*	Nankeen Kestrel
	Falco longipennis	Australian Hobby
	Falco peregrinus	Peregrine Falcon
Phasianidae	*Coturnix pectoralis*	Stubble Quail
Otididae	*Ardeotis australis*	Australian Bustard
Rallidae	*Porzana tabuensis*	Spotless Crake
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Acanthiza inornata	Western Thornbill
	Gerygone fusca	Western Gerygone
	Sericornis frontalis	White-browed Scrubwren
	Smicrornis brevirostris	Weebill
Acrocephalidae	*Acrocephalus australis*	Australian Reed-warbler
Artamidae	*Artamus cinereus*	Black-faced Woodswallow
	Artamus cyanopterus	Dusky Woodswallow
	Artamus personatus	Masked Woodswallow
	Cracticus nigrogularis	Pied Butcherbird
	Cracticus torquatus	Grey Butcherbird
	Gymnorhina tibicen	Australian Magpie
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
	Lalage tricolor	White-winged Triller
Corvidae	*Corvus coronoides*	Australian Raven
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow
	Hirundo neoxena	Welcome Swallow
	Petrochelidon nigricans	Tree Martin

Family	Species	Common Name
Maluridae	*Malurus lamberti*	Variegated Fairy-wren
	Malurus leucopterus	White-winged Fairy-wren
	Malurus splendens	Splendid Fairy-wren
	Stipiturus malachurus	Southern Emu-wren
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark
	Acanthorhynchus superciliosus	Western Spinebill
	Anthochaera carunculata	Red Wattlebird
	Anthochaera chrysoptera	Little Wattlebird
	Anthochaera lunulata	Western Little Wattlebird
	Epthianura albifrons	White-fronted Chat
	Gavicalis virescens	Singing Honeyeater
	Gliciphila melanops	Tawny-crowned Honeyeater
	Lichenostomus ornatus	Yellow-plumed Honeyeater
	Lichmera indistincta	Brown Honeyeater
	Manorina flavigula	Yellow-throated Miner
	Melithreptus lunatus	White-naped Honeyeater
	Sugomel nigrum	Black Honeyeater
	Phylidonyris niger	White-cheeked Honeyeater
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater
Monarchidae	*Grallina cyanoleuca*	Magpie-lark
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoe Bird
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush
	Pachycephala pectoralis	Golden Whistler
	Pachycephala rufiventris	Rufous Whistler
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote
	Pardalotus striatus	Striated Pardalote
Petroicidae	*Eopsaltria georgiana*	White-breasted Robin
	Petroica boodang	Scarlet Robin
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail
	Rhipidura leucophrys	Willie Wagtail
Timaliidae	*Zosterops lateralis*	Silvereye
Cacatuidae	*Cacatua sanguinea*	Little Corella
	Calyptorhynchus banksii naso	Forest Red-tailed Cockatoo
	Calyptorhynchus latirostris	Carnaby's Cockatoo
	Eolophus roseicapilla	Galah
Psittacidae	*Barnardius zonarius*	Australian Ringneck
	Neophema elegans	Elegant Parrot
	Trichoglossus haematodus	Rainbow Lorikeet
Strigidae	*Ninox boobook*	Southern Boobook

Table 4. Amphibians potentially found near the project area

Family	Species	Common Name
Hylidae	*Litoria moorei*	Motorbike Frog
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog
	Limnodynastes dorsalis	Western Banjo Frog

Family	Species	Common Name
Myobatrachidae	*Crinia insignifera*	Squelching Froglet
	Myobatrachus gouldii	Turtle Frog
	Pseudophryne guentheri	Gunther's Toadlet

Table 5. Mammals potentially found near the project area

Family	Species	Common Name
Canidae	*Vulpes vulpes*	Red Fox
Felidae	*Felis catus*	Cat
Dasyuridae	*Sminthopsis fuliginosus*	Grey-bellied Dunnart
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo

Family	Species	Common Name
	Notamacropus irma	Western Brush Wallaby
Tarsipedidae	*Tarsipes rostratus*	Honey Possum
Leporidae	*Oryctolagus cuniculus*	Rabbit
Peramelidae	*Isoodon fusciventer*	Quenda

Family	Species	Common Name
Muridae	*Mus musculus*	House Mouse
	Rattus fuscipes	Bush Rat

Family	Species	Common Name
	Rattus rattus	Black Rat
Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat

Table 6. Reptiles potentially found near the project area

Family	Species	Common Name
Agamidae	*Ctenophorus adelaidensis*	Western Heath Dragon
	Pogona minor	Dwarf Bearded Dragon
Diplodactylidae	*Crenadactylus ocellatus*	Clawless Gecko
	Diplodactylus polyophthalmus	Speckled Stone Gecko
	Strophurus elderi	Jewelled Gecko
	Strophurus spinigerus	South-western Spiny-tailed Gecko
Elapidae	*Brachyurophis fasciolata*	Narrow-banded Burrowing Snake
	Brachyurophis semifasciata	Half-girdled Snake
	Demansia psammophis	Yellow-faced Whipsnake
	Echiopsis curta	Bardick
	Neelaps bimaculatus	Black-naped Burrowing Snake
	Neelaps calonotus	Black-striped Burrowing Snake
	Parasuta gouldii	Gould's Snake
	Pseudonaja affinis	Dugite
	Pseudonaja mengdeni	Western Brown Snake
	Simoselaps bertholdi	Jan's Banded Snake
	Simoselaps littoralis	West Coast Banded Snake
Gekkonidae	*Christinus marmoratus*	Marbled Gecko
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard
	Delma concinna	Javelin Lizard
	Delma fraseri	Fraser's Delma
	Delma grayii	Side-barred Delma
	Lialis burtonis	Burton's Legless Lizard
	Pletholax gracilis	Keeled Legless Lizard

Family	Species	Common Name
	Pygopus lepidopodus	Common Scaly-foot
Pythonidae	*Morelia spilota*	Carpet Python
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink
	Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink
	Ctenotus australis	Western Limestone Ctenotus
	Ctenotus fallens	West-coast Laterite Ctenotus
	Cyclodomorphus celatus	Western Slender Bluetongue
	Egernia kingii	King's Skink
	Egernia napoleonis	Southwestern Crevice Skink
	Hemiergis quadrilineatum	Two-toed Earless Skink
	Lerista distinguenda	South-western Orange-tailed Slider
	Lerista elegans	West Coast Four-toed Lerista
	Lerista lineopunctulata	Dotted-line Robust Slider
	Lerista praepedita	Blunt-tailed West-coast Slider
	Menetia greyii	Common Dwarf Skink
	Morethia lineoocellata	Pale-flecked Morethia
	Morethia obscura	Shrubland Pale-flecked Morethia
	Tiliqua occipitalis	Western Blue-tongued Lizard
	Tiliqua rugosa	Bobtail
Typhlopidae	*Anilios australis*	Austral Blind Snake
	Anilios pinguis	Rotund Blind Snake
Varanidae	*Varanus gouldii*	Gould's Goanna
	Varanus tristis	Black-headed Monitor

These lists include species commonly found in Banksia and Tuart woodlands on the inland side of the coastal dunes, so there are species shown in these lists that are unlikely to be recorded in the coastal dunes, although they may infrequently be recorded as vagrants, particularly for the avian species.

4.3 Conservation significant fauna

Conservation significant fauna are protected by the Commonwealth *EPBC Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and the Western Australia (WA) *BC Act 2016*. The *BC Act 2016* provides for the publishing of the *Wildlife Conservation (Specially Protected Fauna) Notice* that lists species under multiple categories. In addition, DBCA maintains a list of fauna that require monitoring under four priorities based on the current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *BC Act 2016* imply legislative requirements for the management of anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory protection, other than the DBCA wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species. Definitions of the significant fauna under the *BC Act 2016* are provided in Appendix C.

The fauna species that have special status in either State or Commonwealth government legislation or are on the DBCA Priority species list and are potentially present in the vicinity of the project area are listed in Table 7. Although they were recorded in the search of the MNES online database, migratory species that typically would be found around the edge of salt lakes, clay pans, estuaries and marshes have been excluded from Table 7 as there is no suitable habitat nearby.

Threatened and conservation significant waders and shorebirds that utilise the beaches along the edge of the ocean or are marine migratory species or marine turtles that were identified in the MNES online search have not been included in this assessment as the project area does not include habitat in which they will forage or nest.

Two threatened species of fauna and two migratory species of birds were identified under the *EPBC Act 1999* as potentially occurring in the project area or surrounds. There is one Endangered, one Vulnerable and one Schedule 7 species as listed under the *BC Act 2016*, and two species listed on the DBCA's Threatened and Priority Fauna List that potentially occur in the project area or surrounds. The following is an assessment of the likelihood of each of the species listed in Table 7 being found in the project area.

Table 7. Assessment of the potential presence of a conservation significant fauna species in the project area

Species	DBCA Schedule / Priority	Status under Commonwealth *EPBC Act*	Comment on the potential presence of a species
Woylie *Bettongia penicillata*	Critically Endangered	Endangered	Locally extinct from this area.
Western Ringtail Possum *Pseudocheirus occidentalis*	Critically Endangered	Critically Endangered	Locally extinct from this area.
Australasian Bittern *Botaurus poiciloptilus*	Endangered	Endangered	Not present in the project area due to a lack of suitable habitat.
Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*	Endangered	Endangered	This cockatoo will occasionally forage in the Parrot Bush in the project area, but it will not roost or nest in the area.
Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso*	Vulnerable	Vulnerable	Flies over the project area, but a lack of suitable feeding, roosting and nesting resources means any visits will be infrequent.
Malleefowl *Leipoa ocellata*	Vulnerable	Vulnerable	Locally extinct from this area.
Chuditch *Dasyurus geoffroii*	Vulnerable	Vulnerable	Locally extinct from this area.
Balston's Pygmy Perch *Nannatherina balstoni*		Vulnerable	Not present in the project area due to a lack of suitable habitat.
Lancelin Island Skink *Ctenotus lancelini*	Vulnerable	Vulnerable	Highly unlikely to be in the project area.
Fork-tailed Swift *Apus pacificus*	Migratory	Migratory	May infrequently be seen flying in the region.
Grey Wagtail *Motacilla cinerea*	Migratory	Migratory	Highly unlikely to be seen in the project area.
Osprey *Pandion haliaetus*	Migratory	Migratory	Regularly seen flying over the project area but there are no roosting trees, so it is unlikely to roost in the project area.
Quenda *Isoodon fusciventer*	P4		Potentially in the project area.
Black-striped Snake *Neelaps calonotos*	P4		Potentially in the project area.
Peregrine Falcon *Falco peregrinus*	OS		May very infrequently be seen in the project area.

