360 environmental

Lots 11 and 700 Mandurah Road, Karnup

Application for a Native Vegetation Clearing Permit – Area Permit

Prepared for:
Rockingham Montessori School

November 2017

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1 Introduction

360 Environmental Pty Ltd (360 Environmental) was commissioned by Rockingham Montessori School to prepare a Native Vegetation Clearing Permit (NVC) application to facilitate the development of a Montessori School at Lots 11 and 700 Mandurah Road, Karnup (the Proposal) (Figure 1). The development will require the clearing of 5.70 ha of to facilitate the construction of the Montessori School and to satisfy bushfire protection requirements (Figure 2).

Lots 11 and 700 are currently zoned 'Rural' under the Metropolitan Region Scheme (MRS). Lot 11 is zoned 'Rural' and Lot 700 is zoned 'Special Rural' under the City of Rockingham's Town Planning Scheme No. 2 (TPS 2).

1.1 Purpose of Document

The purpose of this document is to present the results of an assessment of the clearing aspects of the Proposal 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 Proposal based on the best available data. This NVCP will be submitted to the DER for assessment.

1.2 Responsible Person

Rockingham Montessori School is responsible for 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 within Lot 11 and 700 Mandurah Road, Karnup situated approximately 12.6 km south east from Rockingham City Centre and approximately 48.5 km south of Perth's Central Business District (CBD) (Figure 1). The Lot covers 10.43 ha, of which the Proposed Disturbance Area covers 5.70 ha to be cleared of vegetation (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 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 Topography

The topography of the Site ranges from undulating to hilly with slopes increasing from 5 m AHD to 28 m AHD west to east within Lot 700. The topography of Lot 11 ranges from 7 m AHD to 37 m AHD, with elevation increasing towards the centre and eastern portions of the Lot.

2.3 Geology

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

- **Safety Bay Sand:** Unlithified sand of mollusc and foram fragments, quartz and heavy mineral grains; and
- **Tamala Limestone:** Unconsolidated to strongly lithified calcarenite with calcrete/kankar soils, Aeolian. Locally quartzrose, feldspathic or heavy mineral bearing.

Soil subsystems mapping identified that the Site is within the following soil subsystems (Figure 3) (DAFWA 2012):

- **211Qu_Qf2, Quindalup South Qf2 Phase:** Relict foredunes and gently undulating beach ridge plain with deep uniform calcareous sands;
- **211Qu_Qp2, Quindalup South Qp2 Phase:** Long walled discrete parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening;
- **211Sp_S1d, Spearwood S1d Phase:** Dune ridges with rare limestone outcrop and slopes at 3 – 20 % occurring on the eastern slipface and moderately deep to very deep brown siliceous yellow-brown sands; and

- **211Sp_S1b, Spearwood S1b Phase:** Dune ridges with slopes up to 15% and deep siliceous yellow-brown sands or pale sands with yellow-brown subsoil.

2.4 Broad Vegetation Associations

Mapping of the vegetation of the Perth of WA 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 998:** Medium woodland; Tuart
- **Rockingham 3048:** Shrublands; scrub-heath on the Swan Coastal Plain

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 – Swan Coastal Plain				
Beard Veg Assoc. No. 998	50,867.50	18,523.20	36.41	45.91
Beard Veg Assoc. No. 3048	10,417.99	3,060.60	29.38	27.98
In IBRA Region SWA02				
Beard Veg Assoc. No. 998	50,867.50	18,523.20	36.41	45.91
Beard Veg Assoc. No. 3048	10,417.99	3,060.60	29.38	27.98
Local Government Authority – City of Rockingham				
Beard Veg Assoc. No. 998	5,319.33	1,742.72	32.76	-
Beard Veg Assoc. No. 3048	9,147.49	2,721.98	29.76	28.82

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). The Site is considered to be constrained as it is within the Perth MRS 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.

2.5 Hydrology

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. Department of Parks and Wildlife's (DPaW) Geomorphic Wetlands dataset identifies no wetlands occurring on or within the immediate vicinity of the Site. The nearest geomorphic wetland is classified as 'Multiple Use' and located approximately 240 m to the east of the Site (DPaW 2017a) (Figure 5).

The Site is not located within or in the vicinity of any Public Drinking Water Source Areas (PDWSA) (DoW 2016).

Groundwater levels range between 5.0 m to 33.0 m below ground level (mbgl) across the Site (DWER 2017). The Perth Groundwater Map has identified the Site as having 'marginal' salinity levels between 500 and 1000 mg/L TDS (DWER 2017).

2.6 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 entirely within the extent of an ESA (Figure 6). The proposal is therefore not eligible for a clearing permit exemption (DER 2017).

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).

No Ecological Linkages intersect the Site, however, one Ecological Linkage (ID: 76) is located approximately 60 m to the west of the Site (PBP 2008) (Figure 6).

2.7 Climate

The nearest official Bureau of Meteorology (BoM) weather station currently in operation is the Medina Research Centre (Station number 009194) located approximately 19 km north of the Site. The climate is described as warm Mediterranean with warm summers and cold winters. The annual mean maximum temperature is 24.5°C and the mean annual mean minimum temperature is 12.3°C. The annual average rainfall is 745.5 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 (then) Department of Parks and Wildlife (DPaW)'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	DPaW NatureMap search, 5 km radial search (DPaW 2017b)
TECs and / or PECs	EPBC Act PMST (DoEE 2017), 5 km radial search

3.2 Flora and Vegetation Field Survey

360 Environmental (2015) undertook a Level 2 Flora and Vegetation Survey on 13 November 2014. The Level 2 Flora and Vegetation Survey was 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;

- Identify, map and discuss the significance of any TECs, PECs and other areas of ecological importance; and
- Assess, map and describe the vegetation associations present.

A Targeted Flora Survey was undertaken for Lot 11 on 6 October 2017 with the following objectives:

- Search for, identify and photograph conservation significant flora species, in particular *Caladenia huegelii*, *Drakaea micrantha* and other species identified during the 2014 survey;
- Document and map the locations of any conservation significant flora; and
- Estimate population size.

3.3 Black Cockatoo Habitat Assessment

A Black Cockatoo Habitat Assessment was undertaken by 360 Environmental on Lot 11 in November 2014 and Lot 700 in February 2015. The survey included an assessment of the potential breeding and foraging habitat for Black Cockatoos. The assessment also comprised of a significant tree survey which involved the identification of suitable species with a Diameter at Breast Height (DBH) that exceeds 500 mm. These species' locations, species type, number of hollows and other descriptive information were recorded.

The Black Cockatoo Assessment involved traversing the Survey Area by foot and trees meeting the following criteria for potential breeding were recorded, marked and electronically logged using a handheld Global Positioning System (GPS) unit:

- Native trees (e.g. Tuart, Jarrah, Marri etc.);
- Diameter at Breast Height (DBH) > 500 mm (300 mm for Wandoo and Salmon Gum); and
- Hollows > 120 mm diameter.

The Black Cockatoo assessment also involved assessing the habitat for tree and shrub species known to be important dietary items and included looking for:

- Evidence of feeding (chewed cones, seed and nut materials); and
- Opportunistic observations of Black Cockatoos in the Survey Area.

4 Results

4.1 Database Results

4.1.1 Flora

A review of the database searches (as described in Table 2) identified 17 conservation significant flora potentially occurring within the vicinity of the Site. Of these, seven are classed as Threatened, two as Priority 2, five as Priority 3 and three as Priority 4. The likelihood of these 17 conservation significant flora occurring within the Site is shown in Appendix D of this report.

4.1.2 Fauna

The NatureMap Report identified 15 conservation significant fauna species as potentially occurring within a 5 km radius of the Site (DPaW 2017b). Of these, four are listed as Threatened (Bush Tail Bettong, *Bettongia pencillata. ogilbyi*; Forest Red-tailed Black Cockatoo, *Calyptorhynchus banksii naso*; Carnaby's Cockatoo, *Calyptorhynchus latirostris*; Loggerhead Turtle, *Caretta caretta),* seven are listed under an International Agreement (*Common Sandpiper, Actitis hypoleucos; Eastern Great Egret*, *Ardea modesta;* Sanderling, *Calidris alba*; Red-necked Stint, *Calidris ruficollis;* Bar-tailed Godwit, *Limosa lapponica;* Rainbow Bee-eater, *Merops ornatus;* Grey Sand Plover, *Pluvialis squatarola*), three are Priority 4 (Southern Brown Bandicoot, *Isoodon obesulus*; Quenda, *Isoodon obesulus fusciventer;* Graceful Sun-moth, *Synemon gratiosa*) and one Priority 3 (Lined Skink, *Lerista lineata)* (DPaW 2017b).

The PMST search identified 29 conservation significant fauna species under the EPBC Act within a 5 km radius from the centre of the Site. This includes three Critically Endangered fauna species (Bar-tailed Godwit, *Limosa lapponica bauera*; Far Eastern Curlew, *Numenius madagascariensis*; Curlew Sandpiper, *Calidris ferruginea*), 17 Vulnerable species and nine Endangered species as listed in Appendix D (DotEE 2017).

4.2 Survey Results

4.2.1 Overview of Flora

A total of 59 taxa (including species, subspecies, varieties and forms) and 49 genera and 31 families were recorded in the Survey Area during the 2014 survey. The commonly occurring families were; Fabaceae (9 taxa), Poaceae (7 taxa), Proteaceae (5 taxa) and Asteraceae (5 taxa) (360 Environmental 2015). The flora inventory is provided in Appendix E of the Flora, Vegetation and Black Cockatoo Report in Appendix A of this report.

4.2.2 Flora of Conservation Significance

The review of the database searches identified 17 conservation significant flora species as potentially occurring within a 5 km radius of the Site and a likelihood assessment of the species occurring within the Site was undertaken (Appendix D). Two species were considered 'Likely' to occur due to the presence of suitable habitat and the close proximity to the Site of previous records. Four species were considered 'Possible' to occur and nine considered 'Unlikely'. 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 a lack of information on their preferred habitat or known closest record to the Site.

No Threatened species pursuant to the EPBC Act and/or gazetted as DRF pursuant to the WC Act were recorded during the 2014 survey (360 Environmental 2015).

The 2017 targeted flora survey was completed within the recommended season and optimum flowering period for the south-west botanical province for conservation significant species *Caladenia huegelii* and *Drakaea micrantha*. No Threatened or Priority flora species were present in the Survey Area during the 2017 survey (360 Environmental 2017; Appendix E).

4.2.3 Vegetation Associations

Three natural vegetation associations were described for the Site during the survey, a description of these associations are provided in Table 3 and Figure 7. The majority of the Proposed Disturbance Area is dominated by BaBm vegetation association (Figure 7) (360 Environmental 2015).

Table 3: Surveyed Vegetation Associations within the Site.

Vegetation Association Code	Name	Description	Extent (%)	Extent (ha)
BaBm	*Banksia attenuata*, *B. menziesii* woodland	Low open woodland of *B. attenuata* over tall shrubland of *Acacia rostellifera* over low open shrubland of *Kunzea glabrescens, Hemiandra pungens* and *Conostylis aculeata* over Grassland of **Ehrharta calycina.*	43.00	4.48
EgBa	*E. gomphocephala – Banksia* woodland	Woodland of *E. gomphocephala* over Tall Shrubland of *B. attenuata* and *B. menziesii* over Open Shrubland of *Hibbertia hypericoides* and *Kunzea glabrescens*, over Very Open Sedgeland of *Lepidosperma gladiatum,* over Grassland of **Ehrharta calycina.*	6.60	0.69
AsOa	*Acacia saligna,*	Tall Shrubland of *A. saligna* over Open Shrubland of *O. axilaris*, over	3.90	0.41

Vegetation Association Code	Name	Description	Extent (%)	Extent (ha)
	Olearia axilaris shrubland	Shrubland of *K. glabrescens*, *Scaevola thesioides* and *H. hypericoides* over Very Open Grassland of **E. calycina.*		
Ne	Non-endemic species	Non-endemic species and/or garden species and/or weedy tracks and/or revegetation	28.76	3.0
Cl	Cleared		17.74	1.85

*Site includes the Proposed Disturbance Area

4.2.4 Floristic Community Types

Statistical analysis and data interpretation of the survey results identified the following floristic community type (FCT) as occurring in the Survey Area (360 Environmental 2015):

- FCT21a: Central *Banksia attenuata – E. marginata* woodlands

As the Site contained low diversity of native species and covered a small area, the following FCTs have been inferred based on indicator species, soil types and landform position (360 Environmental 2015):

- FCT25: Southern *E. gomphocephala – Agonis flexuosa* woodlands; and
- FCT24: Northern Spearwood shrublands and woodlands.

All three of these 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 Disturbance Area ranges from 'Completely Degraded' to 'Good'. The majority in 'Completely Degraded' and 'Degraded' condition (1.97 ha and 1.42 ha respectively) (Figure 8). Portions of Lot 11 have been highly disturbed and has been subject to vegetation clearing associated with the building of a house, tracks and sheds as well as establishment of gardens and non-endemic revegetation. Lot 700 has limited native vegetation except for a couple of *Banksia attenuata*, *Conostylis aculeata* and *Acacia pulchella* that are interspersed with garden plants along the southern fence line. The property is used as a function centre with established tropical and landscaped gardens.

The average fire age of the vegetation was considered very old (> 12 years since last fire).

4.2.6 Threatened / Priority Ecological Communities

A search of the EPBC PMST and DPaW's TEC and PEC database has identified the following as occurring within a 5 km radius of the Site (DotEE 2017; 360 Environmental 2015):

- Sedgelands in Holocene dune swales of the southern Swan Coastal Plain Threatened Ecological Community (SCP19a); and
- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community.

The Sedgelands in Holocene dune swales of the southern Swan Coastal Plain TEC requires specific water regime requirements, and is typically found in coastal or wetland environments. Due to the Site's distance from the coast and the lack of wetland habitat, it is not likely that the Sedgelands in Holocene dune swales TEC will occur.

Desktop analysis of the survey results identified all three FCTs mentioned in section 4.2.4 are sub-communities of the TEC, Banksia Woodlands of the Swan Coastal Plain. Banksia Woodlands of the Swan Coastal Plain ecological community is listed as Endangered under the EPBC Act from 16 September 2016. Banksia Woodlands are significant as they contain a unique collection of plants and provide a vital habitat for the Carnaby's and Forest Red-tailed Cockatoos and the Chuditch (DotEE 2016).

Vegetation condition threshold mapping of the FCTs using the DotEE's Approved Conservation Advice for the Banksia Woodlands of the Swan Coastal Plain (2016) identified that the Site contains 2.22 ha of the Banksia Woodlands TEC, of which 0.84 ha is within the Proposed Disturbance Area proposed to be cleared (Figure 9).

4.2.7 Black Cockatoos

During the Black Cockatoo Assessment, potential foraging and breeding habitat was identified within the Site. Foraging habitat consisted of Tuart, *Banksia* and *Acacia*, all known dietary items of Black Cockatoos and potential breeding habitat consisted of Tuart (Johnstone & Kirkby 2011). No Black Cockatoos were observed or heard during the Survey.

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 three natural vegetation associations described in Section 4.2.3 are consistent with foraging habitat for the Black Cockatoo species (Figure 10). No direct or indirect evidence of foraging was recorded during the survey, suggesting that this Site may not be used extensively by the Black Cockatoos (360 Environmental 2015).

Black Cockatoo foraging habitat within the Site 5.40 ha and the Proposed Disturbance Area to be cleared contains 2.56 ha (Figure 10). The foraging habitat within the Proposed Disturbance Area ranges from 'Good' to 'Completely Degraded' condition (360 Environmental 2015).

Breeding Habitat

Black Cockatoos breed in large hollow-bearing trees, generally within woodlands or forests (Johnstone et al. 2013). The size of the tree can be a useful indication of the hollow-bearing potential. Trees of a suitable Diameter at Breast Height (DBH) are potentially important for maintaining breeding in the long-term, through maintaining the integrity of the habitat and allowing trees to provide future nest hollows. Maintaining the long term supply of trees of a size to provide suitable nest hollows is particularly important in woodland stands known to support Black Cockatoo breeding (DSEWPaC 2012).

The Black Cockatoo assessment identified the Site contains a total of seven Tuart trees (including one dead tree) with a DBH > 500 mm and are therefore considered potential breeding trees under the EPBC Act Black Cockatoo referral guidelines (DSEWPaC 2012) (Figure 10). None of these trees contained hollows, suggesting that the Site is not utilised by the Black Cockatoos for breeding. However, these potential breeding trees have the potential to develop hollows to be utilised by the Black Cockatoos in the future. Only one potential breeding tree is located within the Proposed Disturbance Area, the remaining six trees will be retained.

Although the Site contains suitable habitat important to all three threatened Black Cockatoo species, no Black Cockatoos were heard calling or observed flying overhead. In addition, no direct or indirect foraging evidence was recorded during the survey. This suggests that the site is not extensively used by the Black Cockatoos and therefore not a primary breeding or foraging habitat.

5 Environmental Management Measures and Rehabilitation

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

- Utilising existing access tracks rather than creating new tracks where possible;
- Appropriate speed limits will be set, signposted and adhered to on all site access roads to avoid fauna strike. Speed restrictions will apply in areas between dusk and dawn where there is a high risk of fauna/vehicle collision;
- Larger trees will be avoided where possible, mulching tractors will preferentially clear areas of shrubs and trees less than 100 mm DBH;
- Dieback and weed control will be in place to minimise the risk of spread or introduction of dieback or new weed species;
- Vegetation clearing will be scheduled to occur immediately before planned earthworks to minimise the potential for dust, where practicable;
- Disturbed areas and haul roads will be treated with dust suppressants (water trucks or chemical suppressants) especially in high risk areas and/or on during high risk days;
- 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; and
- Spill kits must be available on site while plant is onsite.

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 10 Clearing Principles

PRINCIPLE	ASSESSMENT
Principle (a) – Native vegetation should not be cleared if it comprises a high level of biological diversity	The PMST search with a 5km buffer from the centre of the Site and subsequent likelihood assessment was undertaken and identified 7 conservation significant flora species listed under the EPBC Act as potentially occurring within the Site. The search identified 5 Endangered flora species (Slender Andersonia, *Andersonia gracilis;* King Spider Orchid, *Caladenia huegelii;* Purdie's Donkey Orchid, *Diuris purdiei*; Glossy-leafed hammer orchid, *Drakaea elastica*; Beaked Lepidosperma, *Lepidosperma rostratum)* and two Vulnerable species (Dwarf Bee-orchid, *Diuris micrantha*; Dwarf Hammer Orchid, *Drakaea micrantha)* (DotEE 2017). A DPaW NatureMap Search was undertaken with a 5 km buffer from the centre of the Survey Area. The subsequent likelihood assessment identified 10 conservation significant flora species as potentially occurring on the Site. This identified two Priority 2 species (Thelymitra variegata; Acacia benthamii), five Priority 3 species *(Beyeria cinerea subsp. cinerea; Calandrinia oraria*; *Dillwynia dillwyniodes; Schoenus capillifolius; Sphaerolobium calcicola*) and four Priority 4 species (*Jacksonia sericea; Stylidium longitubum; Dodonaea hackettiana*) as potentially occurring within the Site (DPaW 2017b). A Level 2 Flora Survey was undertaken in Spring 2014 across an area of 10.43 ha that encompasses the Proposed Disturbance Area (5.70 ha). The survey identified a total of 59 flora taxa (including species, subspecies, varieties and forms) from 49 genera and 31 families across the Site. The commonly occurring families were; *Fabaceae* (9 taxa), *Poaceae* (7 taxa), *Proteaceae* (5 taxa) and *Asteraceae* (5 taxa) (360

PRINCIPLE	ASSESSMENT
	Environmental, 2015). The flora inventory is provided in Appendix A of the Flora, Vegetation and Fauna Report in Appendix A of this report. The Proposed Disturbance Area falls within the broad Shepherd vegetation mapping unit Spearwood 998: medium woodland, tuart (Figure 4). This unit has approximately 36.41 % of its pre-European vegetation extent remaining in the SWA02 sub-region (Government of Western Australia, 2016). The vegetation conditions within the Proposed Disturbance Area were 'Good' (0.84 ha), 'Degraded' (1.42 ha), 'Completely Degraded' (1.97 ha) and cleared (1.47 ha). The majority of the Proposed Disturbance Area is in 'Completely Degraded' condition (1.97 ha). A total of 0.84 ha of vegetation in 'Good' condition within the Proposed Disturbance Area will be cleared. The Site contains 2.22 ha of the Banksia Woodlands of the Swan Coastal Plain TEC and it is proposed that 0.84 ha of Banksia Woodlands TEC will be cleared to facilitate the development of the Site. As mentioned in the Flora and Vegetation report, most of the Site is highly disturbed and has low diversity of native species. A search of the (then) Department of Parks and Wildlife (DPaW) NatureMap database was carried out within a 5 km radius of the centre point of the Site and returned a total of 288 flora and of these one listed as Priority 2, five listed as Priority 3 and one listed as Priority 4. The search identified 167 fauna species (four listed as Threatened, seven listed under International Agreements, one as Priority 3, and 4 listed as Priority 4) (Appendix B). A search of the DotEE's PMST database was carried out within a 5 km radius of the centre point of the Site and returned seven flora taxon and eight fauna taxon as listed under the EPBC Act as potentially occurring within the Site (Appendix C).

