360 environmental

Hardcastle Park, Landsdale

Application for a Native Vegetation Clearing Permit – Purpose Permit

Prepared for:

City of Wanneroo

October 2017

people planet professional

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1 Introduction

The City of Wanneroo is proposing to develop a portion of 39 (Lot 3000) Hardcastle Avenue, Landsdale for a combined nature and community playground park (Hardcastle Park) (Figure 1). The Site is currently a passive park. It is 1.16 ha in size and located approximately 15 km north of Perth's Central Business District (CBD). The development will have a footprint of 0.61 ha and will include a turfed kick-about area, bench seating, paths, picnic settings and play equipment ('the Site') (Figure 2).

The Site is zoned 'Urban Development' under the City's District Planning Scheme No. 2 (DPS 2) and identified as Public Open Space (POS) under the East Wanneroo Cell 5 Agreed Structure Plan 7 (City of Wanneroo 2002).

1.1 Purpose of Document

The purpose of this document is to present the results of an assessment of the clearing aspects of the Project against the ten clearing principles as outlined in the (then) Department of Environment Regulation (DER) *Guide to Assessment: Clearing of Native Vegetation under the Environmental Protection Act 1986* (EP Act). This report identifies the potential environmental impacts associated with the Project based on the best available data. This NVCP will be submitted to the Department of Water and Environmental Regulation (DWER) for assessment.

1.2 Responsible Person

The City of Wanneroo is responsible for the implementation of the clearing described within this document. Correspondence relating to this NVCP application should be addressed to:

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2 Site Overview

2.1 Location

The Site is located at 39 (Lot 3000) Hardcastle Avenue; Landsdale and is situated approximately 15 km north of Perth's Central Business District (CBD) (Figure 1). The entire Lot covers a total area of 1.16 ha. Of which, the development footprint will cover an area of 0.61 ha (Figure 2).

The Site is located within the Swan Coastal Plain (SCP) biogeographic region of Western Australia (WA). The Swan Coastal Plan is a low lying coastal plain, mainly covered with woodlands. The Perth subregion (SWA02) is composed of colluvial and Aeolian sands, alluvial river flats, coastal limestone, heath and/or Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials (Mitchell et al. 2002).

2.2 Site History

Review of historical aerial imagery has identified that the Site is remnant native vegetation (Figures 3a-h). The earliest available aerial imagery is from 1983 and identifies the Site and surrounding area as uncleared native vegetation with a few tracks. By 1965, a number of tracks were cleared to form Lots as part of a subdivision and by 1974; some lots to the west of the Site were completely cleared of all vegetation. By 1985, a number of surrounding areas were also cleared of vegetation and were developed into rural residential properties and rural agricultural land uses. Further clearing of the surrounding area is apparent between 1985 and 1995, particularly thinning of vegetation within the Site and several remaining vegetated areas which has regrown by 2005. Between 2005 and 2015, the entire surrounding area had significantly changed, with all previous residential developments demolished and vegetated/rural lots cleared followed by extensive subdivision and development of several hundred residential lots. The southernmost portion of the Site along the boundary was cleared during this time as part of the subdivision clearing undertaken for adjacent areas.

The Site is currently used as a passive park, reserved as 'Public Recreation' (No. 51878) and contains some cleared tracks.

2.3 Topography

The topography of the Lot slopes from north to south, decreasing in elevation from 64 and 71 m Australian Height Datum (AHD), respectively.

2.4 Geology

Soil Landscapes and Land Systems mapping has identified the Site as typically Spearwood System: sand dunes and plains, yellow deep sands, pale deep sands and yellow/brown shallow sands (DAFWA 2012).

The 1:250 000 surface geology profile mapping (GSWA 2008) indicates the geology of the Site is typically as follows:

- **Coastal Dunes 38488:** Beach sand, sand dunes, coastal dunes and beach ridges with calcareous and siliceous, locally shelly and/or cemented; locally reworked.

Soil subsystems mapping identified that the Site is within a single soil subsystem unit (Figure 3) (DAFWA 2012):

- **211Sp_Ky, Karrakatta Sand Yellow Phase:** Low hilly to gently undulating terrain, yellow, Aeolian sand over limestone at 1-2 m.

2.5 Bioregion

The Site is located within the Swan Coastal Plain bioregion of the Interim Biogeographic Regionalisation of Australia (IBRA). The Swan Coastal Plain sub-region 2 (SWA02) is a low lying coastal plain composed of colluvial and Aeolian sands, alluvial river flats and coastal limestone rising to duricrusted Mesozoic sediments in the east. Outwash plains are extensive only in the south, while a complex series of seasonal wetlands and swamps extends from north to south. Vegetation comprises heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvial soils, *Casuarina obesa* on out-wash plains, and paperbark (*Melaleuca spp*.) in wetland areas (Mitchell et.al 2002).

2.6 Broad Vegetation Associations

Vegetation mapping of the Perth region was completed on a broad scale (1:250,000) by Beard (1981). These vegetation units were re-assessed by Shepherd et al. (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

There are two Beard/Shepherd vegetation units in the Site (Figure 4). The Shepherd et al. (2001) vegetation type is described below, and its representation within the State, IBRA region, IBRA subregion and Local Government are shown in Table 1.

- **Spearwood 6:** Medium woodland; Tuart and Jarrah; and
- **Bassendean 1001:** Medium very sparse woodland; Jarrah, with low woodland; banksia & casuarina.

Table 1: Broad Vegetation Types and its State and Regional Representation (Government of Western Australia 2016)

	Pre–European (ha)	Current Extent (ha)	Remaining (%)	Remaining in DPaW reserves (%)
IBRA Region Total Swan Coastal Plain	1,501,221.93	578,432.17	38.53	37.85
Statewide/IBRA Region – Statewide				
Beard Veg Assoc. No. 6	56,343.01	13,353.48	23.70	37.46
Beard Veg Assoc. No. 1001	57,410.23	12,791.62	22.28	13.74
In IBRA Region SWA02 – Perth Subregion				
Beard Veg Assoc. No. 6	56,343.01	13,353.48	23.70	37.46
Beard Veg Assoc. No. 1001	57,410.23	12,791.61	22.28	13.74
Local Government Authority – City of Wanneroo				
Beard Veg Assoc. No. 6	12,662.10	2,757.49	21.78	50.80
Beard Veg Assoc. No. 1001	663.55	183.64	27.68	45.54

The EPA's Guidance Statement No. 33: Environmental Guidance for Planning and Development has set a threshold for retention of 10% of the pre-existing extent of native vegetation (EPA 2008) within constrained areas. The Site is considered to be constrained as it is within the Perth Metropolitan Region Area and is within close proximity to urban areas. Both vegetation associations in Table 1 have current extents that are greater than the abovementioned 10% threshold.

The vegetation of the Swan Coastal Plain was mapped at a regional scale by Heddle et al (1980). The Site supports remnants of a single vegetation complex:

- **Karrakatta Complex – Central and South:** low open forest of *Eucalyptus gomphocephala, E. margintata, E. calophylla* and woodland of *E. marginata* and *Banksia spp*.

2.7 Hydrology

2.7.1 Surface Water

Review of available surface water feature mapping did not identify any known water bodies within the Site.

Wetlands of the Swan Coastal Plain have been described and mapped by Hill et al. (1996) and assigned a management category reflecting their condition. Mapping undertaken by the (then) Department of Parks and Wildlife (DPaW) has identified no wetlands occurring within or within the vicinity of the Site. The nearest geomorphic wetland is classified as 'Conservation Category' and is located approximately 977 m to the east of the Site (Figure 5) (DPaW 2017).

2.7.2 Groundwater

Groundwater levels range between 28.8 m and 33.5 m below ground level (mbgl) across the Site. The Perth Groundwater Map has also identified the Site as having 'fresh' salinity levels between 250-500 mg/L (DWER 2017a). Groundwater flows from north to south.

The Site is not located within a Public Drinking Water Source Areas (PDWSA) (DoW 2016). A Priority 3 PDWSA exists to the south and the east of the Site in excess of 330 m (Figure 5) (DoW 2016) (Figure 5).

2.8 Conservation Features

Environmentally Sensitive Areas (ESAs) are identified and protected under the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*. Under the Notice, it is an offence to kill or destroy vegetation within an ESA. Mapping undertaken by (then) DER indicates the Site is partially within the extent of an ESA (Figure 6). The Project is therefore not eligible for a clearing permit exemption. According to the Department of Water and Environmental Regulation (DWER)'s Clearing Permit System, the ESA refers to a Threatened Ecological Community and its associated buffers (DWER 2017b).

The Site is not within any conservation areas, including; Bush Forever Sites, Regional Reserves and Department of Biodiversity Conservation and Attractions (DBCA) Managed Lands. A number of these conservation areas are located within the surrounding area of the Site (Figure 6) (DoP 2014; DPaW 2016).

One Ecological Linkage intersects the entire Site (ID: 20) (Figure 6) (PBP 2008).

2.9 Climate

The Site experiences a dry Mediterranean climate with hot dry summers and mild winters (BoM 2017). The nearest official Bureau of Meteorology (BoM) weather station currently in operation is the Perth Metro Station (9225) located approximately 15 km south of the Site. The annual mean maximum temperature is 24.8°C and the annual mean minimum temperature is 12.8°C. The annual average rainfall is 727.5 mm (BoM 2017).

3 Assessment Methodology

3.1 Desktop Assessment

An initial desktop assessment was undertaken which included a review of current and relevant tenure and land ownership details, literature sources, database and GIS information to determine:

- Possible environmental survey and approvals requirements; and
- The location of areas with minimal environmental sensitivities/constraints and any highly constrained areas.

The desktop study provided background information on the flora and vegetation of the Site. Database searches of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST) and the Department of Biodiversity Conservation and Attractions (DBCA)'s NatureMap Search Tool were undertaken to compile a list of expected Threatened or Priority species and Threatened and Priority Ecological Communities (TECs and PECs) that may occur in the area. These database searches are described in Table 2.

Table 2: Database searches undertaken to identify potential environmental constraints

Potential Environmental Constraint(s)	Database Searches
Matters of National Environmental Significance (MNES)	EPBC Act PMST Search (DotEE 2017), 5 km radial search
Declared Rare Flora (DRF) and Priority species	DBCA NatureMap search, 5 km radial search (DBCA 2017)
TECs and / or PECs	EPBC Act PMST (DotEE 2017), 5 km radial search

3.2 Flora, Vegetation and Fauna Survey

Ecoscape Pty Ltd undertook a Level 2 Flora and Vegetation Survey and a Level 1 Fauna Survey on 8 October 2015. The Surveys were completed with the following objectives:

- Conduct a desktop assessment of relevant literature, databases and spatial datasets to determine the environmental values and any potential issues, such as Threatened/Rare significant species and Threatened Ecological Communities (TECs) that may be present;
- Produce a list of plant species;

- Document and map the locations of any Declared Rare Flora (DRF), Priority flora and other flora or local or taxonomic significance;
- Conduct a targeted search for conservation significant Fauna species;
- Record all sightings of fauna and map fauna habitat;
- Describe and map the vegetation and floristic community types;
- Identify, map and discuss the significance of any TECs, PECs and other areas of ecological importance;
- Record the precise location and species name of all trees present within 3 m of the boundary of cleared areas and commencement of remnant vegetation; and
- Assess, map and describe the vegetation associations present.

4 Results

4.1 Database Results

4.1.1 Flora

A review of the database searches (as described in Table 2) identified 38 conservation significant flora potentially occurring within the vicinity of the Site (DBCA 2017; DotEE 2017). Of these, 16 are classed as Threatened, five as Priority 1, three as Priority 2, seven as Priority 3 and seven as Priority 4. The Likelihood of these 38 conservation significant flora occurring within the Site is shown within Appendix D of this report.

4.1.2 Fauna

The NatureMap Report identified 18 conservation significant fauna species as potentially occurring within a 5 km radius of the Site (DBCA 2017). Of these, four are listed as Threatened (Forest Red-tailed Black Cockatoo, *Calyptorhynchus banksii naso*; Baudin's Cockatoo, *Calyptorhynchus baudinii*; Carnaby's Cockatoo, *Calyptorhynchus latirostris*; White-tailed Black Cockatoo, *Calyptorhynchus sp);* six are listed under International Agreements (Cattle Egret, *Ardea ibis* and *Ardea ibis coromanda*; Great Egret, *Ardea modesta*; Great Egret, *Ardea novaehollandiae*; Red-necked Stint, *Calidris ruficollis;* Rainbow Bee-eater, *Merops ornatus*); two are listed as Priority 3 (Black-striped Snake, *Neelaps colonotos*; Masked Owl, *Tyto novaehollandiae novaehollandiae*), seven listed as Priority 4 (Water-rat, *Hydromys chrysogaster*; Southern Brown Bandicoot, *Isoodon obesulus*; Quenda, *Isoodon obesulus fusciventer*; Australian Little Bittern, *Ixobrychus dibius*; Western Brush Wallaby, *Macropus Irma*; Blue-billed Duck, *Oxyura australis;* Graceful Sunmoth, *Synemon gratiosa*) and one is listed as Other Specially Protected Fauna (Peregrine Falcon, *Falco Peregrinus)* (DBCA 2017).

The PMST search identified nine conservation significant fauna species listed under the EPBC Act within a 5 km radius from the Site. This includes two Critically Endangered fauna species (Curlew Sandpiper, *Calidris ferruginea*; Eastern Curlew, *Numenius madagascariensis*); three Endangered species (Red Knot, *Calidris canutus*; Carnaby's Cockatoo, *Calyptorhynchus latirostris*; Australian Painted Snipe, Rostratula australis); and four Vulnerable species (Forest Red-tailed Black Cockatoo, *Calyptorhynchus banksii naso*; Malleefowl, *Leipoa ocellata*; Chuditch, *Dasyurus geoffroii*; Western Ringtail Possum, *Pseudocheirus occidentalis*) (DotEE 2017).

The Likelihood of these conservation significant fauna species occurring within the Site is shown within Appendix D of this report.

4.2 Survey Results

4.2.1 Overview of Flora

A total of 88 vascular flora species from 70 genera and 33 families were recorded within the Site. The commonly occurring families were Fabaceae (14 taxa), Proteaceae (seven taxa), Myrtaceae (six taxa) and Asteraceae (six taxa) (Ecoscape 2015).

The flora inventory is provided in Appendix 3 of the attached *Hardcastle Park Biological Survey* Report in Appendix A of this report.

4.2.2 Flora of Conservation Significance

The review of database searches identifies 38 conservation significant flora species as potentially occurring within a 5 km radius of the Site. One species was considered 'Likely' to occur to due to the presence of suitable habitat and existing records in close proximity to the Site. Four are considered 'Possible' to occur and 30 considered 'Unlikely' to occur. Two flora species were identified as potentially occurring within the Site based on database searches, however, the likelihood of occurrence is not known for these species due to a lack of information on their preferred habitat or lack of close records to the Site.

No Threatened species pursuant to the EPBC Act and/or gazetted as DRF pursuant to the *Wildlife Conservation Act 1950* (WC Act) were recorded during the survey (Ecoscape 2015).

4.2.3 Vegetation Associations

One vegetation association was described for the Site during the survey (Table 3) (Ecoscape 2015).

Table 3. Surveyed Vegetation Association and Extent

Mapping Unit	Vegetation Association	Extent in area (ha, %)
BaHhMc	*Banksia attenuata* low, open woodland over *Allocasuarina humilis* mid, isolated shrubs over *Hibbertia hypericoides*, *Eremaea pauciflora var. pauciflora* low, open shrubland over *Mesomelaena pseudostygia* sparse sedgeland and *Amphipogon turbinatus* sparse tussock grassland.	0.8 ha, 70%
Cleared	Completely Degraded (non-native vegetation)	0.2 ha, 30%

4.2.4 Floristic Community Types

Statistical analysis and data interpretation of the Survey results identified the following Floristic Community Types (FCTs) as occurring within the Site (Ecoscape 2015):

- SCP20a: *Banksia attenuata* woodlands over species rich dense shrublands; and
- SCP28: Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands.

Both FCTs are listed as sub-communities of the Threatened Ecological Community (TEC); Banksia Woodlands of the Swan Coastal Plain (DotEE 2016).

4.2.5 Vegetation Condition

The vegetation condition within the Proposed Clearing Area ranges from 'Excellent' to 'Completely Degraded' and is in mostly Excellent (0.59 ha) and Very Good (0.11 ha) condition with little weed species (Figure 7).

The perimeter of the native vegetation, closest to disturbance and clearing areas, was assessed to be in 'Good to Degraded' condition. These areas lacked a cohesive native understorey and had a high presence of weed species.

The surrounding Site is comprised of cleared areas classified as 'Completely Degraded'.

4.2.6 Threatened / Priority Ecological Communities

A search of the EPBC PMST and the TEC and PEC database has identified the following as occurring within a 5 km radius of the Site (DotEE 2017; Ecoscape 2015):

- Banksia Woodlands of the Swan Coastal Plain ecological community.

The Banksia Woodlands of the Swan Coastal Plain ecological community is listed (16 September 2016) as an Endangered community under the EPBC Act (DotEE 2016). A Level 2 Flora and Vegetation survey was undertaken in October 2015 and a subsequent desktop assessment was undertaken in October 2017 and has confirmed the site contains the Banksia Woodlands TEC.

The statistical analysis identified the vegetation association as having the most affiliation with FCT 20a and FCT 28. These FCTs are listed as sub-communities of the Banksia Woodlands TEC (DotEE 2016). The FCT has to meet key diagnostic characteristics to be considered a TEC. In regards to the presence of the Banksia Woodlands TEC, the Approved Conservation Advice for the thresholds state (DotEE 2016):

- Vegetation in Excellent Condition should have a minimum patch size of 0.5 ha;
- Vegetation in Very Good condition should be a minimum of 1 ha; and
- Vegetation in Good conditions should be a minimum of 2 ha.

In addition, patches that within 30 m of another patch in the same condition class, the patch areas are combined. Vegetation patches considered Degraded or worse are excluded and not protected under the EPBC Act (DotEE 2016).

Based on this information and the survey results, the vegetation mapped in 'Excellent', 'Very Good' and 'Good to Degraded' condition are considered to represent the Banksia Woodlands TEC within the Site and equates to 0.79 ha (Figure 7, 8). It is proposed that

0.30 ha of the Banksia Woodlands TEC be cleared to support the development of Hardcastle Park.

4.2.7 Overview of Fauna

Three fauna species were recorded during the Survey (Ecoscape 2015):

- Bobtail Lizard (*Tiliqua rugosa*);
- Feral cat (*Felis catus);* and
- Western Grey Kangaroo (*Macropus fuliginosus).*

No fauna species of conservation significance were identified in the Site (Ecoscape 2015).

4.2.8 Fauna Habitat Types

The Ecoscape Survey (2015) identified one fauna habitat covering the entire extent of the Site as Banksia Woodland: dominated by a moderate layer of *Banksia attenuata* with occasional *Allocasuarina humilis* and a small patch of *Eucalyptus marginata* (Jarrah) over a moderate to dense layer of shrubs *Hibbertia hypericoides* and *Eremaea pauciflora* over dense ground cover of *Amphipogon turbinatus* and *Mesomelaena pseudostygia*. The substrate is sand with sparse leaf and wood litter.

No potential breeding trees for Black Cockatoos are present within the Site, however, the Site contains potential foraging habitat for the species.

4.2.9 Black Cockatoos

A Level 1 Fauna survey was undertaken by Ecoscape within the Site in October 2015. The survey did not identify any conservation significant species listed under the EPBC Act, including the Black Cockatoos.

During the survey, it was identified that Site contains potential Black Cockatoo foraging habitat (0.79 ha) which coincides with the Banksia Woodlands TEC (Figure 5). No potential Black Cockatoo breeding habitat was identified within the Site (Ecoscape 2015).

Under the Department of the Environment and Energy's (DotEE)'s referral guidelines for three threatened Black Cockatoo species, it is recommended a Project be referred to the DotEE for assessment whereby the clearing of more than 1 ha of quality foraging habitat is proposed (DSEWPaC 2012).

Foraging Habitat

Carnaby's Cockatoo feed on a wide range of foods including seeds, flower buds, flowers and nectar of Banksia spp., Eucalyptus spp. and Acacia spp. (Johnstone & Kirkby 2011). The Forest Red-tailed Black Cockatoo fees mostly on Jarrah and Marri seeds, *Allocasuarina* cones and some introduced Eucalypts. Baudin's Cockatoos mainly feed on Marri, nectar, introduced fruits and insect larvae and the tips of *Pinus spp.* (DSEWPaC 2012).

The one natural vegetation association identified for the Site is consistent with potential foraging habitat for Black Cockatoo species:

- **BaHhMc** – Low *Banksia attenuata* and *Allocasuarina humilis* open woodland.

During the Survey, no Black Cockatoos were observed (Ecoscape 2015).

The Black Cockatoo foraging habitat within the Site covers an area of 0.79 ha and the Project will involve the clearing of approximately 0.30 ha (Figure 9). The foraging habitat within the Project Area ranges between 'Good/Degraded' to 'Excellent' condition (Figure 7). As the Site is isolated within a highly urbanised landscape and no Black Cockatoos were observed, the Site is not considered to be a primary habitat for the species.

During the Flora, Vegetation and Fauna Assessment, potential Black Cockatoo foraging habitat was identified within the Site. Foraging habitat consisted of *Banksia,* Eucalypts and *Allocasuarina*, all known dietary items of Black Cockatoos (DSEWPaC 2012). No Black Cockatoos were observed or heard during the survey.

5 Environmental Management Measures and Rehabilitation

Environmental management measures in place to minimise the risk of impact from the activities associated with the Project will include;

- Infill planting within degraded areas (where vegetation structure has been previously removed);
- Replacement of weed species with native vegetation and/or herbicide treatment prior to revegetation;
- Revegetate the Site with native species of local provenance;
- Staged clearing outside of the breeding period for conservation significant avian species will be conducted where possible;
- Prior to clearing activities, areas of native vegetation to be retained should be clearly demarcated by star pickets, coloured tape or bunting, or fencing and all personnel should be made aware of the requirement to protect native vegetation in these areas;
- No dead standing or fallen timber should be removed unnecessarily. Logs and other debris resulting from land clearing should be placed in retained vegetation to enhance fauna habitat;
- Prior to clearing, any fauna present will be removed and relocated by authorised personnel;
- Utilise existing tracks rather than creating new tracks, where possible;
- Vegetation clearing will be scheduled to occur immediately before planned earthworks to minimise the potential for dust, where practicable;
- Semi-permanent dust control treatments (e.g. hydromulching, dust stabilisers, tarps or geo-textile materials) will be implemented on stockpiles that are to be left for longer than one month;
- To ensure dieback is not introduced into the Site or revegetated areas, the movement of soils and plant material will be strictly managed to the Site;
- Ensure all tubestock used in revegetation activities are sourced from a certified Dieback free nursery;
- Tree guards will be used to protect seedlings from animals during revegetation; and
- Weed control should be undertaken by appropriately trained operators prior to revegetation.

6 Assessment against the Ten Clearing Principles

The proposed clearing activities have been assessed against the ten clearing principles as defined in DER's *Guide to Assessment: Clearing of Native Vegetation under the Environmental Protection Act 1986*, taking into account the current extent and condition of the native vegetation on the site. This assessment is presented in Table 4.

Table 4: Assessment against the 10 Clearing Principles

PRINCIPLE	ASSESSMENT
Principle (a) – Native vegetation should not be cleared if it comprises a high level of biological diversity	A PMST DBCA NatureMap searches were undertaken with a 5km radius from the centre of the Site and a subsequent likelihood assessment was undertaken to identify flora of conservation significance likely to occur within the Site. 16 conservation significant flora species listed under the EPBC Act are considered to potentially occur within the Site. The search identified four Critically Endangered flora species (Blue Tinsel Lily, *Calectasia cyanea*; Native Foxglove, *Dasymalla axillaris*; Muchea Bell, *Darwinia foetida;* and Selena's Syneaphea, *Synaphea sp. Fairbridge),* nine Endangered flora species (Grand Spider Orchid, *Caladenia huegelii*; Slender Andersonia, *Andersonia gracilis;* Purdie's Donkey Orchid, *Diuris purdiei;* Glossy-leafed Hammer Orchid, *Darkaea elastica*; Narrow Curved-leaf Grevillea, *Grevillea curviloba subsp. incurva*; Cinnamon Sun Orchid, *Thelymitra dedmaniarum*; Beaked Lepidosperma, *Lepidosperma rostratum*; Swan Hydatella, *Trithutia occidentalis*; and *Chamelaucium sp. Gingin)* and three Vulnerable flora species (Dwarf Kangaroo Paw, *Anigozanthos viridis subsp. terraspectans*; Dwarf Hammer-Orchid, *Diuris micrantha;* and Keighery's Eleocharis, *Eleocharis keigheryi)* (DotEE 2017). The likelihood assessment identified 22 other conservation significant flora species listed under the *Wildlife Conservation Act 1950* and *Biodiversity Conservation Act 2016* as potentially occurring within the Site. These include five Priority 1 flora species (*Baeckea sp. Limestone; Drosera x sidjamesii; Stachystemon sp.*

PRINCIPLE	ASSESSMENT
	Keysbrook; Amphibromus vickeryae; and *Melaleuca sp. Wanneroo)*, three Priority 2 species (*Acacia benthamii; Tetraria sp. Chandala;* and *Thelymitra variegata)*, seven Priority 3 species (*Amanita carneiphylla; Cyathochaeta teretifolia; Amanita fibrillopes; Dampiera triloba; Styphelia filifolia; Pimelea calcicola* and *Sarcozona bicarinata)* and seven Priority 4 flora species (*Schoenus griffinianus; Drosera occidentalis subsp. occidentalis; Stylidium longitubum; Jacksonia sericea; Anigozanthos humilis subsp. chrysanthus; Hibbertia helianthemoides;* and *Verticordia lindleyi subsp. lindleyi)* (DBCA 2017). A Level 2 Flora and Vegetation survey was undertaken in October 2015 across an area of 1.16 ha that encompasses the Project Area (0.61 ha). The Survey identified a total of 88 vascular flora species from 70 genera and 33 families. The commonly occurring families were Fabaceae (14 taxa), Protaeceae (7 taxa), Myrtaceae (6 taxa) and Asteraceae (6 taxa) (Ecoscape 2015). The flora inventory is provided in Appendix 3 of the Biological Survey report found in Appendix 1 of this report. The Proposed Disturbance Area falls within two broad Shepherd vegetation mapping units; **Spearwood 6:** Medium woodland; Tuart and Jarrah and **Bassendean 1001:** Medium very sparse woodland; Jarrah, with low woodland; banksia & casuarina. These units have approximately 23.70 and 22.28 % of its pre-European vegetation extent remaining within the SWA02 sub-region, respectively (Government of Western Australia 2016). The vegetation conditions within the Proposed Disturbance Area are 'Excellent' (0.18 ha), 'Very Good' (0.08 ha), 'Good to Degraded' (0.04 ha) and 'Completely Degraded' (0.31 ha). The remaining Proposed Disturbance Area is in Completely Degraded condition (0.31 ha). A total of 0.30 ha of vegetation in 'Excellent', 'Very Good' and 'Good to Degraded' (0.30 ha) condition is proposed to be cleared. The Site contains 0.79 ha of the Banksia Woodlands of the Swan Coastal Plain TEC and it is proposed that 0.30 ha of Banksia Woodlands TEC be cleared to facilitate the development of the Site. The development location of Hardcastle Park is strategically located within an area that has the highest proportion in

PRINCIPLE	ASSESSMENT
	'Completely Degraded' condition. The Likelihood assessment of DBCA's NatureMap and DotEE's PMST database searches identified one conservation significant flora species as 'Likely' to occur due to the presence of suitable habitat and the close proximity of the Site to previous records. Five species are listed as 'Possible' to occur and 29 are considered 'Unlikely' to occur. Two flora species were identified as potentially occurring within the Site based on database searches, however, the likelihood of occurrence is not known due to the lack of information on species' preferred habitat or known closest record to the Site. However, during the survey no Threatened species pursuant to the EPBC Act and/or gazetted as DRF pursuant to the WC Act were recorded. The Banksia Woodlands TEC is also considered to be potential Black Cockatoo foraging habitat with an area of 0.79 ha. The Site contains no potential breeding habitat (Ecoscape 2015). No Black Cockatoos were observed during the survey and in addition, the Site is within a highly urbanised landscape and is an isolated patch which indicates the Site may not be a primary habitat or not extensively utilised by the species. The Project will involve the clearing of 0.30 ha of combined Banksia Woodlands TEC and Black Cockatoo potential foraging habitat. The vegetation within the Project Area is 0.18 ha in 'Excellent' condition, 0.08 ha in 'Very Good' condition, 0.04 ha in 'Good to Degraded' condition and 0.31 ha in 'Completely Degraded' condition. The Project Area has been identified to avoid the clearing of a large portion of vegetation in 'Excellent' condition and as such, only 0.18 ha of the total 0.64 ha in 'Excellent' condition will be cleared as part of the development of Hardcastle Park. The Project will retain 0.49 ha of vegetation in 'Excellent' to 'Good to Degraded' condition. **Assessed Outcome:** The Project may be at variance with this Principle as it involves the clearing of a portion of a threatened ecological community.

PRINCIPLE	ASSESSMENT
Principle (b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significant habitat for fauna indigenous to Western Australia	The PMST and NatureMap searches and subsequent likelihood assessment identified 11 conservation significant fauna species as potentially occurring within the Site. Of this, six are listed under the EPBC Act and includes one Endangered fauna species (Carnaby's Cockatoo, *Calyptorhynchus latirostris*), four Vulnerable fauna species (Forest Red-tailed Black Cockatoo, *Calyptorhynchus banksii naso*; Baudin's Cockatoo, *Calyptorhynchus baudinii;* Chuditch, *Dasyurus geoffroii* and Western Ringtail Possum, *Pseudocheirus occidentalis*) and one listed as Marine (Rainbow Bee-eater, *Merops ornatus*) (DotEE 2017). The NatureMap search identified two fauna species listed as Priority 3 (Masked Owl, *Tyto novaehollandiae novahollandiae;* Black Striped Snake, *Neelaps calonotos*), two listed as Priority 4 (Western Brush Wallaby, *Macropus irma* and Graceful Sunmoth, *Synemon gratiosa*) and one listed as Other Specially Protected Fauna (Peregrine Falcon, *Falco peregrinus)* (DBCA 2017). The Site contains approximately 0.79 ha of potential Black Cockatoo foraging habitat and no potential breeding habitat. The Project Area contains 0.30 ha of potential foraging habitat to be cleared, consisting of *Eucalyptus marginata* and *Banksia attenuata* species of inferred FCT 20a – *Banksia attenuata* woodlands over species rich dense shrublands and FCT28 – Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands considered suitable for Carnaby's Cockatoo and the Forest Red-tailed Black Cockatoo. The Site is an isolated patch within a highly urbanised residential landscape. Mapping shows there are 11 Bush Forever Sites and Regional Reserves within a 4 km radius of the Site. These sites have surveyed or inferred floristic community types consistent with the Banksia Woodlands TEC, and considered to be foraging habitat for the Black Cockatoos. These sites have areas ranging between 17.9 ha and 413.4 ha (DoP 2014; Government of Western Australia 2000). The FCTs within these Bush Forever and Regional Reserves are considered to be potential foraging habitat for the Black Cockatoos. They are in mostly 'Excellent' and 'Very Good' condition and cover larger areas than the Site. The FCTs of these conservation areas include: • 20a *Banksia attenuata* woodlands over species rich dense shrublands;

PRINCIPLE	ASSESSMENT
	• 21c Low-lying *Banksia attenuata* woodlands or shrublands; • 22 *Banksia ilicifolia* woodlands; • 23a Central *Banksia attenuata – B.menziesii* woodlands; • 24 Northern Spearwood shrublands and woodlands; • 25 Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands; and • 28 Spearwood Banksia attenuata or B. attenuata – Eucalyptus woodlands. The Project Area contains vegetation with the most affiliation to FCT 20a and 28. These conservation areas contain FCTs considered to have suitable Black Cockatoo foraging habitat that is in a better condition and covers larger areas than the Project Area. In addition, these Bush Forever Sites and Regional Reserves are vested by Local Governments, DBCA and Conservation Council of WA for long term protection and conservation. Given the above, and taking into consideration the Project Area contains 0.30 of potential foraging habitat, no observations of Black Cockatoos were recorded, and there is no potential breeding habitat on site, the proposed clearing of the native vegetation in this area is considered unlikely to represent a significant loss of potential foraging habitat for the Black Cockatoos. The ground dwelling conservation significant fauna species identified in the database searches include; the Chuditch, Western Brush Wallaby and Black Striped Snake (DBCA 2017; DotEE 2017). The presence of these fauna species are considered 'Unlikely' to occur within the Site. Should the species be present within the Project Area, they are not likely to be significantly be impacted by the Project. These fauna species are generally mobile and will use a larger area than the Site for habitat use. The Site is also within a highly urbanised landscape with fragmented patches of vegetation, and it is likely that these fauna species will utilise the nearby large Bush Forever Sites or Regional Reserves within the vicinity of the Site.