Results of the Commonwealth *EPBC Act 1999* protected matters database search are provided in Appendix A.

Woylie (*Bettongia penicillata*) – Critically endangered under the *BC Act* 2016 and endangered under the *EPBC Act 1999*

The Brush-tailed Bettong or Woylie is a small (1-1.6kg) mammal that has a preference for open forests and woodlands, with clumped low understorey of tussock grasses or clumped low woody scrub (Christensen 2000). Woinarski *et al*. (2014) reported a population reduction of greater than 90% in the last 10 years.

It has not been recorded near the project area for many years, so it is Terrestrial Ecosystems' view that it is not present in the project area.

Western Ringtail Possum (*Pseudocheirus occidentalis*) – Critically endangered under the *BC Act* 2016 and *EPBC Act 1999*

The Western Ringtail Possum is an arboreal mammal with a body weight between 820–1020g. This species is regularly encountered in urban development and disturbed areas throughout its distribution which has contracted from what appears to have been a patchy distribution covering the south west of Western Australia from south-east of Geraldton to the Nullarbor with the most inland recordings coming from the Tuatanning Nature Reserve (de Tores *et al*. 1995). Its distribution encompassed a variety of vegetation types including coastal Peppermint (*Agonis flexuosa*), and Peppermint/Tuart (*Eucalyptus gomphocephala*) associations, Eucalypt and Casuarina (*Allocasuarina huegeliana*) woodlands, and mallee heath from the Hampton Tableland (Baynes 1987). It is now almost exclusively restricted to the coastal Peppermint woodland and coastal Peppermint/Tuart associations from the Australind-Eaton area to Two Peoples Bay. The only known natural extant inland populations are in the lower Collie River Valley, Perup Nature Reserve, around Albany and surrounding forest block near Manjimup. DBCA has translocated individuals to Yalgorup National Park and there are isolated populations south of Mandurah.

Factors thought to have contributed to this species decline include habitat loss, modification or fragmentation, changing fire regimes, disease, competition and predation by introduced predators (Clarke *et al*. 2008, Department of Environment Water Heritage and the Arts 2008).

It has not been recorded near the project area for many years, so it is Terrestrial Ecosystems' view that it is not present in the project area.

Australasian Bittern (*Botaurus poiciloptilus*) Endangered under the *BC Act* 2016 and *EPBC Act 1999*

The Australasian Bittern has a distribution from Moora through much of the south-west and east to Mt Arid; however, it is rarely recorded. It is almost always found in dense *Typha*, *Baumea* and sedges in freshwater or brackish swamps (Johnstone and Storr 1998). Garnett *et al*. (2011) reported its population across Australia as less than 2,000 and in decline. Most of the Western Australian records come from Lake Muir.

It has not been recorded in the vicinity of the project area in other fauna surveys. It is highly unlikely to be present in or near the project are due to a lack of semi-permanent water on the very sandy soils.

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) - Vulnerable under the *BC Act* 2016 and *EPBC Act 1999*

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) is a large, pied, cockatoo. Garnett *et al*. (2011) and the DSEWPaC (2011) reported that Carnaby's Black-Cockatoo inhabits the south-west of Western Australia, from Kalbarri to as east on the south coast as Esperance. It breeds inland and moves to the coastal areas when chicks have fledged (Saunders *et al*. 1985). Carnaby's Black-Cockatoos are highly gregarious, usually seen in trios, small parties or large flocks (up to 5000 birds)(Perry 1948). These flocks usually contain males, females and immature birds.

Carnaby's Black-Cockatoos are partly migratory and partly sedentary (Higgins 1999). In the drier regions of their geographic range where most of the native vegetation has been cleared (e.g. wheatbelt), Carnaby's Black-Cockatoos

are postnuptial migrants (Saunders 1980, Saunders and Ingram 1995). After breeding, individuals in these areas migrate to feed in higher rainfall areas including the Swan Coastal Plain, and to a lesser extent, forests dominated by *E. marginata* (Jarrah), *C. calophylla* (Marri) and *E. diversicolor* (Karri; Saunders 1980). On the Swan Coastal Plain, Carnaby's Black-Cockatoos have been recorded foraging in most suburbs and in pine plantations within the greater Perth metropolitan area (Perry 1948). Vagrants have been recorded on Rottnest Island (Winnett 1989) and Garden Island (Wykes *et al*. 1999). These later two sightings clearly indicate that Carnaby's Black-Cockatoo will fly considerable distances over non-vegetated areas to forage.

Garnett *et al*. (2011) estimated there were between 10,000 and 60,000 birds in the population.

Saunders (1980) recorded non-breeding cockatoos at Coomallo Creek foraging within a 50km radius of their breeding area, whereas, cockatoos at Manmanning moved a much greater distance to the coastal plain during their non-breeding season. These data suggest that Carnaby's Black-Cockatoo move from areas where there is little food to southern and western coastal areas where food is presumably more plentiful during summer and autumn (Davies 1966, Saunders 1980).

Carnaby's Black-Cockatoo breed between July and November mostly in eucalypt woodland (Saunders 1980, 1986). Carnaby's Black-Cockatoo nest in tree hollows that are created by fire, fungi, termites or old age, with hollows between 2.5 and 12m above the ground (Saunders 1979, Higgins 1999). Hollows are large, ranging from 10 to over 250cm in depth (Higgins 1999). These hollows are usually in live or dead smooth-barked *Eucalyptus salmonophloia* (Salmon Gum) or *Eucalyptus wandoo* (Wandoo). However, Carnaby's Black-Cockatoo will also nest in *E. longicornis* (Red Morrell), *E. loxophleba* (York Gum), *E. gomphocephala* (Tuart), *E. rudis* (Flooded Gum), *E. salubris* (Gimlet), *E. occidentalis* (Swamp Yate) and *C. calophylla* (Higgins 1999, Cale 2003). When breeding, they most often forage in the surrounding shrubland and kwongan heath (Higgins 1999). On the Swan Coastal Plain, breeding could occur in *E. gomphocephala*, *E. rudis*, *E. occidentalis* and *C. calophylla*. Adults return to the same breeding area each year (Saunders 1977) and some use the same tree hollow for many years in succession to raise their chicks, others shift their nests among a number of trees in the same area (Saunders and Ingram 1998).

At Coomallo Creek, Carnaby's Black-Cockatoo travelled on average 1.4km from their nests to forage, whereas at Manmanning they foraged more widely and travelled an average of 2.5km from their nest to forage (Saunders 1980). At Manmanning, road and railway reserves were extensively used for foraging, presumably as this was the closest food source to their nests. The availability of food near the nest influenced the time spent incubating eggs and fledging body mass (Saunders 1980). At Manmanning, Carnaby's Black-Cockatoo traversed agricultural land to forage in remnant plots of uncleared land.

Saunders (1980) reported Carnaby's Black-Cockatoo at Coomallo Creek (breeding area) foraged mostly on native plants, with the only exception being *Erodium* sp.. Higgins (1999) reported the habitat of Carnaby's Black-Cockatoo was uncleared or remnant woodlands dominated by *Eucalyptus*, particularly *E. wandoo* and *E. salmonophloia* and often in shrubland or kwongan heathland dominated by *Hakea*, *Dryandra*, *Banksia* and *Grevillea* and seasonally in *Pinus* plantations and less often in *C. calophylla*, *E. diversicolor* or *E. marginata*.

Carnaby's Black-Cockatoo has been recorded in other fauna surveys in the vicinity of the project area. This cockatoo will feed on the Parrot Bush (*Banksia sessilis*; see Plate 4) that is present in the project area, so it will occasionally be observed foraging in the project area.

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) - Vulnerable under the *BC Act* 2016 and *EPBC Act 1999*

The Forest Red-tailed Black-Cockatoo is one of three large black-cockatoos found in Western Australia. *Calyptorhynchus banksii naso* frequents the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (Department of Sustainability Environment Water Population and Communities 2011). It was mostly seen in the hills, but small numbers of birds were seen at Mundijong, Baldivis, Karnup, Stakehill, Pinjarra, Coolup and in the Lake Clifton area (Johnstone *et al*. 2011). In

2011, there was an increase in the number of Forest Red-tailed Black-Cockatoo on the coastal strip north from Rockingham to the northern metropolitan suburbs. The reason for the recent increase in abundance is unknown.

Forest Red-tailed Black-Cockatoo nest hollows have been recorded between 6.5 and 33m above the ground, with entrance sizes ranging from 10 x 12cm to 44 x 150cm and a depth of 0.3-8.2m (Johnstone *et al*. 2013a, b). Breeding occurs in all months, but peaks in April-June and August-October with an incubation period of 29-31 days. A female broods her hatchling for the first 3-10 days after hatching and then leaves the nest each day at dawn and returns to feed the chick at dusk. Hatchlings are fully feathered at about 48 days. The majority of nests are in Marri, but they have also been recorded in Jarrah, Blackbutt, Bullich and Wandoo. Nest sites are often clustered in an area.

Johnstone and Kirkby (2011) reported the Forest Red-tailed Black-Cockatoo to feed mostly on seeds from *C. calophylla*, *E. marginata*, but also on *Allocasuarina fraseriana* (Sheoak), *Persoonia longifolia* (Snottygobble), *Eucalyptus patens* (Blackbutt) and introduced species such as *M. azedarach* (Cape Lilac) and *Corymbia citriodora* (Lemon-scented Gum).