PRINCIPLE	ASSESSMENT
	A likelihood assessment of DPaW's NatureMap and DotEE's PMST data, identified two species considered 'Likely' to occur due to the presence of suitable habitat and the close proximity to the Site of previous records. Four species were considered 'Possible' to occur and nine considered 'Unlikely'. 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 a lack of information on their preferred habitat or known closest record to the Site. However, during the 2014 Level 2 Flora and Vegetation Survey and the 2017 Targeted Flora Survey, no Threatened species pursuant to the EPBC Act and/or gazetted as DRF pursuant to the WC Act were recorded. The Site contains 5.40 ha of Black Cockatoo foraging habitat and seven potential Black Cockatoo breeding trees. However, the Proposed Disturbance Area only contains 2.56 ha of foraging habitat and one potential breeding tree to be cleared. In addition, there was a lack of foraging evidence recorded, the potential breeding trees contained no hollows and no Black Cockatoos were heard or observed during the survey. This indicates that the Site is not a primary breeding habitat and is not extensively utilised by the Black Cockatoo species. The vegetation within the Proposed Disturbance Area is 0.84 ha of 'Good' condition, 1.42 ha of 'Degraded' condition, 1.97 ha of 'Completely Degraded' condition and 1.47 ha is completely cleared. The Proposed Disturbance Area has been minimised to avoid the clearing of all vegetation in 'Good' condition within the Site and as such, only 0.84 ha of the total 2.30 ha in 'Good' condition will be cleared as part of the development. **Assessed Outcome:** May be at variance with this Principle.
Principle (b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the	The PMST search and a subsequent likelihood assessment identified six conservation significant fauna species listed under the EPBC Act as potentially occurring within the Site. The search identified two Endangered fauna species (Carnaby's Cockatoo, *Calyptorhynchus latirostris*; Brush-tailed Bettong, *Bettongia penicillata*), four Vulnerable fauna species (Forest Red-tailed Black Cockatoo; *Calyptorhynchus banksii naso*; Baudin's

PRINCIPLE	ASSESSMENT
maintenance of a significant habitat for fauna indigenous to Western Australia	Cockatoo, *Calyptorhynchus baudinii;* Chuditch, *Dasyurus geoffroii*; Western Ringtail Possum, *Pseudocheirus occidentalis*) and three listed as Marine/Migratory (Red-necked Stint, *Calidris ruficollis*; Rainbow Bee-eater, *Merops ornatus*; Grey Plover, *Pluvialis squatarola*) (DotEE 2017). The NatureMap search and subsequent likelihood assessment identified seven conservation fauna species as potentially occurring within the Site. Of these, one is listed as Priority 3 (Lined Skink, *Lerista lineata*), three listed as Priority 4 (Southern Brown Bandicoot, *Isoodon obesulus*; Quenda, *Isoodon obesulus fusciventer;* Graceful Sun Moth, *Synemon gratiosa*) and three listed under International Agreements (Red-necked Stint, *Calidris ruficollis*; Rainbow Bee-eater, *Merops ornatus*; Grey Plover, *Pluvialis squatarola).* The majority of the conservation significant fauna species identified in the PMST and NatureMap database searches included waders, water birds and marine species. However, these species were excluded from the likelihood assessment as they require specific wetland or coastal habitats. As the Site does not contain suitable habitat for these species and nearby habitats are separated by constructed roads and areas devoid of vegetation, they are not considered likely to impact on these species and have been omitted from further discussion. The Site contains approximately 5.40 ha of Black Cockatoo foraging habitat and seven potential Black Cockatoo breeding trees. The Proposed Disturbance Area contains 2.56 ha of Black Cockatoo foraging habitat consisting of *Banskia attenuata* and *B. menziesii* woodland considered suitable for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo. The Site contains a total of seven Black Cockatoo potential breeding trees of Tuart (*E. gomphocephala)*. All of the trees (including one dead tree) have a suitable DBH measuring between 570 mm and 830 mm. None of these potential breeding trees contained hollows. During the survey no Black Cockatoos were head calling or observed flying overhead and no evidence of foraging was identified. This suggests that the Site is not extensively utilised by Black Cockatoos. One potential breeding tree is within the Proposed Disturbance Area

PRINCIPLE	ASSESSMENT
	to be cleared and the remaining six potential breeding trees are located outside of the clearing footprint and will be retained. The Site is surrounded by rural land uses with urban residential encroaching areas to the south west. Mapping shows there are six Bush Forever Sites and Regional Reserves within a 4 km radius of the Site with areas ranging between 24 ha and 1617 ha (DoP 2014; Government of Western Australia 2000). These conservation areas have surveyed or inferred floristic community types (FCT) that are considered to be foraging habitat for Black Cockatoos and that are similar to the vegetation associations within the Site and Proposed Disturbance Area (Government of Western Australia 2000). The FCTs within these Bush Forever and Regional Reserves that are considered suitable Black Cockatoo habitat are mostly in 'Pristine' to 'Good' condition and include: • 29b Acacia shrublands over taller dunes; • 21a Central *Banksia attenuata – Eucalyptus marginata* woodlands; • Northern *Olearia axillaris – Scaevola crassifola* shrublands; • 24 Northern Spearwood shrublands and woodlands; • 25 Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands; and • 28 Spearwood *Banksia attenuata* or *B. attenuata* – Eucalyptus woodlands. The Proposed Development Area contains FCT 21a, 24 and 25. These conservation areas contain FCTs considered suitable Black Cockatoo foraging habitat that is in better condition and cover larger areas than the Proposed Disturbance Area. In addition, these Bush Forever Sites and Regional Reserves are vested by the Department of Biodiversity Conservation and Attractions (DBCA), Conservation Council of WA or the relevant Local Government Authority for long term protection and conservation of these sites. Given this, and the Proposed Disturbance Area contains 2.56 ha of foraging habitat and one Black Cockatoo

PRINCIPLE	ASSESSMENT
	potential breeding tree and no evidence of foraging was observed, it is not expected that the clearing of the native vegetation in this area will represent a significant loss of foraging or breeding habitat for the Black Cockatoos. The ground dwelling conservation significant fauna identified in the database searches include the Brush-tailed Bettong, Chuditch, Southern Brown Bandicoot and Quenda (DPaW 2017b; DotEE 2017). The presence of these fauna species is considered 'Possible' or 'Unlikely' to occur within the Proposed Disturbance Area. Should the species be present in the Proposed Disturbance Area, they are not likely to be significantly impacted by the Proposal. These fauna species are generally mobile and will use a larger area than the Proposed Disturbance Area for habitat use. The Site is also within a rural landscape with fragmented vegetation and fauna species are likely to be utilising the large Bush Forever Sites or DBCA Managed Lands within the vicinity of the Site. It is therefore not expected that the clearing of the vegetation within the Proposed Disturbance Area will have major impacts to fauna or fauna habitat. The clearing of 2.56 ha of Black Cockatoo foraging habitat that has no evidence of foraging is not likely to cause significant habitat loss for the species as larger surrounding areas have suitable habitat. **Assessed Outcome:** As the Proposal will involve the clearing of 2.56 ha of Black Cockatoo foraging habitat and one potential breeding tree, the Proposal may be at variance with this Principle. However, the removal of 2.56 ha and one tree of Black Cockatoo foraging and potential breeding habitat is not considered to represent a significant loss for the Black Cockatoos, given that the Site will retain 2.85 ha of foraging habitat and six potential breeding trees. In addition, the immediate surrounding area includes rural land uses and has fragmented vegetation and extensive superior habitat is available within a 4 km radius of the Site. The vegetation within the Proposed Disturbance Area is not considered necessary for the maintenance of significant habitat for the Black Cockatoos.

PRINCIPLE	ASSESSMENT
Principle (c) – Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora.	*Caladenia huegelii*, *Dillwynia dillwynoides*, *Sphaerolobium calcicola*, *Drakaea micrantha* and *Jacksonia sericea* are considered to potentially occur within the Survey Area due to the presence of suitable habitat and close proximity to previous records. Review of the flora inventory from the survey undertaken in November 2014 identified no Threatened species pursuant to the EPBC Act and/or gazetted as DRF pursuant to the WC Act were identified within the site. No Priority flora species listed by DBCA were recorded during this survey. The Targeted Flora Survey was undertaken in October 2017 during the optimum flowering period of the abovementioned species. No Threatened, DRF or Priority flora species were identified within the Site during the 2017 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 Proposal is unlikely to be at variance with this Principle.
PRINCIPLE	ASSESSMENT
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).	Using the condition thresholds under the DotEE's Approved Conservation Advice for the Banksia Woodlands TEC (2016), the Site contains 2.22 ha of the TEC and the Proposal will involve the clearing of 0.8 ha of this TEC within the Proposed Disturbance Area (Figure 9). Proposal involves the clearing of 0.84 ha (37 %) of the Banksia Woodlands TEC within the Site, it is considered likely to be at variance with this Principle. However, it is not considered a significant impact given small area of clearing and the retention of 1.38 ha (62 %) of the TEC outside of the Proposed Disturbance Area within the Site. In addition, the removal of 0.84 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 Reserves

PRINCIPLE	ASSESSMENT
	contain sub-communities of the Banksia Woodlands and are in mostly (> 60%) 'Excellent' to 'Good' condition (Government of Western Australia 2000; DotEE 2016): • FCT21a – Central *Banksia attenuata – Eucalyptus marginata* woodlands; • FCT24 – Northern Spearwood shrublands and woodlands; • FCT25 – Spearwood *Eucalyptus gomphocephala – Agonis flexuosa* woodlands; and • FCT28 – Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands. These surrounding conservation areas range between 24.3 ha and 1617.5 ha in size and are considered having a greater representation of the Banksia Woodlands TEC in better condition than the Site that are protected and maintained through conservation programs vested by the Local Government, Conservation Commission of WA or the DBCA (Government of Western Australia 2000). **Assessed Outcome:** As the vegetation within the Proposed Disturbance Area represents the Banksia Woodlands TEC it is likely that clearing will be at variance with this Principle. However, the clearing of 0.84 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.
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	One vegetation unit mapped by Shepherd et al. (2001) / Beard (1981) have been identified within the Proposed Disturbance Area: **Spearwoood 998**. Table 1 outlines the total remaining extent of this vegetation unit within the State, Swan Coastal Plain bioregion and the Perth IBRA subregion. Of the pre-European extent, approximately 36.41 % of the Spearwood 998 association is remaining within the Swan Coastal Plain 2 subregion, representing 18,523.20 ha. The EPA's Guidance Statement No. 33 has set a threshold for the retention of 10% of the pre-existing extent of native vegetation (EPA 2008). The Site is considered to be constrained as it is within the Perth MRS 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.

PRINCIPLE	ASSESSMENT
	The Proposed Disturbance Area covers an area of 5.70 ha and Lot 700 has very little native vegetation of *Banksia attenuata*, *Conostylis aculeata* and *Acacia pulchella* that are interspersed with garden plantings. Lot 11 is highly disturbed and has been subject to historical vegetation clearing associated with the construction of the residential dwelling, tracks, sheds and establishing gardens. Additionally, the condition of the vegetation ranges from 'Good' to 'Completely Degraded'. As the Site does not contain a significant amount of native vegetation, the clearing of the vegetation within the Proposed Disturbance Area is not considered to represent a significant loss in the context of the State/IBRA representation of the Spearwood 998 vegetation association. In addition, the vegetation condition of the Proposed Disturbance Area is mostly in 'Completely Degraded' to 'Degraded' condition (3.39 ha) with only 0.84 ha in 'Good' condition. **Assessed Outcome:** Clearing for the Proposal is not considered to have a significant impact on the State/IBRA region representation of the Spearwood 998 vegetation association. Additionally, the vegetation within the Proposed Disturbance Area is mostly in a 'Completely Degraded' to 'Degraded' condition and therefore the Proposal is unlikely to be at variance with this Principle.
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 Proposed Disturbance Area does not contain any watercourses or surface water features. Desktop mapping of DPaW's Geomorphic wetlands dataset has identified no geomorphic wetlands occurring within the Site or Proposed Disturbance Area. The nearest geomorphic wetland is located approximately 250 m east of the Site and is classified as a 'Multiple Use' wetland (MUW). MUW wetlands are described has having few remaining important ecological attributes and functions (DPaW 2015). No typical wetland indicator species were identified during the Flora and Vegetation survey within the Proposed Disturbance Area or within the property boundary.

PRINCIPLE	ASSESSMENT
	Assessed Outcome: The Site does not contain any vegetation associated with watercourses or wetlands and therefore the Proposal 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 degradation	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); • salinity; or • Waterlogging/flooding. The Proposed Disturbance Area does not contain high quality vegetation, with most of the vegetation completely cleared (1.47 ha) or in 'Completely Degraded' to 'Degraded' condition. 1.55 ha of vegetation in 'Excellent' to 'Good' condition will be retained within the balance of title. The sandy nature of the soils in the Site may cause some short term dust problems or localised wind erosion, dependent on the weather conditions as time of clearing. However, given that most of the Proposed Disturbance Area is in a degraded condition and consists of a relatively sparse understorey, erosion is not likely to be significantly elevated from the present state. Regardless, management measures will be implemented to ensure mobilisation of sand is mitigated, including dampening of soil if clearing is undertaken in dry months. The topography of the Site is generally gently sloping in the western portion of the Site and moderately undulating in the south-eastern portion. The elevation ranges between 7 m and 37 m AHD. The steepest areas of the Site have either been already cleared or are located outside of the Proposed Disturbance Area and

PRINCIPLE	ASSESSMENT
	therefore erosion is not considered to be a significant result of the Proposal. Excessive stormwater runoff within the Site is unlikely given the porous nature of the sandy soils within the Site. However, any potential 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 relatively elevated nature and porous sandy soils to allow infiltration. The Perth Groundwater Map has identified the Site as having 'marginal' salinity levels between 500 and 1000 mg/L TDS. The clearing area of 5.70 ha of vegetation mostly degraded vegetation is unlikely to significantly impact upon groundwater levels and is therefore unlikely to create increased salinity at the Site. Waterlogging and flooding are not considered to become an issue as the depth the groundwater ranges between 5.0 and 33.0 mbgl and the Site contains no surface water features. **Assessed Outcome:** The Proposal 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 Proposed Disturbance Area is not immediately adjacent to any conservation areas. The nearest conservation area is Bush Forever Site 356 located approximately 200 m north west of the Site (Figure 6). Bush Forever Site 356 and the Site are separated by a major road (Mandurah Road) and horse stables. Other nearby Bush Forever Sites are located in excess of 600 m from the Site (Figure 6). The activities associated with the Proposal will only be impacting the vegetation within the extent of the Proposed Disturbance Area. As the clearing associated with the Proposal is of vegetation in mostly 'Completely Degraded' and 'Degraded' condition, it is not expected that the Proposal will have a significant

PRINCIPLE	ASSESSMENT
	impact on the environmental values of the adjacent Bush Forever Site 356. The connectivity between the Proposed Disturbance Area and surrounding Bush Forever Sites are already highly fragmented from rural land uses and of minimal ecological value. It is not likely that the clearing within the Proposed Disturbance Area will impact on any nearby conservation areas. The nearby geomorphic 'Multiple Use' wetland is not likely to be impacted by the Proposal. This wetland exists over a road (Greenham Place) and aerials indicate that most of the vegetation within the extent of the wetland has been previously cleared and in a degraded state. The MUW wetland is also immediately adjacent to two Vineyards (Figure 11). It is not likely that the Proposal will impact upon any nearby wetlands. **Assessed Outcome:** The Proposal 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 approximately 745.5 mm as recorded at the nearest weather bureau station (Medina Research Centre), with most of the rain falling between June and August (BoM 2017). Given the porous nature of the sandy soil and the degraded condition of the vegetation on site, natural surface water hydrology is not likely to be significantly altered by the proposed clearing. The Site is not located within or in the vicinity of any Public Drinking Water Source Areas (PDWSAs) (DWER 2017). Mapping indicates that there are no watercourses or surface water features present within the Site. Regional groundwater mapping by the Department of Water and Environment Regulation (DWER) suggests that the depth to groundwater across the Site ranges from 5.0 m below ground level (mbgl) to 33.3 mbgl (DWER 2017). Groundwater bore mapping also indicates there are no drinking water production bores within the Site or Proposed Disturbance Area. Given the relatively small and degraded clearing area (5.70 ha) and the considerable distance to groundwater,

PRINCIPLE	ASSESSMENT
	the proposed action is unlikely to be at variance with this Principle. **Assessed Outcome:** The Proposal is unlikely to be at variance with this Principle.
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 that there are no known watercourses in the vicinity of the Site. The 100 Year ARI Floodplain Development Control Area mapping (DoW 2014) did not identify the Site as being located within a floodrisk area. Regional soil mapping indicates that the underlying soil profile of the Site is of a porous sandy nature (DAFWA 2012) and separation to groundwater is expected to range between 5.0 mbgl and 33.0 mbgl across the Site based on groundwater mapping (DWER 2017). These characteristics suggest that stormwater would be able to infiltrate without waterlogging and causing excessive runoff. In addition, much of the proposed clearing area is in a degraded condition and therefore any clearing in these areas is unlikely to significantly alter the current characteristics of the Site. The development of the Montessori School will also be in line with the DoW Guidelines for Better Urban Water Management (2008) to ensure the development will not alter the water regimes. It is therefore considered unlikely that the clearing of vegetation will cause or exacerbate the incidence of flooding. **Assessed Outcome:** The Proposal 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 Proposed Disturbance Area, it is considered that the proposal to clear a maximum area of 5.70 ha of vegetation which includes 2.56 ha of Black Cockatoo foraging habitat, one Black Cockatoo potential breeding tree and 0.84 ha of Banksia Woodlands TEC to facilitate the development of Rockingham Montessori School. The proposal may be at variance with three Clearing Principles (A, B and D).

The Proposed Disturbance Area is not a pristine area; it contains vegetation in mostly 'Completely Degraded' and 'Degraded' condition. The Proposed Disturbance Area has been highly disturbed due to historical vegetation clearing associated with the construction of a residential dwelling, tracks, sheds and the establishment of gardens.