PRINCIPLE	ASSESSMENT
	It is therefore considered unlikely that the clearing of the vegetation within the Project Area will have a significant impact to fauna or fauna habitat. The clearing of 0.30 ha of potential Black Cockatoo foraging habitat is not likely to cause significant habitat loss for the species as larger surrounding areas contain more suitable and better quality habitat. The clearing of 0.30 ha of native vegetation will not result in a loss of ecological linkages between areas of intact native vegetation, as 0.49 ha of native vegetation will remain in the balance of title. **Assessed Outcome:** As the Project will involve the clearing of 0.30 ha of potential Black Cockatoo foraging habitat, the Project may be at variance with this Principle. However, the removal of 0.30 ha is not considered to represent a significant loss for the Black Cockatoos, given the Site will retain 0.49 ha of potential foraging habitat. In addition, the immediate surrounding area includes several large Bush Forever Sites and Regional Reserves that have extensive superior habitat within 4 km radius of the Site. The vegetation within the Project Area is not considered necessary for the maintenance of significant habitat for the Black Cockatoos.
Principle (c) – Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora.	Review of the flora inventory from the survey undertaken in Spring 2015 and recent review of the data has identified that no Threatened species pursuant to the EPBC Act and/or gazetted as Threatened/Declared Rare Flora (DRF) pursuant to the *Wildlife Conservation Act 1950* (WC Act) identified within the Site. No Priority flora species, as listed by DPBCA were recorded during the survey. **Assessed Outcome:** The vegetation within the Proposed Disturbance Area does not include, nor is it necessary, for the continued existence of rare flora and therefore, the Project is unlikely to be at variance with this Principle.
PRINCIPLE	ASSESSMENT
Principle (d) – Native	Using the condition thresholds under the DotEE's Approved Conservation Advice for the Banksia Woodlands

PRINCIPLE	ASSESSMENT
vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a Threatened Ecological Community (TEC).	of the Swan Coastal Plain TEC (2016), the Site contains 0.79 ha of the TEC. The Project will involve the clearing of 0.30 ha of this TEC (Figure 7). The Project involves the clearing of 0.30 ha (38 %) of the Banksia Woodlands TEC within the Site, it is considered likely to be at variance with this Principle. However, it is not considered to be a significant impact given the small area of clearing and the retention of 0.49 ha (62 %) of the TEC in the balance of title. In addition, the removal of 0.30 ha of Banksia Woodlands TEC is not considered to be necessary for the maintenance of the TEC within a regional context. Several surrounding Bush Forever sites and Regional Reserves contain the sub-communities of the Banksia Woodlands TEC that and are in mostly 'Excellent' and 'Very Good' condition (Government of Western Australia 2000). These surrounding areas also have a greater range in areas (between 17.9 ha and 413.4 ha) and are considered to have a greater representation of the Banksia Woodlands TEC, in better condition and greater area than the Site. Furthermore, these Bush Forever sites and Regional Reserves are maintained through long term conservation programmes vested by the Local Government, Conservation Commission of WA or the DBCA. **Assessed Outcome:** As the vegetation within the Site represents the Banksia Woodlands TEC, it is likely that clearing will be at variance with this Principle. However, the clearing of 0.30 ha of the Banksia Woodlands TEC is not expected to represent a significant loss necessary for the maintenance of the TEC at a regional level. Furthermore, 0.49 ha of the TEC will remain within the Site to provide for continuing *in situ* existence of the TEC.
Principle (e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in	Two vegetation units mapped by Shepherd et al. (2001) / Beard (1981) have been identified within the Project Area: ● Spearwood 6; and

PRINCIPLE	ASSESSMENT
an area that has been extensively cleared	• Bassendean 1001. Table 1 outlines the total remaining extent of these vegetation units within the State, Swan Coastal Plain bioregion, Perth IBRA Subregion and the City of Wanneroo local government area. Of the pre-European extents, approximately 23.70 % of **Spearwood 6** and 22.28 % of **Bassendean 1001** associations remain within the Swan Coastal Plain 2 (Perth) subregion, representing 13, 353.48 ha and 12, 791.61 ha respectively. The EPA's Guidance Statement No.33 has set a threshold for the retention of 10% of the pre-existing extent of native vegetation within constrained areas (EPA 2008). The Site is considered to be constrained as it is within the Perth Metropolitan Region and is abutting urban residential areas. Both vegetation associations in Table 1 have current extents that are greater than the abovementioned 10% threshold. Therefore, the proposal to clear 0.30 ha of native vegetation across the two vegetation associations is not considered to represent a significant impact to the retention of remnant native vegetation. The *National Objectives and Targets for Biodiversity Conservation 2001-2005* state that the retention of 30% or more of pre-clearing extents of each vegetation association is to be protected for effective representation and ecological viability. Both vegetation associations have less than 30% of pre-European extents remaining. However, the clearing of 0.30 ha across both associations is not likely to represent a significant loss in proportion to the remaining vegetation. The vegetation condition within the Project Area to be cleared is mostly in 'Completely Degraded' condition (0.31 ha) and is therefore, not representative of vegetation in quality condition. Furthermore, the Project Area has been identified to avoid the clearing of a large portion of vegetation in 'Excellent' condition and as such, only 0.18 ha of the total 0.64 ha in 'Excellent' condition will be cleared as part of the development of Hardcastle Park. The Project will retain 0.49 ha of vegetation in 'Excellent' to 'Good to Degraded' condition. The Site is also within an Ecological Linkage located within an extensively cleared landscape, and the clearing

PRINCIPLE	ASSESSMENT
	of the remnant vegetation within the Site is not likely to reduce the movement of species within the landscape. **Assessed Outcome:** Clearing for the Project is not considered to have a significant impact on the remnant native vegetation of the Spearwood 6 and the Bassendean 1001 vegetation associations although their current extents are below 30 % of the pre-clearing extents. However, the Project is likely to be at variance with this Principle as it is within an extensively cleared landscape. The vegetation within the Project Area to be cleared is mostly in 'Completely Degraded' condition and is therefore, not representative of quality remnant vegetation.
Principle (f) – Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The Site does not contain any watercourses or surface water features and the vegetation is not growing in association with a watercourse or wetland. Desktop mapping of the (then) Department of Parks and Wildlife (DPaW)'s Geomorphic Wetland dataset has identified no geomorphic wetlands occurring in or within the vicinity of the Site. The nearest geomorphic wetland is located approximately 1 km to the south east of the Site (DPaW 2017) (Figure 3). No typical wetland indicator species were identified during the Level 2 Flora and Vegetation survey within the Site. **Assessed Outcome:** The Site does not contain any vegetation associated with watercourses or wetlands and therefore, the Project is unlikely to be at variance with this Principle.
Principle (g) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land	The (then) Department of Environment Regulation (DER) has defined land degradation as including the following (DER 2014): • The clearing of vegetation; • Decline in vegetation condition; • Soil erosion and soil acidity (caused by wind and water erosion due to vegetation clearing);

PRINCIPLE	ASSESSMENT
degradation	• Salinity; or • Waterlogging / flooding. The Project Area does not contain a significant proportion of vegetation in high quality, most of the vegetation is in Completely Disturbed condition (0.31 ha). 0.50 ha of vegetation in 'Excellent', 'Very Good' and 'Good to Degraded' condition will be retained within the balance of title. The sandy nature of the soils at the Site may cause some short term dust problems or localised wind erosion, dependent upon the weather conditions at the time of vegetation clearing. However, given that most of the Project Area is in a 'Completely Degraded' condition, it is not likely to be significantly elevated from the present state. Regardless, management measures will be implemented to ensure mobilisation of sand is mitigated. Some of the management measures may include: • Dampening of soil if clearing is undertaken in dry months; • Semi-permanent dust control treatments (hydro mulching, dust stabilisers, tarps or geotextile materials) will be implemented on stockpiles that are to be left for longer than one month; and • Vegetation clearing will be scheduled to occur immediately prior to planned earthworks to minimise the potential for dust, where practicable. The topography of the Site is generally gently sloping from the northern to the southern boundary of the Site. The elevation ranges between 70 m and 64 m AHD. The development is within the lowest point of the Site, with elevation ranging between 64 and 67 m AHD. The steepest areas of the Site have either been previously cleared or are located outside of the Project Area footprint, and therefore erosion is not considered unlikely to occur as a result of the proposed development. Excessive stormwater runoff within the Site is unlikely given the porous nature of sandy soils, which is characteristic of the Site. However, as the development is located at the lowest point of the Lot any potential

PRINCIPLE	ASSESSMENT
	surface runoff during construction will be managed in accordance with Best Practice Management where necessary. ASS risk mapping has identified the Site as having no known risk of ASS. This is also supported by the Site's relatively elevated nature and porous sandy soils, which will allow infiltration. The Perth Groundwater Map has identified the Site as having 'fresh' salinity levels between 250-500 mg/L TDS. The clearing of 0.30 ha of vegetation in mostly 'Completely Degraded' (0.31 ha) condition is considered unlikely to significantly impact upon groundwater levels and thereby, create increased salinity at the Site. Waterlogging and flooding are not considered to become an issue as depth to groundwater ranges between 28.8 m and 33.5 m and the Site contains no surface water features. In addition, the Site is within a highly urbanised new residential development area that will have implemented urban water management measures to address flooding. **Assessed Outcome:** The Project is unlikely to be at variance with this Principle.
Principle (h) – Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	The Project Area is not immediately adjacent or abutting any conservation areas. The nearest conservation area is Bush Forever Site 493 located approximately 890 m south of the Site (Figure 5). Bush Forever Site 493 and the Site are separated by residential dwellings, cleared land and a major road. Other Bush Forever Sites are located in excess of 900 m from the Site. The activities associated with the Project will only be impacting the vegetation within the extent of the development footprint. It is not expected that the proposed clearing of vegetation within the Site will have an impact on the environmental values of Bush Forever Site 493. The connectivity between the Site and surrounding Bush Forever sites are already highly fragmented from urban land uses and of minimal ecological value. It is not likely that the clearing within the Site will impact on any nearby conservation significant areas.

PRINCIPLE	ASSESSMENT
	Nearby geomorphic 'Conservation Category' wetlands are also not likely to be impacted by the Project due to the separation by residential dwellings and other urban surfaces. It is not likely that the Project will impact upon any nearby wetlands. The Ecological Linkage that runs through the Site will be maintained by the retention of 0.49 ha of vegetation within the Site. This will ensure the connectivity between conservation areas and other areas of native vegetation is maintained. **Assessed Outcome:** The Project is unlikely to be at variance with this Principle.
Principle (i) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	The annual mean rainfall for the area is 707.2 mm as recorded at the nearest weather bureau station (Sorrento), with most of the rain falling between June and August (BoM 2017). Given the porous nature of the sandy soils and a large portion of the Site is in 'Completely Degraded' condition, it is not likely that the natural surface hydrology will be significantly altered by the proposed clearing of 0.30 ha of vegetation. The Site is not located within a Public Drinking Water Source Area (PDWSA) (DWER 2017a). The nearest PDWSA is located approximately 350 m south of the Site and is Priority 3. Additionally, no surface water features are located within or nearby the Site. As aforementioned, the depth to groundwater across the Site ranges from 28.8 m and 33.5 m and development of Hardcastle Park is unlikely to cause deterioration to the quality of underground water. The Site does not contain any Water Information Network (WIN) groundwater bores. Given the relatively small and degraded clearing area (0.30 ha) and the considerable distance to groundwater and large distance from surface water features, the proposed action is unlikely to be at variance with this Principle. **Assessed Outcome:** The Project is unlikely to be at variance with this Principle.

PRINCIPLE	ASSESSMENT
Principle (j) – Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	The (then) Department of Water (DoW) mapping suggests there are no known watercourses in the vicinity of the Site and is not within the mapped 100 Year ARI Floodplain area (DoW 2014). Regional soil mapping indicates that the underlying soil profile of the Site is of a porous sandy nature and the separation to groundwater is between 28.8 m and 33.5 m below ground level (mbgl) across the Site (DAFWA 2012; DWER 2017a). These characteristics suggest that stormwater would be able to infiltrate without waterlogging or causing excessive runoff. In addition, much of the proposed clearing area is already in a 'Completely Degraded' condition and therefore any clearing in these areas are unlikely to significantly alter the current characteristics of the Site. In addition, the development of the Hardcastle Park will be in line with WAPC's Guidelines for Better Urban Water Management (2008) to ensure development will not alter the water regimes and any issues with infiltration or runoff can be managed. It is therefore considered unlikely that the clearing of vegetation will cause or exacerbate the incidence of flooding. **Assessed Outcome:** The Project is unlikely to be at variance with this Principle.

7 Summary of Assessment and Conclusion

In summary, after desktop and field assessments of the environmental values of the Project Area the proposal to clear 0.30 ha of native remnant vegetation that represents both the Banksia Woodlands of the Swan Coastal Plain TEC and potential Black Cockatoo foraging habitat may be at variance with four of the ten Clearing Principles (A, B, D and E).

The Project Area is not in pristine condition; it contains vegetation in 'Excellent' to 'Completely Degraded' condition. The Project Area has been disturbed due to historical vegetation clearing associated with tracks and subdivision prior to 1965.

Principle (a) states that native vegetation should not be cleared if it comprises a high level of biological diversity. As the Project will involve the clearing of 0.30 ha of 0.79 ha of the Banksia Woodlands of the Swan Coastal Plain TEC, it is considered it may be at variance with Principle (a). However, majority of the Project Area is in 'Completely Degraded' condition and contains no flora or fauna of conservation significance. This suggests that although the action may be at variance with this Principle, it is not considered to be significant.

Principle (b) states that native vegetation should not be cleared if it comprises the whole part of, or necessary for the maintenance of a significant habitat for fauna indigenous to Western Australia. Although the Site contains 0.79 ha of vegetation considered to be potential Black Cockatoo foraging habitat and 0.30 ha of this is proposed to be cleared, it is not considered to be of high ecological value to the species in a local and regional context. Compared to the surrounding Bush Forever Sites and Regional Reserves, the Site has a significantly lower area and lower vegetation conditions. The removal of 0.30 ha of potential foraging habitat is not considered to represent a significant loss of habitat for the Black Cockatoos, within the lot and on a regional scale.

Principle (d) states that native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a TEC. A portion of the Site contains 0.79 ha of the Banksia Woodlands TEC whereby 0.30 ha is proposed to be cleared and 0.49 ha will remain in the balance of title. It is not considered that the removal of 0.30 ha of the Banksia Woodlands TEC is significant for the maintenance of the TEC in a regional context; however, it may be at variance with this Principle.

Principle (e) states that native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared. Although the Site's regional vegetation association's pre-European extents are above the 10 % extent threshold for constrained areas, such as the Perth Metropolitan Area, it is under the 30 % threshold identified as for effective representation and ecological viability. As such, the

Project is likely to be at variance with this Principle, however, the clearing of 0.30 ha is not considered to represent a significant reduction in the remaining vegetation extents.

Table 5 summarises the assessment against each clearing principle.

Table 5: Summary of Assessment

CLEARING PRINCIPLE	SUMMARY OF ASSESSMENT	PROPOSED OUTCOME
Principle (a) – Native vegetation should not be cleared if it comprises a high level of biological diversity.	The Site supports native vegetation in mostly 'Excellent' condition (0.59 ha). However, the Project Area is in mostly 'Completely Degraded' condition (0.34). The remnant vegetation is considered to represent the Banksia Woodlands of the Swan Coastal Plain TEC. The Site contains no conservation significant flora or fauna species pursuant to the EPBC Act or gazetted under the WC Act or BC Act. The Project may be at variance with this Principle.	May be at variance with Principle A.
Principle (b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significant habitat for fauna indigenous to Western Australia.	The Banksia Woodlands TEC is also representative of potential Black Cockatoo foraging habitat. The clearing of 0.30 ha of potential foraging habitat is not considered to be a significant impact to the maintenance of the Black Cockatoos as 0.49 ha will be retained on site. Furthermore, there are numerous conservation areas within 4 km of the Site that support large areas of Black Cockatoo habitat in better condition. The Project Area is within a highly fragmented and urbanised landscape and the clearing of a portion of Black Cockatoo potential foraging habitat is not considered to be significant to the species in a regional or local context.	May be at variance with Principle B.
Principle (c) – Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare	No Threatened species pursuant to the EPBC Act and/or gazetted as Threatened/Declared Rare Flora (DRF) were identified within the Site. No Priority flora species, as listed by DBCA were	Unlikely to be at variance with Principle C.

CLEARING PRINCIPLE	SUMMARY OF ASSESSMENT	PROPOSED OUTCOME
flora.	recorded during the survey.	
Principle (d) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a Threatened Ecological Community (TEC).	The Site contains 0.79 ha of Banksia Woodlands TEC, of which, 0.30 ha is proposed to be cleared and 0.49 ha will be retained in the balance of title. In addition, several Bush Forever Sites within 4 km of the Site contain the same or similar FCTs as the Site or FCTs representative of the Banksia Woodlands TEC. These areas range between 17.9 ha and 413.4 ha and are considered to have a greater representation of the TEC in a better condition than the Site. Furthermore, the Site is an isolated patch within a highly fragmented and urbanised landscape. It is not likely that the clearing of 0.30 ha of the TEC will have a significant impact on the vegetation necessary for the maintenance of the TEC on a regional or local scale.	Likely to be at variance with Principle D.
Principle (e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Clearing for the Project is not considered to have a significant impact on the remnant native vegetation of the Spearwood 6 and the Bassendean 1001 vegetation associations although their current extents are below 30 % of the pre-clearing extents. However, the Project is likely to be at variance with this Principle as it is within an extensively cleared landscape. The vegetation proposed to be cleared is mostly in 'Completely Degraded' condition and is therefore not representative of quality remnant vegetation.	Likely to be at variance with Principle E.
Principle (f) – Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or	No surface water features, watercourses or wetlands exist within the Site and no vegetation within the Site is growing in or with association to watercourses or wetlands. Therefore, the Project is unlikely to be at variance with this Principle.	Unlikely to be at variance with Principle F.

CLEARING PRINCIPLE	SUMMARY OF ASSESSMENT	PROPOSED OUTCOME
wetland.		
Principle (g) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The proposed clearing is not likely to cause appreciable land degradation. The sandy nature of the soils allows high infiltration rates and excessive stormwater runoff is unlikely. The Site is also not within any mapped risk of ASS. The Site also has 'fresh' salinity levels between 250-500 mg/L TDS and waterlogging is not considered to become an issue due to the large depth to groundwater and the lack of surface water features within or nearby the Site.	Unlikely to be at variance with Principle G.
Principle (h) – Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The nearest conservation area is Bush Forever Site 493 and is located approximately 890 m to the south and is separated by a major road, cleared areas and residential dwellings. The development of Hardcastle Park is not likely to have an impact on any nearby conservation areas.	Unlikely to be at variance with Principle H.
Principle (i) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	Given the relatively small clearing footprint, the considerable distance to groundwater and surface water features, it is unlikely that the clearing of vegetation will cause deterioration of the quality of underground water.	Unlikely to be at variance with Principle I.
Principle (j) – Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	The Site's soils are sandy and given its porous nature and large depths to groundwater, stormwater will be able to infiltrate without waterlogging and causing excessive run off. Most of the Project Area to be cleared is in 'Completely Degraded' condition and as such, it is not likely that the clearing will cause or exacerbate the incidence of flooding.	Unlikely to be at variance with Principle J.

8 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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9 References

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FIGURES

Legend

- Site Boundary (1.16 ha)
- Roads

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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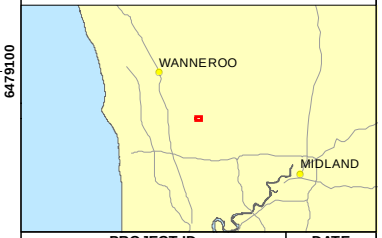

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City of Wanneroo
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Native Vegetation Clearing Permit

Figure 1
Site Location

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Legend

- Site Boundary (1.16 ha)
- Development Footprint (0.61 ha)

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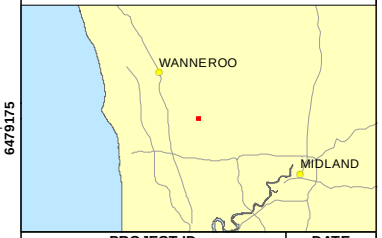

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Figure 2
Proposed Clearing Area

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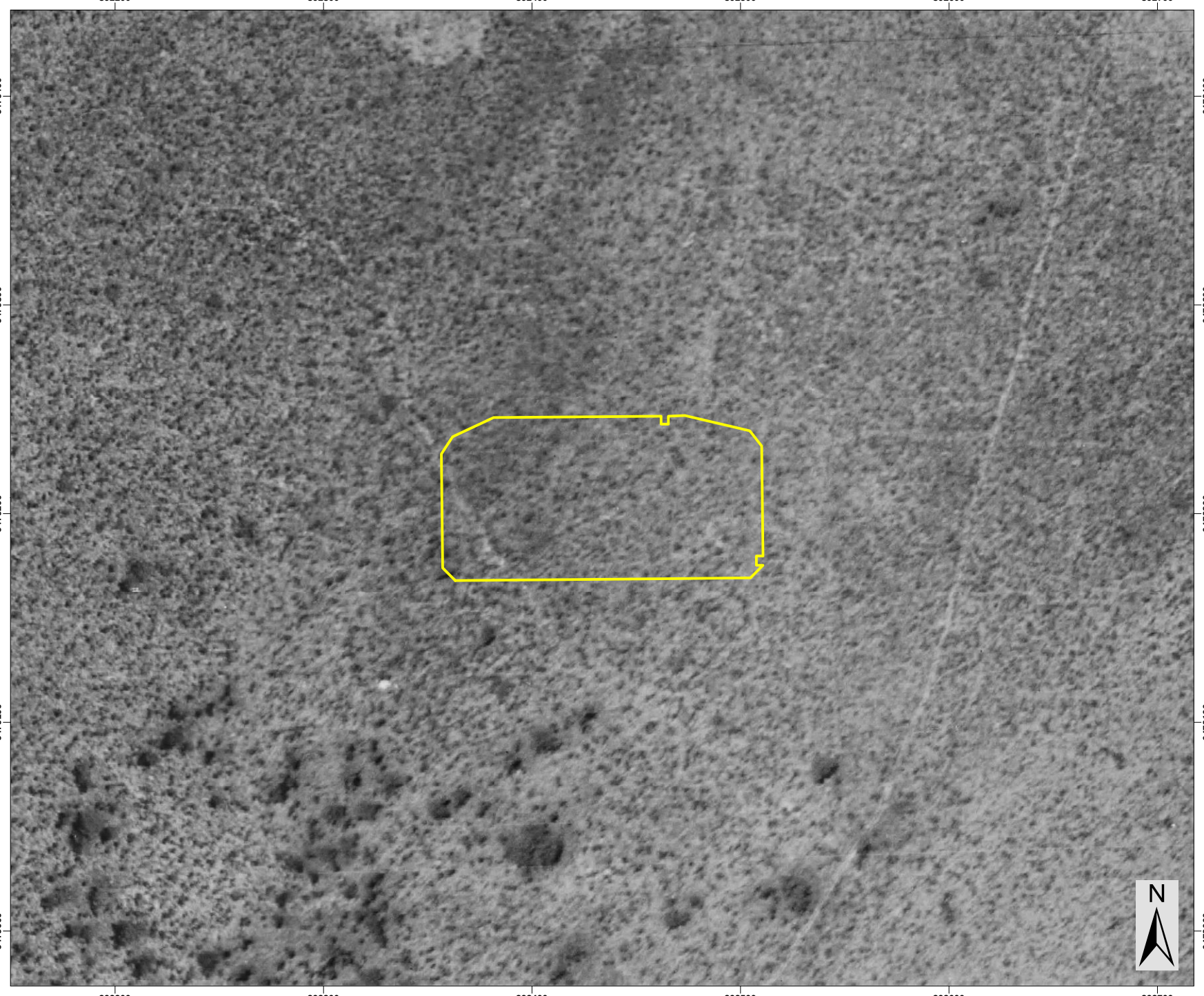

Legend

Site Boundary (1.16 ha)

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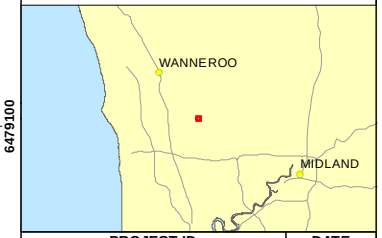

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Figure 3a
Historical Aerials (1953)

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Legend

Site Boundary (1.16 ha)

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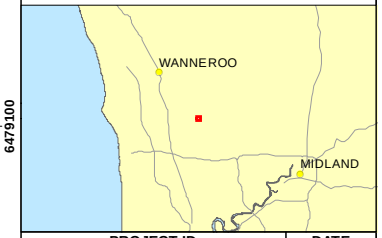

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Figure 3b
Historical Aerials (1965)

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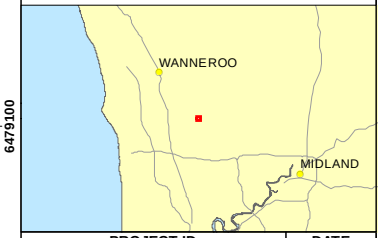

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Figure 3c
Historical Aerials (1974)

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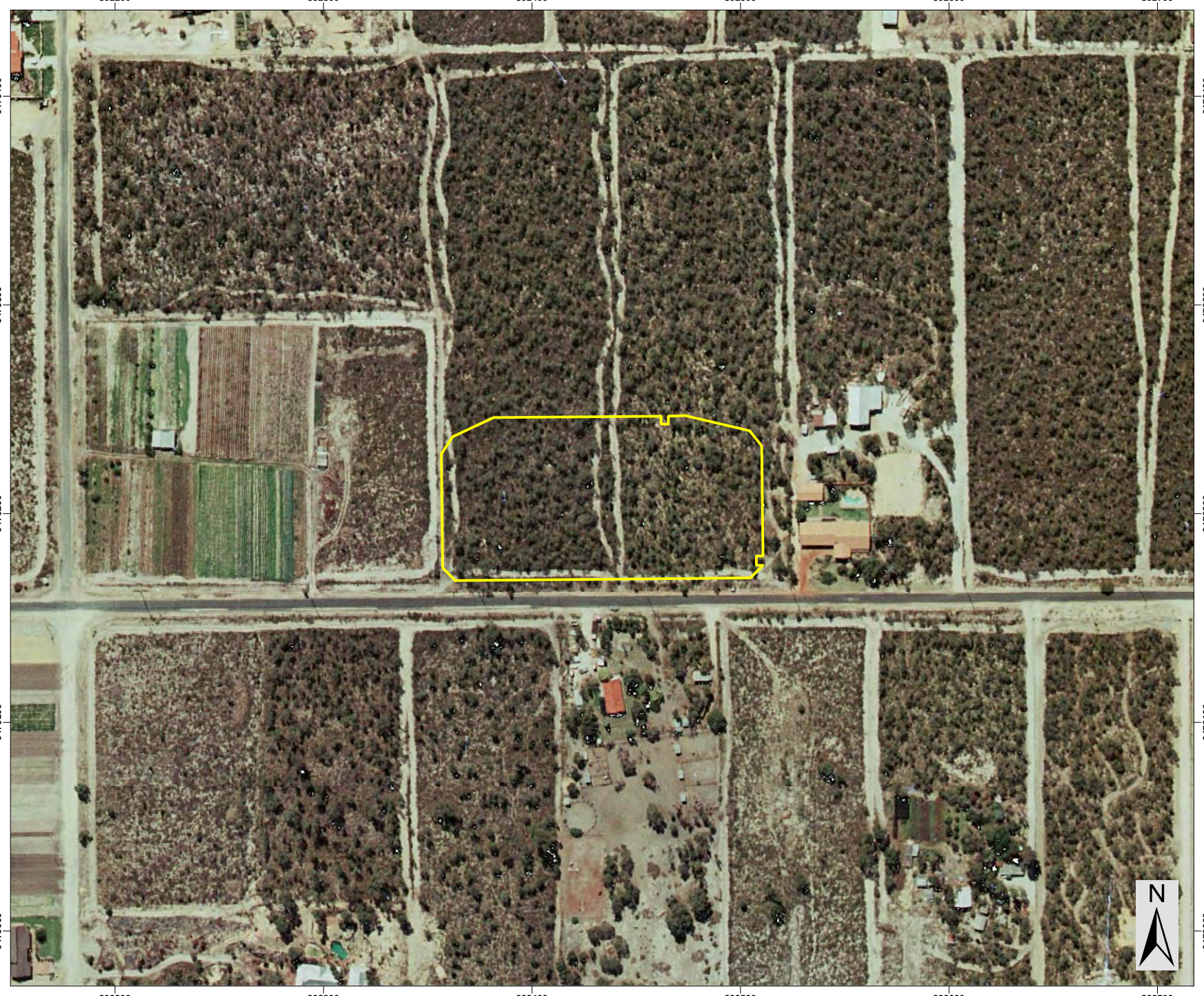

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Site Boundary (1.16 ha)

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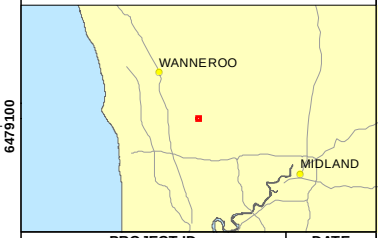

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Figure 3d
Historical Aerials (1985)

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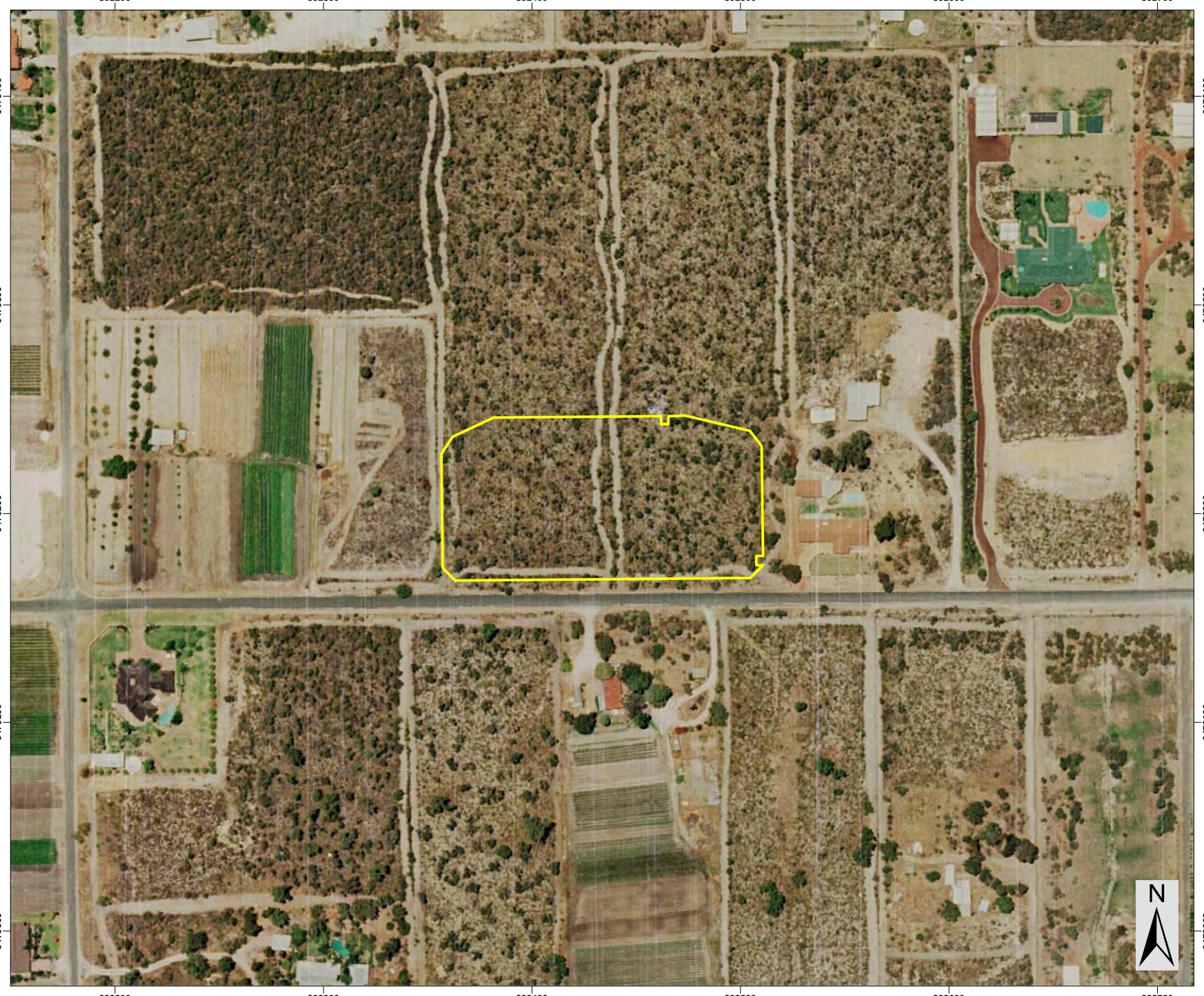

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Site Boundary (1.16 ha)

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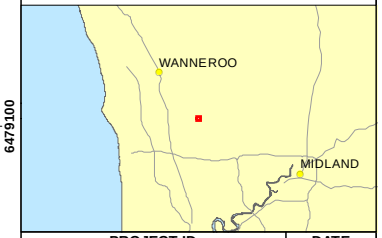