Loss of breeding habitat in the form of suitable hollows and adequate feeding resources in the vicinity of nesting hollows to enable adults to feed chicks is a primary threat. Abbott (1998) reported that trees within its known breeding distribution was not a factor in limiting breeding. He estimated there were about 15,000 birds and Garnett *et al*. (2011) thought about 10% of these birds bred each year. Competition for nesting hollows by other cockatoos, Wood Ducks, Galahs and feral Honey Bees appears to also be a significant threat (Garnett *et al*. 2011).

The Forest Red-tailed Black-Cockatoo is unlikely to frequent the project area as there are very few plants that offer a food resource. There are no Forest Red-tailed Black-Cockatoo nesting or roosting sites in the project area due to a lack of suitable trees, but may infrequently fly over the project area.

Malleefowl (*Leipoa ocellata*) – Vulnerable under the *BC Act* 2016 and *EPBC Act 1999*

Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed or are perching for the night. Historically, Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Prior to vegetation clearing for agriculture, Malleefowl were abundant in the WA Wheatbelt. Vegetation clearing for agriculture also opened adjacent bushland to predators, and in the south-west of WA, Malleefowl often only persist in isolated remnant patches of native vegetation. Sheep and other herbivores (e.g. goats, kangaroos) grazing in remnant vegetation removes or thins the undergrowth, and they also compete with Malleefowl for herbaceous foods and can cause changes to the structure and floristic diversity of foraging habitats (Benshemesh 2007).

Malleefowl and their eggs are vulnerable to predation by foxes, and newly hatched chicks are vulnerable to foxes, cats and raptors (Priddel and Wheeler 1990, 1997, Benshemesh and Burton 1999, Benshemesh 2007, Lewis and Hines 2014). Their abundance in the Goldfields is low and they are sparsely distributed, favouring those areas that are more densely vegetated. Malleefowl build distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. These nest mounds range in diameter but can span more than five metres and may be up to one metre high. Malleefowl are generally monogamous and once breeding commences they pair for life. The presence of nest mounds provides an indication of the presence of Malleefowl in the area.

Malleefowl has not been observed in the bioregion for many decades and it is not present in or near the project area.

Chuditch (*Dasyurus geoffroii*) – Vulnerable under the *BC Act 2016* and *EPBC Act 1999*.

The Chuditch is the largest extant carnivorous marsupial in WA. It is usually active from dusk to dawn. Formally known from over 70% of Australia, the Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-west WA and other isolated areas. Chuditch are solitary animals for most of their life and den in hollow logs, burrows, culverts, etc. and have also been recorded in tree hollows and rock cavities. Chuditch are opportunistic feeders, and forage primarily on the ground at night. Their diet can include other

mammals, birds, lizards, bird and reptile eggs but the majority is a mixture of large invertebrates (e.g. spiders, scorpions and crickets).

Chuditch have not been recorded in or near the project area for many years, so it is highly unlikely to be present.

Balston's Pygmy Perch (*Nannatherina balstoni*) - Vulnerable under the *BC Act 2016* and *EPBC Act 1999*.

Balston's Pygmy Perch is the rarest of all the endemic freshwater fishes of south-western Australia. It inhabits coastal streams, lakes, ponds and swamps, where the water is dark and acidic (pH as low as 3.0) and has a large seasonal fluctuation in temperature (11-30°C). It is often found in association with tall sedge thickets.

Balston's Pygmy Perch is not present in the project area due to a lack of permanent freshwater.

Lancelin Island Skink (*Ctenotus lancelini*) - Vulnerable under the *BC Act 2016* and *EPBC Act 1999*.

The approved conservation advice (Anon 2008) for the Lancelin Island Skink indicates that this small grey-brown lizards with indistinct streaks running along its back from the neck to the base of the tail is known only from Lancelin Island off the Western Australian coast (Pearson and Jones 2000). It typically uses all vegetation types on the island, but favours slopes facing north to north-east; areas protected from the prevailing south-westerly winds.

Having not been found on the mainland, except for a single individual near Lancelin, it is highly unlikely that the Lancelin Island Skink would be recorded in the project area.

Fork-tailed Swift (*Apus pacificus*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

This species breeds in the northeast and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara in November and in the southwest land division in mid-December, and leaving by late April. The Fork-tailed Swift is an almost exclusively aerial species, foraging and sleeping on the wing. It rarely comes to ground, usually only for breeding. It is common in the Kimberley, uncommon to moderately common near northwest, west and southeast coasts and rare to scarce elsewhere. It is rarely seen in the Goldfields.

Terrestrial Ecosystems' assessment is that the Fork-tailed Swift may very infrequently be seen flying over the project area, however, the Fork-tailed Swift is essentially an aerial species and would be highly unlikely to land in the project area.

Grey Wagtail (*Motacilla cinerea*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

The Grey Wagtail is a small yellow breasted bird with a grey back and head. Johnstone and Storr (2004) reported this migratory species as breeding in Palearctic from western Europe and north-west Africa to eastern Asia and wintering in Africa, south-east Asia, Indonesia, the Philippines, New Guinea and Australia. Its preferred habitat in Australia is banks and rocks in fast-running fresh water including rivers, streams and creeks where it feeds on insects. The Atlas of Living Australia records two sightings on the south-coast of Western Australia and none around the project area.

It is highly unlikely to be seen in the project area due to a lack of records and suitable habitat.

Osprey (*Pandion haliaetus*) – Migratory under the *EPBC Act 1999*

The Osprey is a large raptor that is mostly found in coastal areas, off-shore islands and the lower sections of rivers. It mainly feeds on fish, sea-snakes and large lizards. This species is a regular coastal visitor and likely to be recorded flying over the project area; however, due to a lack of suitable large trees is unlikely to roost on site. There is however, a roosting/nesting platform south of the project area.

The Osprey is seen along the coastal area searching for food in the shallow water. It nests on tall structures, rock outcrops and large trees, none of which are in the project area.

Quenda (*Isoodon fusciventer*) – Priority 4 species with the DBCA

Quenda prefer dense scrub (up to one metre high), with swampy vegetation but are found in a variety of other habitats. They will often feed in adjacent forest and woodland that is open grassland, pasture and crop land lying close to dense cover.

Quenda have been recorded as far north as Two Rocks in the DBCA threatened species database, and Dr Scott Thompson caught them near the old Club Capricorn Resort. It is possible that Quenda are present in very low densities in areas that provide suitable habitat. Given the abundance of foxes and cats along the coastal zone, Quenda are only going to survive in areas of dense undergrowth which provide some protection from these predators.

Black-striped Snake (*Neelaps calonotus*) – Priority 3 with DBCA

This species occurs on dunes and sand-plains vegetated with heaths and eucalypt/banksia woodlands. It feeds largely on skinks and its distribution is restricted and threatened by urban development. In its natural undisturbed state, the project area would provide habitat for the Black-striped Snake. The DBCA threatened species database has records of this snake around Mindarie, and the Atlas of Living Australia records one south of Lancelin, so it is feasible that they are in the project area.

Peregrine Falcon (*Falco peregrinus*) – Other specially protected fauna under the *BC Act 2016*

The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It favours hilly or mountainous country and open woodlands and may be an occasional visitor to the project area. Nesting sites include ledges along cliffs, granite outcrops and quarries, hollow trees near wetlands and old nests of other large bird species. There is no evidence to suggest any change in status in the last 50 years.

The Atlas of Living Australia contains records of this species around Joondalup and Lancelin, so it is possible that they are infrequently seen in the project area, however, the habitat in the project area is atypical for this species. The Peregrine Falcon will not rely on this site for continued survival in the region.

5 DISCUSSION

5.1 Adequacy of the fauna survey data for fauna habitats represented in the project area

The EPA's (2016a) *Technical Guidance on Terrestrial Fauna* indicated that a Level 2 fauna assessment is required for a disturbance area of in excess of 10ha in this bioregion. The project area is greater than 10ha, however, it contains the site of the former Quinns Rocks Caravan Park, the Quinns Mindarie Surf Life Saving Club facilities, the Portofinos Restaurant, Café and Function venue and the adjacent bituminised access road and car park, so the area of native vegetation is less than 10ha.

Level 2 fauna surveys are typically not undertaken now on the Swan Coastal Plain as the EPA considers the vertebrate fauna in this IBRA subregion to be well known. Even if such a survey was undertaken, it is unlikely to provide new species, in particular a conservation significant species that have not previously been identified for this area that would alter the assessment of potential impacts, however, as with all surveys, until it is completed the outcome is unknown.

5.1.1 Amphibians

Amphibians typically found on the Swan Coastal Plain are listed in Table 4. The lack of permanent freshwater means that only those species able to survive away from permanent water on very porous sandy soil (e.g. potentially *Heleioporus eyrei*, *Limnodynastes dorsalis* and *Myobatrachus gouldii*) are likely to be present in the project area. Frogs in this area are normally only detected immediately after rainfall. All three species have a wide-spread distribution and are abundant. There are no conservation significant amphibians in the Swan Coastal IBRA subregion.

5.1.2 Reptiles

Reptile species richness in the project area will be comparable with other sandy dune habitats in the subregion. The list provided in Appendix A represents species likely to be found over a large area of diverse habitat types. Sandy dune habitats are likely to have a restricted reptile fauna assemblage and these areas would typically support 8-15 species of reptiles, but many of these would be in low abundance (see Table 6). The herpetofauna assemblage in the project area are likely to be similar to that in the adjacent areas.

The Black-striped Snake, which is listed as a Priority 4 species, is found in Banksia woodlands and sandy areas in the Perth region. There are records of this snake in the vicinity of the project area, so it is potentially present in the project area.

The Lancelin Island Skink is essentially only known from an off-shore island, and the single record on the mainland probably represents a translocation from the island. It is highly unlikely that this species is present in the project area.