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 Proposed Disturbance Area contains 5.70 ha of vegetation and one potential breeding tree considered suitable for Black Cockatoo foraging and potential breeding, it is not considered to be of high ecological value for the species compared to the quality and size of adjacent Bush Forever and Regional Reserves sites in a better condition than the site. The removal 2.56 ha of Black Cockatoo foraging habitat and one potential breeding tree within the Site 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. The entire Site contains 2.22 ha of Banksia Woodlands TEC. However, the majority of the Site is in a degraded condition, with only 0.84 ha of the TEC will be cleared, allowing 1.38 ha to remain in the balance of title. It is not considered that the removal of 0.84 ha of Banksia Woodlands TEC is significant for the maintenance of the TEC in a regional or Site context.

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 Proposal is considered to be of little biological diversity condition. The site supports fragmented patches of native vegetation in mostly 'Completely Degraded' to 'Degraded' condition and a large portion of the Site predominantly	May be at variance with Principle A.

CLEARING PRINCIPLE	SUMMARY OF ASSESSMENT	PROPOSED OUTCOME
	cleared. The proposal is unlikely to be at variance with this Principle.	
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.	One of seven Black Cockatoo potential breeding trees will be cleared, however, this is not considered to be significant for the maintenance of the species. The tree does not contain a hollow and therefore does not support breeding at present. Six of the seven potential breeding trees will be retained within the balance of title. In addition, only 2.56 ha of 5.40 ha Black Cockatoo foraging habitat will be cleared, which is mainly in 'Degraded' condition and 2.85 ha will be retained in the balance of title. There are several conservation areas (Bush Forever Sites and Reserves) within 4 km of the Site that may provide more suitable foraging and breeding habitat for the Black Cockatoo than the Site. The Proposed Disturbance Area is within a fragmented landscape and the clearing of Black Cockatoo potential breeding and foraging habitat is not considered to be significant to the species in a regional or Site context.	Likely to 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 flora.	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 recorded during the 2014 Flora and Vegetation Survey or the 2017 Targeted Flora Survey.	Unlikely to be at variance with Principle C.
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	The Proposed Disturbance Area contains 0.84 ha of Banksia Woodlands TEC. Most of the TEC within the balance of title will be retained (1.38 ha). In addition, several surrounding Bush Forever Sites contain the same or similar FCTs as the Site or	Likely to be at variance with Principle D.

CLEARING PRINCIPLE	SUMMARY OF ASSESSMENT	PROPOSED OUTCOME
Threatened Ecological Community (TEC).	FCTs listed as sub-communities of the Banksia Woodlands TEC. These areas range between 24.3 ha and 1617 ha and are considered to have a greater representation of the TEC in a better condition than the Site. In addition, the TEC within the Site is an isolated area within a highly fragmented and cleared landscape for rural purposes. It is not likely that the clearing will impact on the vegetation necessary for the maintenance of the TEC on a regional or local scale.	
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.	36.41 % of the Spearwood 998 vegetation association is remaining within the Swan Coastal Plain subregion, representing 18,523.20 ha. The clearing of 5.70 ha is not considered significant in a subregional context. In addition, the vegetation within the Proposed Disturbance Area is highly degraded.	Unlikely 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 wetland.	No surface water features, watercourses or wetlands exist within the Site and therefore unlikely to be at variance with this Principle.	Unlikely to be at variance with Principle F.
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 allow high infiltration rates and excessive stormwater runoff is unlikely. The Site is also not within any mapped risk of ASS. The Site also has 'marginal' salinity levels less than 1000 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.	Unlikely to be at variance with Principle G.
Principle (h) – Native	The nearest conservation area is Bush	Unlikely to be

CLEARING PRINCIPLE	SUMMARY OF ASSESSMENT	PROPOSED OUTCOME
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.	Forever Site 356 located approximately 200 m northwest of the Site seoerated by a main road and horse stables. As the surrounding environment is highly fragmented and cleared for intensive rural activities, the development of the school is not likely to impact on any nearby conservation areas.	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 and degraded clearing footprint and the considerable distance to groundwater, it is unlikely that the clearing of vegetation will cause deterioration of the quality of surface or 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, this suggests that stormwater will be able to infiltrate without waterlogging and causing excessive run off. Most of the Site is already in a fragmented and degraded state, 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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FIGURES

Legend

- Site Boundary (10.43 ha)
- Major Roads

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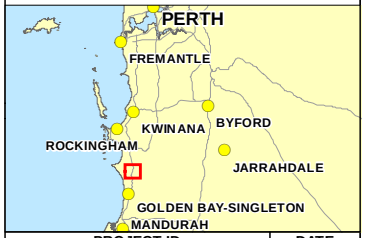
LOCALITY MAP



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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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Rockingham Montessori School
Lots 11 & 700 Mandurah Road, Karnup

Native Vegetation Clearing Permit

Figure 1
Project Location

K:\Projects\9.0 APP\785 Mandurah Road Karnup EAR\Figures\NVCP\785 NVCP Figure 1 Site Location.mxd

Legend

- Site Boundary (10.43 ha)
- Proposed Disturbance Area (5.70 ha)
- Major Roads

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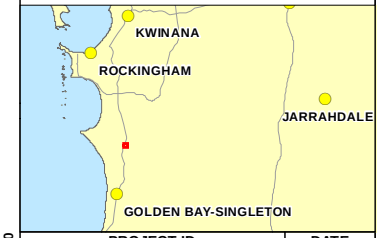

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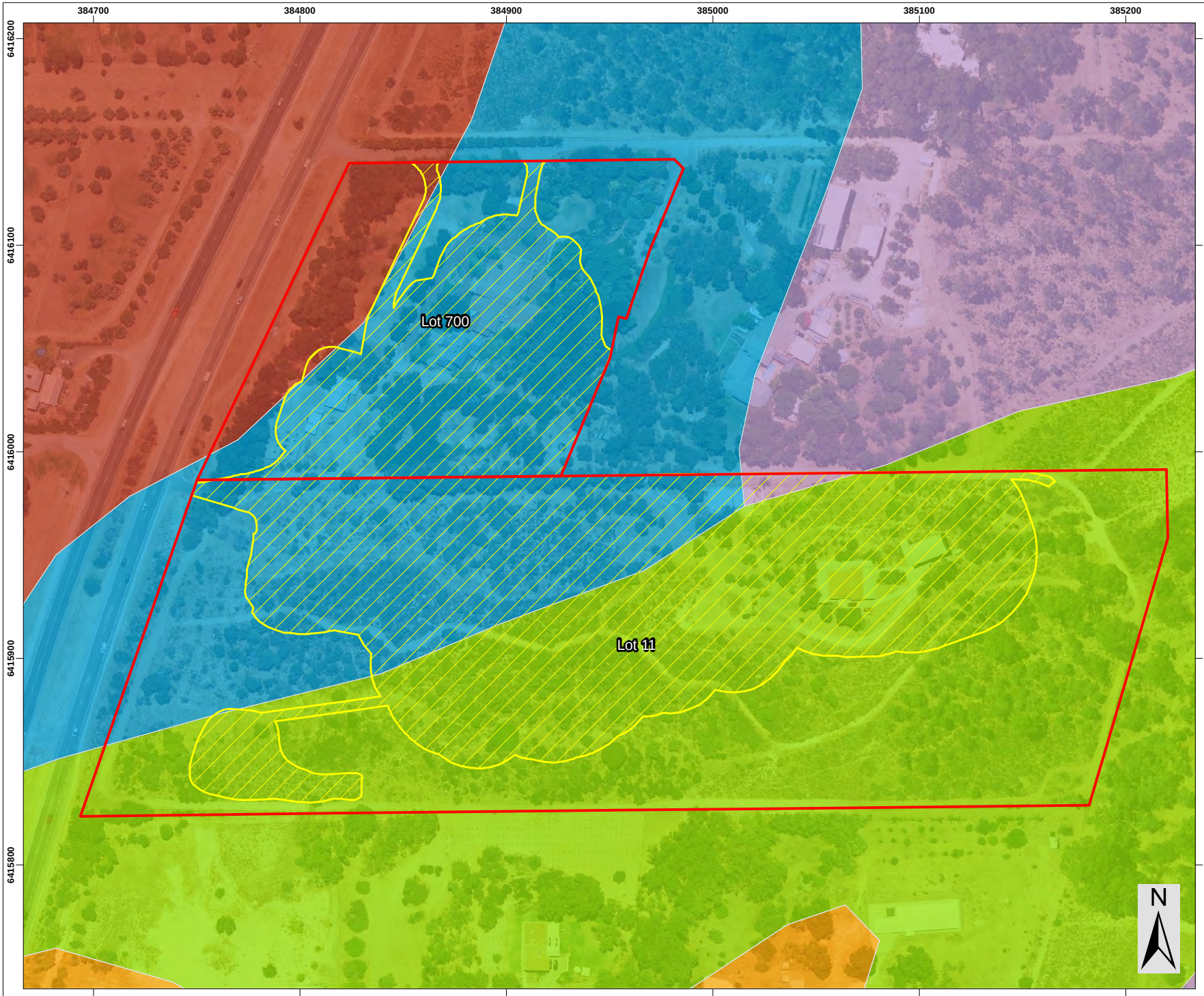
Figure 2
Proposed Disturbance Area

K:\Projects\9.0 APP\785 Mandurah Road Karnup EAR\Figures\NVCP\785 NVCP Figure 2 Proposed Disturbance Area.mxd



Legend

Site Boundary (10.43 ha)

Proposed Disturbance Area (5.70 ha)

Soil Subsystems

211Qu__Qf2: Relict foredunes and gently undulating beach ridge plain with deep uniform calcareous sands.

211Qu__Qp1: Complex of nested low relief parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening.

211Qu__Qp2: Long walled discrete parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening.

211Sp__S1b: Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.

211Sp__S1d: Dune ridges with moderately deep to very deep siliceous yellow-brown sands, rare limestone outcrop and slopes 3-20% occurring on the eastern slipface.

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- SOIL SUBSYSTEMS SOURCED DAFWA 2012
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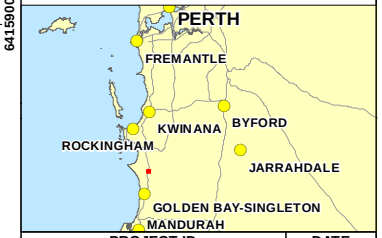
LOCALITY MAP



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Rockingham Montessori School
Lot 11 & 700 Mandurah Road, Karnup

Native Vegetation Clearing Permit

Figure 3
Soil Subsystems

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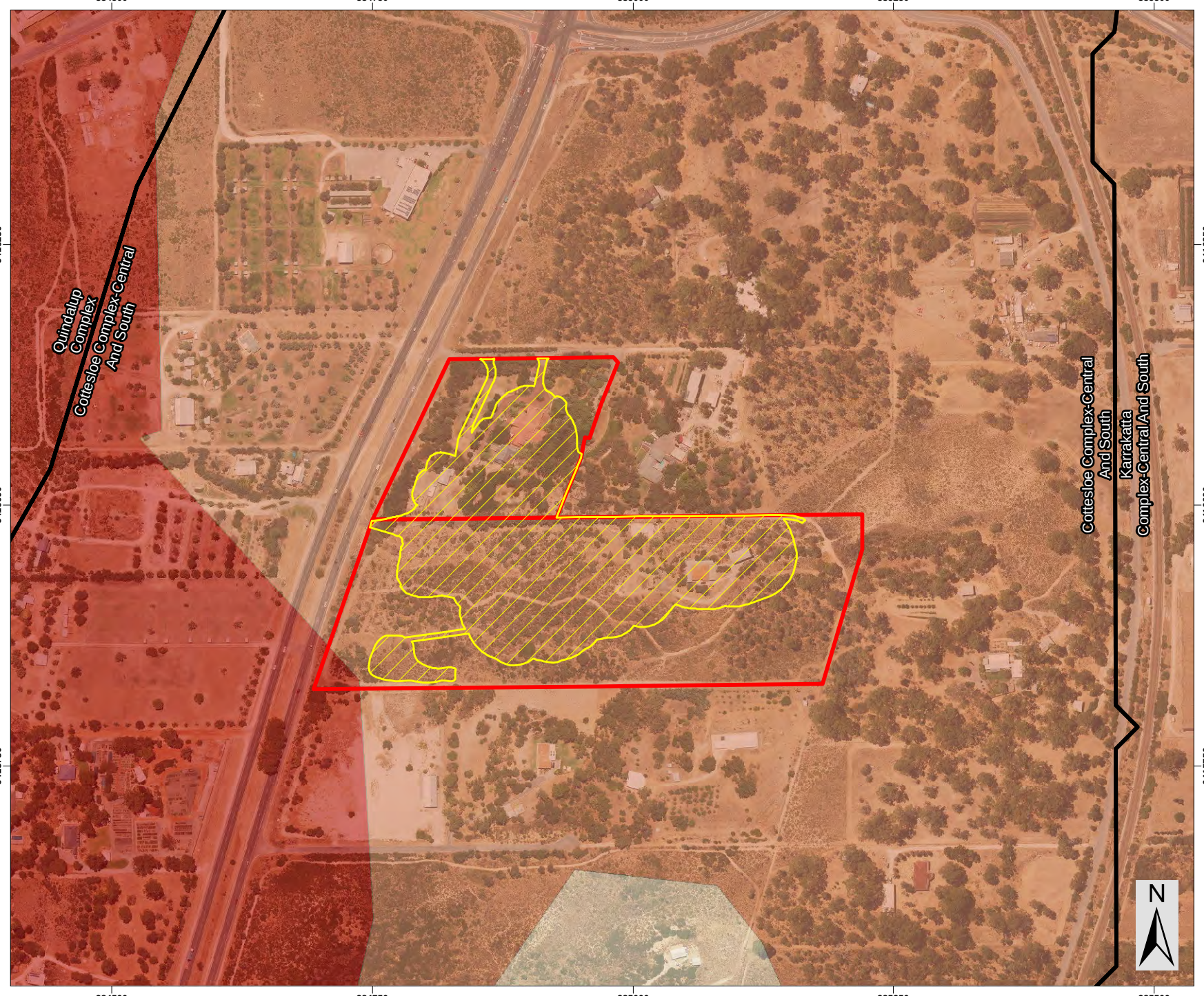

Legend

- Site Location (10.43 ha)
- Proposed Disturbance Area (5.70 ha)
- Heddle (1980) Vegetation Complexes

Pre-European Vegetation Complexes

- Rockingham: 3048
- Spearwood: 998
- Spearwood: 1001

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- PRE EUROPEAN VEGETATION SOURCED DAFWA 2012
- HEDDLE VEGETATION SOURCED CALM 1980

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LOCALITY MAP

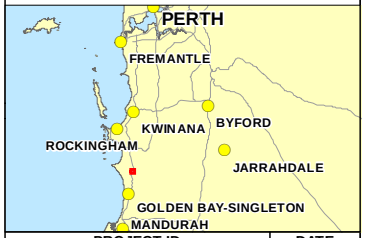

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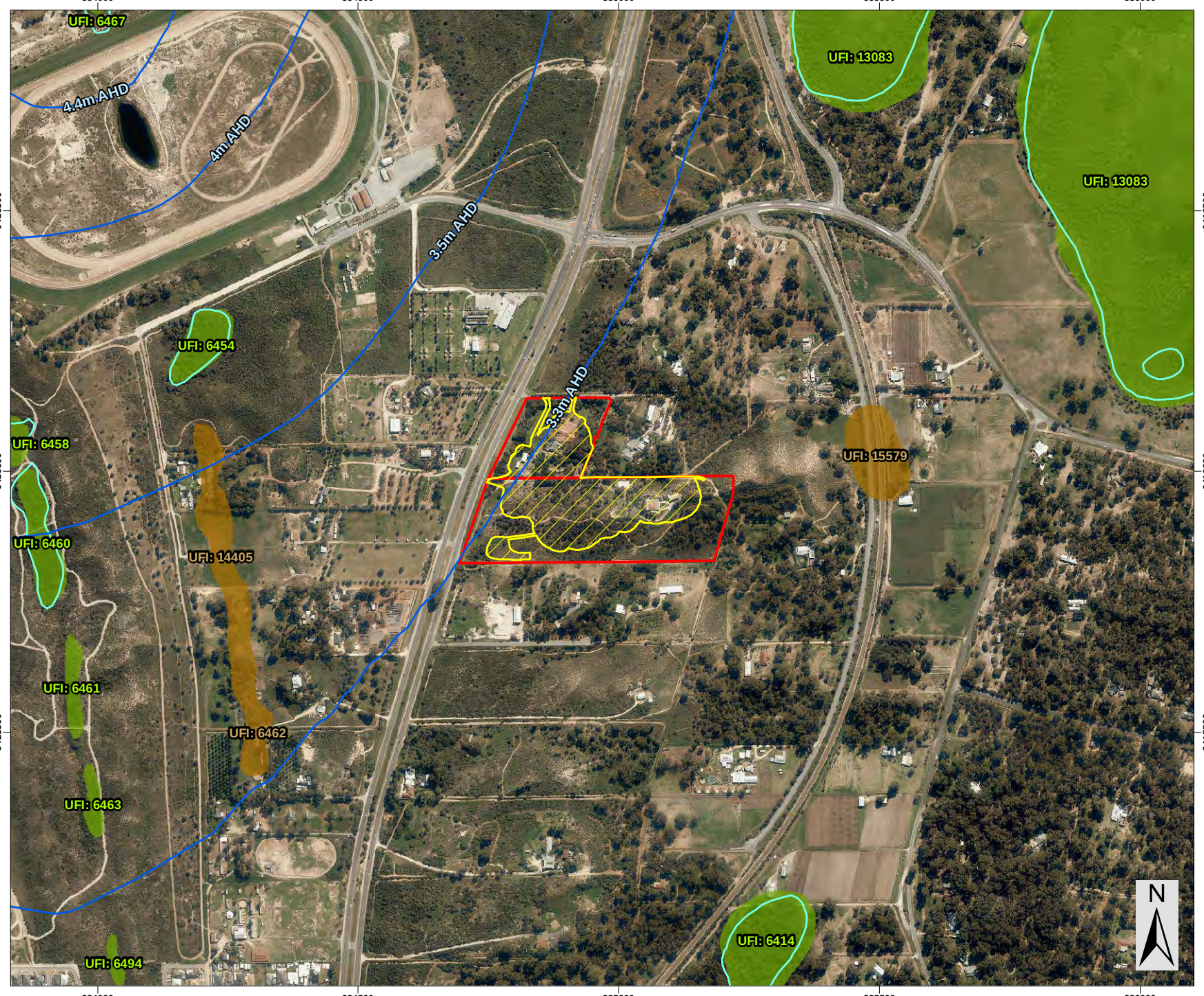
Figure 4
Broad Vegetation Associations



Legend

- Site Boundary (10.43 ha)
- Proposed Disturbance Area (5.70 ha)
- Major Roads
- Groundwater Contour (Max)

Surface Water Features

- Swamp (Perennial)

Geomorphic Wetlands

- Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed

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

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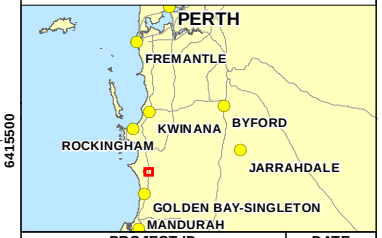