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Figure 3e
Historical Aerials (1995)

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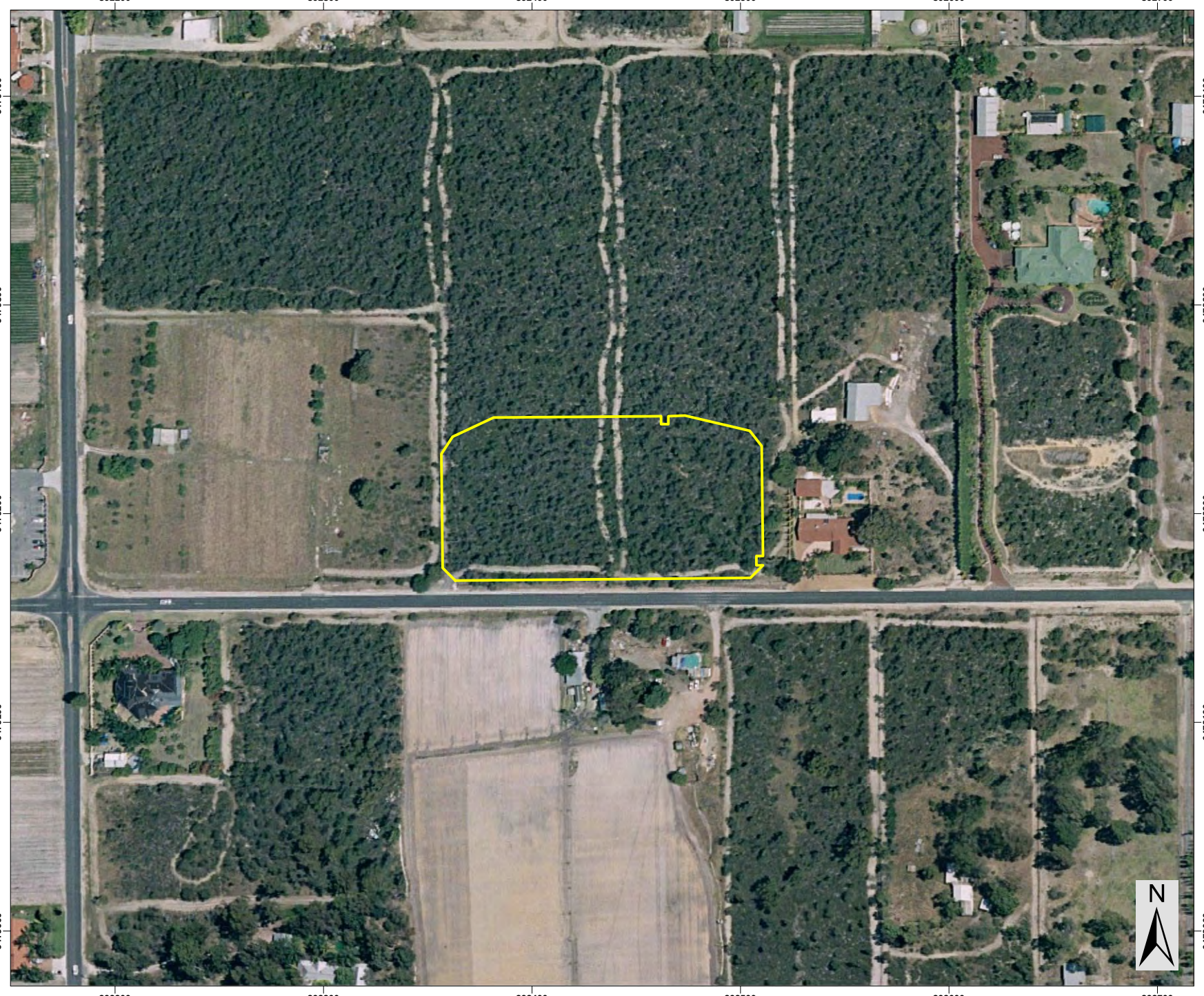

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Site Boundary (1.16 ha)

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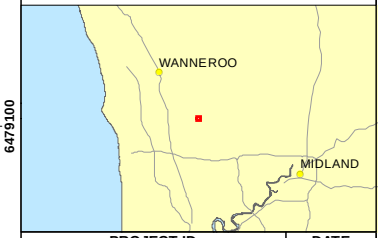

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Figure 3f
Historical Aerials (2005)

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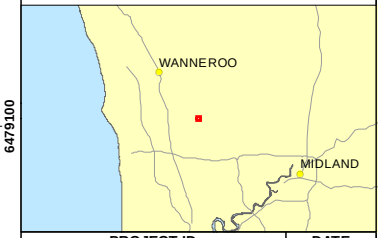

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Figure 3g
Historical Aerials (2015)

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Legend

Site Boundary (1.16 ha)

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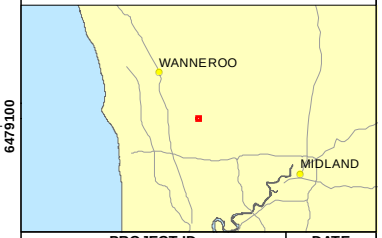

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Figure 3h
Historical Aerials (2017)

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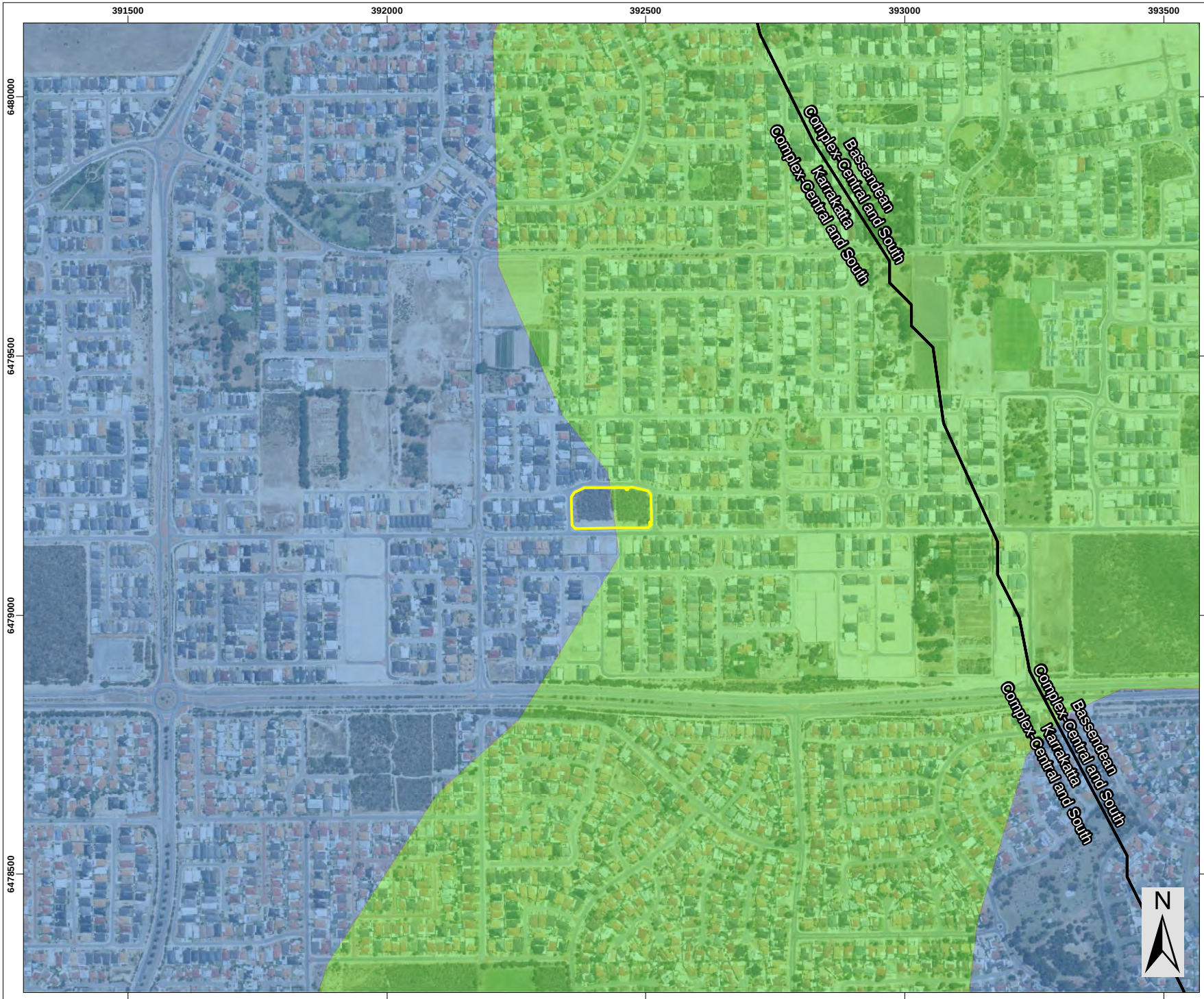

Legend

- Site Boundary (1.16 ha)
- Swan Coastal Plain Vegetation Complexes

Vegetation, Pre-European Settlement (1788)

- BASSENDEAN_1001: Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina
- SPEARWOOD_6: Medium woodland; tuart & jarrah

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- VEGETATION COMPLEXES SOURCED DPAW 2017
- PRE-EURO VEGETATION SOURCED DAFWA 2012

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Figure 4
Broad Vegetation Types

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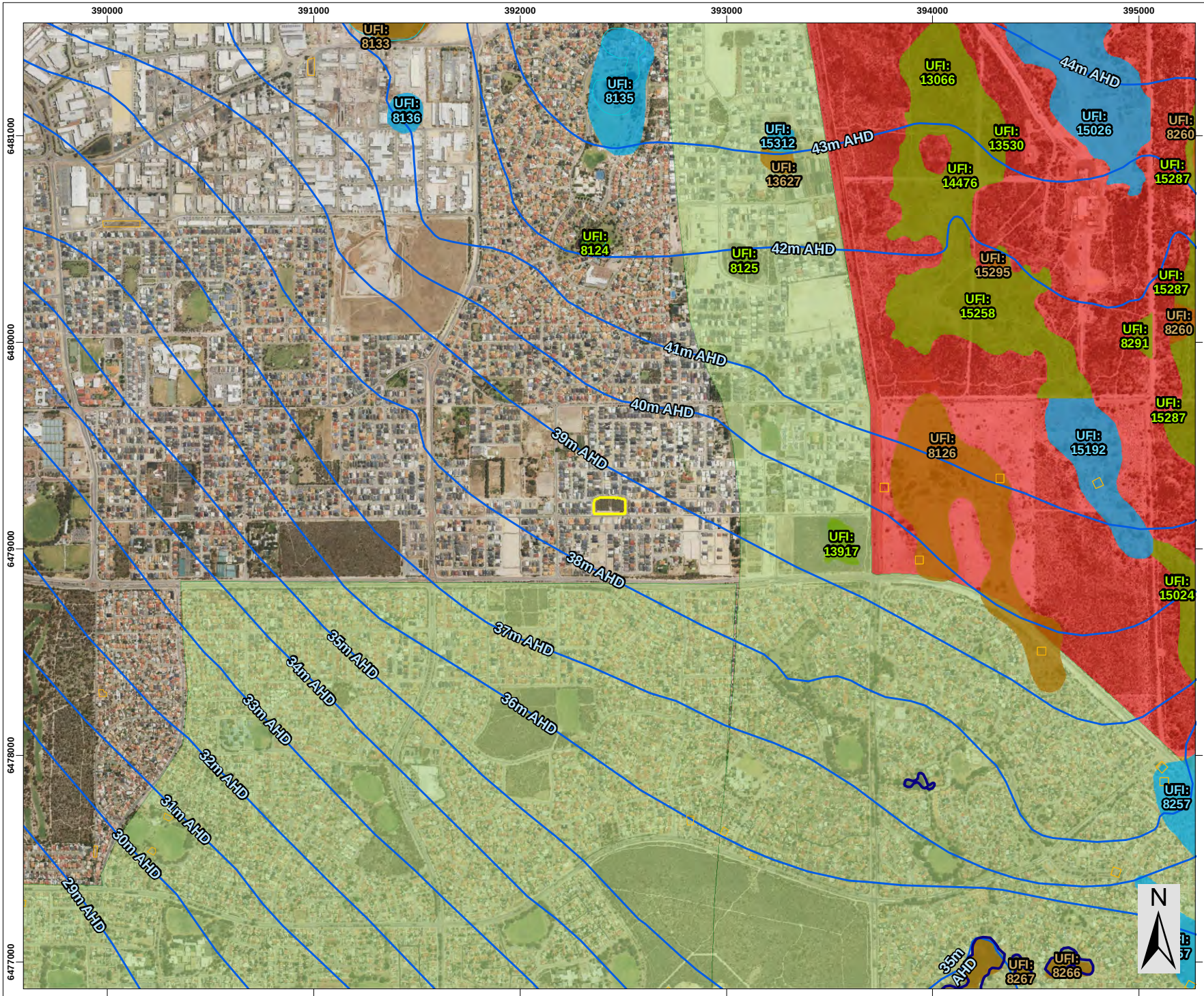

Legend

- Site Boundary (1.16 ha)
- Groundwater Contour (Max)
- Lake - perennial
- Swamp - perennial
- Earth Dam

Geomorphic Wetlands

- Conservation
- Resource Enhancement
- Multiple Use

Public Drinking Water Source Areas

- Priority 1
- Priority 2
- Priority 3

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- GROUNDWATER CONTOURS SOURCED DOW 2015
- PDWSA SOURCED DOW 2015
- HYDROGRAPHY SOURCED DOW 2015
- GEOMORPHIC WETLANDS SOURCED DPAW 2016
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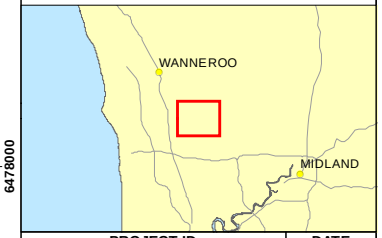

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Figure 5
Hydrography

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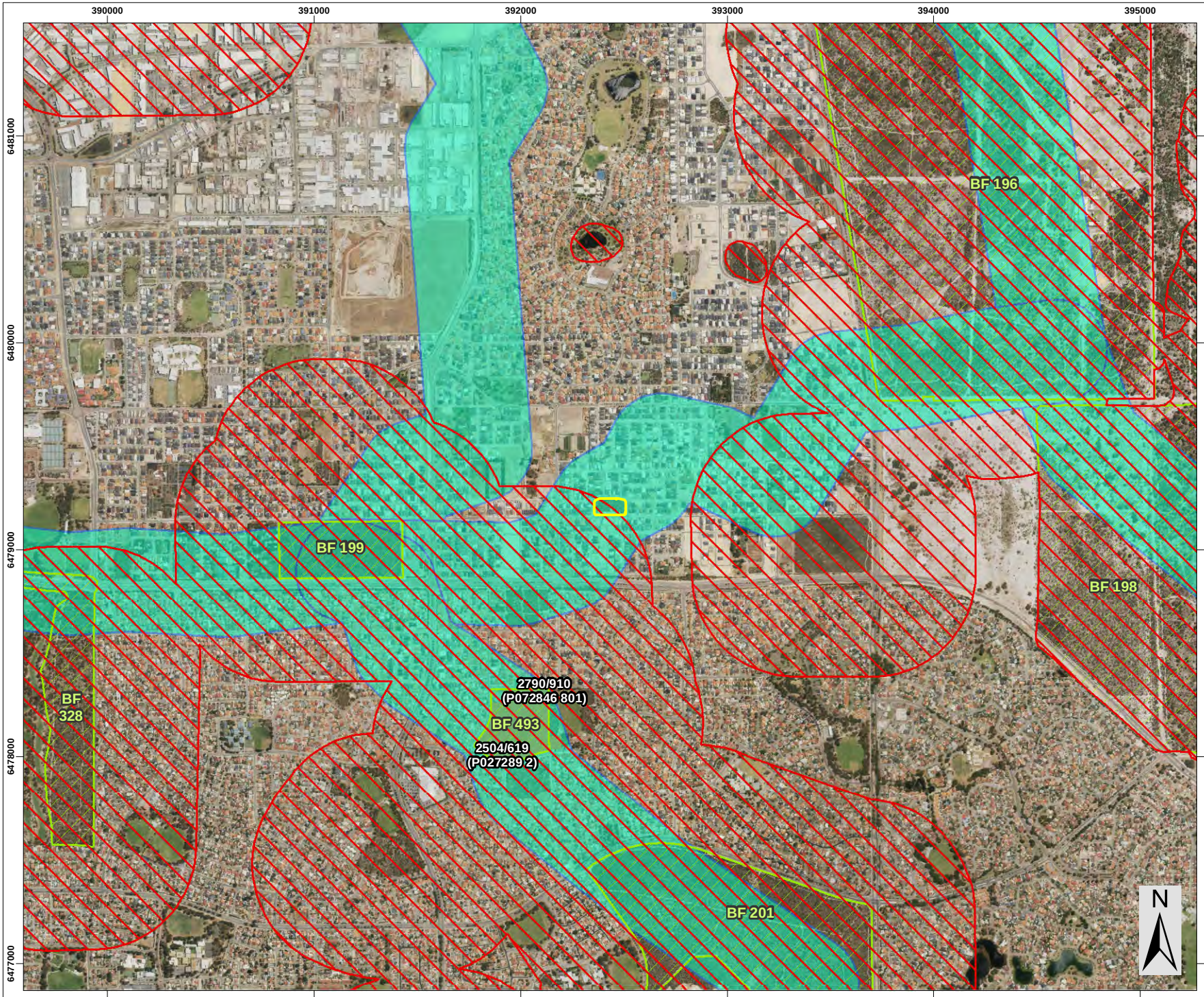
K:\Projects\9.0 APP\2418 Hardcastle Avenue Landsdale\Figures\2418 NVCP Figure 4 Hydrology.mxd



Legend

- Site Boundary (1.16 ha)
- Environmentally Sensitive Areas
- Bush Forever Sites
- DPAW Managed Lands
- Perth Regional Ecological Linkages

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- ESA SOURCED DER 2015
- BUSH FOREVER SOURCED DOP 2016
- DBCA MANAGED LANDS SOURCED DPAW 2016
- ECOLOGICAL LINKAGES SOURCED WALGA 2014
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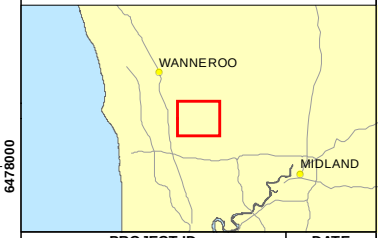
LOCALITY MAP



PROJECT ID	DATE
2418	9/10/2017

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
EW	CM	KC	0

City of Wanneroo
39 Hardcastle Avenue, Landsdale

Native Vegetation Clearing Permit

Figure 6
Conservation Areas

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K:\Projects\9.0 APP\2418 Hardcastle Avenue Landsdale\Figures\2418 NVCP Figure 5 Conservation Areas.mxd

Legend

- Site Boundary (1.16 ha)
- Proposed Clearing Area (0.61 ha)

Vegetation Condition (Proposed Clearing Area)

- **E:** Excellent (0.18 ha)
- **VG:** Very Good (0.08 ha)
- **G-D:** Good - Degraded (0.04 ha)
- **CD:** Completely Degraded (0.31 ha)

Vegetation Condition (Remaining)

- **E:** Excellent (0.41 ha)
- **VG:** Very Good (0.03 ha)
- **G-D:** Good - Degraded (0.06 ha)
- **CD:** Completely Degraded (0.03 ha)

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017 (© Western Australian Land Information Authority 2017)

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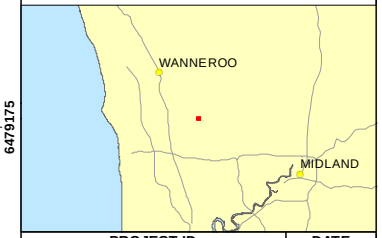
LOCALITY MAP



PROJECT ID	DATE
2418	13/10/2017

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
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City of Wanneroo
39 Hardcastle Avenue, Landsdale

Native Vegetation Clearing Permit

Figure 7
Vegetation Condition

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Legend

- Site Boundary (1.16 ha)
- Proposed Clearing Area (0.61 ha)

Banksia Woodlands

- Proposed Clearing Area (0.30 ha)
- Remaining (0.49 ha)

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
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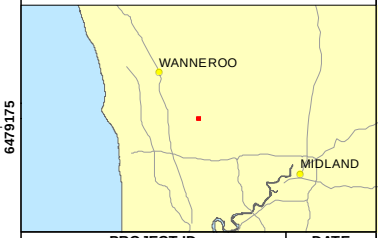

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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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City of Wanneroo
39 Hardcastle Avenue, Landsdale

Native Vegetation Clearing Permit

Figure 8
Banksia Woodlands TEC

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K:\Projects\9.0 APP\2418 Hardcastle Avenue Landsdale\Figures\2418 NVCP Figure 7 Banksia Woodlands TEC.mxd

Legend

- Site Boundary (1.16 ha)
- Proposed Clearing Area (0.61 ha)

Black Cockatoo Foraging Habitat

- Proposed Clearing Area (0.30 ha)
- Remaining (0.49 ha)

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
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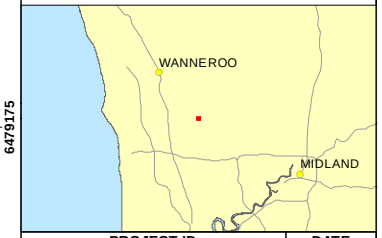
LOCALITY MAP



PROJECT ID	DATE
2418	13/10/2017

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
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City of Wanneroo
39 Hardcastle Avenue, Landsdale

Native Vegetation Clearing Permit

Figure 9
Black Cockatoo Habitat

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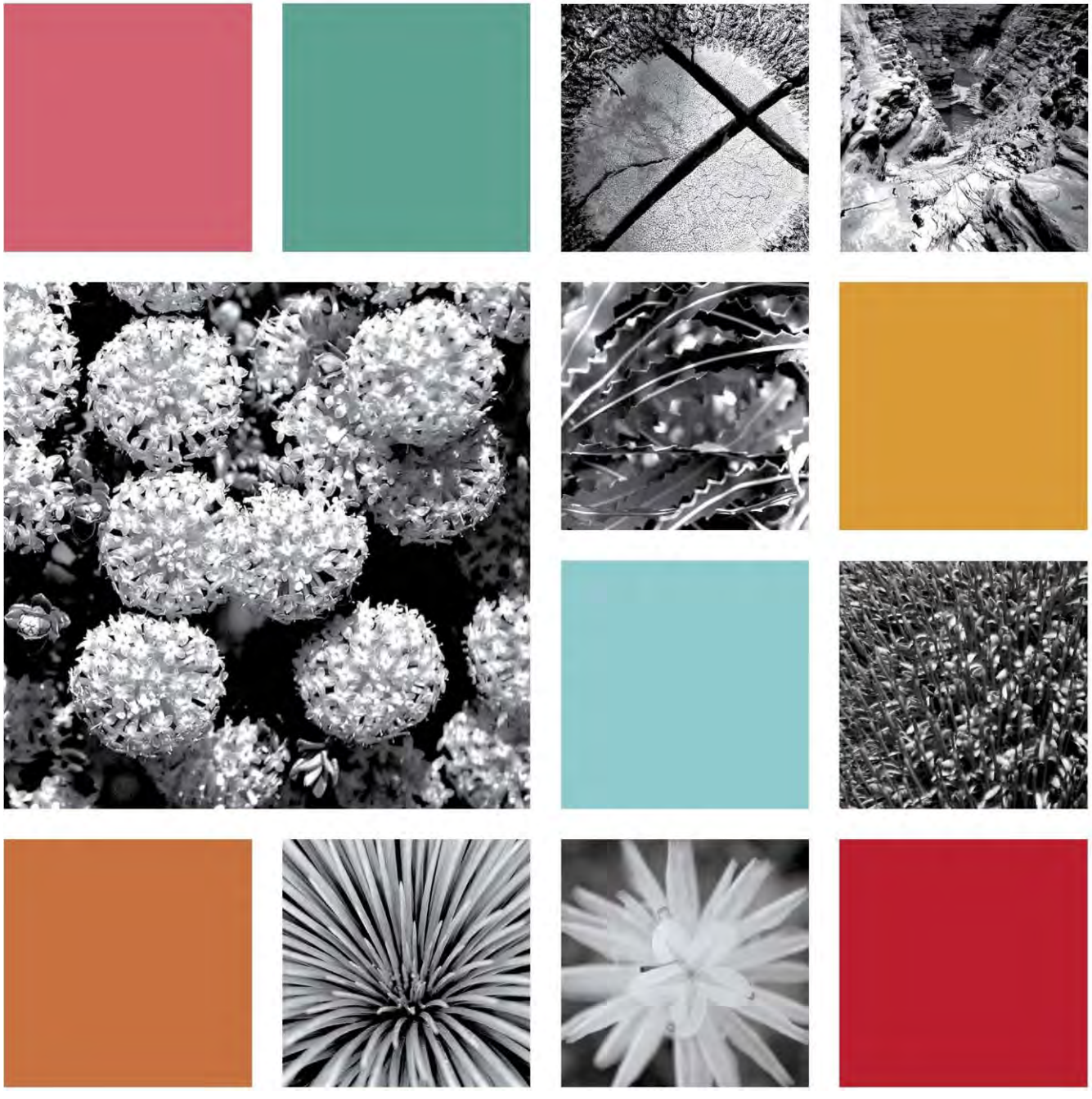
APPENDIX A

Hardcastle Park Biological Survey

Hardcastle Park Biological Survey

City of Wanneroo

ecoscape



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VERSION	AUTHOR	QA REVIEWER	APPROVED	DATE
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Final	Chris Parker	L. Atkins LYN ATKINS	L. Atkins LYN ATKINS	29/10/2015

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SUMMARY

The City of Wanneroo is proposing to develop a passive park at 39 Hardcastle Avenue, Landsdale. Design of the proposed works will commence in the near future as part of the City's Capital Works Program.

The City of Wanneroo has commissioned Ecoscape to conduct a flora, vegetation and fauna assessment of the study area in which all environmental values will be defined to support a Native Vegetation Clearing Permit.

The assessment includes:

- a Level 2 Flora and Vegetation Survey
- a Level 1 Fauna Survey
- an inventory of all trees within 3 m of the boundary of remnant native vegetation and cleared areas
- preparation of flora, vegetation and fauna survey report, including an assessment against the Department of Environment Regulation's 10 Clearing Principles.

Hardcastle Park is located in the Perth metropolitan area, 15 km north of the City centre within the City of Wanneroo. The 1.16 ha park consists of remnant native vegetation within suburbia.

Flora and Vegetation

A total of 88 vascular flora species from 70 genera and 33 families were recorded within the study area. Nineteen (20.4%) of the 88 species recorded were introduced flora. The number of species recorded is typical of a 1 ha area in good condition

Searches of the DPaW's Threatened and Priority flora database, the EPBC Protected Matters Search Tool (PMST) and the IUCN database were conducted. These searches returned 27 Threatened and Priority flora present within 10 km of the study area from previously known locations. Of the 27 species, five Threatened and six Priority 1 flora have been recorded, none of which occur within 2 km of the study area.

No Threatened or Priority flora were recorded at Hardcastle park during the flora and vegetation survey. The area was searched in its entirety during the appropriate survey season; therefore, it can be concluded that no Threatened or Priority flora species went undetected.

The tree survey at the study area recorded a total of 79 individuals from four species within the 3 m tree target area; *Banksia attenuata* (75 trees), *Eucalyptus marginata* subsp. *marginata* (two trees), *Hakea ruscifolia* (a single tree) and *Nuytsia floribunda* (a single tree).

A single vegetation unit was defined and delineated at Hardcastle Park, *BaHhMc,* defined as *Banksia attenuata* and *Allocasurina humilis* low, open woodland over *Hibbertia hypericoides*, *Eremaea pauciflora* var. *pauciflora* low,open shrubland over *Mesomelaena pseudostygia* sparse sedgeland and *Amphipogon turbinatus* sparse tussock grassland. Much of the remnant vegetation is in either Very Good or Excellent condition, with weeds concentrated around disturbed areas.

A search of the DPaW communities database (Search: 19-01015EC) for TECs and PECs within 10 km of Hardcastle Park. The search indicates that the Endangered TEC, SCP20a, is present at the study area. Ecoscape also performed a Floristic Community Type analysis which also indicated that vegetation present at Hardcastle Park matches the composition of the SCP20a TEC.

Fauna

The study area comprises of one habitat type which consists of Banksia woodland with dense lower mixed shrubs and ground cover.

The desktop assessment resulted in a total of 14 mammal species (eight native species and five introduced species), 189 bird species, 25 reptile species and eight amphibian species potentially occurring within the study area.

Based on the results from the desktop assessment and observation during the site visit, a total of 14 species of conservation significance (three mammals, 10 bird species and one reptile species) have the potential to

occur within the study area. Of these, four species have a moderate likelihood to occur within the study area: Southern Brown Bandicoot (*Isoodon obesulus fusciventer*, DPaW Priority 5), Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris,* EPBC Act Endangered, WC Act S1), Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso,* EPBC Act Vulnerable, WC Act S1) and Rainbow Bee-eater (*Merops ornatus,* EPBC Migratory, WC Act S3).

No fauna of conservation significance was recorded from the study area.

10 Clearing Principles

The development was found to be at variance with three of the ten clearing principles. This is due to the presence of the SCP20a TEC and the presence of foraging habitat for the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo. Principles at which the project is at variance with are:

- (a) - Native vegetation should not be cleared if it comprises a high level of biological diversity.
- (b) - Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.
- (d) - Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

1 INTRODUCTION

1.1 PROJECT OVERVIEW

The City of Wanneroo (the City) is proposing to develop a passive park at 39 Hardcastle Avenue, Landsdale (the study area). Design of the proposed works will commence in the near future as part of the City's Capital Works Program.

The City has commissioned Ecoscape to conduct a flora, vegetation and fauna assessment of the study area in which all environmental values will be defined to support a Native Vegetation Clearing Permit. The assessment will include:

- a Level 2 Flora and Vegetation Survey
- a Level 1 Fauna Survey
- an inventory of all trees within 3 m of the boundary of remnant native vegetation and cleared areas
- prepare a flora, vegetation and fauna survey report, including an assessment against the Department of Environment Regulation's 10 Clearing Principles.

1.1.1 STUDY AREA LOCATION

The study area is located in the Perth metropolitan area, 15 km north of the City centre within the City of Wanneroo. The 1.16 ha park consists of remnant native vegetation within suburbia (**Figure 1).**

Figure 1: Hardcastle park study area location

1.2 SCOPE AND OBJECTIVES

The City's document File Ref: 15/474177 details the Scope of Works. Specifically, the scope required:

- a desktop assessment and collation of available Threatened and Priority Ecological Communities (TECs and PECs), vegetation, and Threatened Flora (formerly known as Declared Rare Flora, DRF) and Priority Flora and conservation significant fauna data
- collecting an inventory of all flora species on the site, including weeds
- establishing floristic quadrats
- conducting an intensive targeted search for conservation significant flora (Threatened and Priority Flora) that have been identified as likely to occur by database searches, and mapping their populations
- conducting an intensive targeted search for Specially Protected Fauna and mapping results
- record all sightings of fauna and map fauna habitat
- mapping populations of flora species of local or taxonomic significance (as defined according to Guidance Statement No. 51)
- describing and mapping vegetation and floristic communities in the area
  - describing and mapping the vegetation on site
  - conducting floristic analysis to determine community type as defined in Gibson et. al (1994)
- describing and mapping vegetation condition, assessed against the Keighery (1994) Bushland Condition Scale
- a record of the precise location and species name of all trees present within 3 metres of the boundary of cleared areas and commencement of remnant vegetation (MGA94 Zone 50 ± 1 m)
- identify and map any Threatened or Priority Ecological Communities
- preparation of an 'Executive Summary' suitable for use in administration reports
- preparation of a concise report detailing the findings of the field survey, designed to meet the requirements of relevant regulatory bodies so as to be used in the approvals process for the proposed development.

1.3 LEGISLATION AND POLICIES

This assessment was conducted in accordance with Commonwealth and State legislation and guidelines:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Western Australian *Environmental Protection Act 1986* (EP Act)
- Western Australian *Wildlife Conservation Act 1950* (WC Act)
- Department of Environment Water Heritage and the Arts (2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.

In addition, the Minister for the Environment has published lists of fauna and flora species in need of special protection because they are considered rare, likely to become extinct, or are presumed extinct. The current listings were published in the *Government Gazette* on 2 December 2014 (Government of Western Australia) and was taken into account.