5.1.3 Birds

Avian species richness on the Swan Coastal Plain is influenced by rainfall, urban disturbance and vegetation clearing, and in coastal areas the migratory shore birds and waders that may be seasonally present along the beaches. The list provided in Table 3 represents species likely to be found over a large area of diverse habitat types. Coastal dunes with limited variation in the vegetation structure and diverseness in habitats would typically support between 20-40 species of birds, but many of these would be in very low numbers (see Appendix A).

The Peregrine Falcon, which is a Schedule 7 species under the *BC Act*, will normally have a very large home range and is unlikely to be seen on the relatively flat coastal dunes. Carnaby's Black-Cockatoos will occasionally forage in the Parrot Bush in the project area, however, this plant is not considered as high quality foraging habitat.

5.1.4 Mammals

The diversity of small terrestrial mammals potentially caught in the project area would be low given the lack of diversity on the sandy coastal dunes. Although, records of Chuditch (*D. geoffroii*), Woylie (*B. penicillata*) and Western Ringtail Possums (*P. occidentalis*) are present in the MNES database search for the area (Appendix B), they are no longer present in the region, having been predated on by foxes and cats and lost due to vegetation clearing and urban development many years ago.

Quenda (*I. fusciventer*) are present in the sections of dense vegetation on the sandy dunes in the vicinity of the project area. This species is in low abundance, as it is predated on by foxes and feral cats which are present in the area.

It was noted during the site visit that there was an abundance of rabbits, and moderate density of cats and foxes utilising the project area.

6 SUMMARY

The City of Wanneroo has requested a Level 1 vertebrate fauna risk assessment as part of its evaluation to determine the long-term development options for the site.

Terrestrial Ecosystems undertook a Level 1 vertebrate fauna survey of the 14.6ha project area, which included a review of the available literature to determine vertebrate fauna species potentially in the project area and a site visit to determine major fauna habitats and their condition as the basis for an impact assessment which is contained in a separate report (Terrestrial Ecosystems and One Tree Botanical 2020).

There are three broad fauna habitats in the project area:

- coastal low heath on sand and karst limestone;
- mixed open and closed shrubland and heath on sand and limestone; and
- highly disturbed, cleared habitat or planted vegetation.

Some of the site is highly disturbed, cleared, contains buildings and bituminised car parks and provides no habitat value for vertebrate fauna.

It is probable that Quenda (Priority 4) and Black-striped Snake (Priority 3) are present in the project area. Carnaby's Black-Cockatoo (Endangered) would infrequently forage in the Parrot Bush in the project area, but this bush is not considered high quality foraging habitat, and they would not roost or nest in the area. The Osprey will be regularly seen flying over the site but there is a very low probability that the Peregrine Falcon would be seen near project area. There was evidence of rabbits, cats and foxes in the project area.

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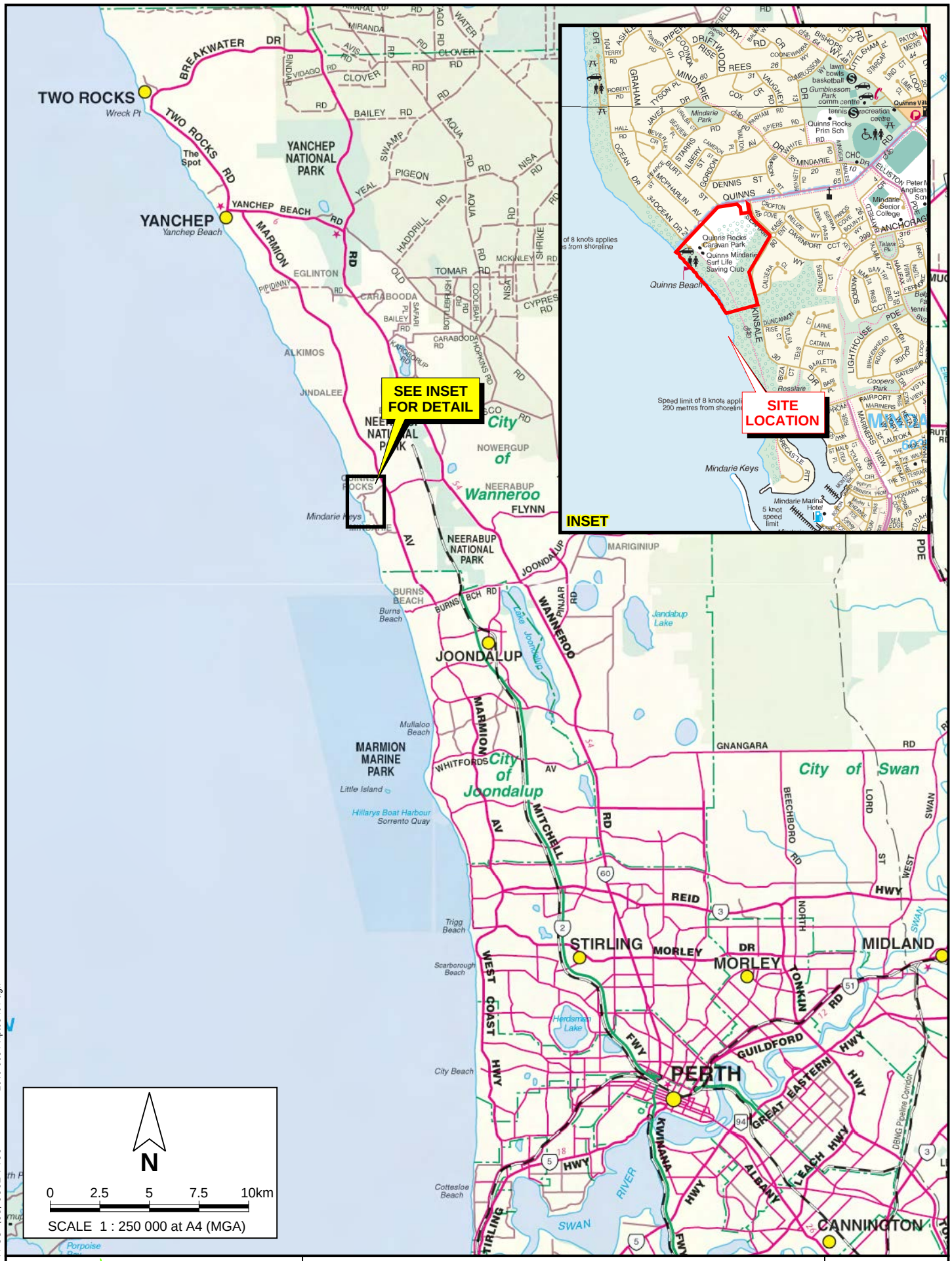
Figures

Vertebrate Fauna Survey - Lot 211 Quinns Road, Mindarie



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PINPOINT CARTOGRAPHICS (08) 9562 7136

TERRESTRIAL ECOSYSTEMS

City of Wanneroo
VERTEBRATE FAUNA SURVEY
LOT 211, QUINNS ROCKS

Figure 1

REGIONAL LOCATION

Drawn: S. Thompson | Date: 8 Oct 2019 | Job: 2019-0054

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-0054-Rpt03-f02.dgn

TERRESTRIAL ECOSYSTEMS

City of Wanneroo
VERTEBRATE FAUNA SURVEY
LOT 211, QUINNS ROCKS

Figure 2

FAUNA HABITAT ASSESSMENT

Drawn: S. Thompson | Date: 9 Oct 2019 | Job: 2019-0054

Appendix A
Results of the *EPBC Act* Protected Matters Search

Vertebrate Fauna Survey - Lot 211 Quinns Road, Mindarie

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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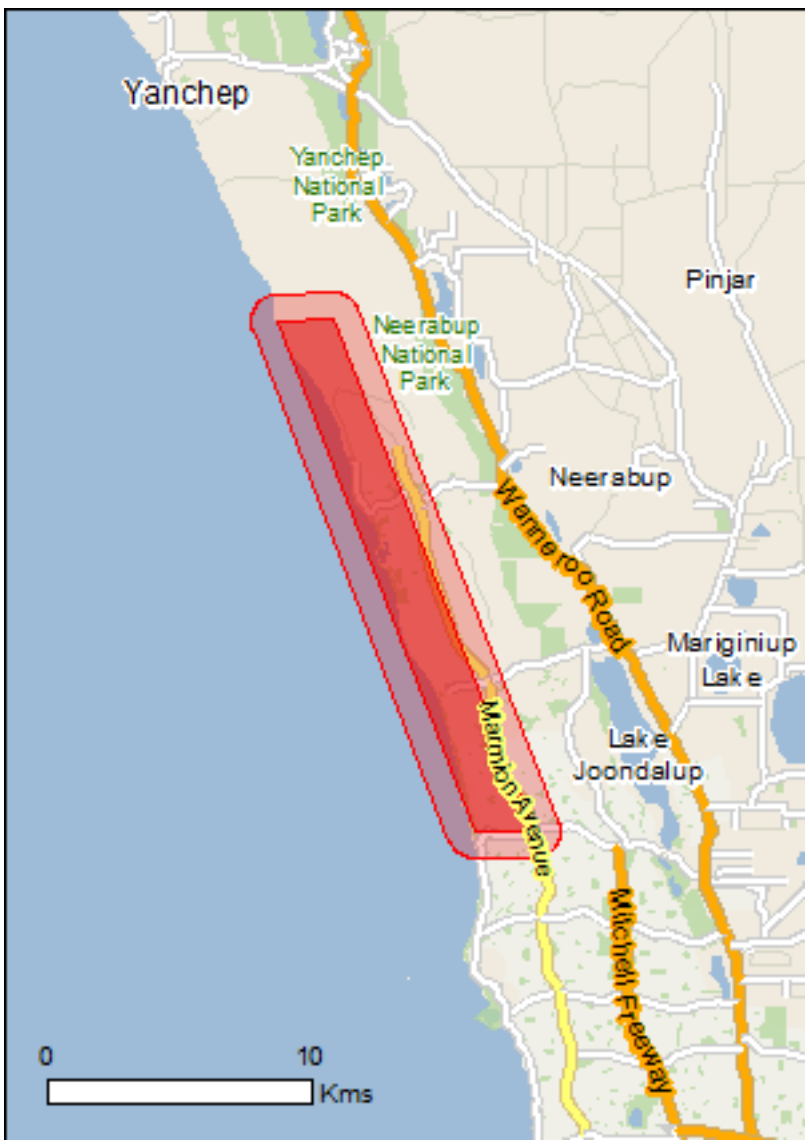