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Rockingham Montessori School
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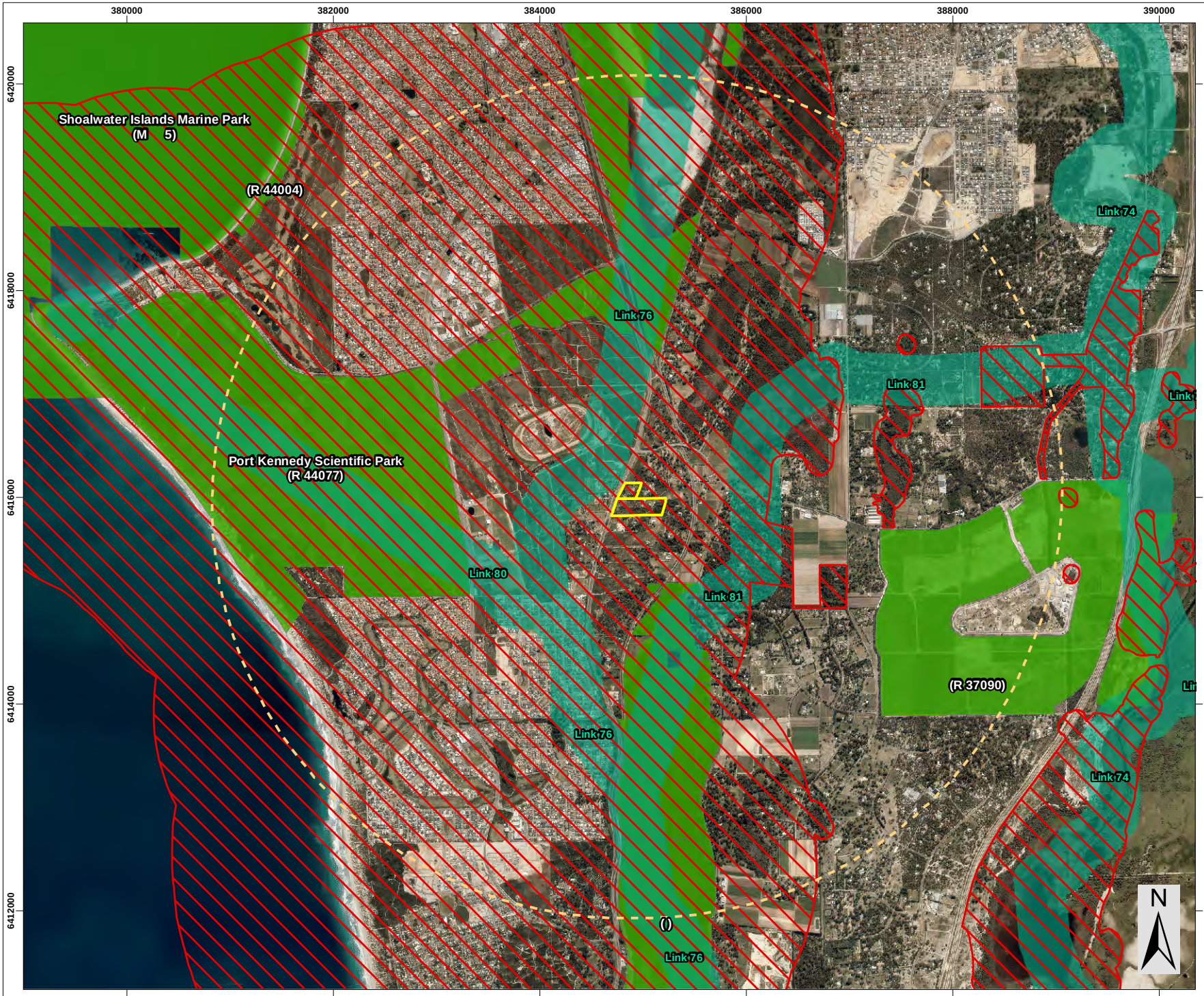
Figure 5
Hydrology



Legend

- Site Boundary (10.43 ha)
- 4km Buffer
- Bush Forever Sites
- DBCA Managed Lands
- Environmentally Sensitive Areas
- Perth Regional Ecological Linkages

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- BUSH FOREVER SITES SOURCED DOP 20
- ENVIRONMENTALLY SENSITIVE AREAS SOURCED DER 2015
- DPAW MANAGED LANDS SOURCED DPAW 2014
- PERTH REGIONAL ECOLOGICAL LINKAGES SOURCED WALGA 2014

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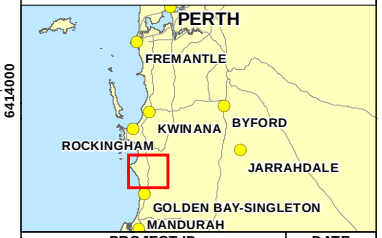
LOCALITY MAP



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Rockingham Montessori School
Lots 11 & 700 Mandurah Road, Karnup

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Figure 6
Conservation Areas

K:\Projects\9.0 APP\785 Mandurah Road Karnup EAR\Figures\NVCP\785 NVCP Figure 6 Conservation Areas.mxd

Legend

- Site Boundary (10.43 ha)
- Proposed Disturbance Area (5.70 ha)

Vegetation Associations

AsOa: Tall Shrubland of *Acacia saligna* over Open Shrubland of *Olearea axilaris*, over Shrubland of *Kunzea glabrescens*, *Scaevola thesioides* and *Hibbertia hypericoides* over Very Open Grassland of *Ehrharta calycina* (0.41 ha)

BaBm: Low Open Woodland of *Banksia attenuata* over Tall Shrubland of *Acacia rostellifera* over Low Open Shrubland of *Kunzea glabrescens*, *Hemiandra pungens* and *Conostylis aculeata* over Grassland of *Ehrharta calycina* (4.48 ha)

EgBa: Woodland of *Eucalyptus gomphocephala* over Tall Shrubland of *Banksia attenuata* and *Banksia menziesii* over Open Shrubland of *Hibbertia hypericoides* and *Kunzea glabrescens*, over Very Open Sedgeland of *Lepidosperma gladiatum*, over Grassland of *Ehrharta* (0.69 ha)

Ne: Non-endemic species and/or Garden species and/or weedy tracks and/or revegetation (3.00 ha)

Cl: Cleared (1.85 ha)

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

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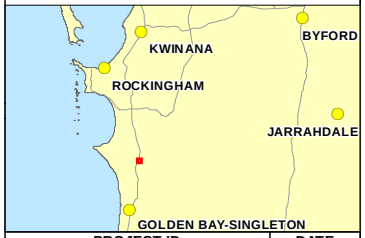
LOCALITY MAP



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Rockingham Montessori School
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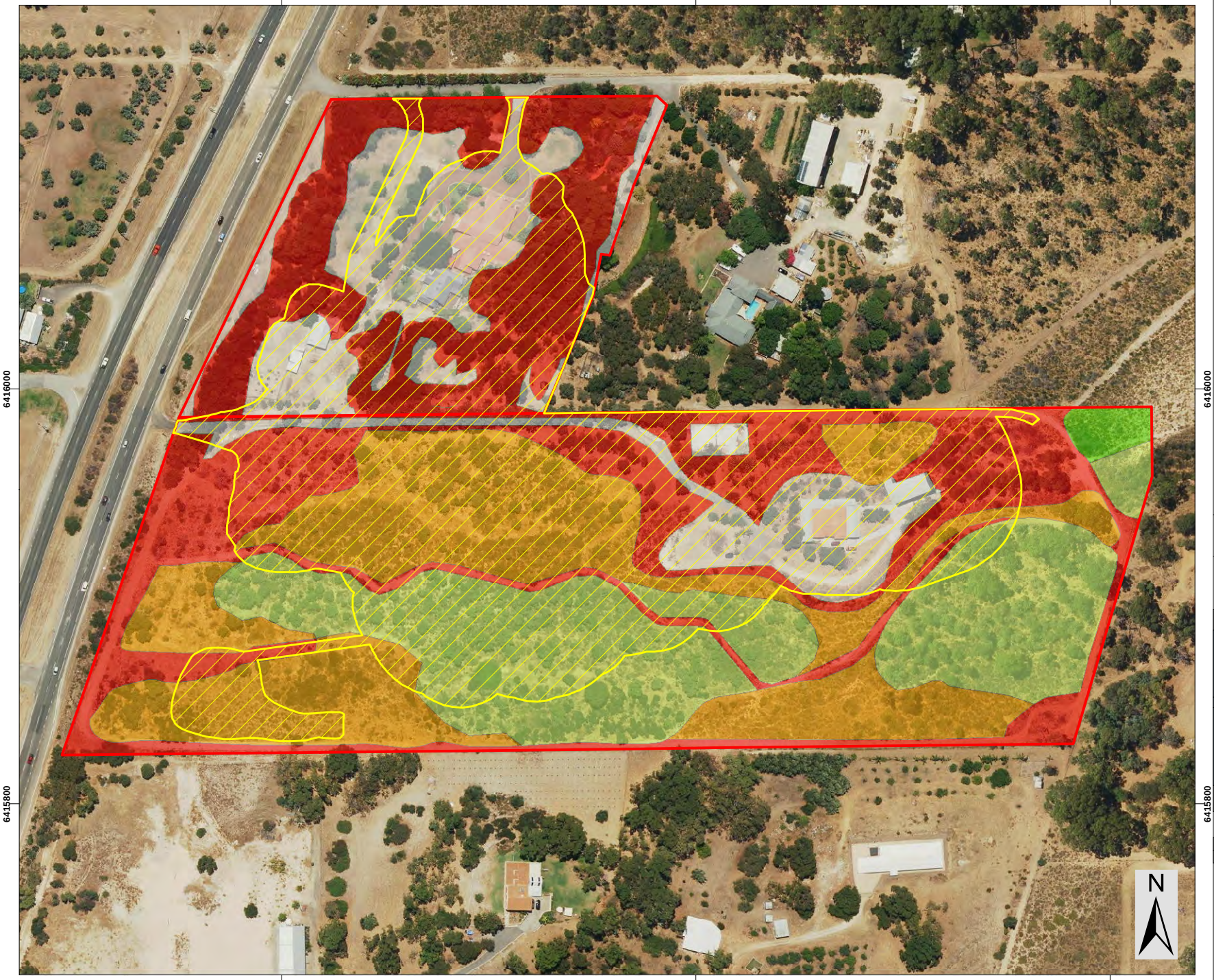
Figure 7
Surveyed Vegetation Associations

K:\Projects\9.0 APP\785 Mandurah Road Karnup EAR\Figures\NVCP\785 NVCP Figure 7 Surveyed Vegetation Associations.mxd



Legend

- Site Location (10.43 ha)
- Proposed Disturbance Area (5.70 ha)

Vegetation Condition (Project Area)

- Cleared (1.47 ha)
- Completely Degraded (1.97 ha)
- Degraded (1.42 ha)
- Good (0.84 ha)

Vegetation Condition (Remaining)

- Cleared (0.38 ha)
- Completely Degraded (1.62 ha)
- Degraded (1.18 ha)
- Good (1.46 ha)
- Excellent (0.09 ha)

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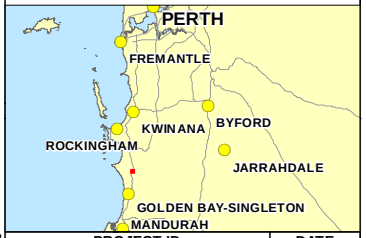
LOCALITY MAP



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Rockingham Montessori School
Lots 11 & 700 Mandurah Road, Karnup

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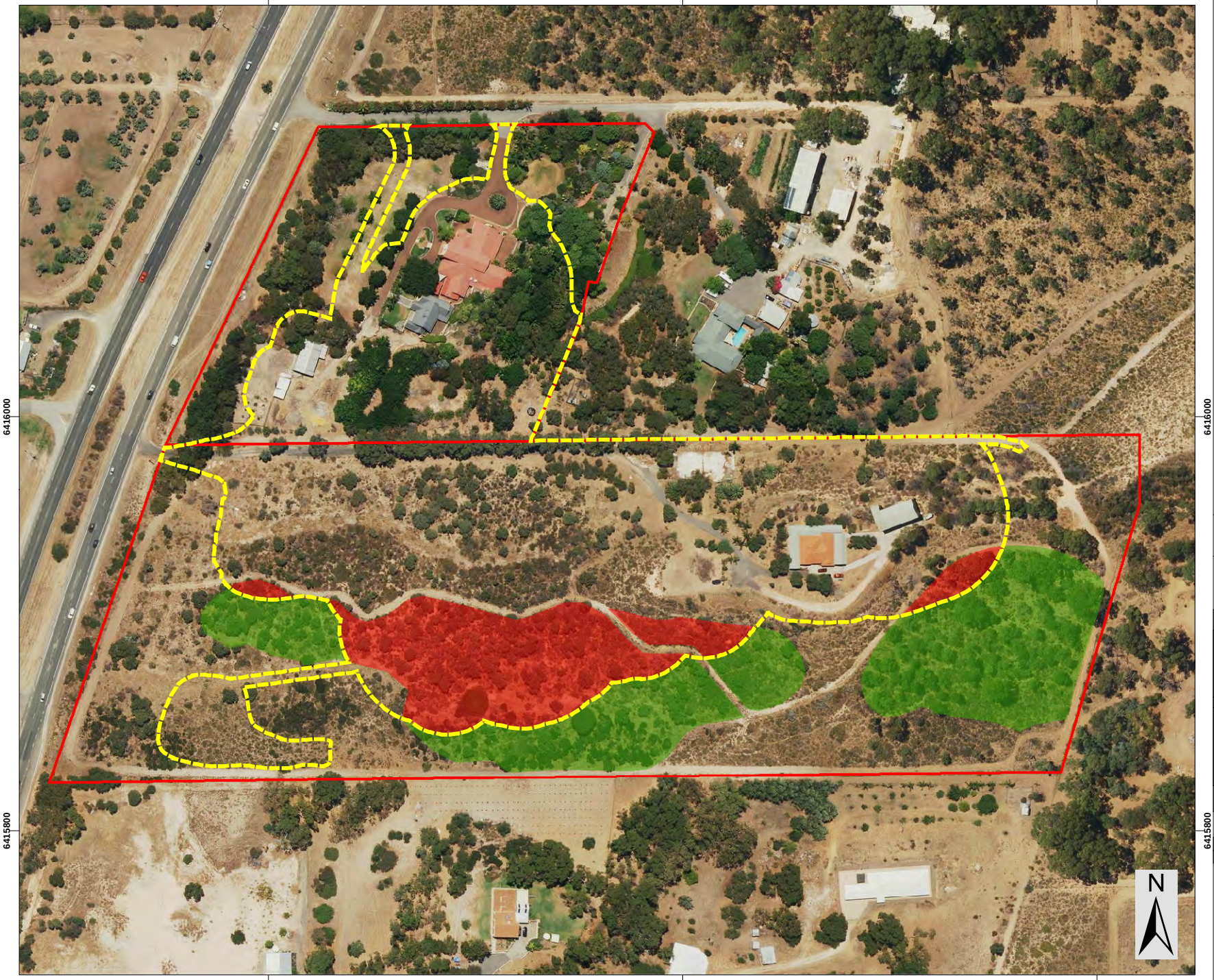
Figure 8
Vegetation Condition



Legend

- Site Location (10.43 ha)
- Proposed Disturbance Area (5.70 ha)

Banksia Woodlands

- **TEC:** Project Area (0.84 ha)
- **TEC:** Remaining (1.38 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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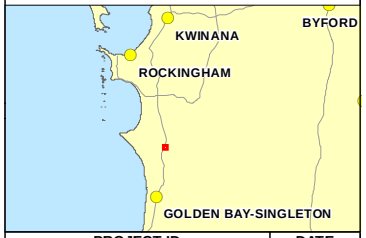
LOCALITY MAP



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Rockingham Montessori School
Lots 11 & 700 Mandurah Road, Karnup

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Figure 9
Banksia Woodlands TEC

Legend

- Site Boundary (10.43 ha)
- Proposed Disturbance Area (5.70 ha)

Black Cockatoo Foraging Habitat

- Project Area (2.56 ha)
- Remaining (2.85 ha)

Potential Breeding Trees

- *Eucalyptus gomphocephala*
- *Eucalyptus gomphocephela* (dead)

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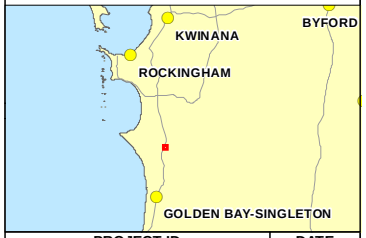
LOCALITY MAP



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Rockingham Montessori School Lots 11 & 700 Mandurah Road, Karnup

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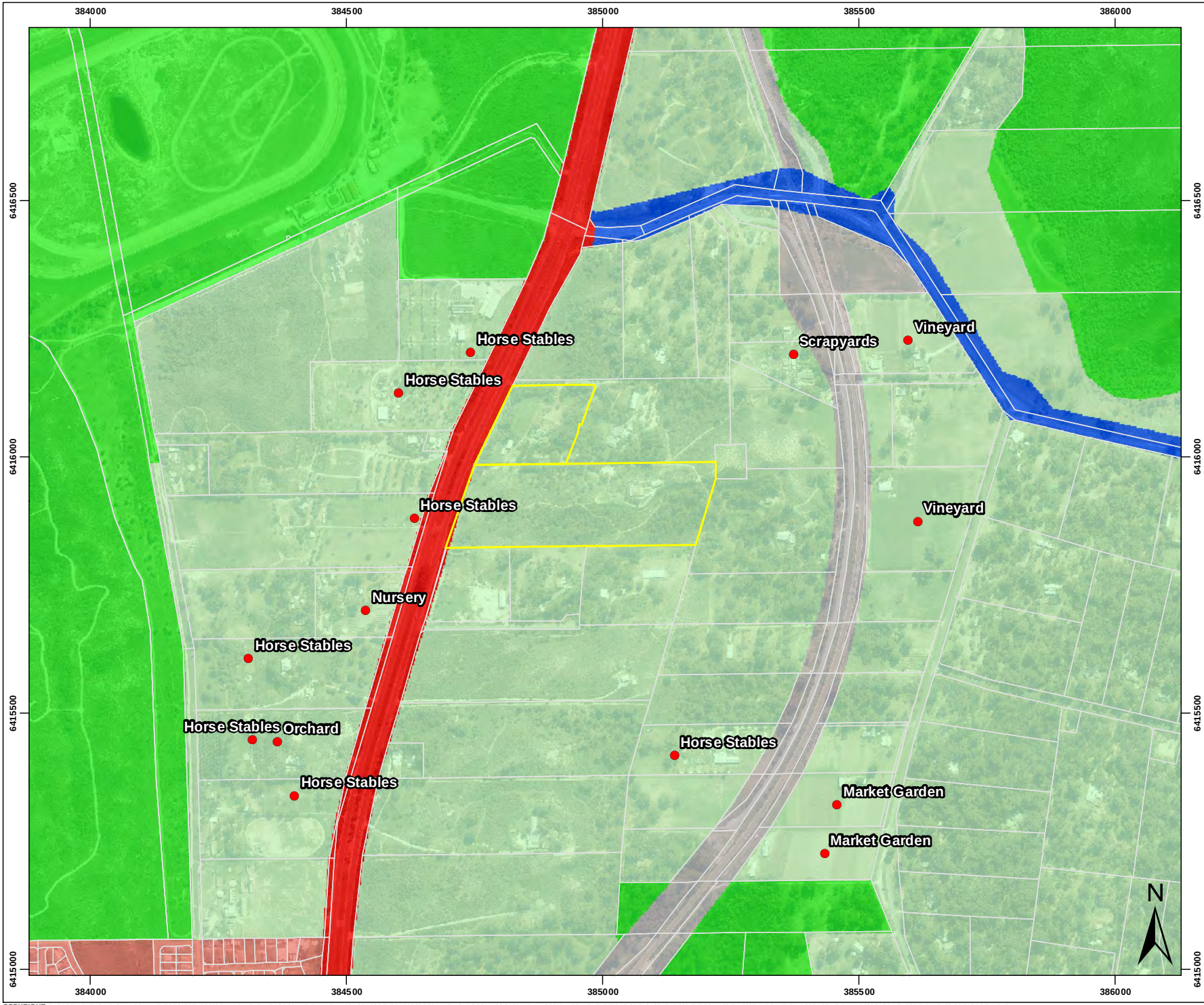
Figure 10
Black Cockatoo Habitat

K:\Projects\9.0 APP\785 Mandurah Road Karnup EAR\Figures\NVCP\785 NVCP Figure 10 Black Cockatoo Habitat.mxd



Legend

Site Location

Surrounding Land Uses

Scheme Legend

Scheme boundary

Reserved Lands

- Parks and recreation
- Resricted public access
- Railways
- Port installations
- State forests
- Water catchments
- Civic and cultural
- Waterways
- Primary regional roads
- Other regional roads
- Public purposes - denoted as follows:

H	Hospital	CG	Commonwealth Government
HS	High school	SEC	State Energy Commission
TS	Technical school	SU	Special uses
CP	Car park	WSD	Water Authority of WA
U	University	P	Prison

Zones

- Urban
- Urban deferred
- Central city area
- Industrial
- Special industrial
- Rural
- Rural - water protection
- Private recreation

Redevelopment schemes

- Redevelopment scheme / act area

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- MRS ZONING FROM LANDGATE, CURRENT AS OF 12 NOV 2014
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE AUG 2014 (© Western Australian Land Information Authority 2014)

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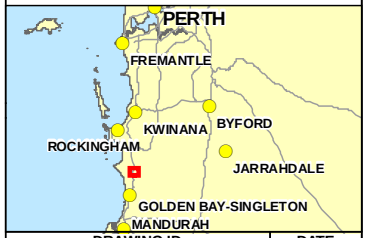
LOCALITY MAP



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Rockingham Montessori School
Lots 11 & 700 Mandurah Road, Karnup
NVCP

Figure 11 Surrounding Land Uses

APPENDIX A

Flora, Vegetation and Black Cockatoo Survey Report

360 environmental

Lot 11, Mandurah Road, Karnup

Flora, Vegetation and Black Cockatoo Report

Prepared for:

Rockingham Montessori School

February 2015

people planet professional

Document Reference	Revision	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
808 AB	A INTERNAL DRAFT	SF/LS	RF	1 Electronic (email)	18/12/14
	B SUBMITTED TO CLIENT	NW	TS	1 Electronic (email)	28/01/15
	C FINAL	NW	TS	1 Electronic (email)	23/02/15

Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by Rockingham Montessori School to undertake a Level 2 Flora and Vegetation Assessment and a Black Cockatoo Assessment for Lots 11 and 700 Mandurah Road, Karnup (Survey Area). The Survey Area is approximately 10.43 ha in size, surrounded by large residential lots with remnant vegetation. The Survey Area is located approximately 55 km south of Perth, Western Australia (WA).