In addition to those listed above, the assessment complied with the Office of the Environmental Protection Authority (OEPA) requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (Environmental Protection Authority 2000) *Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia*
- EPA (2002) *Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection*
- EPA (2006) *Guidance Statement No. 10: Level of Assessment for Proposals Affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region*, known as *Guidance Statement No. 10*
- EPA (2005) *Guidance Statement No. 33: Environmental Guidance for Planning and Development*

- EPA (2004a) *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia*, known as *Guidance Statement No. 51*
- EPA (2003) *Guidance Statement No. 55: Implementing Best Practice in Proposals Submitted to the Environmental Impact Assessment Process*
- EPA (2004b) *Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia*
- EPA and Department of Environment and Conservation (EPA & DEC 2010) *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*, knowns as *Technical Guide.*

1.3.1 THREATENED AND PRIORITY FLORA AND FAUNA

Conservation significant flora and fauna species are those that are listed by the Department of Parks and Wildlife (DPaW) as TF (Threatened Flora/Fauna) and PF (Priority Flora/Fauna). Taxa are classified as TF or listed as PF where populations are geographically restricted or threatened by local processes.

There are seven categories covering State-listed TF and PF species (DPaW 2014; 2015a) which are outlined in **Table 11** in **Appendix One**. PF for Western Australia are regularly reviewed by the DPaW whenever new information becomes available, with species status altered or removed from the list when data indicates that they no longer meet the requirements outlined in **Table 12**.

1.3.1.1 Western Australian Wildlife Conservation Act 1950

Threatened species (TF) (previously known in Western Australia as Declared Rare Flora (DRF)) are listed by the DPaW and are protected under the Western Australian WC Act. Rare flora species, as they are termed in the Act, are gazetted under Sub-section 2 of Section 23F, thereby making it an offence to remove or damage rare flora without Ministerial approval.

1.3.1.2 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

At a Commonwealth level, Threatened taxa are protected under the EPBC Act, which lists species that are considered Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct, or Extinct in the Wild (detailed in **Table 12** in **Appendix One**).

Migratory species are matters of Commonwealth environmental significance under the EPBC Act. Recognised migratory species include any native species identified in an international agreement approved by the Minister and those listed under:

- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- The China-Australia Migratory Bird Agreement (CAMBA)
- The Japan-Australia Migratory Bird Agreement (JAMBA).

1.3.1.3 IUCN Red List Search of Threatened Species

An International Union for Conservation of Nature (IUCN) Red List search (International Union for Conservation of Nature 2015) identified 43 plant species listed for Western Australia. Threatened Flora are further categorised according to their level of threat using IUCN Red List criteria (International Union for Conservation of Nature 2001); these criteria are presented in **Table 13** in **Appendix One**.

1.3.2 INTRODUCED FLORA

Introduced plant species, known as weeds, are plants that are not indigenous to an area and have been introduced either directly or indirectly (unintentionally) through human activity. Species are regarded as introduced if they are listed as 'alien' on *FloraBase* (Western Australian Herbarium 2015).

1.3.2.1 Weeds of National Significance (WONS)

At a national level there are thirty-two weed species listed as Weeds of National Significance (WONS). The Commonwealth *National Weeds Strategy: A Strategic Approach to Weed Problems of National Significance* (2012b) describes broad goals and objectives to manage these species.

1.3.2.2 Declared Plants

The Western Australian Organism List (WAOL) details organisms listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). Under the BAM Act, Declared Pests are listed as one of the three categories:

- C1 (exclusion), that applies to pests not established in Western Australia; control measures are to be taken to prevent their entry and establishment
- C2 (eradication), that applies to pests that are present in Western Australia but in low numbers or in limited areas where eradication is still a possibility
- C3 (management), that applies to established pests where it is not feasible or desirable to manage them in order to limit their damage.

1.3.2.3 Environmental Weeds

Introduced species have also been ranked by a number of attributes, including invasiveness, distribution and environmental impacts in the various DPaW regions in an *Environmental Weed Strategy* (Department of Conservation and Land Management 1999). To advance the above categorisation, the *Invasive Plant Prioritization Process for DEC* was developed in 2011 by the Department of Environment and Conservation (Department of Environment and Conservation [DEC] 2011), ranked within each DPaW region.

1.3.3 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

1.3.3.1 Nationally Listed Threatened Ecological Communities

Ecological communities are naturally occurring biological assemblages associated with a particular type of habitat (Department of Environment and Conservation 2010). At Commonwealth level, Threatened Flora and Threatened Ecological Communities (TECs) are protected under the Commonwealth EPBC Act. An ecological community may be categorised into one of the three sub-categories:

- Critically Endangered, if it is facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered, if it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
- Vulnerable, if it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

1.3.3.2 State Listed Threatened Ecological Communities

The Western Australian DPaW also maintains a list of TECs which are further categorised into three subcategories much like those of the EPBC Act. Within the Western Australian classification, an ecological community will be listed as Vulnerable "when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future". The full details of DPaW criteria are shown in **Table 14** in **Appendix One**.

1.3.3.3 State Listed Priority Ecological Communities

DPaW maintains a list of Priority Ecological Communities (PECs). PECs include potential TECs that do not meet survey criteria, or that are not adequately defined.

1.3.4 ENVIRONMENTALLY SENSITIVE AREAS

There are a number of areas around Western Australia identified as being of environmental significance within which the exemptions to the Native Clearing Regulations do not apply. These are referred to as Environmentally Sensitive Areas (ESAs), and are declared under section 51B of the EP Act and described in the Environmental Protection (Environmentally Sensitive Areas) Notice (Government of Western Australia 2005).

1.3.5 CONSERVATION ESTATE

The National Reserve System (NRS) is a network of protected areas managed for conservation under international guidelines. The objective of placing areas of bushland into the Conservation Estate is to achieve and maintain a comprehensive, adequate and representative reserve system for Western Australia. Areas vested in the Conservation Estate are managed by the Conservation Commission.

1.3.6 RIVERS, WETLANDS AND DRAINAGE

Databases were interrogated to determine the potential impact of the project on rivers, wetlands and drainage areas within and surrounding the proposed study area. A search of the Department of Water (DoW) *Geographic Atlas Perth Groundwater Atlas* dataset (Department of Water 2010) was utilised to determine the proximity of the study area to known rivers and wetlands, as well as other water resources of interest such as proclaimed groundwater areas.

.

2 EXISTING ENVIRONMENT

2.1 PHYSICAL ASSESSMENT

2.1.1 CLIMATE

The study area is situated in the Swan Coastal Plain Region of Western Australia and experiences a dry Mediterranean climate with a hot dry summer from December to March and a mild winter from June to August (Bureau of Meteorology 2015). Climate data from 6.5 km north, north west of the study area (weather station Beenyup; BoM station number 009186), indicates that the annual mean maximum temperature is high as 29.4°C in summer. The annual mean minimum temperature is as low as 7.8°C in winter. The climate experienced throughout the year is usually dry since high temperatures and humidity seldom occur simultaneously (**Figure 2**). Comprehensive mean annual rainfall is available at Wanneroo station (station number 9105), 9.7 km to the north, north east of the study area. Mean annual rainfall for the study area is 802.1 mm, for the period of 1906 to 2015 (BoM 2015). The wettest period is from June to August. The average long term rainfall and temperature for the Wanneroo station is shown in **Figure 2.**

Data from the Wanneroo weather station also provides recent, up to date data of weather conditions at the study area. Rainfall in the three months preceding the survey, completed in October 2015, was 237.2 mm, 132.6 mm lower than the long-term mean for those months (BoM 2015).

Rainfall data from Wanneroo station and temperature data from Beenyup station is shown in **Figure 2.**

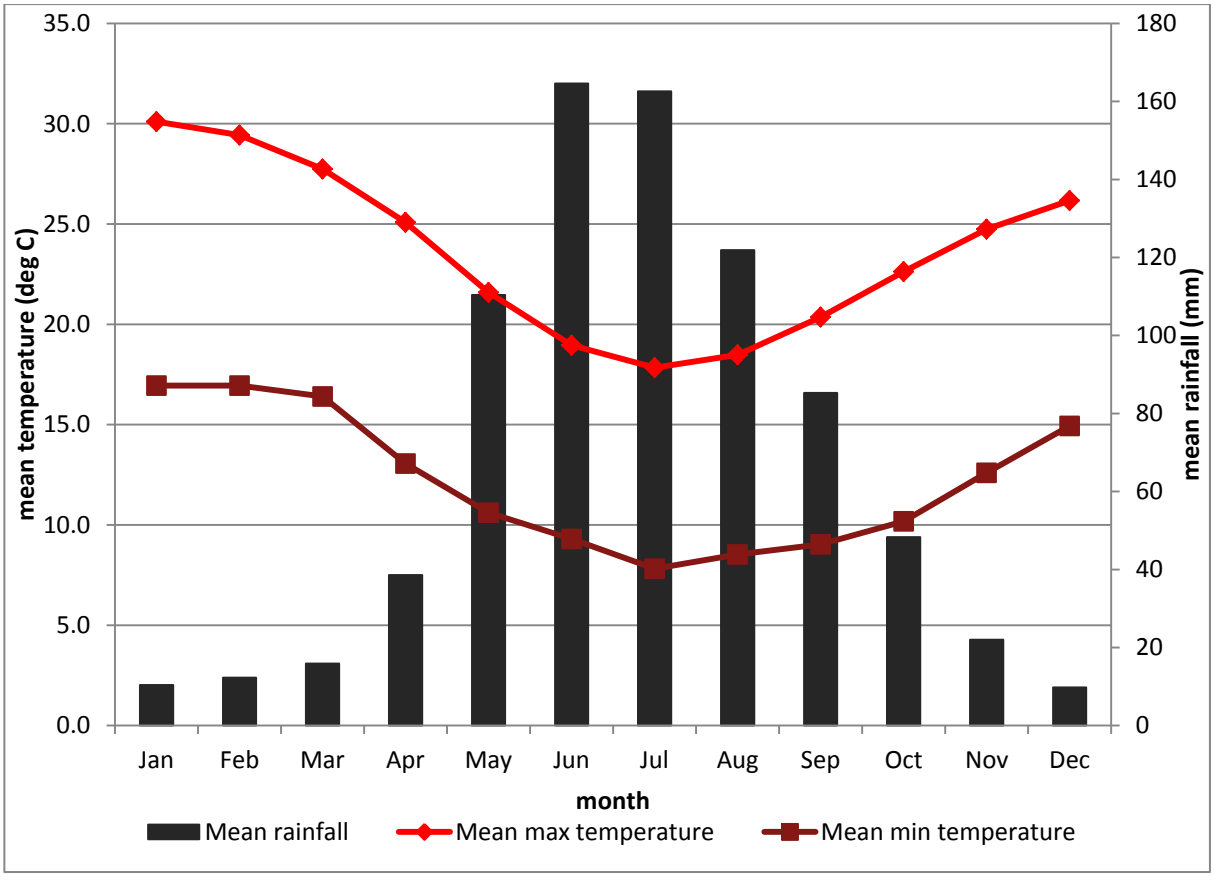

Figure 2: Climatic data (BoM 2015).

2.1.2 CONSERVATION AREAS AND RESERVES

According to Ecoscape's internal GIS database search, the study area does not lie within any Bush Forever Sites or other conservation areas. An Environmentally Sensitive Area (ESA) buffer partially intersects 0.3 ha of remnant native vegetation in the study area. However, the partial intersection indicates that the area may not contain the values of the ESA.

2.1.3 SOILS AND LAND USE

The study area is comprised of a single soil landscape subsystem; Karrakatta Sand Yellow Phase, within the Spearwood system. This is categorised by low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. *Banksia* spp. woodland with scattered emergent *E. gomphocephala and E. marginata* and a dense shrub layer (Department of Agriculture and Food Western Australia 2007).

Acid Sulfate Soils is the common name given to naturally occurring soil and sediment containing iron sulfides. Release of acid and metals as a result of the disturbance of acid sulfate soils can cause significant harm to the environment and infrastructure.

The Western Australian Planning Commission *Planning Bulletin 64 Acid Sulfate Soils* (WAPC 2003) and the online *Perth Groundwater Atlas* (Department of Water 2012) were consulted to determine the presence and risk of Acid Sulfate Soils (ASS) within the study area. The study area lies within an area that is either at low or no risks of being affected by ASS (WAPC 2003).

The study area lies within a housing development and is surrounded on all sides by roads and houses. A proportion (31%) of the area has been cleared, the remainder is occupied by remnant native vegetation.

2.2 BIOLOGICAL ASSESSMENT

2.2.1 BIOGEOGRAPHIC REGION

Biogeographic regions are delineated on the basis of similar climate, geology, landforms, vegetation and fauna and are defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (DoE 2015).

The Swan Coastal Plain IBRA region is comprised of two biogeographical subregions: the Dandaragan Plateau and the Swan Coastal Plain (Perth) subregion. The study area is located within the Swan Coastal Plain subregion.

The Swan Coastal Plain is a low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, Casuarina obesa on outwash plains, and paperbark in swampy areas. In the east the plain rises to duricrusted Mesozoic sediments dominated by Jarrah woodland. The outwash plains, once dominated by C. obesa-marri woodlands and Melaleuca shrublands are now extensive only in the south (Department of Conservation and Land Management 2002).

2.2.2 REGIONAL VEGETATION

During the 1970s, John Beard and associates conducted a systematic survey of native vegetation, describing the vegetation systems in Western Australia at a scale of 1:250 000 in the south-west and at a scale of 1:1,000,000 in less developed areas. The vegetation survey of Western Australia maps and explanatory memoirs (1974-1981) are credited to J.S. Beard (or Beard with various co-authors). Beard's vegetation maps attempted to depict the native vegetation as it was presumed to be at the time of settlement, and is known as the pre-European vegetation type and extent and has since been developed in digital form by Shepherd *et al* (2002), updated by (DAFWA 2012).

Two vegetation communities are mapped within the study area and are presented below in **Table 1**. However, the boundaries placed on the Shepherd *et al* (2002) vegetation communities are broad and the vegetation at the study area is likely to more closely align with just one of the intersecting vegetation communities, community e2Mb cbLi.

Table 1: Pre-European vegetation association representation (DAFWA 2012).

Shepherd Vegetation Association	Beard Vegetation Code	Description	Original Extent (ha)	Current Extent (ha)	% Remaining
1001	e2Mb cbLi	Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina	68,475	18,907	27.6
6	e2,4Mi	Medium woodland; tuart & jarrah	57,410	14,151	24.6

The vegetation of the Swan Coastal Plain has been mapped at a regional scale by Heddle *et al* (1980) in correlation to the major geological units of Churchward & McArthur (1980). The study area supports the remnants of a single vegetation complex; the Karrakatta Complex–Central and South complex (**Table 2**) of the Spearwood Dunes (Heddle *et al*. 1980. This complex it characterised by characterised mainly by low open forest of *E. gomphocephala, E. marginata, E. calophylla* and woodland of *E. marginata* and *Banksia* spp.

Table 2: Vegetation complexes in the study area (Heddle *et al*. 1980)

Vegetation Complex	Number	Area Remaining in Swan Coastal Plain		Area remaining in Study Area	
		ha	%	ha	%
Spearwood Dunes					
Karrakatta Complex–Central and South	49	6,275	18	0.8	<0.01

2.2.3 RESULTS OF THE DESKTOP ASSESSMENT

2.2.3.1 Flora

Searches of the DPaW's Threatened and Priority flora database (Search Reference: 25-1015FL), the EPBC *Protected Matters Search Tool* (PMST) and the IUCN database using a 10 km buffer around the study area was conducted. These searches identified 27 Threatened and Priority flora have been recorded from within 10 km of the study area from previously known locations. Of the 27 species, five Threatened and six Priority 1 flora have been recorded. Nineteen of the species have coordinate locations and are indicated on **Map 1**.

None of these species are known to occur within 2 km of the study area.

Species returned by the database searches have been assessed for their likelihood of occurrence within the study area based on habitat suitability, associated species and the criteria in **Table 3**. Of the 27 species, three have a likelihood rating of 'Possible' (*Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425), P1; *Acacia benthamii*, P2 and *Anigozanthos humilis* subsp. *chrysanthus*, P4) and one with a rating of 'Likely' (*Jacksonia sericea,* P4). The remainder of the species have been assessed as 'Unlikely' to occur within the study area.

A full assessment is provided in **Table 17** in **Appendix Two**.

Table 3: Criteria used to assess the likelihood of occurrence of Conservation Significant flora

Likelihood	Criteria
Recorded	The taxon has been recorded within the study area
Highly likely	Due to the proximity of previous records (<2 km) and the presence of suitable habitat, the taxon is considered highly likely to occur within the study area
Likely	Given the presence of suitable habitat and moderate proximity (2-10 km) of previous records, the taxon is considered likely to occur within the study area
Possible	The habitat specificity of the taxon is broadly defined or undefined and there are records within 20 km of the study area. There is insufficient information available to exclude the possibility of occurrence within the study area
Unlikely	The habitat specificity of the taxon is well defined from previous records and the habitat is considered unlikely to be present within the study area; or there are no records within 20 km of the study area

2.2.3.2 Vegetation

A search of the DPaW communities database (Search Reference: 19-01015EC) for TECs and PECs within 10 km of the study area was undertaken as part of the desktop assessment. The search revealed six Priority 3 PECs and one Endangered TEC (**Table 4**, **Map 1**).

The search indicates that the Endangered TEC, SCP20a, is present at the study area (**Map 1**). This community is categorised by *Banksia attenuata* woodlands over species rich dense shrublands.

Table 4: TECs and PECs within 4 km of the study area

Community Type	Community ID	Description	Significance
TEC	SCP20a	*Banksia attenuata* woodlands over species rich dense shrublands	Endangered
PEC	SCP21c	Low lying *Banksia attenuata* woodlands or shrublands	Priority 3
PEC	SCP22	*Banksia ilicifolia* woodlands	Priority 3
PEC	SCP23b	Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands	Priority 3
PEC	SCP24	Northern Spearwood shrublands and woodlands	Priority 3
PEC	SCP25	Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands	Priority 3
PEC	SCP29a	Coastal shrublands on shallow sands	Priority 3

2.2.3.3 Fauna

The desktop assessment resulted in a total of 14 mammal species (eight native species and five introduced species), 189 bird species, 25 reptile species and eight amphibian species potentially occurring within the study area (**Table 17** - **Table 19**, **Appendix Two**). Of these, 28 species are of conservation significance: four mammal species, 23 species of bird and one species of reptile.

Shorebird and pelagic bird species that were part of the database returns were excluded from this assessment due to the distance of the study area to shoreline and coastal areas.

In addition, a total of 13 waterbird and migratory bird species were considered to be unlikely to occur within the study area due to the lack of wetlands and river systems in the vicinity. The species may occasionally overfly the study area to travel between surrounding suitable habitats but are not expected to directly utilise the study area. For this reason, the following waterbird species have not been included in this section:

- Blue-billed Duck (*Oxyura australis*) DPaW Priority 4

- Eastern Great Egret (*Ardea modesta*) EPBC Act Migratory, WC Act Schedule 3
- Cattle Egret (*Ardea ibis*) EPBC Act Migratory, WC Act Schedule 3
- Glossy Ibis (*Plegadis falcinellus*) EPBC Act Migratory, WC Act Schedule 3
- Eastern Osprey (*Pandion cristatus*) EPBC Act Migratory
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*) EPBC Act Migratory, WC Act Schedule 3
- Hooded Plover (*Thinornis rubricollis*) DPaW Priority 4
- Australian Painted Snipe (*Rostratula australis*) EPBC Act Vulnerable / Migratory, WC Act Schedule 1 / Schedule 3, DPaW Vulnerable
- Common Sandpiper (*Actitis hypoleucos*) EPBC Act Migratory, WC Act Schedule 3
- Common Greenshank (*Tringa nebularia*) EPBC Act Migratory, WC Act Schedule 3
- Wood Sandpiper (*Tringa glareola*) EPBC Act Migratory, WC Act Schedule 3
- Red-necked Stint (*Calidris ruficollis*) EPBC Act Migratory, WC Act Schedule 3
- Caspian Tern (*Hydroprogne caspia*) EPBC Act Migratory, WC Act Schedule 3

In addition to the above species of water birds, one species of mammal, the Water-rat *Hydromys chrysogaster* (DPaW Priority 4) inhabits permanent water that is not present within the study area and therefore is not thought to be present. For this reason the species has been excluded from this assessment.

3 METHODS

The flora, vegetation and fauna survey was conducted by a botanist and a zoologist over a six hour period on 8 October 2015. The survey effort was equivalent to one whole person day. The flora, vegetation and fauna assessment was carried out in accordance with the relevant EPA *Guidance Statements* (**Section 1.2**) and comprised both desktop and field assessments

3.1 FLORA AND VEGETATION ASSESSMENT

3.1.1 GUIDING PRINCIPLES

The following statements and information were followed in developing the survey methodology:

- EPA (2000) *Position Statement No. 3*
- EPA (2004a) *Guidance Statement No. 51*
- background information on the study area (i.e. desktop assessment, aerial imagery and other data).

EPA *Guidance Statement No. 51* recommends the following characteristics for a Level 2 Flora and Vegetation survey:

- one or more visits to the target area in the main flowering season
- replication of plots in each vegetation community to thoroughly sample the flora and characterize the vegetation communities over their full extent in the target area
- multivariate analysis of the vegetation using, at a minimum, presence/absence data and perennial species
- mapping of vegetation at an appropriate scale
- tabulation of the area of each vegetation community mapped and an assessment of the environmental values including such factors as extent, condition and presence of significant flora.

3.1.2 DATABASE SEARCHES

The following database searches were conducted in September 2015, prior to the field survey, to determine the conservation significant species previously recorded from the vicinity of the study area:

- DPaW Threatened Flora database search, compiled from DPaW's Threatened (Declared Rare) Flora Database (TPFL), Declared Rare and Priority Flora List (TPlist) and Western Australian Herbarium Specimen Database (WAHERB)
- DPaW Threatened and Priority Ecological Community Database search.

3.1.3 FLORA VEGETATION FIELD SURVEY

Following the requirements of EPA (2004a) *Guidance Statement No. 51*, the survey was conducted by sampling with non-permanent quadrats. Quadrats were sampled in areas where the vegetation was in good or better condition. Each quadrat sampled an area of 100 m^2 (10 m x 10 m).

Opportunistic observations were carried out within the entire study area to contribute to a complete species inventory and search for conservation significant flora. The entirety of the study area was traversed at a approximately 5 m intervals.

On ground observations supported by aerial photography was used to describe the vegetation community of the study area. Higher survey effort was applied to areas with native vegetation while degraded areas were also adequately sampled in order to record all the species present within the study area.

3.1.3.1 Timing of Field Survey

The flora and vegetation survey was undertaken on 8 October 2015; within the appropriate season as per EPA (2004a) *Guidance Statement No. 51*. For the Swan Coastal Plain bioregion, spring (September to November) is the recommended survey period. Survey timing was selected to coincide with seasonal conditions with optimal times for surveying flora and vegetation. Specifically, the optimal time for surveys within the Perth area is typically late September to early October.

3.1.3.2 Quadrats

Quadrat locations were selected using aerial photography, environmental values and field observations to represent the vegetation values existing at the site. The quadrats sampled were 10 m x 10 m in size.

The following information was collected from within each quadrat sampled:

- observer
- date
- quadrat/site number
- GPS location (GDA94)
- digital photograph (spatially referenced with a reference number)
- soil type and colour
- topography
- list of flora species recorded with the average height and the total cover within the quadrat for each species
- vegetation community
- vegetation condition.

3.1.3.3 Conservation Significant Flora Search

The entire extent of the study area was searched for conservation significant flora at a grid spacing of 10 m, searching 5m either side of the walked line.

3.1.3.4 Range Extensions

Taxa recorded during the current survey that are outside of their known distribution were identified as range extensions. Known taxa records (Western Australian Herbarium 2015) were used as a guide to determine if each taxon recorded in the study area was representative of a range extension (in this case defined as greater than 100 km from nearest record) or outlier population.

3.1.3.5 Introduced Species

Declared Plants (listed under the BAM Act) were searched in DAFWA's website (Department of Agriculture and Food Western Australia 2015) for the local government area that the study area is located within to determine if any of the recorded species are listed as Declared Plants.

3.1.3.6 Vegetation Condition and Mapping

Vegetation condition was assessed continuously throughout the study area and at each quadrat using the Keighery (1994) Bushland Condition Scale (**Table 15** in **Appendix One**).

The spatial extent of the varying vegetation condition was mapped using GIS and vegetation condition maps are provided in this report.

3.1.4 STATISTICAL ANALYSIS

Floristic Community Types (FCTs) are groups of co-occurring plant species, identified by floristic analysis from over 500 10 m x 10 m quadrats located on the southern Swan Coastal Plain (SCP) between Seabird and the foothills of the Wicher Range by Gibson *et al.* (1994). This floristic analysis defined 43 community types and subtypes. The major correlations with the floristic classification were seasonal moisture regime and geomorphology; however there was poor correlation with vegetation structure and mapped vegetation units. Despite the poor correlation with mapped vegetation units, DPaW defines many TECs and PECs on the SCP in terms of FCTs, as identified from the Gibson *et al.* (1994) data.

The extent of an FCT is not mapped in the same way as vegetation complexes or vegetation units, thus their presence cannot be determined by desktop assessment.

Affinities with FCTs are identified after analysis of field survey quadrat data. There were three types of comparisons conducted:

- statistical analysis, discounting FCTs from different landforms or landscape positions (i.e. in this case not including FCTs from Spearwood sands or low-lying FCTs)
- comparing dominant species to FCT descriptions
- examining inferred FCT types and soil types of surrounding bushlands.

FCT analysis of the collected data is conducted using an in-house database program which compares the species list collected from the quadrat data with the information in Table 12 of Gibson *et al.* (1994) and includes data from additional unpublished sites. The analysis produces a list of possible FCTs, with the output including:

- the number of FCT species in the quadrat in relation to the defined FCT list
- the percentage of FCT species in the quadrat in relation to the defined FCT list
- the total cumulative frequency (i.e. running total) of FCT species in the quadrat for each defined FCT, which weights typical FCT species.

The output list of possible FCTs is compared with landform, landscape position, distribution, typical species and descriptions in Gibson *et al.* (1994) to indicate the best possible match with an FCT.

This analysis provides an objective and quantitative method for determining FCTs. Ecoscape appreciates that, as TECs on the SCP are generally described in terms of FCTs, DPaW may be required to confirm the presence of TECs if they are determined from FCT analysis.

3.1.5 TREE SURVEY

The precise location and species name of all trees present within 3 m of the boundary of cleared areas and commencement of remnant vegetation was recorded during the field survey using a NavCom SF-3040 Starfire Differential GPS (MGA94 Zone 50 ± 0.5 m).

3.2 FAUNA ASSESSMENT

3.2.1 GUIDING PRINCIPLES

The survey methods adopted by Ecoscape were formulated using:

- EPA (2002) *Position Statement No. 3*
- EPA (2004b) *Guidance Statement No. 56*
- EPA & DEC (2010) *Technical Guide*
- background information on the footprint or target area (i.e. results of literature, data and map-based information).

EPA (2004b) *Guidance Statement No. 56* recommends the following characteristics for a Level 1 Fauna survey which were incorporated into the survey and reporting design:

- site visit by suitably qualified personnel to undertake selective, low level sampling
- provide habitat description and habitat maps of the study area
- verify the accuracy of the background study
- delineate and characterize the fauna and faunal assemblage present within the target area
- identify potential impacts.

3.2.2 DATABASE SEARCHES

Searches of the following databases were undertaken in September 2015 prior to the field survey, to determine the fauna assemblage and species of conservation significance previously recorded in the vicinity of the study area (**Table 5**):

- Commonwealth Department of the Environment (DoE) EPBC *Protected Matters* Database (PMST) (DoE 2015)
- *Atlas of Living Australia* (ALA 2015)
- *NatureMap* (DPaW 2015b)
- Birdlife Australia *Birdata* (Birdlife Australia 2015).

Table 5: Fauna database searches

Database	Custodian	Search details
Commonwealth *Protected Matters* Search (PMST)	Department of Environment (DoE)	Date: 12/10/15 Buffer: 5 km
Atlas of Living Australia	National Research Infrastructure for Australia (NCRIS) & Global Biodiversity Information Facility (GBIF)	Date: 05/10/15 Buffer: 5 km Centre point: 115°51'43"E, 31°49'02"S
NatureMap	DPaW / WAM	Date: 05/10/15 Buffer: 5 km Centre point: 115°51'47"E, 31°49'02"S
Birdata	Birdlife Australia	Date: 12/10/15 Centre point: 115.87207, -31.8275 Buffer: 1 degree (100 km)

3.2.3 CONSERVATION SIGNIFICANT FAUNA OCCURENCE

The likelihood of fauna listed under the current legislative frameworks to occur within the study area was identified by utilising the results of the literature review, database searches and survey results. Three conservation lists have been developed at national (EPBC Act) and State level (WC Act and DPaW priority list).

Following criteria were examined to determine the likelihood of occurrence:

- suitability of habitats present within the study area
- distance between previous record of conservation significant species and the study area
- frequency and number of records in the region, and
- date of record of conservation significant species (recent or historical).

Each conservation significant species that potentially occurs within the study area was assigned a likelihood of occurrence based on the below categories (**Table 6**). The sufficiency of information and behavioural and ecological characteristics, such as cryptic behaviours were also taken into account.

Table 6: Criteria for likelihood of occurrence of conservation significant fauna

Likelihood	Criteria
Recorded	Species recorded within the study area within a reasonable timeframe (0-5 years)
High	Species recorded in close proximity to the study area (<5 km) within the past 10 years; suitable habitat occurs within the study area
Medium	Species historically recorded in close proximity (<5 km) to the study area, more than 10 years ago; suitable habitat may exist within the study area
Low	Species not recorded in the proximity of the study area or rarely recorded within 10 km of the study area; suitable habitat unlikely to occur within the study area
Very Low	Species not recorded by multiple surveys/databases within 20 km of the study area and suitable habitat does not occur within the study area, however species or suitable habitat is listed as potentially occurring in the wider region

3.2.4 FAUNA FIELD SURVEY

To comply with the EPA *Guidance Statement No. 56* (EPA 2004b), the entire study area was traversed using a series of transects to produce a species inventory and to search for fauna of conservation significance. A combination of aerial photography and the site visit were used to identify an appropriate approach to surveying the study area.

3.2.4.1 Timing of the Field Survey

The fauna survey was undertaken within the appropriate season as per EPA & DEC (2010) *Technical Guide*. Survey timing was selected to coincide with optimal conditions for surveying native fauna, which for Swan Coastal Plain bioregion, is the spring (September to December) to ensure sampling during peak activity of reptile, amphibian and bird. Survey timing for these fauna groups is dependent on warm temperature and/or rainfall events. Mammal activity is not dependant on weather and therefore not constrained.

3.2.4.2 Fauna Habitat Mapping

Fauna habitat types were assessed continuously throughout the study area. The spatial extent of each habitat type was mapped using GIS and provided in **Section 4.3.1.**

4 RESULTS

4.1 FLORA

The botanical survey was conducted by Dr Andrew Craigie (flora licence SL011507) on 6 October 2015.

Two floristic quadrats were recorded within the study area.

A total of 88 vascular flora species from 70 genera and 33 families were recorded within the study area from the floristic quadrats and opportunistic observations. Nineteen (20.4%) of the 88 species recorded were introduced flora. The full list of vascular flora species is presented in **Table 20** in **Appendix Three**. Qualitative data recorded from individual quadrats is presented in **Appendix Four**.

Families with the highest number of taxa were Fabaceae (14 taxa), Proteaceae (seven taxa) and Myrtaceae and Asteraceae (six taxa each). The most commonly recorded genera at the study area were Stylidium, Daviesia and Hibbertia, with four, three and three species, respectively.

4.1.1 FLORA OF CONSERVATION SIGNFICANCE

No Threatened EPBC Act or WC Act listed taxa were recorded in the study area.

No Priority Flora taxa were recorded.

4.1.2 RANGE EXTENSION

No range extensions over 100 km from their nearest historical occurrence were recorded.

4.1.3 INTRODUCED FLORA

No Weeds of National Significance (WONs) were recorded in the study area.

No Declared Pest plants were recorded in the study area, and as such there is no requirement for any weed control.

A total of 18 taxa were recorded as introduced species, two are of high priority based on the assessment in **Table 7**; **Lupinus angustifolius* and **Lupinus cosentinii.* **Table 7** contains a list of all species and their rating under:

- *Biosecurity and Agriculture Management Act 2007* (BAM Act)
- Weeds Australia (2012) Weeds of National Significance (WONS)
- DEC Weed Prioritization Process (DEC 2011)
- DPaW Regional Rank (DPaW 2012).

The distribution of introduced species at the study area was observed to be concentrated around the boundary of remnant native vegetation in disturbed areas. The most common weeds observed at the boundary were, **Avena barbata, *Lupinus cosentinii* and **Pelargonium capitatum;* with *Gladiolus caryophyllaceous*, Patersonia occidentals** and **Ehrharta calycina* more common within the native vegetation.