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Coordinates

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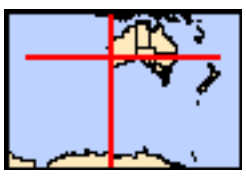

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	43
Listed Migratory Species:	42

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	65
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	34
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Insects		
Hesperocolletes douglasi Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Plants		
[Diuris micrantha](#) Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
[Diuris purdiei](#) Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
[Drakaea elastica](#) Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
[Drakaea micrantha](#) Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
[Eucalyptus argutifolia](#) Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat likely to occur within area
[Lepidosperma rostratum](#) Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
[Marianthus paralius](#) [83925]	Endangered	Species or species habitat known to occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
[Carcharias taurus (west coast population)](#) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
[Anous stolidus](#) Common Noddy [825]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
[Caperea marginata](#) Pygmy Right Whale [39]		Species or species habitat may occur within area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
[Lamna nasus](#) Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
[Manta alfredi](#) Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
[Manta birostris](#) Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus pooleorum Shark Bay Seasnake [66061]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.62306 115.66456,-31.62246 115.68352,-31.77026 115.75136,-31.77026 115.73126,-31.62306 115.66456

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B
Vertebrate Fauna Recorded in Biological Surveys in the Region

Vertebrate Fauna Survey - Lot 211 Quinns Road, Mindarie

Appendix B(1). Vertebrate fauna assessments

		Surveys	A	B	C		D	E	F	G				H									I	J				K		L			M
Family	Species	Common Name			Brighton	Unknown			Trinity	Acacia	Dryandra	Eucalypt & Banksia	Banksia	Site 01	Site 02	Site 10B	Site 02B	Site 02A	Site 10A	Site 01A	Site 14A	Site 4	Site 4	Site 2	Site 1	Opportunistic	Opportunistic	Site 5	Cassilda Park	Kinsale Park	Brighton	
Birds																																	X
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk																									1					
	Accipiter fasciatus	Brown Goshawk								1	1	1															2					
	Aquila audax	Wedge-tailed Eagle																						1								
	Circus approximans	Swamp Harrier																									3					
	Elanus axillaris	Black-shouldered Kite								1														1			4					
	Haliastur sphenurus	Whistling Kite								1																	2					
	Hieraaetus morphnoides	Little Eagle																						1	1		3					
	Lophoictinia isura	Square-tailed Kite																						1								
Anatidae	*Tadorna tadornoides*	Australian Shelduck																					5									
Podargidae	*Podargus strigoides*	Tawny Frogmouth																									1					
Casuariidae	*Dromaius novaehollandiae*	Emu																					1	1		1	9					
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull																							1							
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis																									92					
Columbidae	*Columba livia*	Domestic Pigeon																						1	12							
	Ocyphaps lophotes	Crested Pigeon								3	7																15					
	Phaps chalcoptera	Common Bronzewing									2	1											2	1			14					
	Phaps elegans	Brush Bronzewing							75																							
	Spilopelia senegalensis	Laughing Turtle-dove								6	4														6		2		1	1		
	Spilpopelia chinensis	Spotted Turtle-dove																								1						
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra										6											1				9					
	Todiramphus sanctus	Sacred Kingfisher										2	1										1		1	1	1		1			
Meropidae	*Merops ornatus*	Rainbow Bee-eater																					2				26					
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo																					1	3		1						
	Chalcites basalis	Horsfield's Bronze-cuckoo								1	1													2	1	1	1					
	Chalcites lucidus	Shining Bronze-cuckoo																						2								
	Heteroscenes pallidus	Pallid Cuckoo																						2								
Falconidae	*Falco berigora*	Brown Falcon																									2					
Falconidae	*Falco cenchroides*	Nankeen Kestrel											1												2	1	1			1		
	Falco longipennis	Australian Hobby																						1			1					
	Falco peregrinus	Peregrine Falcon																							1							
Phasianidae	*Coturnix pectoralis*	Stubble Quail																									7					
Otididae	*Ardeotis australis*	Australian Bustard																							1							
Rallidae	*Porzana tabuensis*	Spotless Crake				1																										
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill	X																					1		1	8					
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	X										3										4	5			9					
	Acanthiza inornata	Western Thornbill	X							7														4			28					
	Gerygone fusca	Western Gerygone	X							1		10	6										6	12		2	1	35			1		
	Sericornis frontalis	White-browed Scrubwren	X								3												2			22		13		1	1		
	Smicrornis brevirostris	Weebill	X									11												1			1	11					
Acrocephalidae	*Acrocephalus australis*	Australian Reed-warbler	X																													

		Surveys	A	B	C		D	E	F	G				H									I	J				K		L			M
Family	Species	Common Name			Brighton	Unknown			Trinity	Acacia	Dryandra	Eucalypt & Banksia	Banksia	Site 01	Site 02	Site 10B	Site 02B	Site 02A	Site 10A	Site 01A	Site 14A	Site 4	Site 4	Site 2	Site 1	Opportunistic	Opportunistic	Site 5	Cassilda Park	Kinsale Park	Brighton	
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	X			5					11														7		1	2					
	Artamus cyanopterus	Dusky Woodswallow	X																														
	Artamus personatus	Masked Woodswallow	X																														
	Cracticus nigrogularis	Pied Butcherbird	X																														
	Cracticus torquatus	Grey Butcherbird	X							2	6	3	3										1	3	5		4			1	1		
	Gymnorhina tibicen	Australian Magpie	X							1		7	6									4	7	2	3	1	74		1	1	1		
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	X			5				1	3	1	3										3	2			12		1				
	Lalage tricolor	White-winged Triller	X			15					1																						
Corvidae	*Corvus coronoides*	Australian Raven	X							2			1									4	6	6	6	1	34			1			
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow	X																					1	1		3						
	Hirundo neoxena	Welcome Swallow	X							4														1	4		20		1	1			
	Petrochelidon nigricans	Tree Martin	X																					1	18								
Maluridae	*Malurus lamberti*	Variegated Fairy-wren	X			5																					24		1				
	Malurus leucopterus	White-winged Fairy-wren	X																						4		23						
	Malurus splendens	Splendid Fairy-wren	X							12	30	22	18									4	18	8	1		204						
	Stipiturus malachurus	Southern Emu-wren	X																														
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark	X																														
	Acanthorhynchus superciliosus	Western Spinebill	X																				4				4						
	Anthochaera carunculata	Red Wattlebird	X			5				1	11	11	15									5	6	4	6	1	36		1	1			
	Anthochaera chrysoptera	Little Wattlebird																					14	1	1		3						
	Anthochaera lunulata	Western Little Wattlebird	X																														
	Epthianura albifrons	White-fronted Chat	X																								15						
	Gavicalis virescens	Singing Honeyeater	X							7	4		10										2	1	12		10		1	1			
	Gliciphila melanops	Tawny-crowned Honeyeater	X																					12			9						
	Lichenostomus ornatus	Yellow-plumed Honeyeater																					1										
	Lichmera indistincta	Brown Honeyeater																									193						
	Lichmera indistincta	Brown Honeyeater	X							3		44	11										21	15	7				1	1			
	Manorina flavigula	Yellow-throated Miner	X																												1		
	Melithreptus lunatus	White-naped Honeyeater																					1										
	Sugomel nigrum	Black Honeyeater																									109						
	Phylidonyris niger	White-cheeked Honeyeater	X			1				30	230	10												5	3				1				
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	X																				3				152		1	1			
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	X																				1				2		1	1	1		
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit	X			15				2															1	1	31						
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoe Bird				10																											
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	X								5	8										2	5				1						
	Pachycephala pectoralis	Golden Whistler										5	9									1											
	Pachycephala rufiventris	Rufous Whistler	X																			10	3				19						
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	X																				4										
	Pardalotus striatus	Striated Pardalote	X									1										5	8				4			1			
Petroicidae	*Eopsaltria georgiana*	White-breasted Robin	X																														
	Petroica boodang	Scarlet Robin	X																				6										