Database searches showed 19 flora species of conservation significance have been recorded as potentially occurring within the vicinity of the Survey Area. These include eight Threatened species pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* and/or gazetted as Declared Rare Flora pursuant to the *Wildlife Conservation Act 1950,* and 11 Priority species as listed by the Department of Parks and Wildlife (DPaW).

No Threatened or Priority species were recorded during the survey.

A total of 59 flora taxa (including species, subspecies, varieties and forms) from 49 genera and 31 families were recorded in the Survey Area. The commonly occurring families were; Poaceae (7 taxa, 6 of which were weed species), Fabaceae (9 taxa), Proteaceae (5 taxa) and Asteraceae (5 taxa).

A total of 16 introduced flora species were recorded during the field survey. None of these are listed as Declared under the Biosecurity and Agriculture Management Act or listed as a Weed of National Significance (WONS).

Three natural vegetation associations were described in the Survey Area.

- BaBm – *Banksia attenuata*, *Banksia menziesii* woodland
- EgBa – *Eucalyptus gomphocephala*, *Banksia* woodland
- AsOa – *Acacia saligna*, *Olearia axilaris* shrubland

No Threatened Ecological Communities (TEC) occurred within the Survey Area.

One Priority 3 vegetation community was found to occur within the Survey Area;

- Central *Banksia attenuata – Eucalyptus marginata* woodlands (type 21a)

Two Priority 3 vegetation communities that have been inferred were also thought to occur on site;

- Northern Spearwood shrublands and woodlands (type 24)
- Southern Swan Coastal Plain *E. gomphocephala – A. flexuosa* woodlands (type 25)

There is no written policy on how to respond to the presence of Priority Ecological Communities or Threatened Ecological Communities within proposed development sites and the presence of these communities is dealt with by DPaW on a case by case basis.

Vegetation condition ranged from Excellent to Completely Degraded with majority large portion of the Survey Area considered in Completely Degraded condition (52.2%).

A Black Cockatoo Assessment was undertaken in the Survey Area. A total of seven potential Black Cockatoo breeding trees were recorded. All of the trees were Tuarts (*Eucalyptus gomphocephela)* and were located in the north east corner of the site (Figure 9). The trees (including one dead tree) had DBH measurements ranging from 570 mm to 830 mm. There were no hollows observed and there was no evidence of foraging. Three natural vegetation associations which potentially provide foraging habitat for Black Cockatoos were identified in the Survey Area:

- BaBm – 4.48 ha of the Survey Area consisted of *B. attenuata* and *B. menziesii* woodland.
- EgBa – 0.96 ha of the Survey Area consisted of *E. gomphocephala* over *Banksia* woodland.
- AsOa – 0.41 ha of the Survey Area consisted of *A. saligna*, and *Olearia axilaris* shrubland.

Permits

This flora survey was conducted under the following licences issued by DPaW; Licence to take flora for scientific or other prescribed purposes SL011217 issued to Sophie Fox.

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1 Introduction

1.1 The Project

360 Environmental Pty Ltd (360 Environmental) was commissioned by Rockingham Montessori School in November 2014 to undertake a Level 2 Flora and Vegetation Assessment and a Black Cockatoo Assessment for Lot 11 Mandurah Road, Karnup, (Survey Area) (Figure 1). 360 Environmental was later commissioned in February 2015 to survey Lot 700 Mandurah Road, Karnup. The Survey Area is approximately 10.43 ha and is located about 50 km south of Perth, on the Swan Coastal Plain (SCP) Biogeographic Region of Western Australia (WA).

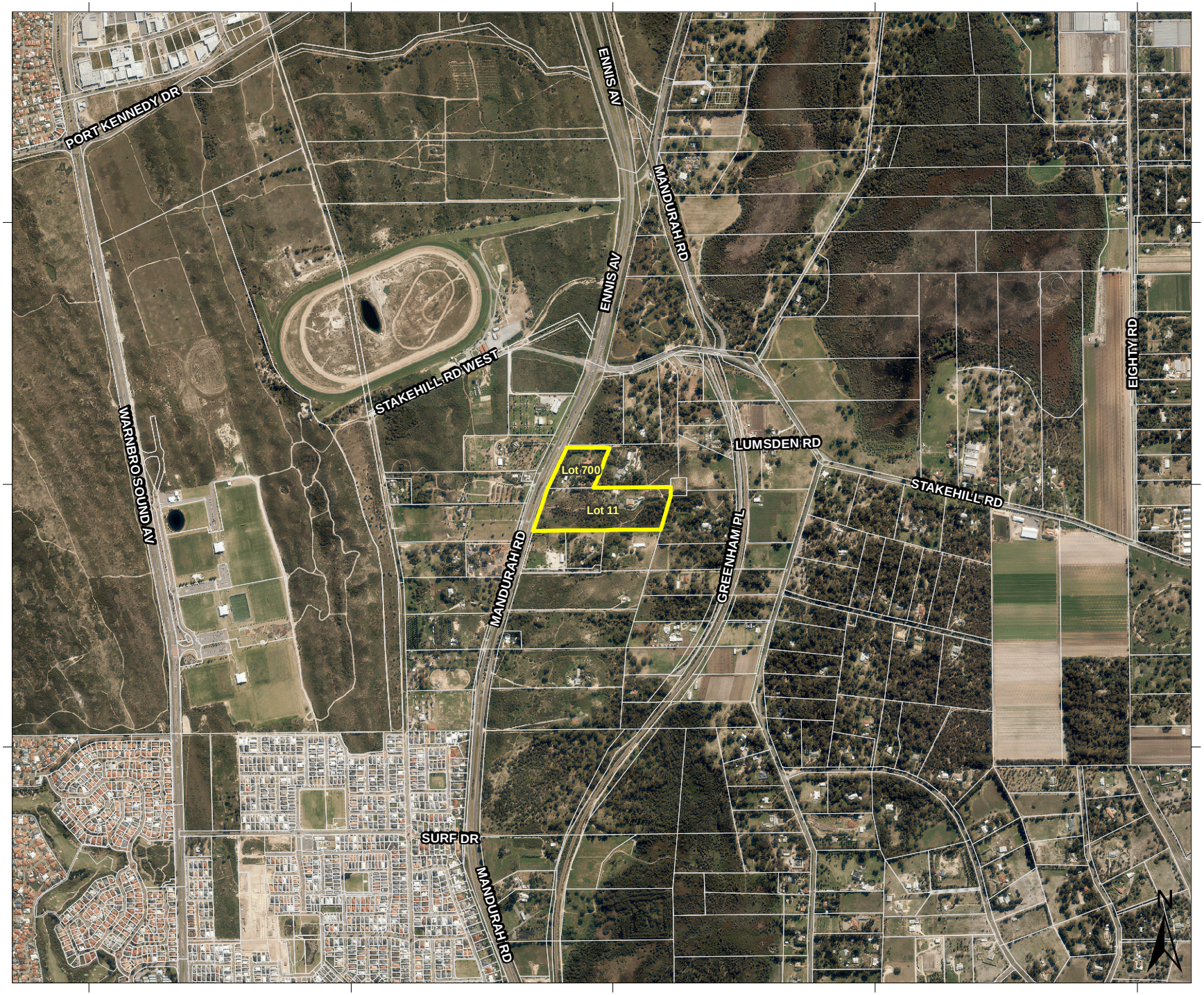
1.1.1 Objectives

The objectives of the flora and vegetation assessment were to:

- Conduct a desktop assessment of relevant literature, databases and spatial datasets to determine the environmental values and any potential issues, such as Threatened/Rare and significant species, Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs), that may be present in the site and the surrounding areas;
- Produce a list of plant species (including weed species);
- Document and map the location of any Declared Rare Flora (DRF), Priority flora and any other flora of local or taxonomic significance;
- Identify, map and discuss the significance of any TECs, PECs and any other areas of ecological importance (e.g. National Parks, wetlands and Environmentally Sensitive Areas [ESAs] etc.);
- Assess, map and photograph vegetation condition; and
- Document, describe and map the vegetation associations present.

The objective of the Black Cockatoo Survey was to:

- Identify and determine the type and extent of habitat (breeding and foraging) suitable for Black Cockatoos in the Survey Area with reference to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (now Department of the Environment [DoE]) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral guidelines for three threatened black cockatoo species (DESEWPaC 2012).



Legend

- Survey Area (10.43 ha)
- Cadastral Boundaries

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- CADASTRE SOURCED FROM LANDGATE 7 NOV 2014
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2014
(© Western Australian Land Information Authority 2014)

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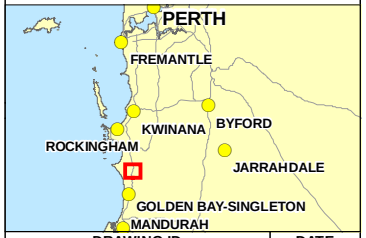
LOCALITY MAP



DRAWING ID	DATE
808_f1_sitelocation v2.mxd	10-Feb-2015

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	LS/NW	RF	0

Rockingham Montessori School
Lots 11 Mandurah Road, Karnup

Flora, Vegetation and Black Cockatoo Report

Figure 1 - Site Location

1.2 Background to the Protection of Flora, Vegetation and Fauna

WA flora and fauna is protected formally and informally by various legislative and non-legislative measures, which are as follows:

Legislative measures:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Wildlife Conservation Act 1950* (WC Act);
- *Environmental Protection Act 1986* (EP Act); and
- *Biosecurity and Agriculture Management Act 2007* (BAM Act).

Non-legislative measures:

- WA Department of Parks and Wildlife (DPaW) Priority lists for flora, ecological communities and fauna;
- Weeds of National Significance; and
- Recognition of locally significant populations by the DPaW.

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix A. Conservation categories for ecological communities are provided in Appendix B.

1.2.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance (MNES). Under the EPBC Act, the Commonwealth Department of the Environment (DotE) lists threatened species and communities in categories determined by criteria set out in the Act (Appendix A and B).

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) is listed as Endangered under the EPBC Act. The Forest Red-tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*) and Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) are classified as Vulnerable.

Projects likely to cause a significant impact to MNES should be referred to the DotE for assessment under the EPBC Act.

1.2.2 WC Act

The WA DPaW lists flora and fauna under the provisions of the WC Act as protected according to their need for protection (Appendix A).

Flora is given Declared Rare status when populations are geographically restricted or are threatened by local processes. In addition, under the WC Act, by Notice in the WA Government Gazette of 9 October 1987, all native flora (spermatophytes, pteridophytes,

bryophytes and thallophytes) is protected throughout the State. Fauna are classified as Schedule 1 to Schedule 4 according to their need for protection.

Under the WC Act both Carnaby's Black Cockatoo and Baudin's Black Cockatoo are listed as Endangered and the FRTBC is listed as Vulnerable.

1.2.3 EP Act

Declared Rare Flora (DRF) and TECs are given special consideration in environmental impact assessments, and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Exemptions for a clearing permit do not apply in an ESA. In addition, habitat necessary for the maintenance of indigenous fauna is considered in the clearing principles and assessed during consideration of applications for a clearing permit.

1.2.4 BAM Act

Plants may be 'Declared' by the minister for Agriculture under the BAM Act 2007 (WA). The Western Australian Organism List (WAOL) contains information on the area(s) in which a plant is declared and the control and keeping categories to which it has been assigned in Western Australia. Details of the definitions of these categories are provided in Appendix C. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties (Department of Agriculture and Food Western Australia [DAFWA] 2014).

DPaW Weed Prioritisation Process

The DPaW Weed Prioritisation Process (WPP) was developed to progress the Environmental Weed Strategy of WA (CALM 1999). The Weed Prioritisation Process for DPaW (DPaW 2013) prioritises weeds in each of the DPaW Regions, with the aim being to establish both a species-led and an asset-protection-based approach to weed management

The species-led process assesses weed species for their invasiveness, ecological impacts, potential and current distribution and feasibility of control. The resulting priorities focus on infestations of species which are considered to be high impact, rapidly invasive and still at a population size which is feasible to eradicate or contain to a manageable size. Weed species which are already widespread do not rank as a high priority through this part of the process.

The next stage of the process investigates the use of an asset-protection-based approach to guide the management of widespread weeds. This approach focuses on identifying high value biodiversity assets, the weeds that pose a threat to these assets and the sites where control will have the greatest biodiversity benefit and cost

effectiveness. Social, cultural and economic assets as well as good neighbour issues are considered at a later stage of the process.

1.2.5 Weeds of National Significance

The Australian Government along with the State and Territory governments has endorsed 32 Weeds of National Significance (WONS). Four major criteria were used in determining WONS:

- The invasiveness of a weed species;
- A weed's impacts;
- The potential for spread of a weed; and
- Socio-economic and environmental values.

Each WONS has a national strategy and a national coordinator, responsible for implementing the strategy. WONS are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts (Commonwealth of Australia 2014).

1.2.6 DPaW Priority Lists

The DPaW lists 'Priority' flora and fauna that have not been assigned statutory protection as Declared Rare or 'Scheduled' under the WC Act, but which are under consideration for declaration as DRF or 'Scheduled' fauna. Flora and fauna assessed as Priority 1-3 are considered to be in urgent need of further survey. Priority 4 flora and fauna require monitoring every 5-10 years and Priority 5 flora and fauna are subject to a specific conservation programme (Appendix A).

The DPaW maintains a list of PECs which identifies ecologically valuable communities that need further investigation before possible nomination for TEC status. Once listed, a community is a PEC, and when endorsed by the WA Minister of Environment becomes a TEC, and protected as an ESA under *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Appendix B).

1.2.7 Informal Recognition of Flora and Fauna

Certain populations or communities of flora may be of local significance or interest because of their patterns of distribution and abundance. For example, specific locations of flora may be locally significant because they are range extensions to the previously known distribution, or are newly discovered taxa (and have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, changed fire regimes), and relict populations of such species assume local importance for the DPaW. It is not uncommon for the DPaW to make comment on these species of interest.

2 Biophysical Environment

2.1 Climate

The closest long term official Bureau of Meteorology (BoM) weather station currently operating near to the Survey Area is the Medina Research Centre (Station number 009194), approximately 16 km north west of the Survey Area. The climate is described as Mediterranean (Mitchell *et al*. 2002), with mean minima of 12.3 °C, and a maxima of 24.4 °C and an average of 761.5 mm of rainfall per annum (BoM 2014).

Medina Research Centre recorded 560.4 mm of rain in 2014 prior to the survey (January 2014 – October 2014). This is 150.4 mm below the long term average rainfall of 710.8 mm for the same period (BoM 2014). The three months prior to survey (August 2014 – Oct 2014), Medina Research Centre recorded 175.3 mm of rainfall, 24.3% below the 231.5 mm long term average rainfall for the same period (BoM 2014).

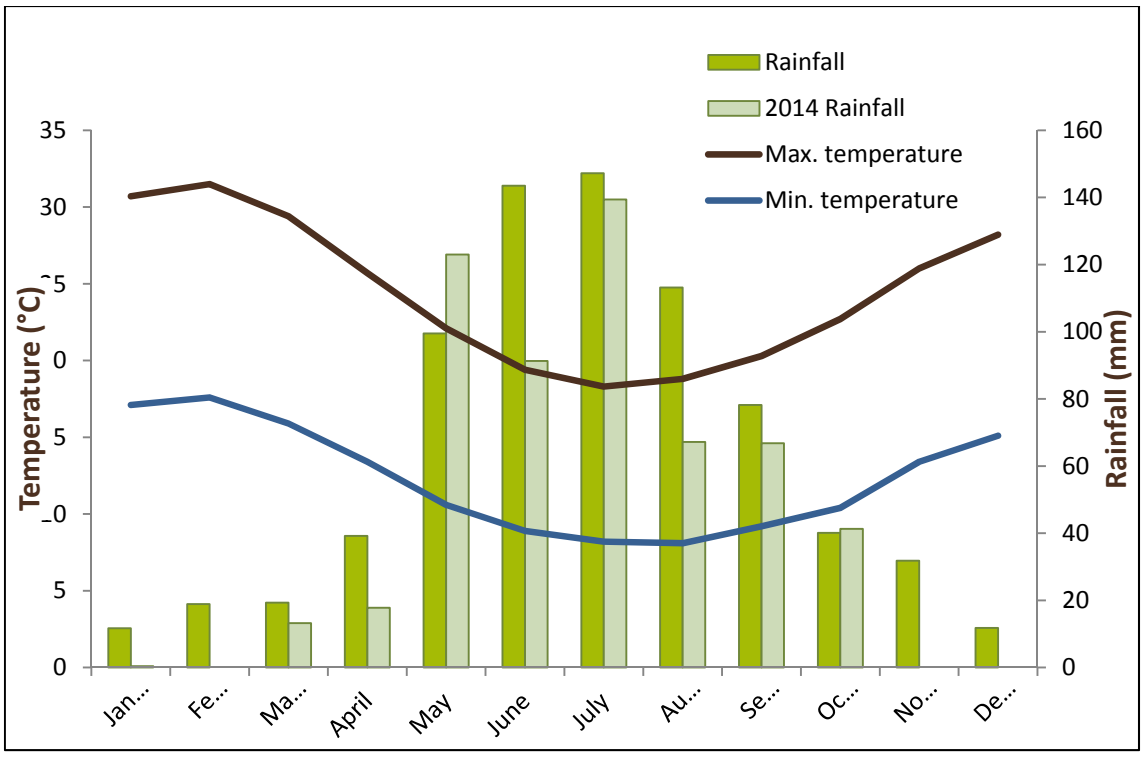


Figure 2: Mean rainfall (from 1983 to 2014) and temperature data (from 1983 to 2014) for Medina Research Centre (009194) (BoM 2014).