Table 7: Rating of introduced flora

Species	Common Name	DP (BAM Act)	WONS	DEC Weed Prioritization Process Rank			Regional Rank (Management Actions)
				Ecol. Impact	Invasive -ness	Control	
**Arctotheca calendula*	Cape Weed	-	-	H	R	M	L (D,E)
**Avena barbata*	Bearded Oat	-	-	H	R	H	L (D,E)
**Brassica tournefortii*	Wild Turnip	-	-	H	R	L	L (D)
**Briza maxima*	Blowfly Grass	-	-	U	R	H	L (B,C)
**Bromus diandrus*	Great Brome			H	R	H	L (D)
**Ehrharta calycina*	Perennial Veldt Grass	-	-	H	R	M	L (D,E)
**Euphorbia terracina*	Geraldton Carnation Weed	-	-	H	R	M	M (D,E,F,G)
**Gladiolus caryophyllaceus*	Wild Gladiolus	-	-	H	R	M	M (D,E,F)
**Lupinus angustifolius*	Narrowleaf Lupin	-	-	H	M	H	H (G,H,I)
**Lupinus cosentinii*	Western Blue Lupin, Sandplain Lupin	-	-	H	M	H	H (G,H,I)
**Lysimachia arvensis*	Pimpernel	-	-	U	R	L	N (B)
**Melilotus indicus*	King Island Melilot	-	-	U	R	U	M (D,E,F)
**Oenothera drummondii*	Beach Evening Primose	-	-	U	R	U	M (D,E,F)
**Pelargonium capitatum*	Rose Pelargonium	-	-	H	R	M	L (D,E)
**Raphanus raphanistrum*	Wild Radish	-	-	U	M	L	N (B)
**Sonchus oleraceus*	Common Sowthistle	-	-	U	R	L	N (B)
**Trifolium arvense*	Hare's Foot Clover	-	-	U	U	L	-
**Ursinia anthemoides* subsp. *anthemoides*	Ursinia	-	-	U	R	L	N (B)

DEC Weed Prioritization Process (DEC 2011):

- Ecological Impact: High, Medium, Low, Unknown
- Invasiveness: Rapid, Moderate, Slow, Unknown
- Feasibility of Control: High, Medium, Low, Unknown.

Management actions according to DPaW Regional Rank (DPaW 2012)

A. no action (the weed species ranking is so low as to not warrant any investment in regional strategic management actions)
B. monitor only (aims to detect any significant changes in the species' weed risk or management ability
C. improve general weed management (aims to minimise weed impact and maintain the overall biodiversity, social, cultural and economic values in the region through improved general weed management)
D. protect priority sites (aims to prevent spread of weed species to key sites/assets of high biodiversity, social, cultural or economic value)
E. targeted control to reduce infestations at priority sites (may include biocontrol) (aims to significantly reduce the impact of a weed species on key sites/assets of high biodiversity, social, cultural or economic value through targeted management)
F. contain regional spread (aims to prevent the ongoing spread of the weed species in the region)
G. reduce regional infestations (may include biocontrol) (aims to significantly reduce the extent of the weed species in the region)
H. regional eradication (aims to remove the weed species from the region)
I. statewide eradication (aims to remove the weed species from the state).

4.1.4 TREES WITHIN THREE METRES OF REMNANT NATIVE VEGETATION BOUNDARIES

The tree survey at the study area recorded a total of 78 individuals from three species within the 3 m tree target area supplied by the City (**Map 2**); *Banksia attenuata* (75 trees), *Eucalyptus marginata* subsp. *marginata* (two trees) and *Nuytsia floribunda* (a single tree). An additional 11 dead Banksias were recorded within the target area.

Trees present outside the target area were also recorded as additional information; 22 *Banksia attenuata* individuals were recorded in this area, three of which were dead.

The full list of trees and their location is provided in **Appendix Five**.

4.2 VEGETATION

4.2.1 VEGETATION COMMUNITIES

A single vegetation community was defined and delineated at the study area. Due to the size and uniformity of the study area, two quadrats were completed, both of which recorded similar species structure and density. This, along with opportunistic records, was deemed sufficient to define the vegetation of the study area. The vegetation community present at the study are can be defined as low *Banksia attenuata* and *Allocasuarina humilis* open woodland, and occupies 0.80 ha within the study area. The extent and characteristics of the vegetation are listed in **Table 8** and shown in **Map 3**, **Plate 1** and **Plate 2**)

Table 8: Vegetation community of the study area

Mapping Unit	Vegetation Community	Characteristic Species	Area (ha) and Extent (%) of Study Area
BaHhMc	Low *Banksia attenuata* and *Allocasuarina humilis* open woodland *Banksia attenuata* low, open woodland over *Allocasurina humilis* mid, isolated shrubs over *Hibbertia hypericoides*, *Eremaea pauciflora* var. *pauciflora* low,open shrubland over *Mesomelaena pseudostygia* sparse sedgeland and *Amphipogon turbinatus* sparse tussock grassland NVIS: U+ ^*Banksia attenuata*\^tree\6\r;M ^^*Allocasuarina humilis,Eremaea pauciflora* var. *pauciflora,Hibbertia hypericoides*\^shrub\3\r;G ^*Amphipogon turbinatus,* ^*Mesomelaena pseudostygia*\^tussock grass,sedge\1\bi	*Banksia attenuata* *Bossiaea eriocarpa* *Conostylis aurea* *Dampiera linearis* *Desmocladus asper* *Gladiolus caryophyllaceus* *Gompholobium tomentosum* *Haemodorum laxum* *Hibbertia huegelii* *Hibbertia hypericoides* *Hypocalymma robustum* *Jacksonia floribunda* *Lepidosperma scabrum* *Levenhookia stipitata* *Mesomelaena pseudostygia* *Patersonia occidentalis* *Stirlingia latifolia* *Stylidium brunonianum* *Stylidium piliferum* *Xanthorrhoea preissii*	0.8 ha, 70%
Cleared	Completely Degraded (not native vegetation)	**Avena barbata* **Lupinus cosentinii* **Pelargonium capitatum*	0.2 ha (30%)

Plate 1: Vegetation community at Quadrat 1

Plate 2: Vegetation community at Quadrat 2

4.2.1 VEGETATION CONDITION

The vegetation condition at the study area was observed to be in mainly Very Good to Excellent condition within the remnant native vegetation extent, with just a few weeds present. The perimeter of the native vegetation, closest to disturbance and clearing areas, was assessed to be in Good to Degraded condition on the Keighery (1994) Bushland Condition Scale. These areas lacked a cohesive native understory and had a high presence of weed species. The remainder of the study area is comprised of cleared areas and is rated as completely degraded (**Map 3**).

4.2.2 BOTANICAL LIMITATIONS

Table 9: Botanical limitations

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Competency/experience of the consultant conducting the survey	No	The botanist (Dr Andrew Craigie) conducting the field survey has over 10 years botanical experience.
Proportion of the flora identified	No	All flora (88 taxa) were identified to at least species level.
Proportion of the task achieved and further work that may need to be undertaken	No	No additional work is considered necessary to describe the flora and vegetation of the study area.
Timing/weather/season/cycle	No	The field survey was conducted in October, which is considered optimal for surveys conducted in the Southwest Botanical Province. Although the rainfall was below average, there were no visible signs of plant stress and all likely annual and ephemeral species would have been present and all species identifiable.
Intensity of survey (e.g. in retrospect was the intensity adequate?)	No	The area was adequately surveyed to describe the vegetation and floristic composition, and the grid search for conservation significant flora was conducted at an appropriate spacing and timing.
Completeness (e.g. was relevant area fully surveyed?)	No	The area was surveyed completely.
Resources (e.g. degree of expertise available for plant identification)	No	The botanist conducting the survey is an experienced taxonomist. The flora of the Perth region is well-described and resources for identification are adequate.
Remoteness and/or access problems	No	The area was completely accessible.
Availability of contextual (e.g. bioregional) information for the survey area	No	The Perth region is well described.

4.2.3 STATISTICAL (FCT) ANALYSIS

The results of Ecoscape's analyses, as described in **Section 3.1.4** and indicating the most likely FCTs, are included in **Table 10**.

Table 10: FCT analysis results

QUadrat	FCT	Typical landform	Species Richness			Cons. code
			No. FCT spp.	% of FCT spp.	Cumulative Frequency	
Q1	28 Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands	Spearwood	29	52.54	1146	-
	20a *Banksia attenuata* woodlands over species rich dense shrublands	Spearwood/ Pinjarra Plain	28	41.54	2014	TEC
	23a Central Banksia attenuata – B. menziesii woodlands	Bassendean	25	39.81	1485	-
Q2	28 Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands	Spearwood	22	39.86	868	-
	20a *Banksia attenuata* woodlands over species rich dense shrublands	Spearwood/ Pinjarra Plain	21	31.16	1527	TEC

The floristic analysis results were not definitive, with both quadrats showing affinities with two FCTs; SCP28, which has no particular conservation significance as it is not listed as a TEC or PEC and is described in Gibson *et at*. (1994) as 'well reserved' and 'low risk', and SCP20a, which is listed as a TEC by DPaW but not listed under the Commonwealth EPBC Act.

Based on recorded locations indicated in Gibson *et at*. (1994), both are likely to occur in the vicinity of the study area.

Further interrogation of community type descriptions and data included in Table 12 in Gibson *et at*. (1994) indicates that Species Group O, that is considered characteristic of FCT SCP 28, has only a moderate (51%) occurrence overall (i.e. within the site, not just within quadrats) and low (28% and 25%) occurrence within the quadrats. Therefore, SCP20a is considered the most likely FCT associated with the study area.

4.3 FAUNA

4.3.1 FAUNA HABITATS

The entire extent of the study area consists of one fauna habitat which comprises of *Banksia* woodland. It is dominated by a moderate layer of *Banksia attenuata* with occasional *Allocasuarina humilis* and a small patch of *Eucalyptus marginata* (Jarrah) over a moderate to dense layer of shrubs *Hibbertia hypericoides* and *Eremaea pauciflora* over dense ground cover of *Amphipogon turbinatus* and *Mesomelaena pseudostygia*. The substrate was sand with sparse leaf litter and wood litter (**Plate 3**).

Plate 3: Banksia woodland recorded from the study area

4.3.2 FAUNA ASSEMBLAGE

Three species were recorded during the site visit: Shingleback (also known as Bobtail Lizard, *Tiliqua rugosa*), feral cat (*Felis catus*) and the remains of a Western Grey Kangaroo (*Macropus fuliginosus*). No conservation significant species were recorded from the study area.

5 DISCUSSION

5.1 FLORA SIGNIFICANCE

The timing of the survey, during early October, was optimal for identification of the flora present in the Swan Coastal Plain. Ecoscape considers the number of taxa recorded (88) to be typical for a good condition site of this size. The presence of many annual species (**Appendix Three**) is also an indication of optimal survey timing.

5.1.1 THREATENED AND PRIORITY FLORA

No flora species of conservation significance, listed as Threatened under the EPBC Act or the WC Act, nor any species listed as Priority Flora by DPaW, were recorded from the study area. None are considered likely to occur as the area was searched in its entirety with particular attention paid to habitat of flora that were assessed as having a high likelihood of occurrence rating in **Section 2.2.3.1**.

5.1.2 RANGE EXTENSIONS

No range extensions of flora species were recorded.

5.1.3 INTRODUCED FLORA

Of the 18 introduced species recorded at the study area, none were Weeds of National Significance (WONS) or Declared Pest species. Two were ranked as High according to the DPaW Regional Rank (DPaW 2012) for Swan.

5.2 VEGETATION SIGNIFICANCE

A search of the DPaW's community database indicates that the Endangered TEC, SCP20a, is present at the study area (**Map 1**). This community is categorised by *Banksia attenuata* woodlands over species rich dense scrublands.

Ecoscape also performed an in-house FCT analysis. The floristic quadrats recorded in the study were compared by species composition to known FCTs, including TECs and PECs, on the Swan Coastal Plain. This analysis also indicated that the vegetation at the study area is representative of the TEC, SCP20a.

An assessment against the 10 clearing principles as stated in the Governments of Western Australia's *Environmental Protection (Clearing of Native Vegetation) Regulations* (Government of Western Australia 2004) is provided in **Appendix Seven**.

5.3 FAUNA OF SIGNIFICANCE

Based on the results from the desktop assessment and observation during the site visit, a total of 14 species of conservation significance (three mammals, 10 bird species and one reptile species) have the potential to occur within the study area. Of these, four species have a medium likelihood to occur within the study area: Southern Brown Bandicoot (*Isoodon obesulus fusciventer*, DPaW Priority 5), Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris,* EPBC Act Endangered, WC Act S1), Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso,* EPBC Act Vulnerable, WC Act S1) and Rainbow Bee-eater (*Merops ornatus,* EPBC Migratory, WC Act S3). No fauna considered as high likelihood were identified from the desktop and field survey as likely to occur in the study area.

These species of conservation significance having a medium likelihood of occurring within the study area are discussed in further detail in **Appendix Six**.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 FLORA AND VEGETATION

Eighty-eight flora species were recorded from the study area under good seasonal conditions. This species richness is typical for a 1 ha area in good condition. Whilst the remnant native vegetation is in good seasonal condition, 18 (20.5%) of the flora species recorded were weed species.

No Threatened (Rare) or Priority Flora were recorded at the site; nor are they expected to occur as they would have been detected during the survey.

The vegetation at the site was found to be in mainly very good or excellent condition. The vegetation was also found to be representative of the Endangered TEC, SCP20a.

Recommendations based on these findings are as follows:

- due to the presence of ESAs and Endangered TECs, it is likely that the City will require a vegetation clearing permit and approval from the DPaW to commence works
  - Consultation with the DPaW throughout the planning and construction process a necessity
- to increase the likelihood for approval of the development of the passive park the design should consider:
  - design of park infrastructure around already cleared areas
  - design of low impact park infrastructure such as pathways and boardwalks
- it is also recommended that a weed control and management plan be implemented to retain the natural values at the park. This is likely to been viewed upon favourably by the DPaW

6.2 FAUNA

No fauna of conservation significance was recorded from the study area.

No potential breeding trees for Black-Cockatoo species are present at the study area, however clearing of any trees should be kept to a minimum due to the presence of potential foraging trees.
Based on these finding it is recommended that:

- clearance of trees should be kept to a minimum to reduce reduction of potential foraging habitat for Black Cockatoo species.

6.3 ASSESSMENT AGAINST THE 10 CLEARING PRINCIPLES

The assessment against the Department of Environment Regulation's 10 clearing principles (Department of Environment Regulation 2014) is provided in **Appendix Seven**.

In summary, clearing the study area is considered to be at variance with clearing principles:

a. Native vegetation should not be cleared if it comprises a high level of biological diversity
b. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community
c. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared,

Clearing the study area may be at variance with clearing principle b. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

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MAPS

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372000 376000 380000 384000 388000 392000 396000 400000

6488000 6484000 6480000 6476000 6472000

LEGEND

Study area

Native Vegetation Extent (DAFWA 2012)

Roads

Freeway

Highway

Main road

Local road

Threatened

1 *Caladenia huegelii*

2 *Dasymalla axillaris*

Priority 1

3 *Baeckea* sp. Limestone (N. Gibson, M.N. Lyons 1425)

4 *Drosera x sidjamesii*

Priority 2

5 *Acacia benthamii*

6 *Amanita carneiphylla*

7 *Tetraria* sp. Chandala (G.J. Keighery 17055)

Priority 3

8 *Amanita fibrillopes*

9 *Cyathochaeta teretifolia*

10 *Dampiera triloba*

11 *Pimelea calcicola*

12 *Stylidium longitubum*

13 *Thelymitra variegata*

Priority 4

14 *Anigozanthos humilis* subsp. *chrysanthus*

15 *Drosera occidentalis* subsp. *occidentalis*

16 *Hibbertia helianthemoides*

17 *Jacksonia sericea*

18 *Stachystemon* sp. Keysbrook (R. Archer 17/11/99)

19 *Verticordia lindleyi* subsp. *lindleyi*

TECs and PECs

TEC (Endangered)

SCP20a, *Banksia attenuata* woodlands over species rich dense shrublands

PEC (Priority 3)

SCP21c, Low lying *Banksia attenuata* woodlands or shrublands

SCP22, *Banksia ilicifolia* woodlands

SCP23b, Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands

SCP24, Northern Spearwood shrublands and woodlands

SCP25, Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands

SCP29a, Coastal shrublands on shallow sands

MITCHELL FWY

GNANGARA RD

STUDY AREA

HEPBURN AV

WANNEROO RD

MARMION AV

ALEXANDER DR

REID HWY

MORLEY DR

GDA 1994 MGA Zone 50

IMAGERY SOURCE: NEARMAP

AUTHOR: CP CHECKED: SB

DATE: OCT-2015 PROJECT NO: 3545-15

SCALE:1:80,000 @ A3

0 1 2 3 4 Km

ecoscape

HARDCASTLE PARK FLORA AND FAUNA SURVEY

CLIENT: CITY OF WANNEROO

RESULTS OF THE FLORA AND VEGETATION DATABASE SEARCHS

MAP 1

392360 392400 392440 392480 392520

6479240

6479200

6479160

Hardcastle Ave

Rennes Ln

Landsdale Rd

LEGEND

Study Area

TreeTarget Zones

3 m Tree Zone

Vegetation Extent

Trees

Inside 3 m Target Area

Eucalyptus marginata subsp. *marginata*

Nuytsia floribunda

Banksia attenuata, Alive

Banksia attenuata, Dead

Outside 3 m Target Area

Banksia attenuata, Alive

Banksia attenuata, Dead

GDA 1994 MGA Zone 50

IMAGERY SOURCE: NEARMAP, OCTOBER 2015

ecoscape

AUTHOR: CP CHECKED: SB

DATE: OCT-2015 PROJECT NO: 3545-15

SCALE: 1:500 @ A3

0 10 20 30 m

HARDCASTLE PARK FLORA AND FAUNA SURVEY

CLIENT: CITY OF WANNEROO

RESULTS OF THE TREE SURVEY

MAP 2

392350 392400 392450 392500

6479250

6479200

6479150

Hardcastle Ave

Rennes Ln

Landsdale Rd

Q1

Q2

LEGEND

Quadrats

Study Area

Vegetation Community

BaHhMc — *Banksia attenuata and Allocasurina humilis low, open woodland over Hibbertia hypericoides, Eremaea pauciflora var. pauciflora low,open shrubland over Mesomelaena pseudostygia sparse sedgeland and Amphipogon turbinatus sparse tussock grassland*

Cleared — *Cleared*

Vegetation Condition (Keighery 1994)

Excellent

Very Good

Good/Degraded

Completely Degraded

GDA 1994 MGA Zone 50

IMAGERY SOURCE: NEARMAP

ecoscape

AUTHOR: cp CHECKED: SB

DATE: OCT-2015 PROJECT NO: 3545-15

SCALE: 1:500 @ A3

0 10 20 30 m

HARDCASTLE PARK FLORA AND FAUNA SURVEY

CLIENT: CITY OF WANNEROO

VEGETATION COMMUNITY AND CONDITION

MAP 3

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APPENDIX ONE: DEFINITIONS AND CRITERIA

Table 11: Conservation codes for WAs flora and fauna (DPaW 2014)

Conservation codes for Western Australian flora and fauna	
T	**Threatened species** – Listed as Specially Protected under the *Wildlife Conservation Act 1950*, published under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora). Fauna that is rare or likely to become extinct are declared to be fauna that is need of special protection Flora that are extant and considered likely to become extinct, or rare and therefore in need of special protection, are declared to be rare flora Species* which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X	**Presumed extinct species** – Listed as Specially Protected under the *Wildlife Conservation Act 1950*, published under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora). Species* which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	**Migratory birds protected under an international agreement** – Listed as Specially Protected under the *Wildlife Conservation Act 1950*, listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice. 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), relating to the protection of migratory birds.
S	**Other specially protected fauna** – Listed as Specially Protected under the *Wildlife Conservation Act 1950*. Fauna declared to be in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 or 3, are published under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.
Threatened Fauna and Flora are ranked according to their level of threat using IUCN Red List categories and criteria. For example: Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is listed as 'Specially Protected' under the *Wildlife Conservation Act 1950*, published under Schedule 1, and referred to as a 'Threatened' species with a ranking of 'Endangered'. **CR** Critically Endangered-considered to be facing an extremely high risk of extinction in the wild. **EN** Endangered-considered to be facing a very high risk of extinction in the wild. **VU** Vulnerable-considered to be facing a high risk of extinction in the wild. A list of the current rankings can be downloaded from the Parks and Wildlife Threatened Species and Communities webpage at http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities	
P Priority species Species that may be threatened or near threatened but are data deficient, have not yet been adequately surveyed to be listed under the Schedules of the Wildlife Conservation (Specially Protected Fauna) Notice or the Wildlife Conservation (Rare Flora) Notice 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 flora or fauna. 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 list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation dependent species that are subject to a specific conservation program are placed in Priority 5. 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 One: Poorly-known species** Species that are known from one or a few collections or sight records (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 or 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 localities 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 study.
P2	**Priority Two: Poorly-known species** Species that are known from one or a few collections (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 localities 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 study.
P3	**Priority Three: Poorly-known species** Species that are known from several localities, and the species does not appear to be under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further study.
P4	**Priority Four: 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 do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five: Conservation Dependent species** Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.
*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, variety or forma).	

Table 12: *EPBC Act 1999* categories for flora and fauna

EPBC ACT 1999 category	Definition
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Table 13: IUCN Red List Categories and Criteria

IUCN Category	Definition
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see below), and it is therefore considered to be facing an extremely high risk of extinction in the wild. If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
	A: Reduction in population size based on a defined criteria (including a reduction of ≥90% or ≥80% over the last 10 years, depending on other defined factors) B: Geographic range in the form of either B1 (extent of occurrence <100 km2 and fragmented, continuing to decline or fluctuating) or B2 (area of occupancy <10 km2 and fragmented, continuing to decline or fluctuating) or both C: Population size estimated to number fewer than 250 mature individuals and shows continuing decline or extreme fluctuations D: Population size estimated to number fewer than 50 mature individuals E: Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years)
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see below), and it is therefore considered to be facing a very high risk of extinction in the wild.
	A: Reduction in population size based on a defined criteria (including a reduction of ≥70% or ≥50% over the last 10 years, depending on other defined factors) B: Geographic range in the form of either B1 (extent of occurrence <5,000 km2 and fragmented, continuing to decline or fluctuating) or B2 (area of occupancy <500 km2 and fragmented, continuing to decline or fluctuating) or both C: Population size estimated to number fewer than 2,500 mature individuals and shows continuing decline or extreme fluctuations D: Population size estimated to number fewer than 250 mature individuals E: Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years)

IUCN Category	Definition
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see below), and it is therefore considered to be facing a high risk of extinction in the wild.
	A: Reduction in population size based on a defined criteria (including a reduction of ≥50% or ≥30% over the last 10 years, depending on other defined factors) B: Geographic range in the form of either B1 (extent of occurrence <20,000 km2 and fragmented, continuing to decline or fluctuating) or B2 (area of occupancy <2,000 km2 and fragmented, continuing to decline or fluctuating) or both C: Population size estimated to number fewer than 10,000 mature individuals and shows continuing decline or extreme fluctuations D: Population size very small or restricted and estimated to number fewer than 1,000 mature individuals or occupy typically < 20 km2 or five or less locations E: Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future
Least Concern (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Table 14: DPaW definitions and criteria for TECs and PECs (DEC 2010b)

Criteria	Definition
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B. All occurrences recorded within the last 50 years have since been destroyed
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i. geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii. modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C. The ecological community exists only as highly modified occurrences that may be capable

Criteria	Definition
	of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C): A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.
Priority ecological communities	
Priority One	*Poorly known ecological communities* Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority Two	*Poorly known ecological communities* Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, state forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities, but do not meet adequacy of survey requirements, and / or are not well defined, and appear to be under threat from known threatening processes.
Priority Three	*Poorly known ecological communities* i. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or;

Criteria	Definition
	ii. Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; iii. Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities, but do not meet adequacy of survey requirements and / or are not well defined, and known threatening processes exist that could affect them.
Priority Four	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. i. Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. ii. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. iii. Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority Five	*Conservation Dependent Ecological Communities* Ecological Communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Table 15: Keighery (1994) Bushland Condition Scale

Condition rating	Description
Pristine	No obvious signs of disturbance
Excellent	Vegetation structure intact, disturbance only affecting individual species and weeds are non-aggressive species
Very Good	Vegetation structure altered, obvious signs of disturbance e.g. repeated fires, aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure altered, obvious signs of disturbance. Retains basic vegetation structure or ability to regenerate it. The presence of very aggressive weeds at high density, partial clearing, dieback, logging and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Requires intensive management. The presence of very aggressive weeds at high density, partial clearing, dieback, logging and grazing.
Completely Degraded	Vegetation structure is no longer intact and the area is completely or almost completely without native flora. 'Parkland Cleared'.

APPENDIX TWO: DATABASE SEARCH RESULTS

Table 16: Conservation significant flora database results

Species name	Source	DPaW status	*EPBC ACT 1999* status	*WC ACT 1950* status	IUCN Red list	Preferred Habitat	Fl. Period	Likelihood
Caladenia huegelii	DPaW, PMST	T	EN	CR		Grey or brown sand, clay loam soils	Sep-Oct	Unlikely
Dasymalla axillaris	DPaW, IUCN	T	CR	CR	C1+C2a(i)b	Yellow brown sandy clay on plains	-	Unlikely
Anigozanthos viridis subsp. *terraspectans*	PMST	T	VU	VU		Grey sand, clay loam on winter-wet depressions	Aug-Sep	Unlikely
Chamelaucium sp. Gingin (N.G.Marchant 6)	PMST	T	EN	EN		Dry white/grey sand on slopes	Sep-Oct	Unlikely
Darwinia foetida	PMST	T	CR	CR		Low, moist plains with dry grey/black sand	-	Unlikely
Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	DPaW	1				Yellow brown sand over limestone	Oct-Jan	Possible
Drosera x sidjamesii	DPaW	1				Peaty sand along lake margins, close to high-water lines	Nov-Dec	Unlikely
Stachystemon sp. Keysbrook (R. Archer 17/11/99)	DPaW	1				Shallow, grey, well drained sand with some humus	Sep-Oct	Unlikely
Amphibromus vickeryae	DPaW	1				Sandy soils associated with wet areas, springs or depressions	-	Unlikely
Calectasia sp. Pinjar (C. Tauss 557)	DPaW	1				Deep grey quartz soils on gentle slopes usually above damplands	Sep-Oct	Unlikely
Melaleuca sp. Wanneroo (G.J. Keighery 16705)	DPaW	1				Rugged limestone ridge with mossy black sand	-	Unlikely
Acacia benthamii	DPaW	2				Typically found on limestone breakaways	Aug-Sep	Possible
Amanita carneiphylla	DPaW	2				In soil, over, or at the fringe of flat granite sheets	-	Unlikely
Tetraria sp. Chandala (G.J. Keighery 17055)	DPaW	2				Mound springs or swamps with black peat over clay and humic	Sep-Oct	Unlikely
Cyathochaeta teretifolia	DPaW	3				Grey sand, sandy clay on swamps and creek edges	Sep-Oct	Unlikely
Stylidium longitubum	DPaW	3				Sandy clay, clay in Seasonal wetlands	Oct-Dec	Unlikely
Amanita fibrillopes	DPaW	3				Sandy lateritic gravel and grey,quartz sand. Occasionally on ridgees	-	Unlikely
Dampiera triloba	DPaW	3				Dry, grey soil with high organic	Aug-Dec	Unlikely

Species name	Source	DPaW status	*EPBC ACT 1999* status	*WC ACT 1950* status	IUCN Red list	Preferred Habitat	Fl. Period	Likelihood
						matter		
Pimelea calcicola	DPaW	3				Coarse sand on coastal limestone ridges	Sep-Nov	Unlikely
Thelymitra variegata	DPaW	3				Clayey sand and laterite	Jun-Sep	Unlikely
Sarcozona bicarinata	DPaW	3				White sand or shallow grey sand on limestone outcrops	Aug	Unlikely
Schoenus griffinianus	DPaW	3				White sand on gently undulating sandplains	Sep-Oct	Unlikely
Drosera occidentalis subsp. *occidentalis*	DPaW	4				Sandy and clayey soils in swamps and wet depressions	Nov	Unlikely
Jacksonia sericea	DPaW	4				Calcareous and sandy soils	Dec-Feb	Likely
Anigozanthos humilis subsp. *chrysanthus*	DPaW	4				Well drained grey or yellow sand	Jul-Oct	Possible
Hibbertia helianthemoides	DPaW	4				Clayey sand over sandstone or loam over quartzite on hills and scree slopes	Sep-Oct	Unlikely
Verticordia lindleyi subsp. *lindleyi*	DPaW	4				Sand or sandy clay associated with winter-wet depressions	Nov-Jan	Unlikely

Table 17: Mammal species recorded from the region

Family and Species	Common name	EPBC Act	WC Act	DPaW	NatureMap	ALA	PMST
DASYURIDAE							
Dasyurus geoffroii	Western Quoll	VU	S1	VU			✓
PERAMELIDAE							
Isoodon obesulus fusciventer	Southern Brown Bandicoot (south-western)			P5	✓	✓	
MACROPODIDAE							
Macropus fuliginosus	Western Grey Kangaroo				✓	✓	
Macropus irma	Western Brush Wallaby				✓		
PSEUDOCHEIRIDAE							
Pseudocheirus occidentalis	Western Ringtail Possum	VU	S1	VU			✓
TARSIPEDIDAE							
Tarsipes rostratus	Honey Possum				✓	✓	
VESPERTILIONIDAE							
Chalinolobus gouldii	Gould's Wattled Bat				✓	✓	
MURIDAE							
Hydromys chrysogaster	Water-rat			P4	✓		
INTRODUCED MAMMALS							
**Mus musculus*	House Mouse				✓		
**Rattus rattus*	Black Rat				✓		
**Canis lupus familiaris*	Dog/Dingo				✓		
**Felis catus*	Cat				✓		
**Oryctolagus cuniculus*	Rabbit				✓		

Table 18: Bird species recorded from the region

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
CASUARIIDAE								
Dromaius novaehollandiae	Emu					✓	✓	
MEGAPODIIDAE								
Leipoa ocellata	Malleefowl	VU	S1	VU				✓
PHASIANIDAE								
Coturnix pectoralis	Stubble Quail						✓	
Coturnix ypsilophora	Brown Quail						✓	
ANATIDAE								
Dendrocygna eytoni	Plumed Whistling-Duck						✓	
Biziura lobata	Musk Duck				✓	✓	✓	
Stictonetta naevosa	Freckled Duck				✓		✓	
Cygnus atratus	Black Swan				✓	✓	✓	
Tadorna tadornoides	Australian Shelduck				✓	✓	✓	
Chenonetta jubata	Australian Wood Duck				✓	✓	✓	
Malacorhynchus membranaceus	Pink-eared Duck				✓		✓	
Anas rhynchotis	Australasian Shoveler				✓	✓	✓	
Anas gracilis	Grey Teal				✓	✓	✓	
Anas castanea	Chestnut Teal						✓	
Anas platyrhynchos	Mallard				✓	✓	✓	
Anas superciliosa	Pacific Black Duck				✓	✓	✓	
Aythya australis	Hardhead				✓	✓	✓	
Oxyura australis	Blue-billed Duck			P4	✓	✓	✓	
PODICIPEDIDAE								
Tachybaptus novaehollandiae	Australasian Grebe				✓	✓	✓	
Tachybaptus ruficollis	Little Grebe						✓	
Poliocephalus poliocephalus	Hoary-headed Grebe				✓	✓	✓	
Podiceps cristatus	Great Crested Grebe				✓	✓	✓	
COLUMBIDAE								

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
**Columba livia*	Rock Dove/Domestic Pigeon				✓	✓	✓	
**Streptopelia senegalensis*	Laughing Dove				✓	✓	✓	
**Streptopelia chinensis*	Spotted Dove				✓	✓	✓	
Phaps chalcoptera	Common Bronzewing				✓	✓	✓	
Phaps elegans	Brush Bronzewing					✓	✓	
Ocyphaps lophotes	Crested Pigeon				✓	✓	✓	
PODARGIDAE								
Podargus strigoides	Tawny Frogmouth						✓	
APODIDAE								
Apus pacificus	Fork-tailed Swift	M	S3				✓	✓
ANHINGIDAE								
Anhinga novaehollandiae	Australasian Darter				✓	✓	✓	
PHALACROCORACIDAE								
Microcarbo melanoleucos	Little Pied Cormorant				✓	✓	✓	
Phalacrocorax carbo	Great Cormorant				✓	✓	✓	
Phalacrocorax sulcirostris	Little Black Cormorant				✓		✓	
Phalacrocorax varius	Pied Cormorant				✓	✓	✓	
PELECANIDAE								
Pelecanus conspicillatus	Australian Pelican				✓	✓	✓	
ARDEIDAE								
Ixobrychus dubius	Australlian Little Bittern					✓	✓	
Ardea pacifica	White-necked Heron				✓	✓	✓	
Ardea modesta	Eastern Great Egret	M	S3		✓	✓	✓	✓
Ardea ibis	Cattle Egret	M	S3		✓	✓	✓	✓
Egretta novaehollandiae	White-faced Heron				✓	✓	✓	
Egretta garzetta	Little Egret						✓	
Nycticorax caledonicus	Nankeen Night-Heron				✓	✓	✓	
THRESKIORNITHIDAE								
Plegadis falcinellus	Glossy Ibis	M	S3			✓	✓	