		Surveys	A	B	C		D	E	F	G				H								I	J				K		L			M
Family	**Species**	**Common Name**			**Brighton**	**Unknown**			**Trinity**	**Acacia**	**Dryandra**	**Eucalypt & Banksia**	**Banksia**	**Site 01**	**Site 02**	**Site 10B**	**Site 02B**	**Site 02A**	**Site 10A**	**Site 01A**	**Site 14A**	**Site 4**	**Site 4**	**Site 2**	**Site 1**	**Opportunistic**	**Opportunistic**	**Site 5**	**Cassilda Park**	**Kinsale Park**	**Brighton**	
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	X									4	1									2	5		3		34		1			
	Rhipidura leucophrys	Willie Wagtail	X			1					1		1											1	1		11		1	1		
Timaliidae	*Zosterops lateralis*	Silvereye	X							62	70	45	11											4	4		321		1	1	1	
Cacatuidae	*Cacatua sanguinea*	Little Corella								2												2				1	14					
	Calyptorhynchus latirostris	Carnaby's Cockatoo									2	1	8									3	4	1			240					
	Eolophus roseicapilla	Galah									2	12	4									8	12		5	1	116		1	1		
Psittacidae	*Barnardius zonarius*	Australian Ringneck									2	14										4	19			1	67			1		
	Neophema elegans	Elegant Parrot																					1									
	Trichoglossus haematodus	Rainbow Lorikeet																				2										
Strigidae	*Ninox boobook*	Southern Boobook																					2						1			
Fish																																
Percichthyidae	*Bostockia porosa*	Nightfish	X																													
Amphibians																																
Hylidae	*Litoria moorei*	Motorbike Frog	X																													
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog	X	8		40			1			1	17			1	6	12		7	13		3					3				
	Limnodynastes dorsalis	Western Banjo Frog	X	15	30	75				4	23	1	2			2	1	5		4	2		1		1			16				
Myobatrachidae	*Crinia insignifera*	Squelching Froglet	X	7		35																										
	Myobatrachus gouldii	Turtle Frog																					2									
	Pseudophryne guentheri	Gunther's Toadlet	X	1		1																										
Mammals																																
Canidae	*Vulpes vulpes*	Red Fox							1				1											1	1	1						
Felidae	*Felis catus*	Cat																							1	1						
Dasyuridae	*Dasyurus geoffroii*	Chuditch	X	1																												
	Sminthopsis fuliginosus	Grey-bellied Dunnart																						1								
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	X	1						6	1	3											8	11		1						
	Notamacropus irma	Western Brush Wallaby																					1									
Tarsipedidae	*Tarsipes rostratus*	Honey Possum	X	5		5					16													1				3				
Leporidae	*Oryctolagus cuniculus*	Rabbit																					1	1	1	1						
Peramelidae	*Isoodon obesulus*	Quenda	X						1																							
Muridae	*Mus musculus*	House Mouse			10				98	13	17	7	4		1	2		14	5		1		2		6			5				
	Rattus fuscipes	Bush Rat	X	6		1	4	1	6		1								1						3							
	Rattus rattus	Black Rat							2													1			2							
Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat	X	1			1																1			1						
Reptiles																																
Agamidae	*Ctenophorus adelaidensis*	Western Heath Dragon	X	7		35											5	1														
	Pogona minor	Dwarf Bearded Dragon	X	8		8			35	2		1	3				3	9							1			3				
Diplodactylidae	*Crenadactylus ocellatus*	Clawless Gecko	X	3																			2									
	Diplodactylus polyophthalmus	Speckled Stone Gecko	X	2		10																										
	Strophurus elderi	Jewelled Gecko								1																						
	Strophurus spinigerus	South-western Spiny-tailed Gecko	X	4		4			81	8	4						5	7					2									
Elapidae	*Brachyurophis fasciolata*	Narrow-banded Burrowing Snake	X																													
	Brachyurophis semifasciata	Half-girdled Snake	X	4		20			12				2															1				

		Surveys	A	B	C		D	E	F	G				H								I	J				K		L			M
Family	Species	Common Name			Brighton	Unknown			Trinity	Acacia	Dryandra	Eucalypt & Banksia	Banksia	Site 01	Site 02	Site 10B	Site 02B	Site 02A	Site 10A	Site 01A	Site 14A	Site 4	Site 4	Site 2	Site 1	Opportunistic	Opportunistic	Site 5	Cassilda Park	Kinsale Park	Brighton	
	Demansia psammophis	Yellow-faced Whipsnake							15	7	2	1	2				2											1				
	Echiopsis curta	Bardick	X	3		15			8	1																		2				
	Neelaps bimaculatus	Black-naped Burrowing Snake	X	2		10			3																			1				
	Neelaps calonotus	Black-striped Burrowing Snake	X	1																												
	Parasuta gouldii	Gould's Snake	X	8		8			12	1																						
	Pseudonaja affinis	Dugite	X	1	2	1			9		1	2												1	1							
	Pseudonaja mengdeni	Western Brown Snake							1																							
	Simoselaps bertholdi	Jan's Banded Snake	X	9		9			38	2	2		6				2	1										1				
	Simoselaps littoralis	West Coast Banded Snake	X																													
Gekkonidae	*Christinus marmoratus*	Marbled Gecko	X	4		20			10											4	2											
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard	X	4		25																2			1			1				
	Delma concinna	Javelin Lizard	X		5				6																							
	Delma fraseri	Fraser's Delma	X	1		5			7				1											1				1				
	Delma grayii	Side-barred Delma	X	3		15			22								1															
	Lialis burtonis	Burton's Legless Lizard	X	4		20			57			1	1			1		2				6	1									
	Pletholax gracilis	Keeled Legless Lizard							6																1							
	Pygopus lepidopodus	Common Scaly-foot	X	2	1	2			22		1																					
Pythonidae	*Morelia spilota*	Carpet Python	X	1																												
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink	X	2		10															2											
	Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink	X	3		15			19		2	2	5					1	1	8	8	5	2			1						
	Ctenotus australis	Western Limestone Ctenotus	X	5	10	25			73	3	11	1	5				5	3										12				
	Ctenotus fallens	West-coast Laterite Ctenotus	X	5	20	25			57	6	20	22	16				2	5		3	2	2			1			22				
	Cyclodomorphus celatus	Western Slender Bluetongue	X	6		30					2	1																2				
	Egernia kingii	King's Skink																							1							
	Egernia napoleonis	Southwestern Crevice Skink	X	2	5	10			20			3																				
	Hemiergis quadrilineatum	Two-toed Earless Skink	X	8	45	40			123	18	9	32	43			7	3	11	5	20	3	63	3	1	1			2				
	Lerista distinguenda	South-western Orange-tailed Slider							1													4										
	Lerista elegans	West Coast Four-toed Lerista	X	11	20	55											9	18		4	48	2	2	2	2			1				
	Lerista lineopunctulata	Dotted-line Robust Slider	X	4		20			2									1														
	Lerista praepedita	Blunt-tailed West-coast Slider	X	13		65			11								1					2	1									
	Menetia greyii	Common Dwarf Skink	X	5	5	25			17	2	2	4	3			2	1	3	2	24	57	5	1	6				2				
	Morethia lineoocellata	Pale-flecked Morethia							8													1	1	1								
	Morethia obscura	Shrubland Pale-flecked Morethia	X	2	20	10			40		3	3	4				2	4	2	6	21	8	1									
	Tiliqua occipitalis	Western Blue-tongued Lizard							7				2		2			1					2	4	2	1		9				
	Tiliqua rugosa	Bobtail	X	1	2				46	2	3	3	10	9	16	1	1	4				1						4				
Typhlopidae	*Anilios australis*	Austral Blind Snake	X	1		2			4				1																			
	Anilios pinguis	Rotund Blind Snake							2																							
Varanidae	*Varanus gouldii*	Gould's Goanna							1																							
	Varanus tristis	Black-headed Monitor	X	1		1																										
Chelidae	*Chelodina colliei*	Collie's Snake-necked Turtle		1		5																										

A Atlas of Living Australia

B Western Australian Museum

C NatureMap - Brighton
D NatureMap - Gnangara
E NatureMap – Mitchell Freeway
F Terrestrial Ecosystems (2012) Trinity
G ATA Environmental (ATA Environmental 2008) Vertebrate Fauna Assessment Lot 3 Romeo Road, Alkimos, Unpublished report for Northern Corridor Developments Limited.
H Valentine, I.E., Wilson, B.A., Reaveley, A., Huang, N., Johnson, B. and Brown, P.R. (2009) *Patterns of Ground-dwelling Vertebrate Biodiversity in the Gnangara Sustainability Strategy Study Area*, Unpublished report for the Department of Environment and Conservation, Perth.
I GHD (2014b) *Neerabup Road Extension Level 2 Fauna Survey*, Unpublished report for Main Roads Western Australia, Perth
J ATA Environmental (1991) *Yanchep Structure Plan Vertebrate Fauna Survey*, Unpublished report for Tokyu Corporation, Perth.
K ATA Environmental (2007) *Vertebrate Fauna Assessment St Andrews Estate (Southern Precinct), Yanchep*, Unpublished report for Yanchep Sun City Pty Ltd, Perth.
L Gole, C.A. (2003) *Bird Survey in selected Perth Metropolitan Reserves. A Joint Biodiversity Conservation Project between Birds Australia WA and Perth Biodiversity Project*, Unpublished report Birds Australia and Perth Biodiversity Project, Perth.
M Bamford Consulting Ecologists (2005) *Alkimos Proposed Wastewater Treatment Plant: Fauna Assessment*, Unpublished report for Water Corporation, Perth.

Appendix B(2). Vertebrate fauna assessments

		Survey	A						
Family	**Species**	**Common Name**	**Site 3**	**Site 6**	**Site 5**	**Site 4**	**Site 2**	**Site 1**	**Opportunist**
Amphibians									
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog	24	12	13	27	9	5	
	Limnodynastes dorsalis	Western Banjo Frog				4			
Myobatrachidae	*Crinia georgiana*	Quacking Frog				4			
	Crinia insignifera	Squelching Froglet				1			
	Pseudophryne guentheri	Gunther's Toadlet				1			
Birds									
Accipitridae	*Accipiter fasciatus*	Brown Goshawk	1						
	Elanus axillaris	Black-shouldered Kite	1						
	Hieraaetus morphnoides	Little Eagle					1		
Anatidae	*Anas superciliosa*	Pacific Black Duck				2			
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	1						1
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	6						
Columbidae	*Phaps chalcoptera*	Common Bronzewing	1			1			
	Spilopelia senegalensis	Laughing Turtle-dove				2			
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra		1		7	2		
	Todiramphus sanctus	Sacred Kingfisher		1	1	6	3	1	
Meropidae	*Merops ornatus*	Rainbow Bee-eater				1	8	1	1
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-cuckoo					1		
	Chalcites lucidus	Shining Bronze-cuckoo		3					
	Heteroscenes pallidus	Pallid Cuckoo						1	
Falconidae	*Falco berigora*	Brown Falcon		1					
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill				4			
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill		10		25	4	9	
	Acanthiza inornata	Western Thornbill		9			17		
	Gerygone fusca	Western Gerygone	20	24	10	6	47	25	2
	Smicrornis brevirostris	Weebill	8	14	1		12	3	
Artamidae	*Cracticus torquatus*	Grey Butcherbird	2	8	8	7	4	2	1
	Gymnorhina tibicen	Australian Magpie	9		6	21	6	11	3
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike		7	2	1	5	11	1
Corvidae	*Corvus coronoides*	Australian Raven	3	5	8	6	14	22	1
Maluridae	*Malurus splendens*	Splendid Fairy-wren				5	14		
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	2	4	10	14	13	12	1
	Gavicalis virescens	Singing Honeyeater		6	7	4	7	6	
	Lichmera indistincta	Brown Honeyeater				3	5	9	
	Phylidonyris niger	White-cheeked Honeyeater			6	3	4	1	
Monarchidae	*Grallina cyanoleuca*	Magpie-lark		2	2	3	1	1	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush					2		
	Pachycephala pectoralis	Golden Whistler	2	1					
	Pachycephala rufiventris	Rufous Whistler	2	6	1	3	5	1	1
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	1		4		3	4	
Petroicidae	*Petroica boodang*	Scarlet Robin					1		
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	2	2	1	50	11	3	1
Timaliidae	*Zosterops lateralis*	Silvereye	4	8	15	34	90	26	