2.2 Geology and Soils

Soil-landscape mapping of south WA has been captured at scales ranging from 1:20 000 to 1:250 000. Soil-landscape mapping describes broad soil and landscape characteristics

from regional to local scales. Regional soil mapping indicates that the Survey Area occurs within the following four broad soil systems (DAFWA 2004) (Figure 3):

- 211Qu__Qf2, Quindalup South Qf2 Phase-Calcareous deep sands (landform: relict foredunes and gently undulating beach ridge plain);
- 211Qu__Qp2, Quindalup South Qp2 Phase-Uniform calcareous sands showing variable depths of surface darkening (Landform: long walled discrete parabolic dunes with moderate to steep slopes);
- 211Sp__S1d, Spearwood S1d Phase-Moderately deep to very deep brown siliceous yellow-brown sands (landform: dune ridges with rare limestone outcrop and slopes 3-20% occurring on the eastern slipface); and
- 211Sp__S1b, Spearwood S1b Phase-Deep siliceous yellow-brown sands or pale sands with yellow-brown subsoil (dune ridges with slopes up to 15%).

2.3 Hydrology

A review of available surface water feature mapping did not identify any known water bodies occurring within the Survey Area. Several geomorphic wetlands were located in the vicinity of the Survey Area, the closest of which is a Multiple Use Wetland located approximately 190 m east of the Survey Area. The closest wetland of conservation significance is a Conservation Category Wetland located approximately 570 m north-east of the Survey Area (The Department of Water [DoW] 2014).

2.4 Bush Forever

Bush Forever is a State Government Policy and programme that identifies 51,200 ha of regionally significant vegetation for protection, covering 26 vegetation complexes. This amounts to approximately 18% of the original vegetation on the SCP portion of the Perth metropolitan area.

Regionally significant vegetation has been identified based on criteria relating to its conservation value. Important criteria in the identification process include the achievement, where possible, of a comprehensive representation of all the ecological communities originally occurring in the region. This is principally achieved through protecting a target of at least 10% of each vegetation complex in the Bush Forever project boundary (Government of WA 2000).

There are no Bush Forever Sites in the Survey Area, however, there are five Bush Forever sites within 2km of the Survey Area (Table 1 and Figure 4).

Table 1: Bush Forever Sites near the Survey Area.

Bush Forever ID	Distance from Survey Area (km)
356	0.36
377	1.50
278	0.75
379	0.65
75	2.0

2.5 Ecological Linkages

The purpose of the Regional Ecological Linkages identified by the Perth Biodiversity Project was to link protected natural areas with other areas of mapped native vegetation. Priority was given to identifying linkages through those areas having the greatest assumed protection and to those areas that maximised opportunities to form continuous corridors of native vegetation. The Survey Area does not form part of the Perth Biodiversity Project's Draft Regional Ecological linkage network, however, there are Ecological Linkages near the Survey Area (Table 2 and Figure 4).

Table 2: Ecological Linkages near the Survey Area

Ecological Linkage Number	Distance from Survey Area (km)
81	0.60
76	0.98
80	1.0

2.6 Biogeographic Regionalisation for Australia

The Biogeographic Regionalisation of Australia (IBRA7) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework (DotE 2014a).

The Survey Area lies within the Swan Coastal Plain Bioregion and Perth subregion (SWA2) of the IBRA. The Perth subregion 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 (*Eucalyptus gomphocephala*) woodlands on limestone, *Banksia* and Jarrah (*Eucalyptus marginata*) -*Banksia* woodlands on Quaternary marine dunes of various ages, Marri (*Corymbia calophylla*) on colluvial and alluvial soils, Swamp She-oak *(Casuarina obesa)* on out-wash plains, and Paperbark (*Melaleuca* sp.) in wetland areas (Mitchell *et al*. 2002).

2.7 Broad Vegetation Types

Mapping of the vegetation of the Perth region of WA was completed on a broad scale (1:250,000) by Beard (1975). 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 Survey Area. The Shepherd *et al.* (2001) vegetation type (along with the corresponding Beard [1975] type in brackets) is described below, and its representation within the Survey Area, subregion, region and state is shown in Table 3.

- 998: Medium Woodland; Tuart
- 3048: Shrublands; Scrub-heath on the SCP

Table 3: Broad Vegetation Type within the Survey Area and its State and Regional Representation (Government of WA 2013)

	Pre-European area (ha)	Current extent (ha) 1	Remaining (%)	Current extent % in IUCN Class I-IV Reserves1
Vegetation Types (Beard 1979/ Shepherd *et al*. 2001) in the state				
998	51,015.33	19,373.13	37.98	11.98
3048	12,100.68	3,329.31	27.51	6.95
Vegetation Types (Beard 1979/ Shepherd *et al*. 2001) in the Swan Coastal Bioregion				
998	50,867.50	19,372.82	38.08	12.02
3048	10,417.98	3,316.97	31.84	8.00
Vegetation Types (Beard 1979/ Shepherd *et al*. 2001) in the Perth Subregion				
998	50,867.50	19,372.82	38.08	12.02
3048	10,417.98	3,316.97	31.84	8.00

Mapping by Heddle *et al.* (1980) is based on the relation of landform-soil units determined by Churchward and McArthur (1980). Heddle *et al.* identified one vegetation complex occurring in the Survey Area which is summarised in Table 4. The delineation of vegetation complexes is based on the concept of a series of plant communities forming regularly repeating complexes associated with a particular soil unit. The Heddle *et al.* (1980) vegetation complex that occurs across the site is described below:

- Cottesloe Complex Central and South

Table 4: Vegetation Complex within the Survey Area and its State and Regional Representation

	Pre-European area (ha)	Current extent (ha)	Remaining (%)	Current extent % Secure Tenure Reserves
Vegetation Complexes (Heddle *et al.*, 1980) in the System 6/part System 1 area (EPA 2006)				
Cottesloe Complex Central and South	44,995	18,474	41.1	8.8
Vegetation (Heddle *et al.*, 1980) in the Swan Coastal Bioregion (PBP 2013)				
Cottesloe Complex Central and South	44,899.92	15,815.73	35.22	12.75

2.8 Background to Black Cockatoos

Carnaby's Cockatoo

Carnaby's Cockatoo is listed as Endangered under the EPBC Act. Carnaby's Cockatoo is endemic to south-west WA, and is distributed from the Murchison River to Esperance and inland to Coorow, Kellerberrin and Lake Cronin (Cale 2003). The species was once common, but the population has declined significantly in the last half century, and is now locally extinct in some areas (Johnstone and Storr 1998, Shah 2006). In the last 45 years the species has suffered a 50% reduction in its abundance (Cale 2003). This reduction is due to the clearing of core breeding habitat in the wheatbelt, the deterioration of nesting hollows, and clearing of food resources on the Swan Coastal Plain (Cale 2003). The total population of Carnaby's Cockatoo is currently estimated at 40,000 (Johnstone and Johnstone 2008).

Carnaby's Cockatoos feed on seeds, nuts and flowers of a variety of native and exotic plants. Food plants include Banksia (including those previously included in the genus Dryandra), Pine trees (Pinus sp.), Marri, Jarrah, Grevillea, Allocasuarina, and Hakea species (Shah 2006). Marri nuts that are damaged extensively, especially on the main body of the nut, are likely to have been chewed by Carnaby's Cockatoo or FRTBC. The severed new growth, developing flower heads and chewed seed pods of Banksia species

are also a good indicator of Black Cockatoo feeding. Recent damage to bark is regarded as Black Cockatoo feeding activity along with the stripping of pine needles and cones (Cale 2003).

Carnaby's Cockatoo are less efficient at extracting Marri seeds than (the long-billed) Baudin's Cockatoo (Cooper *et al.* 2002). The seeds from seed pods of Banksia and the cones of Pine trees provide the highest energetic yield (Cooper *et al.* 2002).

Breeding has been recorded from early July to mid-December, and primarily occurs in the wheatbelt in the semi-arid and subhumid interior (Johnstone and Storr 1998). However judging from breeding records in the Storr-Johnstone Bird Data Bank, this species is currently expanding its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp (e.g. Wungong Dam Catchment) and into the Tuart forests of the Swan Coastal Plain including Yanchep, Baldivis, Lake Clifton and near Bunbury.

Carnaby's Cockatoo display strong pair bonds and mate for life. They nest in hollows of smooth-barked eucalypts especially Salmon Gum (E. *salmonophloia*) and Wandoo but nests have also been found in other eucalypts including York Gum (E. *loxophleba)*, Flooded Gum (*E. rudis*) and Tuart, and the rough-barked Marri. On the Swan Coastal Plain most nests are in Tuart. Eggs are laid on a mat of wood chips at the bottom of a large hollow (mostly top entry hollows) ranging from a few centimetres to 5 m deep. Clutch size is 1–2 (mostly two but only one young is reared). Incubation lasts for 29 days and only the female incubates and broods. The nestling is brooded by the female during which time both rely on the male for food. The female then leaves the nest each day at dawn, sometimes returning mid-morning (with the male) to feed the chick. After approximately three weeks she ceases to brood and the chick is fed by one or both parents in the morning and at late evening.

Baudin's Cockatoo

Baudin's Cockatoo is listed as Vulnerable under the EPBC Act. The species is distributed through the south-western humid and subhumid zones, from the northern Darling Range and adjacent far east of the Swan Coastal Plain (south of the Swan River), south to Bunbury and across to Albany. Baudin's Cockatoo rarely occurs near the coast north of Mandurah, and rarely occurs north of the Swan River (Johnstone & Kirkby 2008, Johnstone & Storr 1998). Baudin's Cockatoo usually occur in small flocks of up to 30, or occasionally up to 50 and rarely in aggregations of up to 1200 (Johnstone & Kirkby 2008). Baudin's Cockatoo is distinguished from Carnaby's Cockatoo by its longer bill and slightly different call.

This species forages primarily in eucalypt forest, where it feeds on Marri seeds, flowers, nectar and buds. They also feed on a wide range of seeds of Eucalyptus, Banksia, Hakea and Pines (*Pinus* sp.) as well as fruiting apples and pears and beetle larvae from under the bark of trees (Johnstone & Kirkby 2008, Johnstone & Storr 1998). Baudin's

Cockatoo forages at all levels of the forest from the canopy to the ground, often feeding in the understorey on proteaceous trees and shrubs, especially Banksia, and in orchards both in trees and on dropped or fallen fruit on the ground.

There is very little breeding information and the breeding biology of this species is poorly known. Recorded breeding in deep south-west, north to the Whicher Range and Lowden and also isolated records at Wungong Catchment, Serpentine (hills area) and east to Kojonup and near Albany. They nest in large, mostly vertical, hollows of Karri, Marri, Wandoo, and Bullich. Baudin's Cockatoos display strong pair bonds are monogamous, and probably mate for life. The pair remain together all year round except when the female is incubating and brooding. Both adults play a part in selecting the nest hollow, but only the female is responsible for renovation and preparing the hollow for breeding. Preparation of the hollow consists of chewing around the entrance of the hollow and down one part of the interior wall. Pairs have also been recorded prospecting for hollows in most months and also outside the breeding range (Johnstone & Kirkby 2011).

Forest Red-tailed Black Cockatoo

The FRTBC is listed as Vulnerable under the EPBC Act. The FRTBC is distributed through the humid and subhumid south-west of WA from Gingin through the Darling Ranges to the south-west from Bunbury to Albany. It occasionally occurs in the southern SCP, and rarely in the Perth metropolitan area. The FRTBC occurs in pairs or small flocks, or occasionally large flocks of up to 200 birds (Johnstone & Storr 1998). The FRTBC inhabits dense Jarrah (*E. marginata*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*), forests that receive more than 600 mm average annual rainfall (DSEWPaC 2012).

The FRTBC feeds primarily on Marri and Jarrah fruit (Johnstone *et al*. 2013a). Also Tuart (Johnstone & Kirkby 2011) and to a lesser extent on Blackbutt (*E. patens*), Albany Blackbutt (*E. staeri*), Karri, Sheoak (*Allocasuarina fraseriana*) and Snottygobble (*Persoonia longifolia*). FRTBC can obtain energy faster when feeding on Marri and Jarrah than other food sources (Cooper *et al.* 2002) and these two plant species make up 90% of their diet (DSEWPaC 2012).

FRTBC are monogamous and pair nest in tree hollows from 6.5 – 33 m above ground. Most nests are in large and old mature Marri, and these trees are the most important nesting tree throughout the FRTBC range (Johnstone *et al.* 2013a). Nest trees of the FRTBC have a mean circumference at breast height of 2.79 m, a mean estimated age of 222 years and a mean overall height of 20.24 m. Marri nest trees have a mean circumference at breast height of 2.76 m, a mean estimated age of 220 years (95% confidence limit 209–231 years) and an average height of 20.04 m (Johnstone *et al.* 2013b).

Breeding has been recorded from February to December (with a peak between October and December, also a peak in some years in April–May). The FRTBC nests in large

hollows of Tuart, Marri, Jarrah, Wandoo (*E. wandoo*), Bullich (*E. megacarpa*), and Karri. FRTBC have a clutch size of one, rarely two and only the female incubates and broods. The incubation period is 29–31 days and nestling period 75–85 days (Johnstone and Storr 1998). Most pairs appear to breed every second year (Johnstone & Kirkby 2011).

3 Methods

3.1 Background

The flora survey was consistent with a single season Level 2 survey as per the EPA requirements for environmental surveying and reporting for flora and vegetation in WA where practical and relevant, as set out in the following documents:

- EPA Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in WA No. 51 (EPA 2004a); and
- EPA Guidance for the Level of Assessment for Proposals affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 region. Guidance Statement No. 10 (EPA 2006).

The Black Cockatoo Survey was compliant with the EPBC Act referral guidelines for three threatened black cockatoo species (DSEWPaC 2012).

Three species of Black Cockatoo occur in the south-west of WA and all are protected under the following State and Federal legislation:

- The WA Wildlife Conservation Act 1950 (WC Act); and
- *The Commonwealth Environment Protection and Biodiversity Conservation Act* (EPBC Act).

3.2 Flora and Vegetation Survey Methods

3.2.1 Flora and Vegetation Database Review

The desktop study provided background information on the flora and vegetation of the Survey Area. This involved a search of the following sources:

- DPaW Threatened and Priority Flora database (DPaW 2014a);
- DPaW Threatened and Priority Ecological Communities database (DPaW 2014b); and
- DSEWPaC Protected Matters Search Tool (PMST) (DotE 2014).

A request for a database search was submitted to the DPaW (5 km buffer search around the Survey Area) to obtain a list of Declared Rare Flora/Threatened or Priority flora, and TECs and PECs in and near the Survey Area (Figure 5). These sources were used to compile a list of expected DRF or Priority species and TECs and PECs that may occur based on the landforms in the Survey Area.

3.2.2 Flora and Vegetation Field Survey

The field survey was conducted for Lot 11 on the 13th November 2014 with Lot 700 being surveyed on 3 February 2015.

The survey included the assessment of 2 quadrats, 6 relevés and mapping notes (Figure 6). Quadrats are vegetation survey plots which are accurately measured out as 10 x 10 m (or an area equivalent to 100 m^2) and marked at the NW corner using a handheld Garmin GPS unit.

The information recorded at each quadrat included landscape features, surface soil colour and texture, bare ground, litter cover, disturbance, fire age, aspect and vegetation condition (Government of WA 2000). Each species of plant at each quadrat was recorded, including information on height and percentage cover.

3.2.3 Systematic Searches

In addition to the information collected from the quadrats, traverses throughout the Survey Area were undertaken for significant flora. For each population of suspected significant flora identified during the field survey, the following was recorded:

- Co-ordinate locations (using handheld GPS units);
- Description of vegetation association present; and
- Estimation of population size.

3.2.4 Taxonomy and Nomenclature

Where field identification of plant taxa was not possible, specimens were collected systematically for later identification utilising resources of the Western Australian Herbarium (WAH).

The species list was checked against FloraBase (WAH 2014) to determine the species conservation status. Threatened and Priority Flora were verified against the EPBC Act listing of threatened species to determine the Commonwealth listing.

Introduced species were checked against the DPaW Weed Prioritisation Process (WPP) (DPaW 2013), to determine their ranking in terms of environmental impact. The BAM Act Declared Plants list was consulted to determine if any are Declared Plants, and the Weeds of National Significance list was examined to determine if any were WONS (Commonwealth of Australia 2014).

3.2.5 Vegetation Mapping

The vegetation mapping units were described based on their structure and species composition, as defined by quadrat data and field observations. Vegetation was mapped in the field using handheld GPS (Garmin) units and high-resolution aerial photographs (1:3,402 scale), which in the office were digitised using GIS software (ArcGIS 9.3.1).

Vegetation condition was mapped in the field using handheld GPS (Garmin) units and high-resolution aerial photographs (1:10,000 scale), which in the office were digitised using GIS software (ArcGIS 9.3.1). Vegetation condition was assessed based on Bush Forever (Government of WA 2000) (Appendix D).

3.3 Black Cockatoo Survey Methods

The field survey was undertaken on 13th November 2014 according to the methods (where practical and possible) outlined in the EPBC Act referral guidelines for the three threatened Black Cockatoo species (DSEWPaC 2012).

The Black Cockatoo Assessment involved traversing the Survey Area by foot. Any trees meeting the following criteria for potential breeding were recorded, marked and electronically logged using a hand held Global Positioning System (GPS) unit:

- Native trees (e.g. Jarrah, Tuart, Marri etc.);
- Diameter at breast height (DBH) ≥ 500 mm (300 mm for Wandoo and Salmon Gum); and
- Hollows > 120 mm diameter.

The Black Cockatoo assessment also involved assessing the habitat for tree and shrub species known to be important dietary items e.g. Marri and Banksia *sp.* It also included looking for:

- Evidence of feeding (chewed cones, seed and nut material); and
- Opportunistic observations of Black Cockatoos in the Survey Area.

4 Results

4.1 Flora, Vegetation and Fauna Survey Limitations and Constraints

Survey constraints are often difficult to predict, as is the extent to which they influence survey effort. Survey limitations and constraints of the flora, vegetation and fauna survey are detailed in Table 5.

Table 5: Limitations and constraints associated with the Survey Area.

VARIABLE	IMPACT ON SURVEY OUTCOMES
Access	The whole site was accessed and traversed. Particular focus was given to areas expected to be impacted and or that may have species of conservation significance.
Experience	The personnel who executed these surveys were practitioners suitably qualified in their respective fields: • Field Staff: Botanist: Sophie Fox (November survey) Principal Botanist: Narelle Whittington (February survey). • Field Staff: Zoologist: Laura Stevens. • Data Interpretation and Reporting: Narelle Whittington, Laura Stevens and Sophie Fox. • Report Review: Dr Ron Firth.
Timing, weather, season	The survey was conducted during spring after three months of below average rainfall (refer to section 2.1). Some of the Threatened or Priority species which have potential to occur within the Survey Area have flowering periods outside of the survey timing. Some species, therefore, may not have been located during the survey. Flora composition changes with time, particularly seasonally as a result of seasonal conditions. Therefore, botanical surveys completed at different times of the year will have varying results.
Scope: Life forms sampled	The scope of this project included the surveying of flora and vegetation and searching for conservation significant species or communities, and the surveying of potential Black Cockatoo breeding and foraging habitat.