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
Threskiornis molucca	Australian White Ibis				✓	✓	✓	
Threskiornis spinicollis	Straw-necked Ibis				✓		✓	
Platalea regia	Royal Spoonbill						✓	
Platalea flavipes	Yellow-billed Spoonbill				✓	✓	✓	
ACCIPITRIDAE								
Pandion cristatus	Eastern Osprey	M					✓	✓
Elanus axillaris	Black-shouldered Kite					✓	✓	
Lophoictinia isura	Square-tailed Kite						✓	
Haliaeetus leucogaster	White-bellied Sea-Eagle	M	S3				✓	
Haliastur sphenurus	Whistling Kite				✓	✓	✓	
Accipiter fasciatus	Brown Goshawk				✓	✓	✓	
Accipiter cirrocephalus	Collared Sparrowhawk				✓	✓	✓	
Circus assimilis	Spotted Harrier				✓	✓	✓	
Circus approximans	Swamp Harrier				✓	✓	✓	
Aquila audax	Wedge-tailed Eagle						✓	
Hieraaetus morphnoides	Little Eagle						✓	
FALCONIDAE								
Falco cenchroides	Nankeen Kestrel				✓	✓	✓	
Falco berigora	Brown Falcon				✓	✓	✓	
Falco longipennis	Australian Hobby				✓	✓	✓	
Falco peregrinus	Peregrine Falcon		S4		✓	✓	✓	
RALLIDAE								
Porphyrio porphyrio	Purple Swamphen				✓	✓	✓	
Gallirallus philippensis	Buff-banded Rail						✓	
Porzana pusilla	Baillon's Crake						✓	
Porzana fluminea	Australian Spotted Crake						✓	
Porzana tabuensis	Spotless Crake						✓	
Tribonyx ventralis	Black-tailed Native-hen				✓		✓	
Gallinula tenebrosa	Dusky Moorhen				✓	✓	✓	

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
Fulica atra	Eurasian Coot				✓	✓	✓	
OTIDIDAE								
Ardeotis australis	Australian Bustard			P4		✓		
BURHINIDAE								
Burhinus grallarius	Bush Stone-curlew						✓	
RECURVIROSTRIDAE								
Himantopus himantopus	Black-winged Stilt				✓		✓	
Recurvirostra novaehollandiae	Red-necked Avocet						✓	
Cladorhynchus leucocephalus	Banded Stilt					✓	✓	
CHARADRIIDAE								
Charadrius ruficapillus	Red-capped Plover				✓	✓	✓	
Elseyornis melanops	Black-fronted Dotterel				✓	✓	✓	
Thinornis rubricollis	Hooded Plover			P4			✓	
Erythrogonys cinctus	Red-kneed Dotterel						✓	
Vanellus tricolor	Banded Lapwing				✓	✓	✓	
ROSTRATULIDAE								
Rostratula australis	Australian Painted Snipe	VU, M	S1, S3	VU			✓	✓
SCOLOPACIDAE								
Actitis hypoleucos	Common Sandpiper	M	S3			✓	✓	
Tringa nebularia	Common Greenshank	M	S3		✓	✓	✓	
Tringa glareola	Wood Sandpiper	M	S3			✓	✓	
Calidris ruficollis	Red-necked Stint	M	S3		✓	✓	✓	
TURNICIDAE								
Turnix varius	Painted Button-quail					✓	✓	
Turnix velox	Little Button-quail						✓	
LARIDAE								
Hydroprogne caspia	Caspian Tern	M	S3			✓	✓	
Thalasseus bergii	Crested Tern						✓	
Chroicocephalus novaehollandiae	Silver Gull						✓	

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
CACATUIDAE								
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	VU	S1	VU	✓		✓	✓
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	EN	S1	EN	✓	✓	✓	✓
Calyptorhynchus baudinii	Baudin's Black-Cockatoo	VU	S1	EN	✓	✓	✓	
Eolophus roseicapillus	Galah					✓	✓	
Cacatua tenuirostris	Long-billed Corella				✓	✓	✓	
Cacatua pastinator pastinator	Western Corella, Muir's Corella				✓		✓	
Cacatua sanguinea	Little Corella				✓		✓	
Cacatua galerita	Sulphur-crested Cockatoo				✓	✓	✓	
Nymphicus hollandicus	Cockatiel						✓	
PSITTACIDAE								
Trichoglossus haematodus	Rainbow Lorikeet				✓		✓	
Glossopsitta porphyrocephala	Purple-crowned Lorikeet						✓	
Polytelis anthopeplus	Regent Parrot						✓	
Platycercus icterotis	Western Rosella						✓	
Barnardius zonarius	Australian Ringneck					✓	✓	
Purpureicephalus spurius	Red-capped Parrot					✓	✓	
Neophema elegans	Elegant Parrot				✓	✓	✓	
Neophema petrophila	Rock Parrot						✓	
CUCULIDAE								
Chalcites basalis	Horsfield's Bronze-Cuckoo						✓	
Chalcites lucidus	Shining Bronze-Cuckoo						✓	
Cacomantis pallidus	Pallid Cuckoo				✓	✓	✓	
Cacomantis flabelliformis	Fan-tailed Cuckoo					✓	✓	
STRIGIDAE								
Ninox connivens connivens	Barking Owl (SW subsp)			P2	✓	✓	✓	
Ninox novaeseelandiae	Southern Boobook				✓	✓	✓	
TYTONIDAE								
Tyto novaehollandiae	Masked Owl (SW subsp)			P3	✓	✓		

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
novaehollandiae								
Tyto javanica	Eastern Barn Owl						✓	
HALCYONIDAE								
**Dacelo novaeguineae*	Laughing Kookaburra				✓	✓	✓	
Todiramphus sanctus	Sacred Kingfisher				✓	✓	✓	
MEROPIDAE								
Merops ornatus	Rainbow Bee-eater	M	S3		✓	✓	✓	✓
CLIMACTERIDAE								
Climacteris rufa	Rufous Treecreeper						✓	
MALURIDAE								
Malurus splendens	Splendid Fairy-wren				✓	✓	✓	
Malurus leucopterus	White-winged Fairy-wren						✓	
Malurus lamberti	Variegated Fairy-wren					✓	✓	
Malurus pulcherrimus	Blue-breasted Fairy-wren						✓	
Malurus elegans	Red-winged Fairy-wren						✓	
ACANTHIZIDAE								
Stipiturus malachurus	Southern Emu-wren						✓	
Sericornis frontalis	White-browed Scrubwren				✓	✓	✓	
Calamanthus campestris	Rufous Fieldwren						✓	
Smicrornis brevirostris	Weebill				✓	✓	✓	
Gerygone fusca	Western Gerygone				✓	✓	✓	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill				✓	✓	✓	
Acanthiza inornata	Western Thornbill				✓	✓	✓	
Acanthiza apicalis	Inland Thornbill				✓	✓	✓	
PARDALOTIDAE								
Pardalotus punctatus	Spotted Pardalote				✓		✓	
Pardalotus striatus	Striated Pardalote				✓	✓	✓	
MELIPHAGIDAE								
Acanthorhynchus superciliosus	Western Spinebill				✓	✓	✓	

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
Lichenostomus virescens	Singing Honeyeater					✓	✓	
Lichenostomus leucotis	White-eared Honeyeater				✓	✓	✓	
Lichenostomus ornatus	Yellow-plumed Honeyeater						✓	
Purnella albifrons	White-fronted Honeyeater						✓	
Manorina flavigula	Yellow-throated Miner				✓	✓	✓	
Acanthagenys rufogularis	Spiny-cheeked Honeyeater						✓	
Anthochaera lunulata	Western Wattlebird				✓	✓	✓	
Anthochaera carunculata	Red Wattlebird				✓	✓	✓	
Epthianura tricolor	Crimson Chat						✓	
Epthianura albifrons	White-fronted Chat				✓	✓	✓	
Glyciphila melanops	Tawny-crowned Honeyeater					✓	✓	
Lichmera indistincta	Brown Honeyeater				✓	✓	✓	
Phylidonyris novaehollandiae	New Holland Honeyeater				✓	✓	✓	
Phylidonyris niger	White-cheeked Honeyeater					✓	✓	
Melithreptus brevirostris	Brown-headed Honeyeater						✓	
Melithreptus lunatus	White-naped Honeyeater					✓	✓	
NEOSITTIDAE								
Daphoenositta chrysoptera	Varied Sittella				✓	✓	✓	
CAMPEPHAGIDAE								
Coracina novaehollandiae	Black-faced Cuckoo-shrike				✓	✓	✓	
Lalage sueurii	White-winged Triller					✓	✓	
PACHYCEPHALIDAE								
Pachycephala pectoralis	Golden Whistler				✓	✓	✓	
Pachycephala rufiventris	Rufous Whistler				✓	✓	✓	
Colluricincla harmonica	Grey Shrike-thrush				✓	✓	✓	
Oreoica gutturalis	Crested Bellbird					✓	✓	
ARTAMIDAE								
Artamus personatus	Masked Woodswallow						✓	
Artamus cinereus	Black-faced Woodswallow				✓	✓	✓	

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
Artamus cyanopterus	Dusky Woodswallow						✓	
Cracticus torquatus	Grey Butcherbird				✓	✓	✓	
Cracticus nigrogularis	Pied Butcherbird						✓	
Cracticus tibicen	Australian Magpie				✓	✓	✓	
Strepera versicolor	Grey Currawong						✓	
RHIPIDURIDAE								
Rhipidura albiscapa	Grey Fantail					✓	✓	
Rhipidura leucophrys	Willie Wagtail				✓	✓	✓	
CORVIDAE								
Corvus coronoides	Australian Raven				✓	✓	✓	
Corvus bennetti	Little Crow				✓		✓	
MONARCHIDAE								
Grallina cyanoleuca	Magpie-lark				✓	✓	✓	
PETROICIDAE								
Microeca fascinans	Jacky Winter						✓	
Petroica boodang	Scarlet Robin					✓	✓	
Petroica goodenovii	Red-capped Robin				✓	✓	✓	
Melanodryas cucullata	Hooded Robin						✓	
Eopsaltria griseogularis	Western Yellow Robin						✓	
Eopsaltria georgiana	White-breasted Robin						✓	
ACROCEPHALIDAE								
Acrocephalus australis	Australian Reed-Warbler				✓	✓	✓	
MEGALURIDAE								
Megalurus gramineus	Little Grassbird				✓		✓	
Cincloramphus mathewsi	Rufous Songlark						✓	
Cincloramphus cruralis	Brown Songlark						✓	
TIMALIIDAE								
Zosterops lateralis	Silvereye				✓	✓	✓	
HIRUNDINIDAE								

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	Birdata	PMST
Cheramoeca leucosterna	White-backed Swallow					✓	✓	
Hirundo neoxena	Welcome Swallow				✓	✓	✓	
Petrochelidon ariel	Fairy Martin						✓	
Petrochelidon nigricans	Tree Martin					✓	✓	
NECTARINIIDAE								
Dicaeum hirundinaceum	Mistletoebird				✓	✓	✓	
ESTRILDIDAE								
Stagonopleura oculata	Red-eared Firetail						✓	
MOTACILLIDAE								
Anthus novaeseelandiae	Australasian Pipit						✓	

Table 19: Reptile species recorded from the region

Family and Species	Common name	EPBC Act	WC Act	DPaW	*NatureMap*	ALA	PMST
CHELUIDAE							
Chelodina oblonga	Oblong Turtle				✓	✓	
AGAMIDAE							
Pogona minor	Dwarf Bearded Dragon				✓	✓	
GEKKONIDAE							
Gehyra variegata					✓		
Heteronotia binoes	Binoe's Gecko				✓		
PYGOPODIDAE							
Aprasia repens					✓	✓	
Delma fraseri					✓	✓	
Lialis burtonis					✓	✓	
Pletholax gracilis	Keeled Legless Lizard				✓	✓	
SCINCIDAE							
Acritoscincus trilineatus					✓	✓	
Cryptoblepharus buchananii					✓	✓	
Ctenotus fallens					✓	✓	
Hemiergis quadrilineata					✓	✓	
Lerista elegans					✓	✓	
Lerista praepedita					✓	✓	
Menetia greyii					✓	✓	
Morethia lineoocellata						✓	
Morethia obscura					✓	✓	
Tiliqua rugosa	Bobtail				✓	✓	
VARANIDAE							
Varanus gouldii	Gould's Monitor				✓	✓	
Varanus rosenbergi	Heath Monitor				✓	✓	
Varanus tristis	Racehorse Monitor				✓	✓	
ELAPIDAE							

Brachyurophis semifasciatus					✓	✓	
Neelaps bimaculatus	Black-naped Snake				✓		
Neelaps calonotos	Black-striped Snake			P3	✓	✓	
Notechis scutatus	Tiger Snake				✓	✓	
Parasuta gouldii					✓	✓	
Parasuta nigriceps	Mitchell's Short-tailed Snake				✓	✓	
Pseudonaja affinis	Dugite				✓	✓	
Simoselaps bertholdi	Jan's Banded Snake				✓	✓	

APPENDIX THREE: FLORA FIELD SURVEY RESULTS

Table 20: Flora survey results

Family	Species	Introduced	Sampling Point		
			Q1	Q2	Opp
Anarthriaceae	*Lyginia barbata*		1		
Asparagaceae	*Laxmannia squarrosa*				1
	Thysanotus manglesianus				1
	Thysanotus thyrsoideus				1
Asteraceae	*Arctotheca calendula*	*			1
	Pterochaeta paniculata		1		
	Sonchus oleraceus	*			1
	Ursinia anthemoides subsp. *anthemoides*	*	1		1
	Waitzia suaveolens				1
Brassicaceae	*Brassica tournefortii*	*			1
	Raphanus raphanistrum	*			1
Casuarinaceae	*Allocasuarina humilis*			1	1
Colchicaceae	*Burchardia congesta*				1
Cyperaceae	*Lepidosperma leptostachyum*		1		
	Lepidosperma scabrum		1	1	
	Mesomelaena graciliceps			1	
	Mesomelaena pseudostygia		1	1	
Dasypogonaceae	*Calectasia narragara*		1		1
Dilleniaceae	*Hibbertia huegelii*		1	1	1
	Hibbertia hypericoides		1	1	
	Hibbertia stellaris				1
Ericaceae	*Conostephium preissii*				1
	Leucopogon polymorphus				1
Euphorbiaceae	*Euphorbia terracina*	*			1
	Monotaxis grandiflora var. *grandiflora*				1
Fabaceae	*Acacia pulchella*				1
	Bossiaea eriocarpa		1	1	
	Daviesia divaricata				1
	Daviesia nudiflora		1		
	Daviesia triflora			1	1
	Gastrolobium capitatum				1
	Gompholobium tomentosum		1	1	
	Isotropis cuneifolia subsp. *cuneifolia*			1	
	Jacksonia floribunda		1	1	
	Jacksonia sternbergiana				1
	Lupinus angustifolius	*			1
	Lupinus cosentinii	*			1
	Melilotus indicus	*			2

Family	Species	Introduced	Sampling Point		
			Q1	Q2	Opp
	Trifolium arvense	*			1
Geraniaceae	*Pelargonium capitatum*	*			1
Goodeniaceae	*Dampiera linearis*		1	1	
	Lechenaultia floribunda				1
	Scaevola repens			1	
	Scaevola repens var. *repens*				1
Haemodoraceae	*Anigozanthos humilis*			1	1
	Anigozanthos manglesii		1		
	Conostylis aurea		1	1	
	Conostylis setigera		1		
	Haemodorum laxum		1	1	
Iridaceae	*Gladiolus caryophyllaceus*	*	1	1	
	Patersonia occidentalis		1	1	
Lamiaceae	*Hemiandra linearis*				1
Loranthaceae	*Nuytsia floribunda*				1
Myrtaceae	*Calothamnus quadrifidus*		1		
	Chamelaucium uncinatum				1
	Eremaea pauciflora var. *pauciflora*		1	1	
	Eucalyptus marginata subsp. *marginata*				1
	Hypocalymma robustum		1	1	1
Onagraceae	*Oenothera drummondii*	*			1
Orchidaceae	*Pyrorchis nigricans*			1	
Oxalidaceae	*Oxalis* sp. indet.				1
Poaceae	*Amphipogon turbinatus*		1		
	Avena barbata	*			1
	Briza maxima	*			1
	Bromus diandrus	*			2
	Ehrharta calycina	*	1		
Polygalaceae	*Comesperma calymega*				1
Primulaceae	*Lysimachia arvensis*	*			1
Proteaceae	*Banksia attenuata*		1	2	
	Banksia dallanneyi var. *dallanneyi*				1
	Conospermum stoechadis subsp. *stoechadis*				1
	Hakea ruscifolia		1		
	Petrophile linearis		1		
	Petrophile macrostachya				1
	Stirlingia latifolia		1	1	
Restionaceae	*Alexgeorgea nitens*		1		
	Desmocladus asper		1	1	
	Desmocladus flexuosus		1		
Rubiaceae	*Opercularia vaginata*				1

Family	Species	Introduced	Sampling Point		
			Q1	Q2	Opp
Rutaceae	*Philotheca spicata*				1
Stylidiaceae	*Levenhookia stipitata*		1	1	
	Stylidium brunonianum		1	1	
	Stylidium piliferum		2	1	1
	Stylidium repens		1		
	Stylidium schoenoides				1
Thymelaeaceae	*Pimelea sulphurea*				1
Violaceae	*Hybanthus calycinus*			1	
Xanthorrhoeaceae	*Xanthorrhoea preissii*		1	1	1

APPENDIX FOUR: FLORISTIC QUADRAT DATA

1

Staff AIC **Date** 6/10/2015 **Season** E

Revisit

Type Q 10 m x 10 m

Location -

MGA Zone 50 392469 **mE** 6479218 **mN** **Lat.** -31.8176 **Long.** 115.8638

Habitat Mid-Slope

Aspect S **Slope** Gentle

Soil Type Yellow-white sand

Rock Type -

Loose Rock 0% cover ; - mm in size **Litter** 25 % cover ; <2 cm in depth

Bare ground 10% cover **Weeds** -% cover

Vegetation U+ ^*Banksia attenuata*\^tree\6\r;M ^*Hibbertia hypericoides*,^*Eremaea pauciflora*\^shrub\3\r;G ^*Amphipogon turbinatus*,^*Mesomelaena pseudostygia*\^tussock grass,sedge\1\bi

Veg. Condition Excellent

Disturbance Litter

Fire Age none evident

Notes Very good to excel. few weeds some trash

Species	WA Cons.	Height (m)	Cover (%)
Alexgeorgea nitens		.2	<1
Amphipogon turbinatus		0.4	1
Anigozanthos manglesii		0.5	1
Banksia attenuata		4	10
Bossiaea eriocarpa		.4	<1
Calectasia narragara		.2	<1

	Hardcastle Park Surveys	
Calothamnus quadrifidus	1	<1
Conostylis aurea	.5	<1
Conostylis setigera	.2	<1
Dampiera linearis	.3	<1
Daviesia nudiflora	.6	<1
Desmocladus asper	.2	<1
Desmocladus flexuosus	.2	<1
* *Ehrharta calycina*	.6	<1
Eremaea pauciflora var. *pauciflora*	0.5	2
* *Gladiolus caryophyllaceus*	1	<1
Gompholobium tomentosum	0.5	<1
Haemodorum laxum	.6	<1
Hakea ruscifolia	.6	1
Hibbertia huegelii	.3	<1
Hibbertia hypericoides	0.5	5
Hypocalymma robustum	.5	<1
Jacksonia floribunda	.5	<1
Lepidosperma leptostachyum	0.5	<1
Lepidosperma scabrum	.5	<1
Levenhookia stipitata	.1	<1
Lyginia barbata	.5	1
Mesomelaena pseudostygia	0.3	<1
Patersonia occidentalis	.5	<1
Petrophile linearis	.2	<1
Pterochaeta paniculata	.1	<1
Stirlingia latifolia	1.2	<1
Stylidium brunonianum	0.3	<1
Stylidium piliferum	.2	<1
Stylidium piliferum	.2	<1
Stylidium repens	.1	<1
* *Ursinia anthemoides* subsp. *anthemoides*	.1	<1
Xanthorrhoea preissii	1	1

2

Staff AIC **Date** 6/10/2015 **Season** E

Revisit

Type Q 10 m x 10 m

Location -

MGA Zone 50 392395 **mE** 6479215 **mN** **Lat.** -31.8176 **Long.** 115.8631

Habitat Mid-Slope

Aspect S **Slope** Gentle

Soil Type Yellow white sand

Rock Type -

Loose Rock 0% cover ; - mm in size **Litter** 50 % cover ; <2 cm in depth

Bare ground 10% cover **Weeds** -% cover

Vegetation U+ *Banksia attenuata,Allocasuarina humilis*\^tree\6\r;M *Hibbertia hypericoides,Eremaea pauciflora* var. *pauciflora*\^shrub\3\r;G *Mesomelaena pseudostygia*\^sedge\2\i

Veg. Condition Very Good

Disturbance Trash

Fire Age none

Notes

Species	WA Cons.	Height (m)	Cover (%)
Allocasuarina humilis		3	2
Anigozanthos humilis		.25	<1
Banksia attenuata		5	<1
Banksia attenuata		5	10
Bossiaea eriocarpa		.3	<1
Conostylis aurea		.4	<1

	Hardcastle Park Surveys	
Dampiera linearis	.2	<1
Daviesia triflora	.5	<1
Desmocladus asper	.4	<1
Eremaea pauciflora var. *pauciflora*	0.5	2
* *Gladiolus caryophyllaceus*	.6	<1
Gompholobium tomentosum	.7	<1
Haemodorum laxum	.5	<1
Hibbertia huegelii	.5	<1
Hibbertia hypericoides	0.5	5
Hybanthus calycinus	.3	<1
Hypocalymma robustum	.4	<1
Isotropis cuneifolia subsp. *cuneifolia*	.05	<1
Jacksonia floribunda	1.2	1
Lepidosperma scabrum	.5	<1
Levenhookia stipitata	.2	<1
Mesomelaena graciliceps	.3	<1
Mesomelaena pseudostygia	0.4	5
Patersonia occidentalis	.4	1
Pyrorchis nigricans	.01	<1
Scaevola repens	.05	<1
Stirlingia latifolia	1	<1
Stylidium brunonianum	.3	<1
Stylidium piliferum	.1	<1
Xanthorrhoea preissii	.5	<1

APPENDIX FIVE: THREE METRE TREE SURVEY DATA

Table 21: Trees recorded within target area

Heading	Health	Relation to 3 m Target Area	Easting MGA94	Northing MGA94	Accuracy (m)	Time	Date
Banksia attenuata	Alive	Inside	392505.196	6479191.860	0.01	12:24:39	6/10/2015
Banksia attenuata	Alive	Inside	392504.660	6479184.784	0.371	12:25:23	6/10/2015
Banksia attenuata	Alive	Inside	392505.702	6479182.270	0.458	12:25:50	6/10/2015
Banksia attenuata	Alive	Inside	392505.015	6479180.610	0.341	12:26:05	6/10/2015
Banksia attenuata	Alive	Inside	392506.747	6479213.001	0.009	11:37:50	6/10/2015
Banksia attenuata	Alive	Inside	392506.974	6479226.139	0.011	11:41:46	6/10/2015
Banksia attenuata	Alive	Inside	392502.899	6479227.175	0.01	11:42:20	6/10/2015
Banksia attenuata	Alive	Inside	392501.230	6479236.943	0.01	11:43:00	6/10/2015
Banksia attenuata	Alive	Inside	392494.409	6479238.404	0.01	11:43:53	6/10/2015
Banksia attenuata	Alive	Inside	392489.270	6479237.334	0.009	11:44:27	6/10/2015
Banksia attenuata	Alive	Inside	392481.667	6479236.553	0.009	11:45:02	6/10/2015
Banksia attenuata	Alive	Inside	392479.248	6479236.878	0.022	11:46:17	6/10/2015
Banksia attenuata	Alive	Inside	392473.567	6479239.647	0.009	11:46:53	6/10/2015
Banksia attenuata	Alive	Inside	392476.902	6479237.127	0.009	11:47:18	6/10/2015
Banksia attenuata	Alive	Inside	392476.587	6479236.205	0.009	11:47:45	6/10/2015
Banksia attenuata	Alive	Inside	392468.067	6479238.940	0.009	11:48:14	6/10/2015
Banksia attenuata	Alive	Inside	392467.334	6479239.658	0.01	11:48:55	6/10/2015
Banksia attenuata	Alive	Inside	392464.850	6479238.978	0.009	11:49:38	6/10/2015
Banksia attenuata	Alive	Inside	392459.745	6479240.222	0.01	11:50:15	6/10/2015
Banksia attenuata	Alive	Inside	392454.536	6479239.872	0.011	11:50:54	6/10/2015
Banksia attenuata	Alive	Inside	392442.918	6479231.594	0.009	11:53:50	6/10/2015
Banksia attenuata	Alive	Inside	392443.573	6479228.417	0.01	11:54:10	6/10/2015
Banksia attenuata	Alive	Inside	392445.366	6479225.001	0.013	11:55:00	6/10/2015
Banksia attenuata	Alive	Inside	392445.416	6479217.791	0.009	11:56:02	6/10/2015
Banksia attenuata	Alive	Inside	392444.422	6479212.620	0.01	11:56:32	6/10/2015
Banksia attenuata	Alive	Inside	392443.480	6479204.368	0.01	11:56:55	6/10/2015

Heading	Health	Relation to 3 m Target Area	Easting MGA94	Northing MGA94	Accuracy (m)	Time	Date
Banksia attenuata	Alive	Inside	392446.057	6479203.314	0.01	11:57:10	6/10/2015
Banksia attenuata	Alive	Inside	392445.561	6479193.313	0.009	11:58:59	6/10/2015
Banksia attenuata	Alive	Inside	392449.288	6479182.053	0.009	12:01:12	6/10/2015
Banksia attenuata	Alive	Inside	392449.504	6479183.303	0.008	12:01:33	6/10/2015
Banksia attenuata	Alive	Inside	392450.280	6479185.073	0.008	12:01:55	6/10/2015
Banksia attenuata	Alive	Inside	392454.371	6479185.222	0.01	12:02:12	6/10/2015
Banksia attenuata	Alive	Inside	392460.150	6479181.848	0.009	12:02:55	6/10/2015
Banksia attenuata	Alive	Inside	392465.495	6479182.104	0.01	12:03:22	6/10/2015
Banksia attenuata	Alive	Inside	392473.478	6479184.512	0.01	12:03:58	6/10/2015
Banksia attenuata	Alive	Inside	392475.937	6479182.190	0.011	12:04:36	6/10/2015
Banksia attenuata	Alive	Inside	392477.892	6479182.568	0.01	12:05:18	6/10/2015
Banksia attenuata	Alive	Inside	392486.812	6479174.090	0.011	12:06:39	6/10/2015
Banksia attenuata	Alive	Inside	392486.947	6479176.085	0.012	12:07:19	6/10/2015
Banksia attenuata	Alive	Inside	392487.016	6479177.688	0.011	12:07:44	6/10/2015
Banksia attenuata	Alive	Inside	392486.759	6479181.226	0.01	12:08:28	6/10/2015
Banksia attenuata	Alive	Inside	392495.145	6479179.393	0.013	12:09:30	6/10/2015
Banksia attenuata	Alive	Inside	392408.228	6479241.483	0.009	12:34:07	6/10/2015
Banksia attenuata	Alive	Inside	392401.531	6479240.105	0.009	12:34:49	6/10/2015
Banksia attenuata	Alive	Inside	392399.008	6479241.654	0.009	12:35:23	6/10/2015
Banksia attenuata	Alive	Inside	392395.548	6479242.482	0.009	12:35:34	6/10/2015
Banksia attenuata	Alive	Inside	392393.633	6479240.001	0.01	12:35:47	6/10/2015
Banksia attenuata	Alive	Inside	392391.124	6479241.431	0.025	12:35:57	6/10/2015
Banksia attenuata	Alive	Inside	392387.556	6479240.398	0.015	12:36:15	6/10/2015
Banksia attenuata	Alive	Inside	392384.658	6479242.949	0.01	12:36:35	6/10/2015
Banksia attenuata	Alive	Inside	392371.038	6479238.112	0.01	12:37:02	6/10/2015
Banksia attenuata	Alive	Inside	392369.687	6479224.324	0.01	12:37:44	6/10/2015
Banksia attenuata	Alive	Inside	392366.749	6479216.302	0.01	12:38:24	6/10/2015
Banksia attenuata	Alive	Inside	392369.232	6479199.964	0.01	12:39:39	6/10/2015
Banksia attenuata	Alive	Inside	392368.167	6479191.832	0.01	12:39:57	6/10/2015

Heading	Health	Relation to 3 m Target Area	Easting MGA94	Northing MGA94	Accuracy (m)	Time	Date
Banksia attenuata	Alive	Inside	392370.576	6479184.310	0.01	12:40:17	6/10/2015
Banksia attenuata	Alive	Inside	392378.289	6479188.275	0.01	12:40:48	6/10/2015
Banksia attenuata	Alive	Inside	392380.808	6479187.038	0.011	12:40:59	6/10/2015
Banksia attenuata	Alive	Inside	392384.282	6479187.178	0.01	12:41:17	6/10/2015
Banksia attenuata	Alive	Inside	392391.582	6479183.307	0.009	12:42:58	6/10/2015
Banksia attenuata	Alive	Inside	392394.521	6479182.727	0.009	12:43:13	6/10/2015
Banksia attenuata	Alive	Inside	392403.806	6479185.945	0.01	12:43:40	6/10/2015
Banksia attenuata	Alive	Inside	392405.132	6479184.098	0.009	12:43:50	6/10/2015
Banksia attenuata	Alive	Inside	392424.796	6479183.917	0.014	12:44:42	6/10/2015
Banksia attenuata	Alive	Inside	392424.998	6479185.419	0.014	12:44:51	6/10/2015
Banksia attenuata	Alive	Inside	392427.174	6479185.310	0.022	12:45:00	6/10/2015
Banksia attenuata	Alive	Inside	392430.255	6479192.118	0.011	12:45:53	6/10/2015
Banksia attenuata	Alive	Inside	392429.135	6479197.395	0.01	12:46:17	6/10/2015
Banksia attenuata	Alive	Inside	392426.972	6479199.806	0.009	12:46:52	6/10/2015
Banksia attenuata	Alive	Inside	392426.669	6479201.646	0.01	12:47:09	6/10/2015
Banksia attenuata	Alive	Inside	392426.785	6479210.779	0.01	12:47:44	6/10/2015
Banksia attenuata	Alive	Inside	392426.309	6479213.169	0.01	12:47:55	6/10/2015
Banksia attenuata	Alive	Inside	392427.982	6479213.869	0.009	12:48:03	6/10/2015
Banksia attenuata	Alive	Inside	392426.018	6479216.369	0.009	12:48:30	6/10/2015
Banksia attenuata	Alive	Inside	392427.081	6479223.048	0.009	12:49:37	6/10/2015
Banksia attenuata	Dead	Inside	392506.545	6479218.636	0.009	11:40:07	6/10/2015
Banksia attenuata	Dead	Inside	392507.195	6479221.229	0.009	11:40:40	6/10/2015
Banksia attenuata	Dead	Inside	392506.667	6479222.172	0.009	11:41:08	6/10/2015
Banksia attenuata	Dead	Inside	392442.448	6479238.394	0.019	11:51:33	6/10/2015
Banksia attenuata	Dead	Inside	392445.203	6479219.428	0.01	11:55:37	6/10/2015
Banksia attenuata	Dead	Inside	392446.253	6479199.369	0.01	11:57:32	6/10/2015
Banksia attenuata	Dead	Inside	392456.173	6479182.868	0.008	12:02:34	6/10/2015
Banksia attenuata	Dead	Inside	392365.691	6479206.890	0.01	12:38:53	6/10/2015
Banksia attenuata	Dead	Inside	392386.321	6479186.527	0.009	12:41:30	6/10/2015

Heading	Health	Relation to 3 m Target Area	Easting MGA94	Northing MGA94	Accuracy (m)	Time	Date
Banksia attenuata	Dead	Inside	392389.861	6479184.049	0.009	12:42:03	6/10/2015
Banksia attenuata	Dead	Inside	392428.262	6479226.468	0.009	12:49:58	6/10/2015
Eucalyptus marginata subsp. *marginata*	Alive	Inside	392412.776	6479242.305	0.009	12:32:02	6/10/2015
Eucalyptus marginata subsp. *marginata*	Alive	Inside	392413.216	6479239.860	0.009	12:33:08	6/10/2015
Nuytsia floribunda	Alive	Inside	392446.899	6479184.733	0.01	12:00:30	6/10/2015
Outside							
Banksia attenuata	Alive	Outside	392364.848	6479233.656	0.009	12:53:48	6/10/2015
Banksia attenuata	Alive	Outside	392363.648	6479223.938	0.009	12:54:10	6/10/2015
Banksia attenuata	Alive	Outside	392434.038	6479240.272	0.009	12:56:34	6/10/2015
Banksia attenuata	Alive	Outside	392436.173	6479236.608	0.009	12:56:57	6/10/2015
Banksia attenuata	Alive	Outside	392435.129	6479234.740	0.011	12:57:08	6/10/2015
Banksia attenuata	Alive	Outside	392437.129	6479219.788	0.011	12:57:55	6/10/2015
Banksia attenuata	Alive	Outside	392436.057	6479219.171	0.01	12:58:04	6/10/2015
Banksia attenuata	Alive	Outside	392432.432	6479219.601	0.014	12:58:18	6/10/2015
Banksia attenuata	Alive	Outside	392433.901	6479218.610	0.011	12:58:25	6/10/2015
Banksia attenuata	Alive	Outside	392434.472	6479216.776	0.014	12:58:38	6/10/2015
Banksia attenuata	Alive	Outside	392435.488	6479215.630	0.012	12:58:53	6/10/2015
Banksia attenuata	Alive	Outside	392437.145	6479215.766	0.028	12:59:00	6/10/2015
Banksia attenuata	Alive	Outside	392437.056	6479214.366	0.014	12:59:08	6/10/2015
Banksia attenuata	Alive	Outside	392433.984	6479211.642	0.028	12:59:18	6/10/2015
Banksia attenuata	Alive	Outside	392437.021	6479212.540	0.01	12:59:47	6/10/2015
Banksia attenuata	Alive	Outside	392437.095	6479204.097	0.01	13:00:40	6/10/2015
Banksia attenuata	Alive	Outside	392472.674	6479241.575	0.013	13:02:17	6/10/2015
Banksia attenuata	Alive	Outside	392477.148	6479242.163	0.012	13:02:28	6/10/2015
Banksia attenuata	Alive	Outside	392493.279	6479241.326	0.01	13:02:53	6/10/2015
Banksia attenuata	Dead	Outside	392437.738	6479221.944	0.008	12:57:40	6/10/2015
Banksia attenuata	Dead	Outside	392436.856	6479206.312	0.01	13:00:10	6/10/2015
Banksia attenuata	Dead	Outside	392435.395	6479205.535	0.01	13:00:18	6/10/2015

APPENDIX SIX: SIGNIFICANT FAUNA

Table 22: Significant fauna species that may potentially occur in the study area

Species name	EPBC Act	WC Act	DPaW	Habitat	Previous Records	Likelihood of Occurrence
Mammal						
Western Quoll *Dasyurus geoffroi*	VU	S1	VU	Jarrah (*Eucalyptus marginata*) forest (Smith *et al*. 2004).	No records within 5 km of the study area. One recent record (2010) from 8 km north-east of study area (DPaW 2015b). Species or suitable habitat may occur in the wider region (DoE 2015).	**Very Low** No recent records from within 5 km of the study area. Some suitable habitat is present, however the study area is very isolated from habitats known to support the species.
Western Ringtail Possum *Pseudocheirus occidentalis*	VU	S1	VU	Unburnt Peppermint tree (*Agonis flexuosa*) woodland but also Jarrah, Wandoo and Marri forest (Van Dyck & Strahan 2008).	No records within 5 km of the study area. One historic record from 1958 from 16km south-east of the study area (DPaW 2015b). Species or suitable habitat may occur in the wider region (DoE 2015).	**Very Low** No recent records from within 5 km of the study area. Some suitable habitat is present, however the study area is very isolated from habitats known to support the species.
Southern Brown Bandicoot *Isoodon obesulus fusciventer*			P5	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (ATA 2008).	Several records of this species from within 5 km of the study area with one record from 1.2 km south-west and east (Landsdale Park & Hepburn Park, 2003) (DPaW 2015b).	**Medium** Species has been recorded closeby. Study area represents isolated habitat, however the species may utilise the area.
Birds						
Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*	EN	S1	EN	Eucalypt woodlands, especially containing Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*E. wandoo*), and in shrubland or kwongan heathland dominated by *Hakea, Banksia* and *Grevillea* species (Burbidge 2004; Johnstone *et al*. 2011).	Several records in the region and within 5 km of the study area (DPaW 2015b). Species is expected to occur regularly in the area.	**Medium** Species is likely to pass through and may occasionally roost or feed within the study area, however no records are known from the study area and the small area of foraging habitat (0.8 ha) is of moderate value.
Malleefowl *Leipoa ocellata*	VU	S1	VU	Semi-arid to arid mallee, mulga or other dense litter-forming shrublands dry forest dominated by other eucalypts, mulga and other Acacia species (Malleefowl Preservation Group Inc. 2011).	No records within 5 km, habitat may occur in the wider region (DoE 2015).	**Very Low** No records from within 5 km of the study area and habitat is isolated. Species is unlikely to occur.