		Survey	A						
Family	**Species**	**Common Name**	**Site 3**	**Site 6**	**Site 5**	**Site 4**	**Site 2**	**Site 1**	**Opportunist**
Cacatuidae	*Cacatua sanguinea*	Little Corella					5		
	Calyptorhynchus latirostris	Carnaby's Cockatoo	3		2		6		
	Eolophus roseicapilla	Galah		5	6	2	13	15	
Psittacidae	*Barnardius zonarius*	Australian Ringneck	3	7	26	33	33	36	1
	Purpureicephalus spurius	Red-capped Parrot		1		1			
	Trichoglossus haematodus	Rainbow Lorikeet					4	10	
Strigidae	*Ninox boobook*	Southern Boobook					1		
Molossidae	*Austronomus australis*	White-striped Freetail Bat			1				
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat		1					
Mammals									
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	2	1	1	11	5	2	
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	4	1			4		
Leporidae	*Oryctolagus cuniculus*	Rabbit				1	1		
Peramelidae	*Isoodon obesulus*	Southern Brown Bandicoot			1				
Equidae	*Equus caballus*	Horse						1	
Muridae	*Mus musculus*	House Mouse			3		1	8	
Reptiles									
Agamidae	*Pogona minor*	Western Bearded Dragon		1	2		1	1	
Diplodactylidae	*Oedura marmorata*	Marbled Velvet Gecko					1	1	
Elapidae	*Neelaps bimaculatus*	Black-naped Burrowing Snake	1						
	Pseudonaja affinis	Dugite	1				1		
	Simoselaps bertholdi	Jan's Banded Snake					1		
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard	1	4		1		2	
	Lialis burtonis	Burton's Legless Lizard	4	2	9		10	13	
	Pletholax gracilis	Keeled Legless Lizard						1	
Pythonidae	*Morelia spilota*	Carpet Python					2		
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink		1		3			
	Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink	4	8	5		7	3	
	Ctenotus australis	Western Limestone Ctenotus			2		1	2	
	Ctenotus fallens	West-coast Laterite Ctenotus			1		7	8	
	Cyclodomorphus celatus	Western Slender Bluetongue					1		
	Hemiergis quadrilineatum	Two-toed Earless Skink	14	15	9	4	37	28	
	Lerista elegans	West Coast Four-toed Lerista	18	7	6		5	1	
	Lerista praepedita	Blunt-tailed West-coast Slider			1			1	
	Menetia greyii	Common Dwarf Skink	18	6	2	20	1	3	
	Morethia lineoocellata	Pale-flecked Morethia		3	1		4	2	
	Morethia obscura	Shrubland Pale-flecked Morethia	5	3	3		2	1	
	Tiliqua rugosa	Bobtail	3	3	3	4	7	7	
Typhlopidae	*Anilios australis*	Austral Blind Snake	1						
Varanidae	*Varanus tristis*	Black-headed Monitor	1						

A Biota Environmental Sciences (2000) *Lot 52 Burns Beach Road Fauna Survey*, Perth.

Appendix C
Definitions of Significant Fauna under the WA *Biodiversity Conservation Act 2016* and Priority Species

Vertebrate Fauna Survey - Lot 211 Quinns Road, Mindarie

ATTACHMENT C
DEFINITIONS OF SIGNIFICANT FAUNA UNDER THE WA *BIODIVERSITY CONSERVATION ACT 2016*

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*. Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened Species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct Species

[1] The definition of flora includes algae, fungi and lichens

[2] Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that "*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially Protected Species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory birds protected under an international agreement

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependant fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations

P1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

P2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

P3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

P4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species 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 species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix D
Fauna habitat assessment results

Vertebrate Fauna Survey - Lot 211 Quinns Road, Mindarie

Date: 29-Aug-19	Habitat Assessment #: Q1	Observers: Dr Scott Thompson
Zone: 50	Easting: 376473 mE	Northing: 6494451 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Disturbed
Soil Type: Sand	Surface: Sand	

Habitat Structure: Highly disturbed, cleared habitat or planted vegetation

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q2	Observers: Dr Scott Thompson
Zone: 50	Easting: 376466 mE	Northing: 6494395 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Disturbed
Soil Type: Sand	Surface: Sand	

Habitat Structure: Highly disturbed, cleared habitat or planted vegetation

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q3	Observers: Dr Scott Thompson
Zone: 50	Easting: 376409 mE	Northing: 6494393 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Disturbed
Soil Type: Sand	Surface: Sand	

Habitat Structure: Highly disturbed, cleared habitat or planted vegetation

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q4	Observers: Dr Scott Thompson
Zone: 50	Easting: 376323 mE	Northing: 6494448 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q5	Observers: Dr Scott Thompson
Zone: 50	Easting: 376335 mE	Northing: 6494434 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q6	Observers: Dr Scott Thompson
Zone: 50	Easting: 376363 mE	Northing: 6494402 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q7	Observers: Dr Scott Thompson
Zone: 50	Easting: 376402 mE	Northing: 6494356 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q8	Observers: Dr Scott Thompson
Zone: 50	Easting: 376449 mE	Northing: 6494302 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q9	Observers: Dr Scott Thompson
Zone: 50	Easting: 376483 mE	Northing: 6494263 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q10	Observers: Dr Scott Thompson
Zone: 50	Easting: 376503 mE	Northing: 6494225 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q11	Observers: Dr Scott Thompson
Zone: 50	Easting: 376538 mE	Northing: 6494193 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q12	Observers: Dr Scott Thompson
Zone: 50	Easting: 376552 mE	Northing: 6494164 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q13	Observers: Dr Scott Thompson
Zone: 50	Easting: 376555 mE	Northing: 6494123 mN
Landform: Coastal undulating	Fire History: > 5 years	Habitat Quality: Good to poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Coastal low heath on sand and karst limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q14	Observers: Dr Scott Thompson
Zone: 50	Easting: 376575 mE	Northing: 6494132 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q15	Observers: Dr Scott Thompson
Zone: 50	Easting: 376603 mE	Northing: 6494140 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q16	Observers: Dr Scott Thompson
Zone: 50	Easting: 376623 mE	Northing: 6494138 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q17	Observers: Dr Scott Thompson
Zone: 50	Easting: 376628 mE	Northing: 6494160 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q18	Observers: Dr Scott Thompson
Zone: 50	Easting: 376629 mE	Northing: 6494186 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q19	Observers: Dr Scott Thompson
Zone: 50	Easting: 376590 mE	Northing: 6494200 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q20	Observers: Dr Scott Thompson
Zone: 50	Easting: 376560 mE	Northing: 6494221 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q21	Observers: Dr Scott Thompson
Zone: 50	Easting: 376588 mE	Northing: 6494232 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q22	Observers: Dr Scott Thompson
Zone: 50	Easting: 376610 mE	Northing: 6494242 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q23	Observers: Dr Scott Thompson
Zone: 50	Easting: 376633 mE	Northing: 6494250 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q24	Observers: Dr Scott Thompson
Zone: 50	Easting: 376643 mE	Northing: 6494229 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q25	Observers: Dr Scott Thompson
Zone: 50	Easting: 376647 mE	Northing: 6494228 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Poor
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q26	Observers: Dr Scott Thompson
Zone: 50	Easting: 376669 mE	Northing: 6494224 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q27	Observers: Dr Scott Thompson
Zone: 50	Easting: 376665 mE	Northing: 6494190 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q28	Observers: Dr Scott Thompson
Zone: 50	Easting: 376661 mE	Northing: 6494168 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q29	Observers: Dr Scott Thompson
Zone: 50	Easting: 376669 mE	Northing: 6494154 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q30	Observers: Dr Scott Thompson
Zone: 50	Easting: 376658 mE	Northing: 6494153 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q31	Observers: Dr Scott Thompson
Zone: 50	Easting: 376682 mE	Northing: 6494161 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q32	Observers: Dr Scott Thompson
Zone: 50	Easting: 376654 mE	Northing: 6494287 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q33	Observers: Dr Scott Thompson
Zone: 50	Easting: 376638 mE	Northing: 6494311 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q34	Observers: Dr Scott Thompson
Zone: 50	Easting: 376624 mE	Northing: 6494312 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q35	Observers: Dr Scott Thompson
Zone: 50	Easting: 376613 mE	Northing: 6494285 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q36	Observers: Dr Scott Thompson
Zone: 50	Easting: 376596 mE	Northing: 6494276 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q37	Observers: Dr Scott Thompson
Zone: 50	Easting: 376578 mE	Northing: 6494287 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q38	Observers: Dr Scott Thompson
Zone: 50	Easting: 376549 mE	Northing: 6494320 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q39	Observers: Dr Scott Thompson
Zone: 50	Easting: 376508 mE	Northing: 6494355 mN
Landform: Man-made	Fire History: > 5 years	Habitat Quality: Disturbed
Soil Type: Sand	Surface: Sand	