Sources of information	Relevant DPaW searches were undertaken for the Survey Area, see section 3.2.
Completeness	The entire Survey Area was accessible; the time spent conducting the survey was considered adequate for the size and complexity of the site. All vegetation associations were sufficiently surveyed; with two quadrats, six relevés and additional vegetation mapping notes recorded.
Disturbances	Lot 11 is highly disturbed and has been subject to vegetation clearing, building of a property, planting of garden species and non-endemic revegetation. Lot 700 has no native vegetation except for a couple of *Banksia attenuata* scattered through the garden along the southern fence line. The property is a function centre with established tropical and landscaped gardens.

4.2 Flora Results

4.2.1 Overview of Flora

A total of 59 taxa (including species, subspecies, varieties and forms) from 49 genera and 31 families were recorded in the Survey Area. The commonly occurring families were; Fabaceae (9 taxa), Poaceae (7 taxa), Proteaceae (5 taxa) and Asteraceae (5 taxa).

The flora inventory is provided in Appendix E and the site data sheets in Appendix F.

4.2.2 Flora of Conservation Significance

No Threatened species listed under the EPBC Act and/or gazetted as Declared Rare Flora (Threatened) pursuant to the WC Act were recorded during the survey. No Priority species, as listed by DPaW, were recorded during the survey.

The review of the database searches identified 19 conservation significant flora potentially occurring in the vicinity of the Survey Area. The likelihood of these 19 conservation significant taxa occurring in the Survey Area is shown in Table 6. The description of the conservation status is listed in Appendix A.

Table 6: Assessment of the likelihood of occurrence of Significant Flora in the Survey Area

[1]Closest record to Survey Area based on DPaW 2014. Likely = Suitable habitat present and records less than 15 km from the Survey Area, Possible = Suitable habitat present and records between 15 km and 40 km from the Survey Area, and Unlikely = No suitable habitat present and/or records greater than 40 km from the Survey Area.

Conservation Status	Species	Habitat Information (WAH 2014)	Suitable Habitat	Closest Record[1]	Likelihood
T	*Andersonia gracilis*	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Yes	Information unavailable	Unknown
T	*Caladenia huegelii*	Grey or brown sand, clay loam. *Banksia* woodland.	Yes	11km	Likely
T	*Darwinia foetida*	Information not available.	Information unavailable	Information unavailable	Unknown
T	*Diuris micrantha*	Brown loamy clay. Winter-wet swamps, in shallow water.	No	Information unavailable	Unknown
T	*Diuris purdiei*	Grey-black sand, moist. Winter-wet swamps.	No	Information unavailable	Unknown
T	*Drakaea elastica*	White or grey sand. Low-lying situations adjoining winter-wet swamps.	No	Information unavailable	Unknown
T	*Drakaea micrantha*	White-grey sand.	Yes	26km	Possible
T	*Lepidosperma rostratum*	Peaty sand, clay.	No	Information unavailable	Unknown

Conservation Status	Species	Habitat Information (WAH 2014)	Suitable Habitat	Closest Record[1]	Likelihood
P2	*Acacia benthamii*	Typically on limestone breakaways.	No	0.65km	Unlikely
P3	*Beyeria cinerea* subsp. *cinerea*	Information not available.	Information unavailable	1.4km	Unknown
P3	*Calandrinia oraria*	Information not available.	Information unavailable	4km	Unknown
P3	*Dillwynia dillwynioides*	Sandy soils. Winter-wet depressions.	Yes	4.2km	Likely
P3	*Schoenus capillifolius*	Brown mud. Claypans.	No	4.3km	Unlikely
P3	*Sphaerolobium calcicola*	White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas.	Yes	1.1km	Likely
P3	*Stylidium longitubum*	Sandy clay, clay. Seasonal wetlands.	No	Information unavailable	Unknown
P3	*Thelymitra variegata*	Sandy clay, sand, laterite.	Yes	Information unavailable	Unknown
P4	*Centrolepis caespitose*	White sand, clay. Salt flats, wet areas.	No	Information unavailable	Unknown
P4	*Dodonaea hackettiana*	Outcroping limestone.	No	Information unavailable	Unknown

Conservation Status	Species	Habitat Information (WAH 2014)	Suitable Habitat	Closest Record[1]	Likelihood
P4	*Jacksonia sericea*	Calcareous and sandy soils.	Yes	2.2km	Likely

4.2.3 Introduced Flora

A total of 16 introduced species were recorded during the survey (Table 7). None of these species are listed as Declared under the BAM Act or as WONS.

Table 7: Introduced Flora Recorded in the Survey Area and their ranking under the DPaW Weed Prioritisation Process (DPaW 2013)

TAXON	(COMMON NAME)	DPAW WPP RANKING
Arctotheca calendula	Cape Weed	Low
Avena barbata	Wild Oats	Low
Briza maxima	Blowfly Grass	Low
Briza minor	Shivery Grass	Low
Bromus diandrus	Great Brome	Low
Carpobrotus edulis	Hottentot Fig	Moderate
Ehrharta calycina	Perennial Veldt Grass	Low
Euphorbia peplus	Petty Spurge	Negligible
Fumaria capreolata	Whiteflower Fumitory	Low
Lagurus ovatus	Hare's Tail Grass	Low
Melia azedarach	White Cedar	Negligible
Olea europaea	Olive	High
Pelargonium capitatum	Rose Pelargonium	Low
Pinus pinaster	Maritime pine	Negligible
Schinus molle	Pepper Tree	Low
Ursinia anthemoides	Ursinia	Negligible

4.2.4 Vegetation Associations

Three natural vegetation associations were described for the Survey Area, a description of this vegetation association is provided in Table 8 and Figure 7.

Table 8: Vegetation Association Descriptions and Extent in the Survey Area

Vegetation Association Code	Name	Description	Extent (%)	Extent (ha)
BaBm	*B. attenuata, B. menziesii* woodland	Low Open Woodland of *B. attenuata* over Tall Shrubland of *Acacia rostellifera* over Low Open Shrubland of *Kunzea glabrescens*, *Hemiandra pungens* and *Conostylis aculeata* over Grassland of **Ehrharta calycina*	42.9	4.48
EgBa	*E. gomphocephala - Banksia* woodland	Woodland of *E. gomphocephala* over Tall Shrubland of *B. attenuata* and *B. menziesii* over Open Shrubland of *Hibbertia hypericoides* and *Kunzea glabrescens*, over Very Open Sedgeland of *Lepidosperma gladiatum*, over Grassland of **Ehrharta calycina*.	6.6	0.69
AsOa	*A. saligna, Olearia axilaris* shrubland	Tall Shrubland of *A. saligna* over Open Shrubland of *O. axilaris*, over Shrubland of *K. glabrescens*, *Scaevola thesioides* and *H. hypericoides* over Very Open Grassland of **E. calycina*	3.9	0.41
Ne	Non-endemic species	Non-endemic species and/or garden species and/or weedy tracks and/or revegetation	28.7	3.0

4.2.5 Vegetation Condition

Vegetation condition ranged from Excellent to Completely Degraded with majority large portion of the Survey Area considered to be in Completely Degraded condition (52.2%) (Figure 8). Vegetation condition mapping is presented in Figure 8 and the extent is described in Table 9. Lot 11 is highly disturbed and has been subject to vegetation clearing associated with the building of a house, tracks and sheds as well as

establishment of gardens and non-endemic revegetation. Lot 700 has no native vegetation except for a couple of *Banksia attenuata*, *Conostylis aculeata* and *Acacia pulchella* that are interspersed with garden plants along the southern fence line. The property is a function centre with established tropical and landscaped gardens.

The average fire age of the vegetation was considered very old (>12 years since last fire).

Table 9: Vegetation Condition and Extent in the Survey Area

CONDITION	EXTENT (%)	EXTENT (HA)
Excellent	0.86	0.09
Good	21.95	2.29
Degraded	24.9	2.60
Completely Degraded	52.25	5.45

4.2.6 Floristic Community Types

The FCT represented by the vegetation in the Survey Area was determined by statistical analysis (multivariate analysis) and further data interpretation of the two quadrats established, as shown in Table 10 below. The following FCT was found to occur in the Survey Area:

- FCT21a; Central *B. attenuata – E. marginata* woodlands (this FCT is listed as a Priority 3 by Department of Parks and Wildlife (DPaW)

Table 10: Floristic Community Type Analysis for Quadrats

VEGETATION ASSOCIATION	FLORISTIC COMMUNITY TYPES1	SIMILARITY	COMMENTS	INFERRED FLORISTIC COMMUNITY TYPE
BaBm (Q1,Q2,R4,R5)	**FCT 30c** Other mallees or scrubs	15%	Documented occurrences are in the Perth region on the Quindalup-Spearwood landform unit, and not known to occur in the area, or that far south.	**FCT 21a** Central *B. attenuata – E. marginata* woodlands Based on species present, and surrounding occurrences of this FCT
	FCT 24 Northern Spearwood shrublands	13.19%	The dominance of vegetation in BaBm does not match the characteristics of	

Vegetation Association	Floristic Community Types1	Similarity	Comments	Inferred Floristic Community Type
	and woodlands		FCT 24	
	FCT 20c Eastern shrublands and woodlands	13.7%	Not known to occur in the area, occurs in the Ridgehill / Pinjarra landform unit.	

1. Gibson *et al.* 1994

Due to the altered state of the Survey Area and the highly disturbed nature of the vegetation, FCTs were not able to be determined through statistical analysis (multivariate analysis) for all sites. Two Quadrats were established within the Survey Area, however, due to low diversity of native species and the relatively small size of the site, relevés were established ; therefore FCTs have been inferred based on factors that are diagnostic, this includes the presence of indicator species, soil types and landform position (Table 11). The following FCTs are inferred to occur in the Survey Area:

- FCT25; Southern *E. gomphocephala – Agonis flexuosa* woodlands
- FCT24; Northern Spearwood shrublands and woodlands

Table 11. Floristic Community Type Analysis for Relevés

Vegetation Association	Comments	Inferred Floristic Community Type
EgBa (R2)	Based on species present and surrounding occurrences of this FCT	**FCT25** Southern *E. gomphocephala – A. flexuosa* woodlands
AsOa (R3, R6)	Based on species present and surrounding occurrences of this FCT	**FCT24** Northern Spearwood shrublands and woodlands

4.2.7 Threatened and Priority Ecological Communities

A search of the EPBC PMST and DPaWs database for TECs and PECs identified the following as occurring within 5 km of the Survey Area (Figure 5);

- Sedgelands in Holocene dune swales of the southern Swan Coastal Plain Threatened Ecological Community (SCP19a) (Categorised as Critically Endangered under the WC and EPBC Acts)
- Woodlands over sedgelands in Holocene dune swales of the southern Swan Coastal Plain Threatened Ecological Community (SCP19b) (Categorised as Critically Endangered under the WC and EPBC Acts)

Both SCP19a and SCP19b represent the TEC 'sedgelands in Holocene dune swales', however, they are split into two sub-communities, 'a' and 'b', due to differences in overstorey vegetation. The typically common vegetation associated with both SCP19a and SCP19b includes *A. rostellifera*, *A. saligna*, *Xanthorrhoea preissii* over sedges including *Baumea juncea*, *Ficinia nodosa* and *L. gladiatum*, over native grass *Poa porphyroclado*, SCP19b typically contains an overstorey of *E. gomphocephala*, *Melaleuca rhaphiophylla* and *Banksia littoralis* (DoEC 2011).

- Microbial community of a coastal saline lake (Lake Walyungup) (Walyungup Microbial) (Priority 1)
- Northern Spearwood shrublands and woodlands (SCP24) (Priority 3)
- Southern Eucalyptus gomphocephala-Agonis flexuosa woodlands (SCP25) (Priority 3)
- Coastal shrublands on shallow sand (SCP29a) (Priority 3)
- Acacia shrublands on taller dunes (SCP29b) (Priority 3)

No TECs were found to occur within the Survey Area.

4.2.8 Regional Representation

Vegetation mapping units described in the Survey Area were correlated with the Beard (1975) and Shepherd *et al*. (2001) broad vegetation types as much as possible by examining similarities in vegetation descriptions (Table 12). Differences exist with the terminology used in the descriptions as they are based on different methods of categorising and characterising vegetation types, and the different spatial scale of the analysis (i.e. region vs. local scale).

Table 12: Representation of broad vegetation types and corresponding vegetation associations

Vegetation Type and Description (Shepherd *et al.* 2001/Beard 1975)	Corresponding Vegetation Association (Current Survey)	Vegetation Association Extent in Survey Area (ha)
998: Medium Woodland; Tuart	EgBa	0.69
3048: Shrublands; Scrub-heath on the Swan Coastal Plain	AsOa	0.41

4.3 Black Cockatoo Results

During the Black Cockatoo Assessment, no Black Cockatoos were observed utilising the Survey Area and no foraging evidence (for example in the form of chewed nuts) was recorded.

4.3.1 Foraging Habitat

Three natural vegetation associations were described in the Survey Area:

- BaBm – 4.48 ha of the Survey Area consisted of *B. attenuata* and *B. menziesii* woodland.
- EgBa – 0.96 ha of the Survey Area consisted of *E. gomphocephala* over *Banksia* woodland.
- AsOa – 0.41 ha of the Survey Area consisted of *A. saligna*, and *Olearia axilaris* shrubland.

Black Cockatoos have been recorded foraging on a variety of Banksia and Acacia species, as well as *E. gomphocephala* (Johnstone & Kirkby 2011) and will be discussed in section 5.6.

4.3.2 Potential Breeding Habitat

The Survey Area contained a total of seven potential breeding trees with a DBH of 500 mm or greater. All of the seven trees recorded were Tuart (E. *gomphocephala).*

None of these potential breeding trees contained any visible hollows which would be considered suitable for nesting. The dimensions and the locations of the potential breeding trees are displayed in Table 13 and Figure 9 respectively.

Table 13: Potential breeding tree species recorded during the survey, dimensions and location (Coordinates are in GDA 94)
Brackets denotes dead tree

No.	Taxa	Height (m)	DBH (mm)	No of Hollow	Hollow Size	Easting	Northing
1	*E. gomphocephala*	20	700	0	-	0385194	6415936
2	*E. gomphocephala*	20	800	0	-	0385193	6415914
3	*E. gomphocephala*	18	580	0	-	0385180	6415923
4	*E. gomphocephala*	20	570	0	-	0385166	6415921
5	*E. gomphocephala*	19	630	0	-	0385140	6415929
6	*E. gomphocephala*	20	630	0	-	0385134	6415905
7	*(E. gomphocephala)*	18	830	0	-	0385115	6415904

5 Discussion

A total of 59 flora taxa (including species, subspecies, varieties and forms) from 49 genera and 31 families were recorded in the Survey Area.

5.1 Flora of Conservation Significance

No threatened species pursuant to the EPBC Act or to the WC Act were recorded in the Survey Area during the field survey. Nineteen species listed as Threatened by the EPBC Act, and also listed under the WC Act, were identified as potentially occurring in the Survey Area.

Four of these - (*Caladenia huegelii*, *Dillwynia dillwynioides, Sphaerolobium calcicola and Jacksonia sericea)* - are considered likely to occur within the Survey Area due to the presence of suitable habitat and the close proximity to the site of previous records.

One of these (*Drakaea micrantha*) is considered as possibly occurring in the site due to the presence of suitable habitat and the proximity of previous records to the Survey Area.

Two of these (*Acacia benthamii* and *Schoenus capillifolius*) are considered unlikely to occur due to lack of suitable habitat.

A further 12 priority flora taxa were identified as potentially occurring in the Survey Area based on database searches, however, the likelihood of occurrence is not known due to a lack of information on their preferred habitat or known closest record to the site.

Caladenia huegelii is a tuberous, perennial orchid that grows to 0.6 m high that is easily recognizable during its flowering period from September to October (WAH 2014). Outside of this period *C. huegelii* remains as an underground tuber and is difficult to detect in the field. The vegetation in the Survey Area does contain tree species that *Caladenia huegelii* is associated with, however the understorey lacks the majority of typical species. The understory in the Survey Area is regarded as being open whereas *Caladenia huegelii* tends to favour areas of thick undergrowth. Soil preferable for the species is usually deep grey-white sand associated with the Bassendean sand-dune system. However, specimens have been known to extend into the Spearwood system in some areas. From the information above, it can be concluded, that even though the survey was undertaken outside the optimum time for the flowering of this species and it is possible for the species to occur on the soil present on site, there is limited preferable habitat present, it has an open structure and considered to be dominantly in Good to Degraded condition; consequently its likely occurrence is questionable.

Drakaea micrantha is a tuberous, terrestrial herb which has a diminutive flower and a heart shaped leaf which is silvery grey with prominent green veins. The species flowers from September to October. The vegetation in the Survey Area does contain tree species that *Drakaea micrantha* is associated with and there is *Kunzea glabrescens* present which is typically associated with the species. The occurrence of Kunzea on site however, is sporadic and lacking the community structure often associated with the presence of *Drakaea micrantha*. The sands occurring at the site belong to the Spearwood and Quindalup system and therefore are generally calcareous yellow to brown sands. DPaW records suggest that this species is generally confined to areas further inland upon the grey sands of the Bassendean system. Even though the survey was undertaken outside the optimum time for the flowering of this species, the above information implies its possible occurrence in the Survey Area is unlikely.

5.2 Vegetation of Conservation Significance

A search of the EPBC PMST and DPaW TEC and PEC database identified two TECs and five PECs occurring within five km of the Survey Area (DPaW 2014b).

No TEC's were found to occur within the Survey Area.

One Priority 3 vegetation community was found to occur in the Survey Area;

- Central Banksia attenuata – Eucalyptus marginata woodlands (type 21a)
- The vegetation association, BaBm, has been inferred as FCT SCP21a Central Banksia attenuata – Eucalyptus marginata woodlands. Even though FCT SCP21a is not formally listed as a PEC, in 2012 a nomination was put forward under the EPBC Act to list all *Banksia* dominated woodlands as TECs. The nomination is currently being assessed by DoE with the decision to be completed in July 2015. The main feature of these *Banksia* woodlands is the presence of *Banksia attenuata* and/or B. *menziesii* occurring on deeps sands. This community is listed as Priority 3.
- Two additional inferred Priority 3 vegetation communities were found to occur in the Survey Area;Northern Spearwood shrublands and woodlands (type 24) (this FCT is listed as a Priority 3 by DPaW)
- Southern Swan Coastal Plain *E. gomphocephala – A. flexuosa* woodlands (type 25) (this FCT is listed as a Priority 3 by DPaW)

PECs are known as ecologically valuable communities that need further investigation before possible nomination for TEC status. Priority communities listed by DPaW have no formal protection. There is no written policy on how to respond to the presence of PECs within proposed development sites and the presence of these communities is dealt with by DPaW on a case by case basis.

5.3 Vegetation Condition and Introduced Flora

Vegetation condition ranged from Excellent to Completely Degraded, with majority large portion of the Survey Area considered in Completely Degraded condition (52.2%). Tracks and invasive weed species were the most common form of disturbance in the Survey Area. The low percentage of vegetation considered in Excellent or Good condition can be attributed to the location and surrounding land uses of the Survey Area. The surrounding urban development and roads are a source of weeds, rubbish and there are tracks. Lot 700 land-use as a function centre with established tropical gardens and landscaping has left the property devoid of native species except for a very small area along the southern boundary.