Species name	EPBC Act	WC Act	DPaW	Habitat	Previous Records	Likelihood of Occurrence
Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso*	VU	S1	VU	Dense *Eucalyptus marginata* (Jarrah), *E. diversicolor* (Karri) and *Corymbia calophylla* (Marri) forests and nests in the large hollows of Marri, Jarrah and Karri (DSEWPaC 2012a).	Two records from 2012 from Lake Goollelal (DPaW 2015b). More records to the south. Study area lies in northern extent of species' range (DSEWPaC 2012a).	**Medium** Some records in the wider region. Banksia woodland is not listed as foraging habitat, however the species has been recorded more frequently at Swan Coastal Plain in a variety of habitats.
Baudin's Black-Cockatoo *Calyptorhynchus baudinii*	VU	S1	EN	Heavily forested areas which are dominated by Marri and *Eucalyptus* species, especially *E. diversicolor* (Karri) and *E. marginata* (Jarrah) but also *E. patens* (Blackbutt), *E. rudis* (Flooded Gum) and *E. cornuta* (Yate) (DSEWPaC 2012a).	Study area lies at northern edge of species' range (DSEWPaC 2012a), Species records sparse and scattered in the area with one record from 2012 from within 5 km of the study area (DPaW 2015b).	**Low** Species is rarely recorded in the area and study area lies in northern extent of species.
Fork-tailed Swift *Apus pacificus*	M	S3		Almost entirely aerial lifestyle (Johnstone & Storr 2005).	Species recorded in the wider region (Birdlife Australia 2015) and habitat may occur (DoE 2015).	**Low** Species may overfly study area but is not expected to utilise the habitats due to the aerial and nomadic lifestyle.
Rainbow Bee-eater *Merops ornatus*	M	S3		Variety of habitats including drainage lines, mixed shrublands and woodlands (Johnstone & Storr 2005).	Several records from within 5 km of the study area (ALA 2015; DoE 2015; Birdlife Australia 2015; DPaW 2015b)	**Medium** Calls were heard closeby during the site visit, however the species was not recorded from the study area. Potential habitat exists and the species may occasionally occur.
Peregrine Falcon *Falco peregrinus*		S4		Rocky ledges, cliffs, watercourses, open woodland or margins with cleared land (Debus 2012).	One record from 2010 from within 5 km of the study area (DoE 2015; Birdlife Australia 2015; DPaW 2015b)	**Low** One record closeby but study area is small and larger, more suitable areas of suitable habitat are present in the wider region. Species may occasionally overfly study area but is not expected to utilise the habitat.
Australian Bustard *Ardeotis australis*			P4	Open country, preferring grasslands, low shrublands, grassy woodlands and other structurally similar but	Species recorded within 5 km of the study area (ALA 2015).	**Very Low** Recorded within 5 km of the study area but study area is too small and no suitable habitat present.

Species name	EPBC Act	WC Act	DPaW	Habitat	Previous Records	Likelihood of Occurrence
				artificial habitats such as croplands and airfields (Johnstone & Storr 1998).		
Barking Owl (SW subsp) *Ninox connivens connivens*			P2	Large trees, sometimes along creeks and rivers, particularly with River Red Gum (Johnstone & Storr 1998).	One record from Gnangara Lake (2000) 4 km north of the study area (Birdlife Australia 2015; DPaW 2015b)	**Very Low** Recorded within 5 km of the study area but study area is small and more suitable habitat exists to the east of the study area.
Masked Owl (SW subsp) *Tyto novaehollandiae novaehollandiae*			P3	Forests, woodlands, timbered waterways and open country on the fringe of coastal areas. Tall trees with suitable hollows for nesting and roosting (Johnstone & Storr 1998).	One record from Gnangara Lake (2000) 4 km north of the study area (ALA 2015; DPaW 2015b).	**Very Low** Recorded within 5 km of the study area but study area is small and more suitable habitat exists to the east of the study area.
Reptiles						
Black-striped Snake *Neelaps calonotus*			P3	Long-unburnt sites with deep sands of coastal heaths and low shrublands on the Swan Coastal Plain (Cogger 2000; Wilson & Swan 2008).	Species historically recorded at Gnangara Lake in 1983, however no recent records in the area (DPaW 2015b).	**Low** Habitat is very isolated and now recent records from the area. Species is not expected to occur.

MAMMALS

Southern Brown Bandicoot (Quenda*; Isoodon obesulus fusciventer*)

Conservation status: DPaW P5

Distribution and Preferred habitat

Quenda (Peramelidae) are present through much of the Darling Range as well as other parts of the south-west of WA. This species extends up the west coast to about Cervantes, with an uncertain sight record north of Geraldton. They prefer dense scrubby, often swampy, vegetation with dense cover up to one metre high, often feeding in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (ATA 2008).

Ecology

Mostly nocturnal, usually solitary, terrestrial and omnivorous, digging into the soil for invertebrates, fungi, edible plant parts and occasional small vertebrates. Breeding occurs at any season with a peak in spring, nesting in litter-covered depressions concealed under logs, shrubs or debris.

Likelihood of Occurrence

The species is known to exist within 5 km of the study area with numerous records from the area. The closest records are known from Landsdale Park, 1.2 km south-west and Hepburn Park, 1.1 km east of the study area **(Plate 4**). The species has the potential to occur within the study area, however the habitat is very isolated and impacted by urban development and represents low value for the species. Suitable habitat occurs outside the study area.

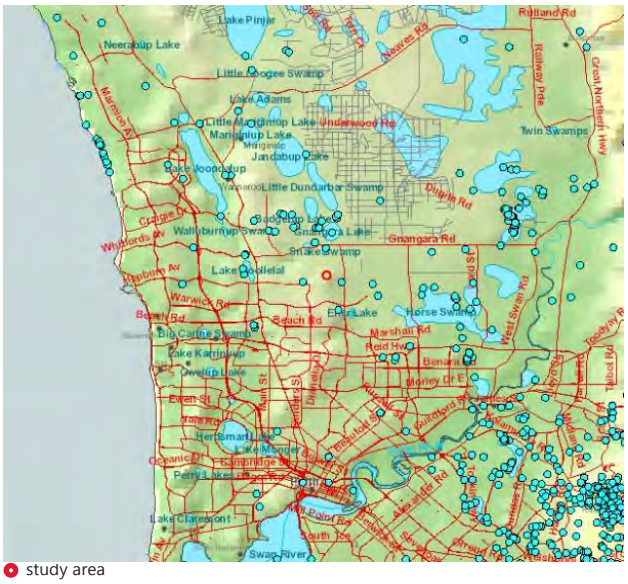

Plate 4: Records of Southern Brown Bandicoots

Potential Impacts

The study area provides some suitable habitat for the species and clearance of understorey may have some impact on the species' ability to move between other areas in the region. It is recommended to avoid clearance of all shrubs.

BIRDS

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

Conservation status: EPBC Act EN, WC Act S1, DPaW EN

Distribution and Preferred habitat

Carnaby's Black-Cockatoo is endemic to southwestern Australia and mainly occurs in uncleared or remnant native eucalypt woodlands, especially those that contain Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (E. wandoo), and in shrubland or kwongan heathland dominated by Hakea, Banksia and Grevillea species (Burbidge 2004; Johnstone et al. 2011). It is a seasonal visitor to plantations of exotic pines (**Pinus* spp.), and sometimes occurs in forests containing Marri (Corymbia calophylla), Jarrah (*E. marginata*) or Karri (*E. diversicolor*). Nesting occurs in tree hollows and has been recorded in the following species: Salmon Gum (*Eucalyptus salmonophloia*), Wandoo (*E. wandoo*), Red Morrell (*E. longicornis*), York Gum (*E. loxophleba*), Tuart (*E. gomphocephala*), Swamp Yate (*E. occidentalis*), and Marri (*Corymbia calophylla*) (Johnstone & Storr 1998). DSEWPC (2012a) indicates modelled breeding and non-breeding range, and also lists habitat features (vegetation structures and plant species) associated with breeding, roosting, and foraging.

A recent study of genetic population structuring in both Baudin's and Carnaby's Black Cockatoos (White et al. 2014) has shown that there is only minor genetic divergence between them, and no support for reciprocal monophyly, and they recommend further taxonomic assessment.

Ecology

Breeding occurs mainly from early July to mid-December, principally in the wheatbelt, but with a shift in recent decades into the Jarrah-Marri forests of the Darling Scarp and Tuart forests of the Swan Coastal Plain; it may also be expanding its breeding range to the south-east around Lake Cronin, Lake King and Ravensthorpe (Johnstone *et al.* 2002; Johnstone *et al.* 2011). This species is a postnuptial nomad, tending to move west into higher rainfall areas with Banksia scrubs or pine plantations after breeding, travelling in pairs or small flocks which may join up into large flocks (up to 10,000) in late spring to midwinter (Johnstone *et al.* 2011). Food includes the flowers, nectar and seeds of *Banksia, Dryandra, Hakea, Eucalyptus, Corymbia*, *Grevillea*, also seeds of *Pinus* sp., fruiting nut trees especially almonds and macadamias, the flesh and juice of apples and persimmons, and insects and larvae from bark, wood, galls and flowers.

Likelihood of Occurrence

The species is known to occur in the area with several records from within 5 km of the study area (DPaW 2015b). The study area lies within the known distribution and provides suitable foraging habitat of 0.8 ha Banksia woodland which is classified as foraging habitat (DSEWPaC 2012a). However, the study area is of small size and the species is likely to pass through to utilise larger parks and areas of suitable habitat in the wider region such as areas to the north (Gnangara Lake) and east (Whiteman Park) where the Carnaby's Black-Cockatoo has been sighted more frequently (**Plate 5**).

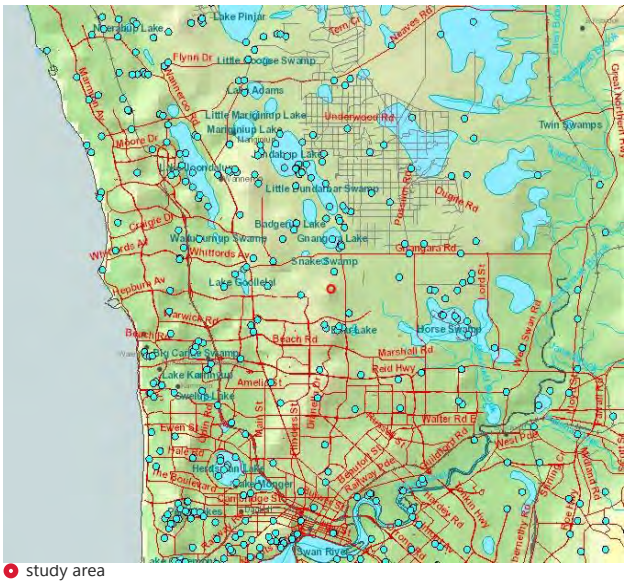

Plate 5: Records of Carnaby's Black-Cockatoo

Potential Impacts

The habitat consisting of Banksia woodland with scattered *Eucalyptus marginata* (Jarrah) within the study area represent suitable foraging habitat as per guidelines (DSEWPaC 2012a), however the area is less than 1 ha in total. Although the quality of foraging habitat is high (type of tree species), the size of the study area is small and the number of individual Carnaby's Black Cockatoo that the area can potentially support is low. Any reduction of trees is thought to have an impact on the species and clearance of trees should be kept to a minimum, however the overall impact on the species is anticipated to be low due to the low variety of tree species and vegetation condition.

Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

Conservation status: EPBC Act VU, WC Act S1, DPaW VU

Distribution and Preferred habitat

The Forest Red-tailed Black Cockatoo mainly inhabits dense *Eucalyptus marginata* (Jarrah), *E. diversicolor* (Karri) and *Corymbia calophylla* (Marri) forests and nests in the large hollows of Marri, Jarrah and Karri. DSEWPaC (2012a) indicates modelled distribution of the subspecies, and also lists habitat features (vegetation structures and plant species) associated with breeding, roosting, and foraging. Formerly rare in the Perth area, listed by Bush Forever (Government of Western Australia 2000) as 'locally extinct' in the Swan Coastal Plain portion of the Perth area, but has recently expanded its feeding range westward onto the Coastal Plain and east into the wheatbelt (Johnstone *et al*. 2011). Other, non-threatened subspecies occurring in WA are *C. b. macrorhynchus* in the Kimberley (the largest-billed form, extending to the Gulf of Carpentaria where it intergrades with *C. b. banksii*), and *C. b. samueli* from the central west coast to northern wheatbelt and Pilbara (relatively small, also occurring in isolated populations in Central Australia, south-west Queensland and north-west NSW).

Ecology

Large, long-lived (25-50 years), slow-breeding birds; breeding usually in October/November, sometimes March/April (DSEWPaC 2012a). Usually in pairs or small flocks, seldom in large flocks of up to 200 (Johnstone *et al*. 2011). Feeds on seeding Marri, Jarrah, Blackbutt, Karri, Sheoak and Snottygobble, also some ornamental eucalypts and introduced Cape Lilac. Threats include destruction of forests, fires in spring breeding season, competition for nest hollows by feral European honey bees, Australian Shelduck and Australian Wood Duck, also vehicle strikes.

Likelihood of Occurrence

The Forest Red-tailed Black-Cockatoo has been recorded from the area on an occasional basis with two records from Lake Goollelal (DPaW 2015b). The study area lies within the northern extent of the species' distribution, however Forest Red-tailed Black-Cockatoos are increasingly seen in a variety of habitats along the Swan Coastal Plain. The species is therefore considered as potentially occurring at the study area.

Potential Impacts

The habitat of the study area is not listed as suitable foraging habitat (DSEWPaC 2012a), however the Forest Red-tailed Black-Cockatoo recently expanded its feeding range westward onto the Coastal Plain. This also includes that species discovers food sources previously not recorded. Clearance of trees in particular of Jarrah (*E. marginata*) should be kept to a minimum.

Rainbow Bee-eater (*Merops ornatus*)

Conservation status: EPBC Act Migratory, WC Act S3

Distribution and Preferred habitat

The Rainbow Bee-eater is widespread throughout most of Australia, and does not depend on any particular habitat or vegetation type for feeding or breeding. They are scarce to common throughout much of Western Australia except for the arid interior, preferring lightly wooded, sandy country near water (DSEWPaC 2012b).

Ecology

Bee-eaters feed mainly on insects taken in flight (hawking), but also take prey from the ground and foliage (gleaning). Populations in southern Australia are migratory, wintering in Indonesia and New Guinea, moving south over summer and breeding in Australia, but the species is resident and present year-round in parts of northern Australia including the Pilbara (DSEWPaC 2012b). Nesting occurs in burrows dug in flat or slightly sloping ground, sandy banks or cuttings, and often at the margins of roads or tracks; breeding is often colonial and cooperative (Boland 2004).

Likelihood of Occurrence

Rainbow Bee-eaters have been recorded from within 5 km of the study area and calls were heard from the surrounding during the site visit (ALA 2015; DoE 2015; Birdlife Australia 2015; DPaW 2015b) (**Plate 6**). The species is expected to occur frequently and most likely overfly and sporadically utilise the study area. However, no breeding habitat is present and the study area is likely to be used as foraging only.

Potential Impacts

The impact of the development is anticipated to be low due to the lack of breeding habitat at the study area and the likelihood of the species to favour habitats outside the study area in the form of parks and remnant vegetation in the area.

Plate 6: Records of Rainbow Bee-eater

APPENDIX SEVEN: ASSESSMENT AGAINST THE 10 CLEARING PRINCIPLES

Principle	Comment
a. Native vegetation should not be cleared if it comprises a high level of biological diversity.	A total of 88 vascular flora species from 70 genera and 33 families were recorded within the study area. This is considered average for an area this size and in good condition. There were no Priority Flora species recorded from the study area. The study area has been identified as the TEC, SCP20a, of which one of its key features is its biological diversity The small size of the area means it does not support a high diversity of fauna species, with only three species recorded at the site. **The proposed clearing is at variance with this principle.** *Avoidance recommendation: design the passive park to minimise disturbance to the vegetation of the study area.* *Mitigation recommendation: consult with the DPaW in the development planning process.*
b. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	The habitat within the study area represents foraging habitat Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo. To reduce the impact on these species, clearance of the Banksias should be kept to a minimum. **The proposed clearing may be at variance with this principle.**
c. Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No taxa of Threatened (rare) flora were recorded in the study area. Intensive searching for Threatened (rare), carried out over the entirety of the study area indicates that these species are not present. Database searches identified five Threatened Flora species within the 10 km buffer; however, none of these were previously recorded within the study area. **The proposed clearing is not at variance with this principle.**
d. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.	The desktop assessment determined that the Endangered SCP20a TEC is present at the study area. Ecoscape's in-house Floristic Community Type assessment also indicates that the vegetation community present at the study area closely aligns with the SCP20a TEC. **The proposed clearing is at variance with this principle.** *Avoidance recommendation: design the passive park to minimise disturbance to the vegetation of the study area. e.g. develop only areas that are already cleared.* *Mitigation recommendation: consult with the DPaW in the development planning process.*
e. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	EPA's Position Statement No. 2 states that at least 30% of the pre-European extent of vegetation should be retained. The study area intersects one Heddle et al (1980) vegetation complex, the Karrakatta Complex–Central and South complex. This complex currently has 18% of its original extent remaining in the Swan Coastal Plain bioregion. **The proposed clearing is at variance with this principle.** *Avoidance recommendation: the area to be cleared represents less than 0.01% of the extent of the remaining vegetation. The small scale and lack of connectivity may offer exemption.*

f. Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The proposed corridor does not traverse any creeks, drainage lines or wetlands including Conservation Category Wetlands. **The proposed clearing is not at variance with this principle.**
g. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The study area is surrounded by housing developments, combined with the small extent; clearing is not likely to cause appreciable land degradation. The area is to be developed into a passive park which will restabilise the area and prevent appreciable land degradation. **The proposed clearing is not at variance with this principle.**
h. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	There are no reserves or conservation areas within the vicinity of the study are. Additionally, given the study area is surrounded by housing development, clearing of the vegetation is not likely to affect adjacent areas **The proposed clearing is not at variance with this principle.**
i. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The study area does not traverse any surface water features; therefore, clearing of the vegetation is not likely to cause deterioration in the quality of surface water. Nor is the small size of the area likely to have an effect on groundwater quality. **The proposed clearing is not at variance with this principle.**
j. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The study area is surrounded by drainage infrastructure on existing roads which will mitigate any increased water runoff. The construction of the passive park will also manage any increase in runoff. **The proposed clearing is not at variance with this principle**

APPENDIX B

DBCA Naturemap Search Report

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 20/10/2017

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 51' 48" E,31° 49' 03" S
Buffer 5km
Group By Kingdom

Kingdom	Species	Records
Animalia	218	3575
Fungi	9	19
Plantae	453	1098
Protozoa	3	3
TOTAL	**683**	**4695**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Animalia					
1.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
2.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
3.	24262	*Acanthiza inornata (Western Thornbill)*			
4.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
5.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
6.	24281	*Accipiter cirrocephalus subsp. cirrocephalus (Collared Sparrowhawk)*			
7.	25536	*Accipiter fasciatus (Brown Goshawk)*			
8.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
9.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
10.		*Amblyomma triguttatum*			
11.		*Aname mainae*			
12.		*Aname tepperi*			
13.	24312	*Anas gracilis (Grey Teal)*			
14.	24313	*Anas platyrhynchos (Mallard)*			
15.	24315	*Anas rhynchotis (Australasian Shoveler)*			
16.	24316	*Anas superciliosa (Pacific Black Duck)*			
17.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
18.	24561	*Anthochaera carunculata (Red Wattlebird)*			
19.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
20.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
21.		*Araneus eburnus*			
22.	25558	*Ardea ibis (Cattle Egret)*		IA	
23.	24338	*Ardea ibis subsp. coromanda (Cattle Egret)*		IA	
24.	41324	*Ardea modesta (great egret, white egret)*		IA	
25.	24340	*Ardea novaehollandiae (White-faced Heron)*			
26.	24341	*Ardea pacifica (White-necked Heron)*			
27.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
28.		*Artoria linnaei*			
29.		*Austracantha minax*			
30.	24318	*Aythya australis (Hardhead)*			
31.		*Ballarra longipalpus*			
32.		*Barnardius zonarius*			
33.	24319	*Biziura lobata (Musk Duck)*			
34.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
35.	25713	*Cacatua galerita (Sulphur-crested Cockatoo)*			
36.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
37.	25716	*Cacatua sanguinea (Little Corella)*			
38.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*	Y		
39.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
40.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
41.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
42.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
43.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
44.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)*		T	
45.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
46.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
47.		*Cercophonius granulosus*			
48.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
49.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
50.	43380	*Chelodina colliei (South-western Snake-necked Turtle)*			
51.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
52.	47909	*Cheramoeca leucosterna (White-backed Swallow)*			
53.	24288	*Circus approximans (Swamp Harrier)*			
54.	24289	*Circus assimilis (Spotted Harrier)*			
55.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
56.	24613	*Colluricincla harmonica subsp. rufiventris (Grey Shrike-thrush)*			
57.	24399	*Columba livia (Domestic Pigeon)*	Y		
58.	24361	*Coracina maxima (Ground Cuckoo-shrike)*			
59.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
60.	24363	*Coracina novaehollandiae subsp. subpallida (Black-faced Cuckoo-shrike)*			
61.		*Cormocephalus turneri*			
62.	24416	*Corvus bennetti (Little Crow)*			
63.	25592	*Corvus coronoides (Australian Raven)*			
64.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
65.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
66.	25595	*Cracticus tibicen (Australian Magpie)*			
67.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
68.	25596	*Cracticus torquatus (Grey Butcherbird)*			
69.	25399	*Crinia glauerti (Clicking Frog)*			
70.	30893	*Cryptoblepharus buchananii*			
71.		*Cryptoerithus quobba*			
72.	25039	*Ctenotus fallens*			
73.	24322	*Cygnus atratus (Black Swan)*			
74.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
75.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
76.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
77.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
78.		*Dingosa serrata*			
79.		*Egretta novaehollandiae*			
80.		*Elanus axillaris*			
81.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
82.		*Eolophus roseicapillus*			
83.	24567	*Epthianura albifrons (White-fronted Chat)*			
84.		*Eriophora biapicata*			
85.	25621	*Falco berigora (Brown Falcon)*			
86.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
87.	25623	*Falco longipennis (Australian Hobby)*			
88.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
89.	25727	*Fulica atra (Eurasian Coot)*			
90.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
91.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
92.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
93.	25530	*Gerygone fusca (Western Gerygone)*			
94.	24271	*Gerygone fusca subsp. fusca (Western Gerygone)*			
95.	47962	*Glyciphila melanops (Tawny-crowned Honeyeater)*			
96.	24443	*Grallina cyanoleuca (Magpie-lark)*			
97.	24295	*Haliastur sphenurus (Whistling Kite)*			
98.	24689	*Halobaena caerulea (Blue Petrel)*			
99.	25408	*Heleioporus albopunctatus (Western Spotted Frog)*			
100.	25410	*Heleioporus eyrei (Moaning Frog)*			
101.	25119	*Hemiergis quadrilineata*			
102.	47965	*Hieraaetus morphnoides (Little Eagle)*			
103.	25734	*Himantopus himantopus (Black-winged Stilt)*			
104.	24491	*Hirundo neoxena (Welcome Swallow)*			
105.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
106.		*Idiommata blackwalli*			
107.		*Isometroides vescus*			
108.	25478	*Isoodon obesulus (Southern Brown Bandicoot)*		P4	
109.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P4	
110.		*Isopeda leishmanni*			
111.	47975	*Ixobrychus dubius (Australian Little Bittern)*		P4	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
112.		*Lamponina elongata*			
113.		*Latrodectus hasseltii*			
114.	25133	*Lerista elegans*			
115.	25165	*Lerista praepedita*			
116.	25005	*Lialis burtonis*			
117.	25659	*Lichenostomus leucotis (White-eared Honeyeater)*			
118.	25661	*Lichmera indistincta (Brown Honeyeater)*			
119.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
120.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
121.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
122.	25388	*Litoria moorei (Motorbike Frog)*			
123.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
124.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
125.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
126.	25654	*Malurus splendens (Splendid Fairy-wren)*			
127.	24583	*Manorina flavigula (Yellow-throated Miner)*			
128.		*Maratus chrysomelas*			
129.		*Maratus pavonis*			
130.		*Masasteron tuart*			
131.	25758	*Megalurus gramineus (Little Grassbird)*			
132.	25184	*Menetia greyii*			
133.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
134.		*Microcarbo melanoleucos*			
135.		*Missulena granulosa*			
136.		*Missulena occatoria*			
137.		*Molycria vokes*			
138.	25191	*Morethia lineoocellata*			
139.	25192	*Morethia obscura*			
140.	24223	*Mus musculus (House Mouse)*	Y		
141.		*Myandra bicincta*			
142.	25420	*Myobatrachus gouldii (Turtle Frog)*			
143.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
144.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
145.	24738	*Neophema elegans (Elegant Parrot)*			
146.		*Nicodamus mainae*			
147.	25747	*Ninox connivens (Barking Owl)*			
148.	25252	*Notechis scutatus (Tiger Snake)*			
149.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
150.		*Ommatoiulus moreleti*			
151.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
152.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
153.	24624	*Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)*			
154.		*Paralampona marangaroo*			
155.	25253	*Parasuta gouldii*			
156.	25255	*Parasuta nigriceps*			
157.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
158.	25682	*Pardalotus striatus (Striated Pardalote)*			
159.	24628	*Pardalotus striatus subsp. murchisoni (Striated Pardalote)*			
160.		*Pediana occidentalis*			
161.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
162.	48061	*Petrochelidon nigricans (Tree Martin)*			
163.	48066	*Petroica boodang (Scarlet Robin)*			
164.	24659	*Petroica goodenovii (Red-capped Robin)*			
165.	25697	*Phalacrocorax carbo (Great Cormorant)*			
166.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
167.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
168.	25699	*Phalacrocorax varius (Pied Cormorant)*			
169.	24409	*Phaps chalcoptera (Common Bronzewing)*			
170.		*Phenasteron machinosum*			
171.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
172.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
173.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
174.	25007	*Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)*			
175.	25704	*Podiceps cristatus (Great Crested Grebe)*			
176.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
177.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
178.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
179.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
180.		*Prionosternum scutatum*			
181.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
182.		*Purpureicephalus spurius*			
183.	24245	*Rattus rattus (Black Rat)*	Y		
184.		*Raveniella cirrata*			
185.		*Raveniella peckorum*			
186.	48096	*Rhipidura albiscapa (Grey Fantail)*			
187.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
188.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
189.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
190.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
191.	30948	*Smicrornis brevirostris (Weebill)*			
192.	24426	*Strepera versicolor subsp. plumbea (Grey Currawong)*			
193.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
194.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
195.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
196.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
197.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
198.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
199.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
200.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
201.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
202.	25519	*Tiliqua rugosa*			
203.	25204	*Tiliqua rugosa subsp. aspera*			
204.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
205.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
206.	48147	*Turnix varius (Painted Button-quail)*			
207.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
208.		*Urodacus novaehollandiae*			
209.		*Urodacus woodwardii*			
210.	24386	*Vanellus tricolor (Banded Lapwing)*			
211.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
212.	25225	*Varanus rosenbergi (Heath Monitor)*			
213.	25526	*Varanus tristis (Racehorse Monitor)*			
214.		*Venator immansueta*			
215.		*Venatrix pullastra*			
216.		*Westrarchaea pusilla*			
217.		*Zachria flavicoma*			
218.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
Fungi					
219.	48332	*Amanita preissii (Cinnamon-ring Lepidella)*		P3	
220.	38756	*Amanita umbrinella*			
221.	38791	*Hebeloma crustuliniforme*			
222.	38802	*Laccocephalum tumulosum*			
223.		*Panus fasciatus*			
224.		*Peziza repanda*			
225.		*Pholiota highlandensis*			
226.		*Phytophthora cinnamomi*			
227.	38836	*Russula erumpens*			
Plantae					
228.	15466	*Acacia applanata*			
229.	15470	*Acacia barbinervis subsp. borealis*			
230.	3237	*Acacia benthamii*		P2	
231.	3262	*Acacia cochlearis (Rigid Wattle)*			
232.	3374	*Acacia huegelii*			
233.	18217	*Acacia iteaphylla*	Y		
234.	11611	*Acacia lasiocarpa var. lasiocarpa*			
235.	17861	*Acacia longifolia*	Y		
236.	15481	*Acacia pulchella var. glaberrima*			
237.	30032	*Acacia saligna subsp. saligna*			
238.	3541	*Acacia sessilis*			
239.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
240.	1775	*Adenanthos cygnorum (Common Woollybush)*			
241.	11837	*Adenanthos cygnorum subsp. cygnorum (Common Woollybush)*			
242.	1791	*Adenanthos obovatus (Basket Flower)*			
243.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
244.	185	*Aira cupaniana (Silvery Hairgrass)*	Y		
245.	1056	*Alexgeorgea nitens*			
246.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
247.	20184	*Amphipogon laguroides subsp. laguroides*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
248.	200	*Amphipogon turbinatus*			
249.	6311	*Andersonia heterophylla*			
250.	6314	*Andersonia lehmanniana*			
251.	1409	*Anigozanthos humilis (Catspaw)*			
252.	11434	*Anigozanthos humilis subsp. humilis*			
253.	1411	*Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)*			
254.	3688	*Aotus gracillima*			
255.	3692	*Aotus procumbens*			
256.	41824	*Aotus sp. Diffusa (W.E. Blackall & C.A. Gardner 1739)*			
257.	43548	*Aphelia sp. Albany (B.G. Briggs 596)*			
258.	7838	*Arctotheca calendula (Cape Weed, African Marigold)*	Y		
259.	1264	*Arnocrinum preissii*			
260.	8779	*Asparagus asparagoides (Bridal Creeper)*	Y		
261.	1364	*Asphodelus fistulosus (Onion Weed)*	Y		
262.	20283	*Astartea scoparia (Common Astartea)*			
263.	6334	*Astroloma pallidum (Kick Bush)*			
264.	6339	*Astroloma xerophyllum*			
265.	17234	*Austrostipa compressa*			
266.	17240	*Austrostipa flavescens*			
267.	17241	*Austrostipa hemipogon*			
268.	233	*Avena barbata (Bearded Oat)*	Y		
269.	234	*Avena fatua (Wild Oat)*	Y		
270.	18279	*Babiana angustifolia*	Y		
271.	36441	*Babingtonia camphorosmae (Camphor Myrtle)*			
272.	32682	*Banksia armata var. armata*			
273.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
274.	32580	*Banksia dallanneyi var. dallanneyi*			
275.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
276.	1834	*Banksia menziesii (Firewood Banksia)*			
277.	32315	*Barbula calycina*			
278.	5382	*Beaufortia elegans (Elegant Beaufortia)*			
279.	25788	*Billardiera fraseri (Elegant Pronaya)*			
280.	17665	*Boronia purdieana subsp. purdieana*			
281.	11381	*Boronia ramosa subsp. anethifolia*			
282.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
283.	7867	*Brachyscome bellidioides*			
284.	244	*Briza maxima (Blowfly Grass)*	Y		
285.	245	*Briza minor (Shivery Grass)*	Y		
286.	249	*Bromus diandrus (Great Brome)*	Y		
287.	12770	*Burchardia congesta*			
288.	1277	*Caesia occidentalis*			
289.	15330	*Caladenia arenicola*			
290.	15348	*Caladenia flava subsp. flava*			
291.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
292.	18019	*Caladenia vulgata*			
293.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
294.	2854	*Calandrinia granulifera (Pygmy Purslane)*			
295.	2856	*Calandrinia liniflora (Parakeelya)*			
296.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
297.	19309	*Calectasia narragara*			
298.	96	*Callitris preissii (Rottnest Island Pine, Maro)*			
299.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower, Pindak)*			
300.	5439	*Calytrix angulata (Yellow Starflower)*			
301.	5458	*Calytrix flavescens (Summer Starflower)*			
302.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
303.	5476	*Calytrix sapphirina*			
304.	18555	*Cardamine sp. Jandakot (P. Luff s.n. 4/7/1969)*	Y		
305.	1162	*Cartonema philydroides*			
306.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
307.	6539	*Centaurium erythraea (Common Centaury)*	Y		
308.	6214	*Centella asiatica*			
309.	1125	*Centrolepis drummondiana*			
310.	17685	*Chaetanthus aristatus*			
311.	1280	*Chamaescilla corymbosa (Blue Squill)*			
312.	5498	*Chamelaucium uncinatum (Geraldton Wax)*			
313.	1513	*Chasmanthe floribunda (African Cornflag)*	Y		
314.	7925	*Chondrilla juncea (Skeleton Weed)*	Y		
315.	17833	*Chordifex microcodon*			
316.	17706	*Chordifex sinuosus*			
317.	4550	*Comesperma calymega (Blue-spike Milkwort)*			