Habitat Structure: Highly disturbed, cleared habitat or planted vegetation

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q40	Observers: Dr Scott Thompson
Zone: 50	Easting: 376514 mE	Northing: 6494409 mN
Landform: Man-made	Fire History: > 5 years	Habitat Quality: Disturbed
Soil Type: Sand	Surface: Sand	

Habitat Structure: Highly disturbed, cleared habitat or planted vegetation

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q41	Observers: Dr Scott Thompson
Zone: 50	Easting: 376532 mE	Northing: 6494391 mN
Landform: Man-made	Fire History: > 5 years	Habitat Quality: Disturbed
Soil Type: Sand	Surface: Sand	

Habitat Structure: Highly disturbed, cleared habitat or planted vegetation

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q42	Observers: Dr Scott Thompson
Zone: 50	Easting: 376567 mE	Northing: 6494343 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q43	Observers: Dr Scott Thompson
Zone: 50	Easting: 376591 mE	Northing: 6494343 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q44	Observers: Dr Scott Thompson
Zone: 50	Easting: 376624 mE	Northing: 6494361 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q45	Observers: Dr Scott Thompson
Zone: 50	Easting: 376654 mE	Northing: 6494372 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q46	Observers: Dr Scott Thompson
Zone: 50	Easting: 376680 mE	Northing: 6494398 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q47	Observers: Dr Scott Thompson
Zone: 50	Easting: 376697 mE	Northing: 6494420 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q48	Observers: Dr Scott Thompson
Zone: 50	Easting: 376698 mE	Northing: 6494454 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q49	Observers: Dr Scott Thompson
Zone: 50	Easting: 376713 mE	Northing: 6494466 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q50	Observers: Dr Scott Thompson
Zone: 50	Easting: 376726 mE	Northing: 6494488 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q51	Observers: Dr Scott Thompson
Zone: 50	Easting: 376719 mE	Northing: 6494520 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q52	Observers: Dr Scott Thompson
Zone: 50	Easting: 376688 mE	Northing: 6494491 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q53	Observers: Dr Scott Thompson
Zone: 50	Easting: 376670 mE	Northing: 6494467 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q54	Observers: Dr Scott Thompson
Zone: 50	Easting: 376647 mE	Northing: 6494443 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q55	Observers: Dr Scott Thompson
Zone: 50	Easting: 376645 mE	Northing: 6494400 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q56	Observers: Dr Scott Thompson
Zone: 50	Easting: 376604 mE	Northing: 6494399 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q57	Observers: Dr Scott Thompson
Zone: 50	Easting: 376592 mE	Northing: 6494371 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q58	Observers: Dr Scott Thompson
Zone: 50	Easting: 376583 mE	Northing: 6494406 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q59	Observers: Dr Scott Thompson
Zone: 50	Easting: 376558 mE	Northing: 6494440 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 29-Aug-19	Habitat Assessment #: Q60	Observers: Dr Scott Thompson
Zone: 50	Easting: 376595 mE	Northing: 6494427 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q61	Observers: Dr Scott Thompson
Zone: 50	Easting: 376563 mE	Northing: 6494463 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q62	Observers: Dr Scott Thompson
Zone: 50	Easting: 376552 mE	Northing: 6494487 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q63	Observers: Dr Scott Thompson
Zone: 50	Easting: 376564 mE	Northing: 6494500 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q64	Observers: Dr Scott Thompson
Zone: 50	Easting: 376586 mE	Northing: 6494483 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q65	Observers: Dr Scott Thompson
Zone: 50	Easting: 376598 mE	Northing: 6494468 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q66	Observers: Dr Scott Thompson
Zone: 50	Easting: 376610 mE	Northing: 6494457 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q67	Observers: Dr Scott Thompson
Zone: 50	Easting: 376641 mE	Northing: 6494478 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q68	Observers: Dr Scott Thompson
Zone: 50	Easting: 376624 mE	Northing: 6494502 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q69	Observers: Dr Scott Thompson
Zone: 50	Easting: 376605 mE	Northing: 6494519 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q70	Observers: Dr Scott Thompson
Zone: 50	Easting: 376590 mE	Northing: 6494531 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q71	Observers: Dr Scott Thompson
Zone: 50	Easting: 376566 mE	Northing: 6494523 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q72	Observers: Dr Scott Thompson
Zone: 50	Easting: 376524 mE	Northing: 6494514 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q73	Observers: Dr Scott Thompson
Zone: 50	Easting: 376517 mE	Northing: 6494539 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q74	Observers: Dr Scott Thompson
Zone: 50	Easting: 376554 mE	Northing: 6494545 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q75	Observers: Dr Scott Thompson
Zone: 50	Easting: 376531 mE	Northing: 6494559 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q76	Observers: Dr Scott Thompson
Zone: 50	Easting: 376517 mE	Northing: 6494569 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q77	Observers: Dr Scott Thompson
Zone: 50	Easting: 376498 mE	Northing: 6494590 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q78	Observers: Dr Scott Thompson
Zone: 50	Easting: 376503 mE	Northing: 6494611 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q79	Observers: Dr Scott Thompson
Zone: 50	Easting: 376523 mE	Northing: 6494616 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q80	Observers: Dr Scott Thompson
Zone: 50	Easting: 376541 mE	Northing: 6494630 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q81	Observers: Dr Scott Thompson
Zone: 50	Easting: 376584 mE	Northing: 6494620 mN
Landform: Drain	Fire History: > 5 years	Habitat Quality: Disturbed
Soil Type: Sand	Surface: Sand	

Habitat Structure: Highly disturbed, cleared habitat or planted vegetation

TERRESTRIAL ECOSYSTEMS

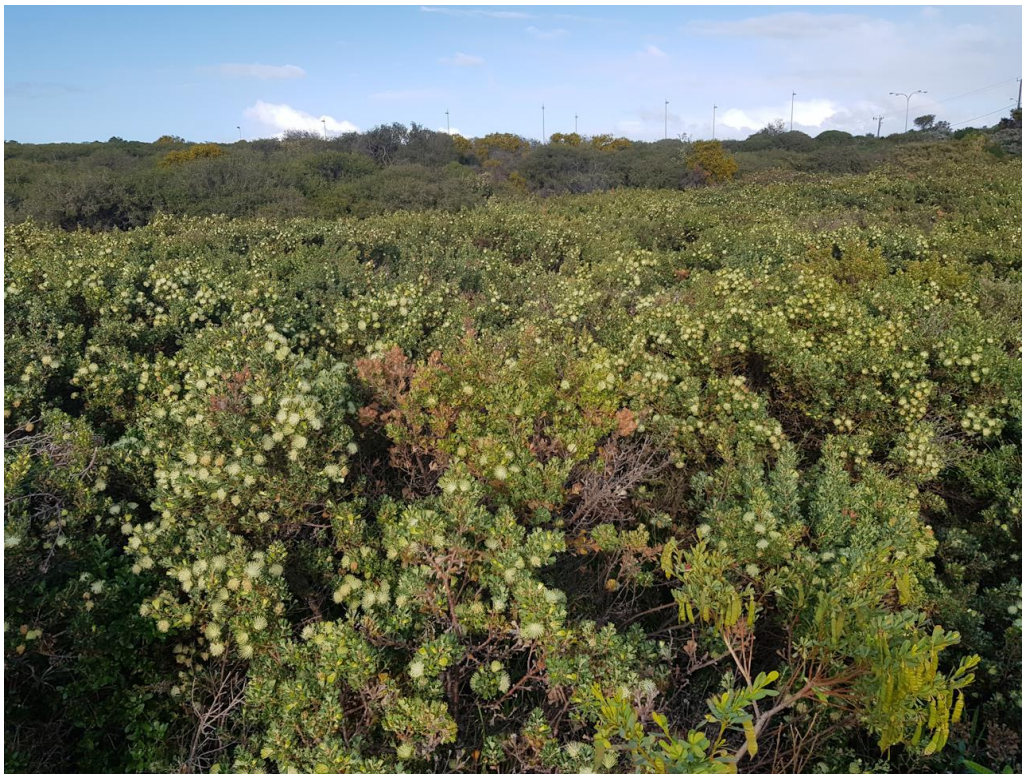
Date: 30-Aug-19	Habitat Assessment #: Q82	Observers: Dr Scott Thompson
Zone: 50	Easting: 376568 mE	Northing: 6494624 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q83	Observers: Dr Scott Thompson
Zone: 50	Easting: 376558 mE	Northing: 6494598 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone



TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q84	Observers: Dr Scott Thompson
Zone: 50	Easting: 376570 mE	Northing: 6494567 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q85	Observers: Dr Scott Thompson
Zone: 50	Easting: 376617 mE	Northing: 6494579 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q86	Observers: Dr Scott Thompson
Zone: 50	Easting: 376635 mE	Northing: 6494613 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q87	Observers: Dr Scott Thompson
Zone: 50	Easting: 376653 mE	Northing: 6494583 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q88	Observers: Dr Scott Thompson
Zone: 50	Easting: 376650 mE	Northing: 6494564 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q89	Observers: Dr Scott Thompson
Zone: 50	Easting: 376642 mE	Northing: 6494545 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q90	Observers: Dr Scott Thompson
Zone: 50	Easting: 376683 mE	Northing: 6494517 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q91	Observers: Dr Scott Thompson
Zone: 50	Easting: 376689 mE	Northing: 6494531 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q92	Observers: Dr Scott Thompson
Zone: 50	Easting: 376679 mE	Northing: 6494553 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q93	Observers: Dr Scott Thompson
Zone: 50	Easting: 376675 mE	Northing: 6494534 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS

Date: 30-Aug-19	Habitat Assessment #: Q94	Observers: Dr Scott Thompson
Zone: 50	Easting: 376668 mE	Northing: 6494503 mN
Landform: Flat	Fire History: > 5 years	Habitat Quality: Good to very good
Soil Type: Sand	Surface: Sand and limestone	

Habitat Structure: Mixed open and closed shrubland and heath on sand and limestone

TERRESTRIAL ECOSYSTEMS