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318.	4554	*Comesperma flavum*			
319.	15607	*Conospermum acerosum subsp. acerosum*			
320.	1876	*Conospermum incurvum (Plume Smokebush)*			
321.	1882	*Conospermum stoechadis (Common Smokebush)*			
322.	15611	*Conospermum stoechadis subsp. stoechadis (Common Smokebush)*			
323.	6347	*Conostephium minus (Pink-tipped Pearl flower)*			
324.	6348	*Conostephium pendulum (Pearl Flower)*			
325.	6349	*Conostephium preissii*			
326.	1418	*Conostylis aculeata (Prickly Conostylis)*			
327.	11513	*Conostylis aculeata subsp. cygnorum*			
328.	1420	*Conostylis androstemma (Trumpets)*			
329.	1423	*Conostylis aurea (Golden Conostylis)*			
330.	11438	*Conostylis candicans subsp. candicans*			
331.	1436	*Conostylis juncea*			
332.	1454	*Conostylis setigera (Bristly Cottonhead)*			
333.	11597	*Conostylis setigera subsp. setigera*			
334.	7941	*Conyza parva*	Y		
335.	2891	*Corrigiola litoralis (Strapwort)*	Y		
336.	1285	*Corynotheca micrantha (Sand Lily)*			
337.	11283	*Corynotheca micrantha var. micrantha*			
338.	7947	*Cotula turbinata (Funnel Weed)*	Y		
339.	3137	*Crassula colorata (Dense Stonecrop)*			
340.	11563	*Crassula colorata var. colorata*			
341.	15706	*Crassula natans var. minus*	Y		
342.	13527	*Croninia kingiana*			
343.	11021	*Cuscuta planiflora*	Y		
344.	769	*Cyathochaeta clandestina*			
345.	16245	*Cyathochaeta teretifolia*		P3	
346.	806	*Cyperus polystachyos (Bunchy Sedge)*	Y		
347.	7454	*Dampiera linearis (Common Dampiera)*			
348.	7485	*Dampiera triloba*		P3	
349.	41022	*Dasymalla axillaris (Native Foxglove)*		T	
350.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
351.	3807	*Daviesia divaricata (Marno)*			
352.	18560	*Daviesia divaricata subsp. divaricata*			
353.	3824	*Daviesia nudiflora*			
354.	16585	*Daviesia nudiflora subsp. nudiflora*			
355.	3831	*Daviesia pedunculata*			
356.	3832	*Daviesia physodes*			
357.	3845	*Daviesia triflora*			
358.	17663	*Desmocladus asper*			
359.	17691	*Desmocladus fasciculatus*			
360.	16595	*Desmocladus flexuosus*			
361.	299	*Deyeuxia quadriseta (Reed Bentgrass)*			
362.	1259	*Dianella revoluta (Blueberry Lily)*			
363.	17838	*Dielsia stenostachya*			
364.	4453	*Diplolaena angustifolia (Yanchep Rose)*			
365.	19649	*Disa bracteata*	Y		
366.	7055	*Dischisma capitatum (Woolly-headed Dischisma)*	Y		
367.	11049	*Diuris corymbosa*			
368.	12939	*Diuris magnifica*			
369.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
370.	13217	*Drosera erythrorhiza subsp. erythrorhiza*			
371.	3098	*Drosera glanduligera (Pimpernel Sundew)*			
372.	3106	*Drosera macrantha (Bridal Rainbow)*			
373.	14298	*Drosera macrantha subsp. macrantha*			
374.	3109	*Drosera menziesii (Pink Rainbow)*			
375.	13216	*Drosera menziesii subsp. penicillaris*			
376.	3116	*Drosera omissa (Bright Sundew)*			
377.	3117	*Drosera paleacea (Dwarf Sundew)*			
378.	13188	*Drosera paleacea subsp. paleacea*			
379.	3118	*Drosera pallida (Pale Rainbow)*			
380.	3119	*Drosera parvula (Small Sundew)*			
381.	31233	*Drosera patens*			
382.	3124	*Drosera pulchella (Pretty Sundew)*			
383.	30712	*Drosera x sidjamesii*		P1	
384.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
385.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
386.	376	*Eragrostis curvula (African Lovegrass)*	Y		
387.	13949	*Eremaea asterocarpa*			

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388.	5541	*Eremaea pauciflora*			
389.	14104	*Eremaea pauciflora var. pauciflora*			
390.	5542	*Eremaea purpurea*			
391.	15410	*Eriochilus dilatatus subsp. dilatatus*			
392.	15412	*Eriochilus dilatatus subsp. multiflorus*			
393.	4332	*Erodium botrys (Long Storksbill)*	Y		
394.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
395.	6219	*Eryngium pinnatifidum (Blue Devils)*			
396.	5616	*Eucalyptus decurva (Slender Mallee)*			
397.	5708	*Eucalyptus marginata (Jarrah, Djara)*			
398.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			
399.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
400.	3872	*Euchilopsis linearis (Swamp Pea)*			
401.	4638	*Euphorbia peplus (Petty Spurge)*	Y		
402.	4648	*Euphorbia terracina (Geraldton Carnation Weed)*	Y		
403.	3880	*Eutaxia virgata*			
404.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
405.	1747	*Ficus carica (Common Fig)*	Y		
406.	6221	*Foeniculum vulgare (Fennel)*	Y		
407.	18392	*Freesia alba x leichtlinii*	Y		
408.	2969	*Fumaria capreolata (Whiteflower Fumitory)*	Y		
409.	11571	*Galenia pubescens var. pubescens*	Y		
410.	20346	*Gamochaeta coarctata*	Y		
411.	20475	*Gastrolobium capitatum*			
412.	20473	*Gastrolobium ebracteolatum*			
413.	20483	*Gastrolobium linearifolium*			
414.	16311	*Gazania linearis*	Y		
415.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
416.	6587	*Gomphocarpus fruticosus (Narrowleaf Cottonbush)*	Y		
417.	10909	*Gompholobium confertum*			
418.	3950	*Gompholobium knightianum*			
419.	11083	*Gompholobium scabrum*			
420.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
421.	6161	*Gonocarpus pithyoides*			
422.	7538	*Goodenia pulchella*			
423.	2032	*Grevillea leucopteris (White Plume Grevillea)*			
424.	8836	*Grevillea obtusifolia (Obtuse Leaved Grevillea)*			
425.	2788	*Gyrostemon subnudus*			
426.	1468	*Haemodorum laxum*			
427.	1475	*Haemodorum spicatum (Mardja)*			
428.	2146	*Hakea costata (Ribbed Hakea)*			
429.	2175	*Hakea lissocarpha (Honey Bush)*			
430.	2197	*Hakea prostrata (Harsh Hakea)*			
431.	2203	*Hakea ruscifolia (Candle Hakea)*			
432.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
433.	3016	*Heliophila pusilla*	Y		
434.	16933	*Hemiandra glabra*			
435.	6838	*Hemiandra linearis (Speckled Snakebush)*			
436.	6839	*Hemiandra pungens (Snakebush)*			
437.	41020	*Hemiphora bartlingii (Woolly Dragon)*			
438.	1293	*Hensmania turbinata*			
439.	5112	*Hibbertia aurea*			
440.	5116	*Hibbertia crassifolia*			
441.	5134	*Hibbertia huegelii*			
442.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
443.	45534	*Hibbertia hypericoides subsp. hypericoides*			
444.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
445.	43280	*Hibbertia sericosepala*			
446.	48381	*Hibbertia striata*			
447.	5173	*Hibbertia subvaginata*			
448.	6222	*Homalosciadium homalocarpum*			
449.	3966	*Hovea pungens (Devil's Pins, Puyenak)*			
450.	3968	*Hovea trisperma (Common Hovea)*			
451.	12859	*Hovea trisperma var. trisperma*			
452.	5216	*Hybanthus calycinus (Wild Violet)*			
453.	452	*Hyparrhenia hirta (Tambookie Grass)*	Y		
454.	35070	*Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)*			
455.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
456.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
457.	1070	*Hypolaena exsulca*			

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458.	917	*Isolepis marginata (Coarse Club-rush)*			
459.	7396	*Isotoma hypocrateriformis (Woodbridge Poison)*			
460.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
461.	19700	*Isotropis cuneifolia subsp. cuneifolia*			
462.	14783	*Jacksonia calcicola*			
463.	4010	*Jacksonia floribunda (Holly Pea)*			
464.	4027	*Jacksonia sericea (Waldjumi)*		P4	
465.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
466.	1295	*Johnsonia acaulis*			
467.	8328	*Juncus amabilis*			
468.	1188	*Juncus pallidus (Pale Rush)*			
469.	4044	*Kennedia prostrata (Scarlet Runner)*			
470.	15498	*Kunzea glabrescens (Spearwood)*			
471.	16091	*Lachenalia bulbifera*	Y		
472.	18585	*Lagenophora huegelii*			
473.	1307	*Laxmannia ramosa (Branching Lily)*			
474.	11464	*Laxmannia sessiliflora subsp. australis*			
475.	1309	*Laxmannia squarrosa*			
476.	7568	*Lechenaultia biloba (Blue Leschenaultia)*			
477.	7574	*Lechenaultia floribunda (Free-flowering Leschenaultia)*			
478.	18074	*Lepidobolus preissianus subsp. preissianus*			
479.	42742	*Lepidosperma calcicola*			
480.	940	*Lepidosperma pubisquameum*			
481.	944	*Lepidosperma scabrum*			
482.		*Lepidosperma sp.*			
483.	945	*Lepidosperma squamatum*			
484.	946	*Lepidosperma striatum*			
485.	1653	*Leporella fimbriata (Hare Orchid)*			
486.	1080	*Leptocarpus scariosus*			
487.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
488.	5857	*Leptospermum spinescens*			
489.	1088	*Lepyrodia macra (Large Scale Rush)*			
490.	1090	*Lepyrodia muirii*			
491.	6360	*Leucopogon australis (Spiked Beard-heath)*			
492.	6374	*Leucopogon conostephioides*			
493.	6425	*Leucopogon oxycedrus*			
494.	6434	*Leucopogon polymorphus*			
495.	6436	*Leucopogon propinquus*			
496.	40803	*Leucopogon squarrosus subsp. squarrosus*			
497.	7676	*Levenhookia pusilla (Midget Stylewort)*			
498.	7677	*Levenhookia stipitata (Common Stylewort)*			
499.	7075	*Linaria maroccana*	Y		
500.	9289	*Lobelia anceps (Angled Lobelia)*			
501.	7402	*Lobelia gibbosa (Tall Lobelia)*			
502.	7408	*Lobelia tenuior (Slender Lobelia)*			
503.	3048	*Lobularia maritima (Sweet Alyssum)*	Y		
504.	11073	*Lolium x hybridum*	Y		
505.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
506.	1228	*Lomandra hermaphrodita*			
507.	1234	*Lomandra nigricans*			
508.	1236	*Lomandra odora (Tiered Matrush)*			
509.	1239	*Lomandra preissii*			
510.	1246	*Lomandra suaveolens*			
511.	4059	*Lotus angustissimus (Narrowleaf Trefoil)*	Y		
512.	8564	*Lotus subbiflorus*	Y		
513.	1097	*Lyginia barbata*			
514.	18049	*Lyginia imberbis*			
515.	6456	*Lysinema ciliatum (Curry Flower)*			
516.	34736	*Lysinema pentapetalum*			
517.	2839	*Macarthuria australis*			
518.	18119	*Macrozamia fraseri*			
519.	5952	*Melaleuca preissiana (Moonah)*			
520.	5964	*Melaleuca seriata*			
521.	5983	*Melaleuca trichophylla*			
522.	955	*Mesomelaena pseudostygia*			
523.	485	*Microlaena stipoides (Weeping Grass)*			
524.	1658	*Microtis atrata (Swamp Mignonette Orchid)*			
525.	10954	*Microtis media (Tall Mignonette Orchid)*			
526.	15419	*Microtis media subsp. media*			
527.	8105	*Millotia myosotidifolia*			

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528.	8106	*Millotia tenuifolia (Soft Millotia)*			
529.	29418	*Monoculus monstrosus*	Y		
530.	4662	*Monotaxis grandiflora (Diamond of the Desert)*			
531.	19585	*Monotaxis grandiflora var. grandiflora*			
532.	4666	*Monotaxis occidentalis*			
533.	6199	*Myriophyllum tillaeoides*			
534.	44496	*Narcissus tazetta subsp. italicus*	Y		
535.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
536.	6138	*Oenothera drummondii (Beach Evening Primrose)*	Y		
537.	35416	*Oenothera lindheimeri*	Y		
538.	6142	*Oenothera stricta (Common Evening Primrose)*	Y		
539.	8133	*Olearia elaeophila*			
540.	18255	*Opercularia vaginata (Dog Weed)*			
541.	36177	*Ornduffia albiflora*			
542.	4114	*Ornithopus pinnatus (Slender Serradella)*	Y		
543.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
544.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
545.	17756	*Osteospermum ecklonis*	Y		
546.	4356	*Oxalis pes-caprae (Soursob)*	Y		
547.	4358	*Oxalis purpurea (Largeflower Wood Sorrel)*	Y		
548.	17114	*Paraserianthes lophantha subsp. lophantha*			
549.	527	*Paspalum dilatatum*	Y		
550.	1546	*Patersonia juncea (Rush Leaved Patersonia)*			
551.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
552.	30472	*Patersonia occidentalis var. occidentalis*			
553.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
554.	40423	*Pentameris airoides (False Hairgrass)*	Y		
555.	40422	*Pentameris pallida*	Y		
556.	2258	*Persoonia comata*			
557.	2273	*Persoonia saccata (Snottygobble)*			
558.	2286	*Petrophile brevifolia*			
559.	2299	*Petrophile linearis (Pixie Mops)*			
560.	2301	*Petrophile macrostachya*			
561.	19825	*Petrorhagia dubia*	Y		
562.	20460	*Pheladenia deformis*			
563.	18529	*Philotheca spicata (Pepper and Salt)*			
564.	1478	*Phlebocarya ciliata*			
565.	16825	*Phyllangium divergens*			
566.	16177	*Phyllangium paradoxum*			
567.	6011	*Pileanthus peduncularis (Coppercups)*			
568.	5254	*Pimelea leucantha*			
569.	5268	*Pimelea sulphurea (Yellow Banjine)*			
570.	8165	*Pithocarpa pulchella (Beautiful Pithocarpa)*			
571.	6249	*Platysace compressa (Tapeworm Plant)*			
572.	4524	*Platytheca galioides*			
573.	8175	*Podolepis gracilis (Slender Podolepis)*			
574.	8182	*Podotheca angustifolia (Sticky Longheads)*			
575.	8183	*Podotheca chrysantha (Yellow Podotheca)*			
576.	4689	*Poranthera ericoides (Heath Poranthera)*			
577.	4691	*Poranthera microphylla (Small Poranthera)*			
578.	122	*Posidonia angustifolia*			
579.	1676	*Prasophyllum hians (Yawning Leek Orchid)*			
580.	1680	*Prasophyllum parvifolium (Autumn Leek Orchid)*			
581.	13255	*Pterochaeta paniculata*			
582.	15426	*Pterostylis aspera*			
583.	17267	*Pterostylis brevisepala*			
584.	1693	*Pterostylis recurva (Jug Orchid)*			
585.	12217	*Pterostylis sanguinea*			
586.	18658	*Pterostylis sp. short sepals (W. Jackson BJ259)*			
587.	1698	*Pterostylis vittata (Banded Greenhood)*			
588.	2742	*Ptilotus manglesii (Pom Poms, Mulamula)*			
589.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
590.	4181	*Pultenaea reticulata*			
591.	16367	*Pyrorchis nigricans (Red beaks, Elephants ears)*			
592.	8195	*Quinetia urvillei*			
593.	6012	*Regelia ciliata*			
594.	6014	*Regelia inops*			
595.	18547	*Rhadinothamnus anceps*			
596.	13300	*Rhodanthe citrina*			
597.	4695	*Ricinocarpos glaucus*			

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598.	19942	*Ricinocarpos undulatus*			
599.	1554	*Romulea flava*	Y		
600.	14485	*Romulea flava var. minor*	Y		
601.	11544	*Romulea rosea var. australis (Guildford Grass)*	Y		
602.	46434	*Rumex hypogaeus*	Y		
603.	40425	*Rytidosperma caespitosum*			
604.	40426	*Rytidosperma occidentale*			
605.	7368	*Scabiosa atropurpurea (Purple Pincushion)*	Y		
606.	7614	*Scaevola globulifera*			
607.	13182	*Scaevola repens var. repens*			
608.	978	*Schoenus brevisetis*			
609.	984	*Schoenus curvifolius*			
610.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
611.	17614	*Schoenus plumosus*			
612.	1018	*Schoenus subfascicularis*			
613.	17409	*Schoenus variicellae*			
614.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
615.	20663	*Senecio multicaulis subsp. multicaulis*			
616.	25884	*Senecio pinnatifolius var. latilobus*			
617.	2909	*Silene gallica (French Catchfly)*	Y		
618.	15972	*Silene gallica var. gallica*	Y		
619.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
620.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
621.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
622.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
623.	1560	*Sparaxis pillansii (Harlequin Flower)*	Y		
624.	2316	*Stirlingia latifolia (Blueboy)*			
625.	7679	*Stylidium adpressum (Trigger-on-stilts)*			
626.	30278	*Stylidium androsaceum*			
627.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
628.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
629.	7696	*Stylidium calcaratum (Book Triggerplant)*			
630.	7699	*Stylidium carnosum (Fleshy-leaved Triggerplant)*			
631.	7709	*Stylidium crossocephalum (Posy Triggerplant)*			
632.	7710	*Stylidium cygnorum*			
633.	25829	*Stylidium neurophyllum (Coastal Plain Triggerplant)*			
634.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
635.	7785	*Stylidium repens (Matted Triggerplant)*			
636.	7798	*Stylidium schoenoides (Cow Kicks)*			
637.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			
638.	48297	*Styphelia filifolia*		P3	
639.	2329	*Synaphea spinulosa*			
640.	15532	*Synaphea spinulosa subsp. spinulosa*			
641.	1036	*Tetraria octandra*			
642.	48341	*Tetratheca hirsuta subsp. viminea*			
643.	1702	*Thelymitra campanulata (Shirt Orchid)*			
644.	1319	*Thysanotus arenarius*			
645.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
646.	1343	*Thysanotus patersonii*			
647.	1351	*Thysanotus sparteus*			
648.	1357	*Thysanotus thyrsoideus*			
649.	1358	*Thysanotus triandrus*			
650.	6280	*Trachymene pilosa (Native Parsnip)*			
651.	1481	*Tribonanthes australis*			
652.	4383	*Tribulus terrestris (Caltrop)*	Y		
653.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
654.	1363	*Tricoryne tenella*			
655.	17542	*Trifolium arvense var. arvense*	Y		
656.	4292	*Trifolium campestre (Hop Clover)*	Y		
657.	4298	*Trifolium hirtum (Rose Clover)*	Y		
658.	98	*Typha domingensis (Bulrush, Djandjid)*			
659.	99	*Typha orientalis (Bulrush, Cumbungi)*			
660.	8255	*Ursinia anthemoides (Ursinia)*	Y		
661.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
662.	7158	*Utricularia volubilis (Twining Bladderwort)*			
663.	8257	*Vellereophyton dealbatum (White Cudweed)*	Y		
664.	7666	*Verreauxia reinwardtii (Common Verreauxia)*			
665.	15432	*Verticordia densiflora var. densiflora*			
666.	6077	*Verticordia drummondii (Drummond's Featherflower)*			
667.	12422	*Verticordia eriocephala (Common Cauliflower)*			

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668.	6101	*Verticordia nitens (Morrison Featherflower, Kodjeningara)*			
669.	6103	*Verticordia ovalifolia*			
670.	11474	*Vicia sativa subsp. nigra*	Y		
671.	4325	*Viminaria juncea (Swishbush, Koweda)*			
672.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
673.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
674.	7389	*Wahlenbergia preissii*			
675.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
676.	13333	*Waitzia suaveolens var. suaveolens*			
677.	14544	*Xanthorrhoea brunonis subsp. brunonis*			
678.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
679.	6289	*Xanthosia huegelii*			
680.	1049	*Zantedeschia aethiopica (Arum Lily)*	Y		

Protozoa

681.	39018	*Didymium bahiense*			
682.	39079	*Physarum viride*			
683.	39094	*Trichia affinis*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX C

EPBC PMST Report

Australian Government
Department of the Environment and Energy

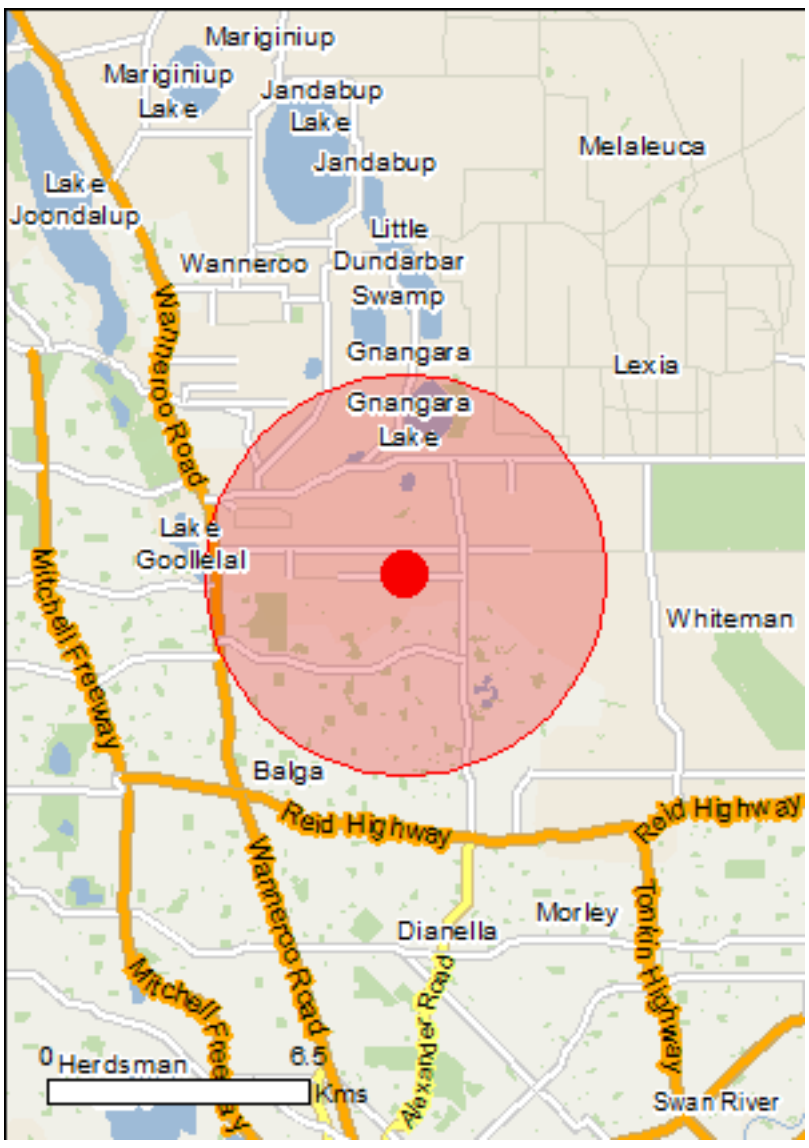
EPBC Act Protected Matters Report

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.

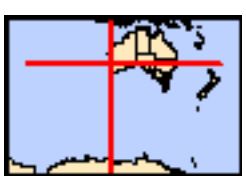
Report created: 02/10/17 17:00:52



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 5.0Km



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:	1
Listed Threatened Species:	22
Listed Migratory Species:	10

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:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	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:	2
Regional Forest Agreements:	None
Invasive Species:	41
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 likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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 likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Anigozanthos viridis subsp. terraspectans		
Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
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 likely to occur within area
Eleocharis keigheryi		
Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
Grevillea curviloba subsp. incurva		
Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum		
Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696)		
Selena's Synaphea [82881]	Critically Endangered	Species or species habitat may occur within area
Thelymitra dedmaniarum		
Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat likely to occur within area
Trithuria occidentalis		
Swan Hydatella [42224]	Endangered	Species or species habitat likely to 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		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to 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 likely to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
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 likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to 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 likely 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 likely to 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 likely to 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 likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to 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
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Unnamed WA46756	WA
Unnamed WA50514	WA

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

Name	Status	Type of Presence 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
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		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
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,		Species or species

Name	Status	Type of Presence
Florist's Smilax, Smilax Asparagus [22473]		habitat likely to occur within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		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
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to 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 within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk,		Species or species

Name	Status	Type of Presence
Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		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

-31.81765 115.86349

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 D

Flora and Fauna Likelihood Assessments

Taxa	State Status	EPBC Status	Likelihood
Grand Spider Orchid *(Caladenia huegelii)*	Threatened	Endangered	Unlikely
Blue Tinsel Lily (*Calectasia cyanea)*	Threatened	Critically Endangered	Possible
Native Foxglove (*Dasymalla axillaris)*	Threatened	Critically Endangered	Unlikely
Slender Andersonia *(Andersonia gracilis)*	Threatened	Endangered	Unlikely
Dwarf Kangaroo Paw (*Anigozanthos viridis subsp. terraspectans)*	Threatened	Vulnerable	Unlikely
Dwarf Hammer-Orchid *(Diuris micrantha)*	Threatened	Vulnerable	Unlikely
Purdie's Donkey Orchid (Diuris purdiei)	Threatened	Endangered	Unlikely
Glossy-leafed Hammer Orchid (*Drakaea elastica)*	Threatened	Endangered	Unlikely
Keighery's Eleocharis (*Eleocharis keigheryi)*	Threatened	Vulnerable	Unlikely
Narrow Curved-Leaf Grevillea *(Grevillea curviloba subsp. incurva)*	Threatened	Endangered	Unlikely
Selena's Synaphea *(Synaphea sp. Fairbridge)*	Threatened	Critically Endangered	Unknown
Cinnamon Sun Orchid (*Thelymitra dedmaniarum)*	Threatened	Endangered	Unlikely
Beaked Lepidosperma (*Lepidosperma rostratum)*	Threatened	Endangered	Unlikely
Swan Hydatella (*Trithutia occidentalis)*	Threatened	Endangered	Unknown
Chamelaucium sp. Gingin	Threatened	Endangered	Unlikely
Muchea Bell (*Darwinia foetida)*	Threatened	Critically Endangered	Unlikely
Baeckea sp. Limestone	Priority 1	-	Possible
Drosera x sidjamesii	Priority 1	-	Unlikely
Stachystemon sp. Keysbrook	Priority 1	-	Unlikely
Amphibromus vickeryae	Priority 1	-	Unlikely
Melaleuca sp. Wanneroo	Priority 1	-	Unlikely

Taxa	State Status	EPBC Status	Likelihood
Acacia benthamii	Priority 2	-	Possible
Tetraria sp. Chandala	Priority 2	-	Unlikely
Thelymitra variegata	Priority 2	-	Unlikely
Amanita carneiphylla	Priority 3	-	Unlikely
Cyathochaeta teretifolia	Priority 3	-	Unlikely
Amanita fibrillopes	Priority 3	-	Unlikely
Dampiera triloba	Priority 3	-	Unlikely
Styphelia filifolia	Priority 3	-	Possible
Pimelea calcicola	Priority 3	-	Unlikely
Sarcozona bicarinata	Priority 3	-	Unlikely
Schoenus griffinianus	Priority 4	-	Unlikely
Drosera occidentalis subsp. occidentalis	Priority 4	-	Unlikely
Stylidium longitubum	Priority 4	-	Unlikely
Jacksonia sericea	Priority 4	-	Likely
Anigozanthos humilis subsp. chrysanthus	Priority 4	-	Possible
Hibbertia helianthemoides	Priority 4	-	Unlikely
Verticordia lindleyi subsp. lindleyi	Priority 4	-	Unlikely

TAXA	STATE STATUS	EPBC STATUS	LIKELIHOOD
Red Knot (*Calidris canutus*)	Threatened	Endangered	Unlikely
Curlew Sandpiper (*Calidris ferruginea)*	Threatened	Critically Endangered	Unlikely
Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso)*	Threatened	Vulnerable	Possible
Carnaby's Cockatoo *(Calptorhynchus latirostris*)	Threatened	Endangered	Possible
Baudin's Cockatoo (*Calyptorhynchus baudinii)*	Threatened	Vulnerable	Possible
Malleefowl (Leipoa ocellata)	Threatened	Vulnerable	Unlikely
Eastern Curlew (*Numenius madagascariensis)*	Threatened	Critically Endangered	Unlikely
Australian Painted Snipe (*Rostratula australis)*	Threatened	Endangered	Unlikely
Chuditch (*Dasyurus geoffroii)*	Threatened	Vulnerable	Unlikely
Western Ringtail Possum *(Pseudocheirus occidentalis)*	Threatened	Vulnerable	Unlikely
Fork Tailed Swift *(Apus pacificus)*	-	Marine/Migratory	Unlikely
Rainbow Bee-eater *(Merops ornatus)*	International Agreement	Marine	Possible
Peregrine Falcon *(Falco peregrinus)*	Other Specially Protected Fauna	-	Unlikely
Masked Owl (*Tyto novaehollandiae novahollandiae)*	Priority 3	-	Unlikely
Black Striped Snake *(Neelaps calonotus)*	Priority 3	-	Unlikely
Australian Little Bittern *(Ixobryhcus dubius)*	Priority 4	-	Unlikely
Western Brush Wallaby (*Macropus irma)*	Priority 4	-	Unlikely
Graceful Sunmoth (*Synemon gratiosa)*	Priority 4	-	Likely

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