A total of 16 introduced species were recorded during the field survey. None of these taxa are listed as Declared under the BAM act or WONS. All of the weed species recorded are common bushland and agricultural weeds (Hussey *et al.* 2007). One of the weeds (**Olea europaea*) has a High rating under the DPaW Weed Prioritization Process, One is rated Moderate, Ten are rated Low and four are rated as Negligible under the DPaW Weed Prioritization Process (Table 7).

5.4 Regional Representation

The Cottesloe Complex is estimated to have 41.1% native vegetation remaining based on the pre-European extent, with 8.8% in secure tenure (EPA 2006). More recently the (PBP) has mapped native vegetation extent by vegetation complex on the SCP. It is estimated that 35.22% of Cottesloe Complex remains compared to its pre-European extent (PBP 2013).

The EPA recognises vegetation complexes that are not well represented as being significant. Vegetation complexes which have 10%-30% remaining may be considered regionally significant. Proposals that would affect a vegetation complex with 10% or less remaining are likely to be formally assessed by the EPA (EPA 2006).

5.5 Ecological Linkages

The purpose of the Regional Ecological Linkages identified by the PBP was to link protected natural areas with other areas of mapped native vegetation. Priority was given to identifying linkages through those areas having the greatest assumed protection and to those areas that maximised opportunities to form continuous corridors of native vegetation. The Survey Area does not form part of the PBP's Draft Regional Ecological linkage network, however, there are Ecological Linkages surrounding the Survey Area (Table 2 and Figure 4).

5.6 Black Cockatoo Assessment

During the Black Cockatoo Assessment potential foraging and breeding habitat was identified in the Survey Area. Foraging habitat consisted of Tuart, Banksia and Acacia, all known dietary item of Black Cockatoos and potential breeding habitat consisted of Tuart (Johnstone & Kirkby 2011).

5.6.1 Foraging Habitat

Carnaby's Cockatoo have been observed feeding on a wide range of foods including the seeds of *B. attenuata, B. baxteri, B. coccinea, B. menziesii, B. grandis, B. prionotes, B. speciosa, B. ilicifolia, B. longifolia, B. ericifolia, B. quercifolia, B. hookeriana*, as well as flower buds, flowers and nectar of *B. attenuata, B. ericifolia, B. grandis, B. ilicifolia, B. menziesii, E. gomphocephala.* They have been recorded foraging on insect larvae and insects (including weevils) from under bark, from wood of live and dead trees and shrubs, from galls and from flowers and flower stems, of *Acacia* spp. including *A. saligna, Banksia* spp., *and Eucalyptus* spp. (Johnstone & Kirkby 2011).

Baudin's Cockatoo is mainly found in eucalypt forests, especially *E. marginata – C. calophylla* forest, *E. diversicolor* forest, and less frequently in woodlands of *E. wandoo, E. patens and E. rudis*. This cockatoo forages at all levels of the forest from the canopy to the ground, often feeding in the understorey on proteaceous trees and shrubs, especially Banksia (Johnstone & Kirkby 2011).

FRTBC feeds mainly on the seeds of *C. calophylla and E. marginata* (Johnstone & Kirkby 2011). Immature FRTBC have been recorded taking up to three times as long as their parents to open Jarrah or Marri nuts and eat the seeds (Johnstone *et. al.* 2013).

In more recent years there has been an interesting change in foraging behaviour of FRTBC in the northern Darling Range (adjacent to the Perth metropolitan area) with the FRTBC discovering and using a new food source, the introduced Cape Lilac (*Melia azedarach*), This species is of growing importance as food in the Perth region (Johnstone *et. al.* 2013).

5.6.2 Potential Breeding Habitat

Black cockatoos breed in large hollow-bearing trees, generally in woodlands or forests (Johnstone *et al.* 2013). The size of the tree can be a useful indication of the hollow-bearing potential of the tree. Trees of suitable DBH are potentially important for maintaining breeding in the long-term, through maintaining the integrity of the habitat and allowing trees to provide future nest hollows. Maintaining the long-term supply of trees of a size to provide suitable nest hollows is particularly important in woodland stands that are known to support Black Cockatoo breeding (DSEWPaC 2012).

The Black Cockatoo Assessment revealed that the Survey Area contains Tuart trees which have reached a size that are considered to be potential future hollow bearing

trees, therefore potential breeding trees (≥500 mm DBH) according to the EPBC Act Black Cockatoo referral guidelines.

In total, seven trees were recorded which met the criteria to be classed as a potential breeding tree (Figure 9). This suggests that these trees may develop hollows and have the potential to be used for Black Cockatoo breeding in the future. In order to be suitable for Black Cockatoos, the holes need to be greater than 120 mm diameter (Johnstone *et al.* 2013). No hollows were observed in any of the trees.

In summary, 49.1% of the Survey Area consists of species, such as Banksia, Acacia and Tuart, which are known to provide potential foraging, roosting and breeding habitat. Therefore the Survey Area contains habitat which is important to all three Black Cockatoo species. During the survey no Black Cockatoos were observed directly utilising the Survey Area and none were observed flying over the site. No direct or indirect foraging evidence was recorded during the survey. This may suggest that the site is not extensively utilised by Black Cockatoos.

6 Conclusions

The flora and vegetation survey was undertaken during Spring, however was outside of the optimum flowering period of several species. The Survey Area was surveyed sufficiently and to a high standard, and as such the following conclusions can be drawn:

- No Threatened species are likely to be present on site;
- No Priority species are likely to be present on site;
- No TECs are present in the Survey Area;
- One Priority 3 PEC, as listed by DPaW, occur within the Survey Area:
    - Central Banksia attenuata – Eucalyptus marginata woodlands (type 21a).
- Two Priority 3 vegetation Communities that were inferred have been identified as occurring on site:
    - Northern Spearwood shrublands and woodlands (type 24); and
    - Southern Swan Coastal Plain *E. gomphocephala – A. flexuosa* woodlands (type 25).

During the Black Cockatoo Assessment, the Survey Area was sufficiently surveyed and as such the following conclusions can be made:

- No Black Cockatoos were observed during the assessment;
- The Survey Area contained potential foraging and breeding habitat;
- Seven potential breeding trees were recorded;
- No breeding hollows were observed; and
- No foraging evidence was recorded in the Survey Area.

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8 Limitations

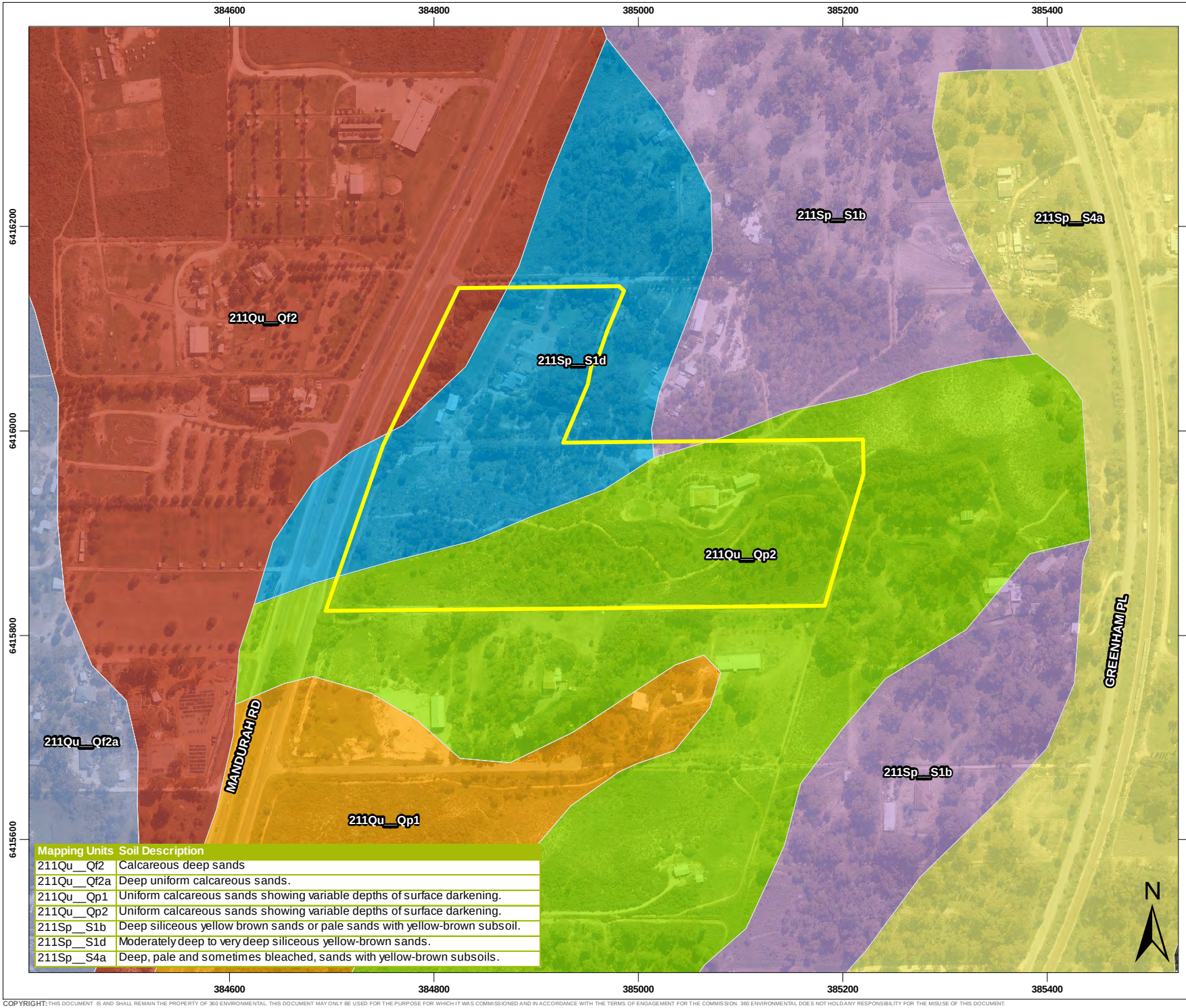
This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and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

FIGURES



Mapping Units	Soil Description
211Qu__Qf2	Calcareous deep sands
211Qu__Qf2a	Deep uniform calcareous sands.
211Qu__Qp1	Uniform calcareous sands showing variable depths of surface darkening.
211Qu__Qp2	Uniform calcareous sands showing variable depths of surface darkening.
211Sp__S1b	Deep siliceous yellow brown sands or pale sands with yellow-brown subsoil.
211Sp__S1d	Moderately deep to very deep siliceous yellow-brown sands.
211Sp__S4a	Deep, pale and sometimes bleached, sands with yellow-brown subsoils.

Legend

Survey Area

Soil Subsystems

- **211Qu__Qf2,** Quindalup South Qf2 Phase
- **211Qu__Qf2a**, Quindalup South Qf2a Phase
- **211Qu__Qp1**, Quindalup South Qp1 Phase
- **211Qu__Qp2**, Quindalup South Qp2 Phase
- **211Sp__S1b**, Spearwood S1b Phase
- **211Sp__S1d**, Spearwood S1d Phase
- **211Sp__S4a**, Spearwood S4a Phase

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- SOILS SOURCED FROM DAFWA 2004
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2014 (© Western Australian Land Information Authority 2014)

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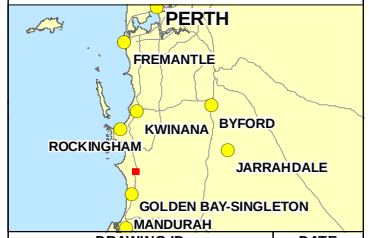
LOCALITY MAP



DRAWING ID	DATE
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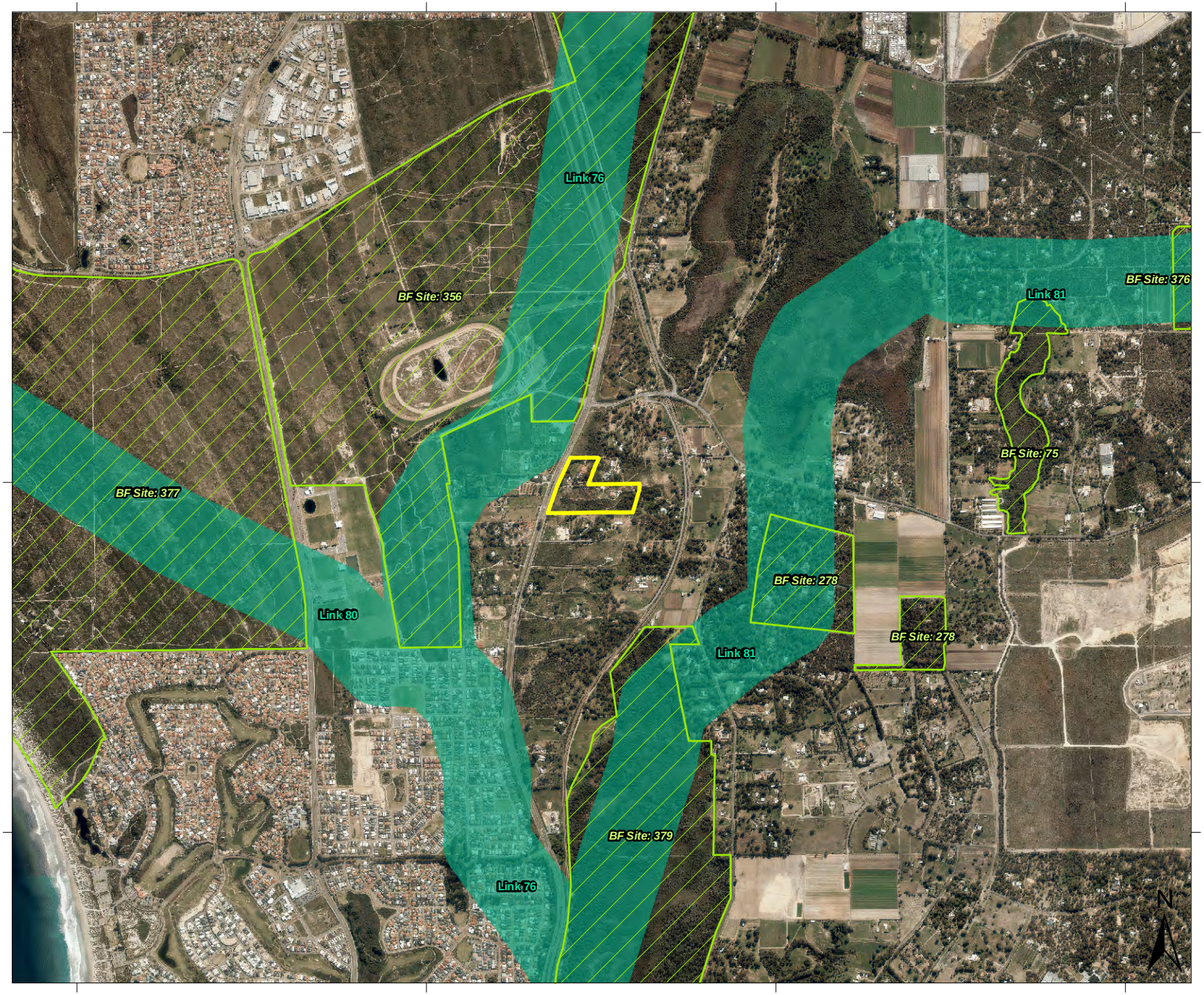
HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
CS	LS/SF	RF	0

Rockingham Montessori School
Lot 11 Mandurah Road, Karnup

Flora, Vegetation and Black Cockatoo Report

Figure 3 - Soils



Legend

- Survey Area
- Bush Forever Sites
- Perth Regional Ecological Linkages

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- BUSH FOREVER SITES SOURCED FROM DOP 2012
- ECOLOGICAL LINKAGES SOURCED FROM PBP (WALGA) 2008
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE AUG 2014 (© Western Australian Land Information Authority 2014)

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Flora, Vegetation and Black Cockatoo Report

Figure 4 - Conservation Area

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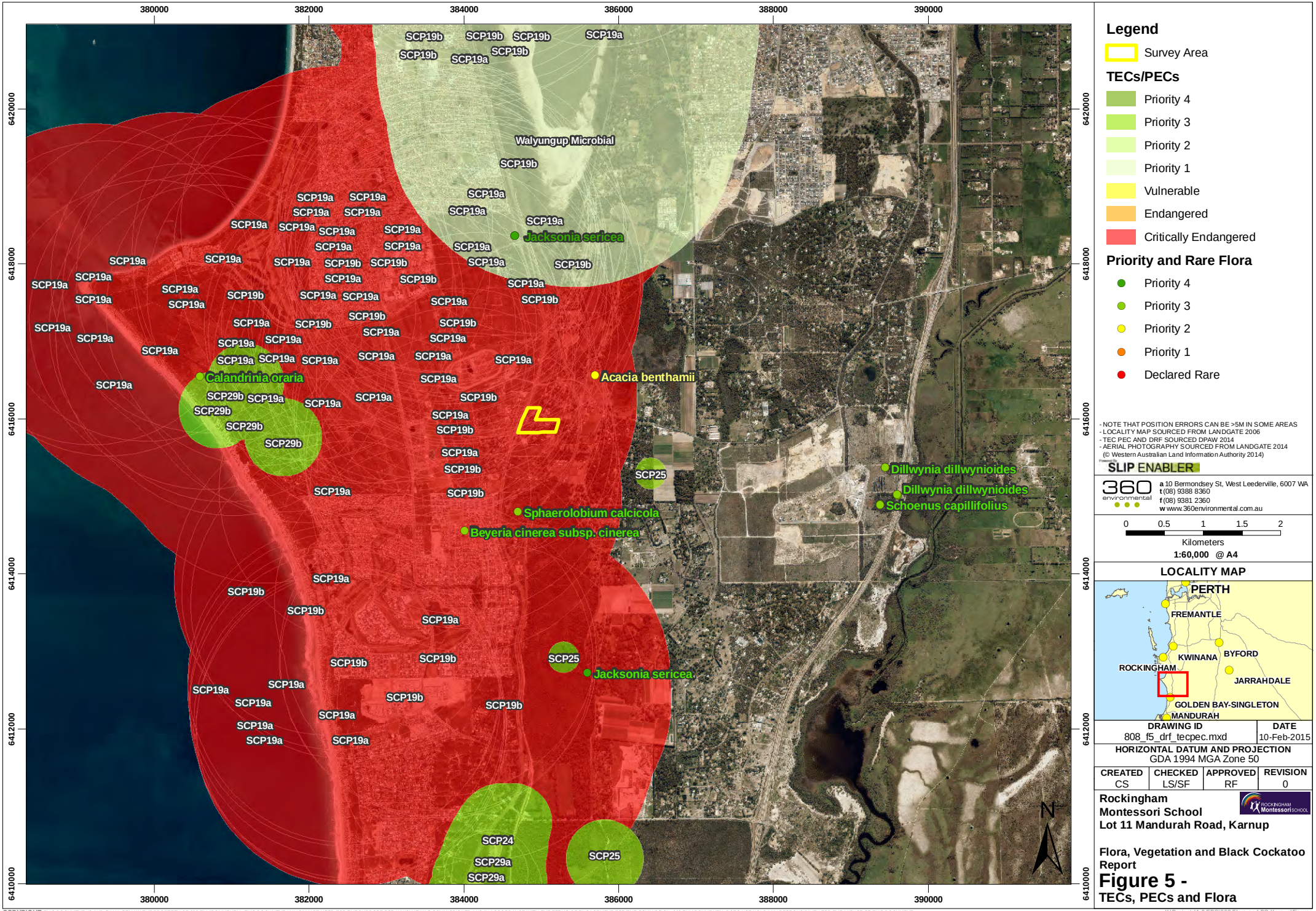

Legend

- Survey Area

TECs/PECs

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Vulnerable
- Endangered
- Critically Endangered

Priority and Rare Flora

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Declared Rare

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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- TEC PEC AND DRF SOURCED DPAW 2014
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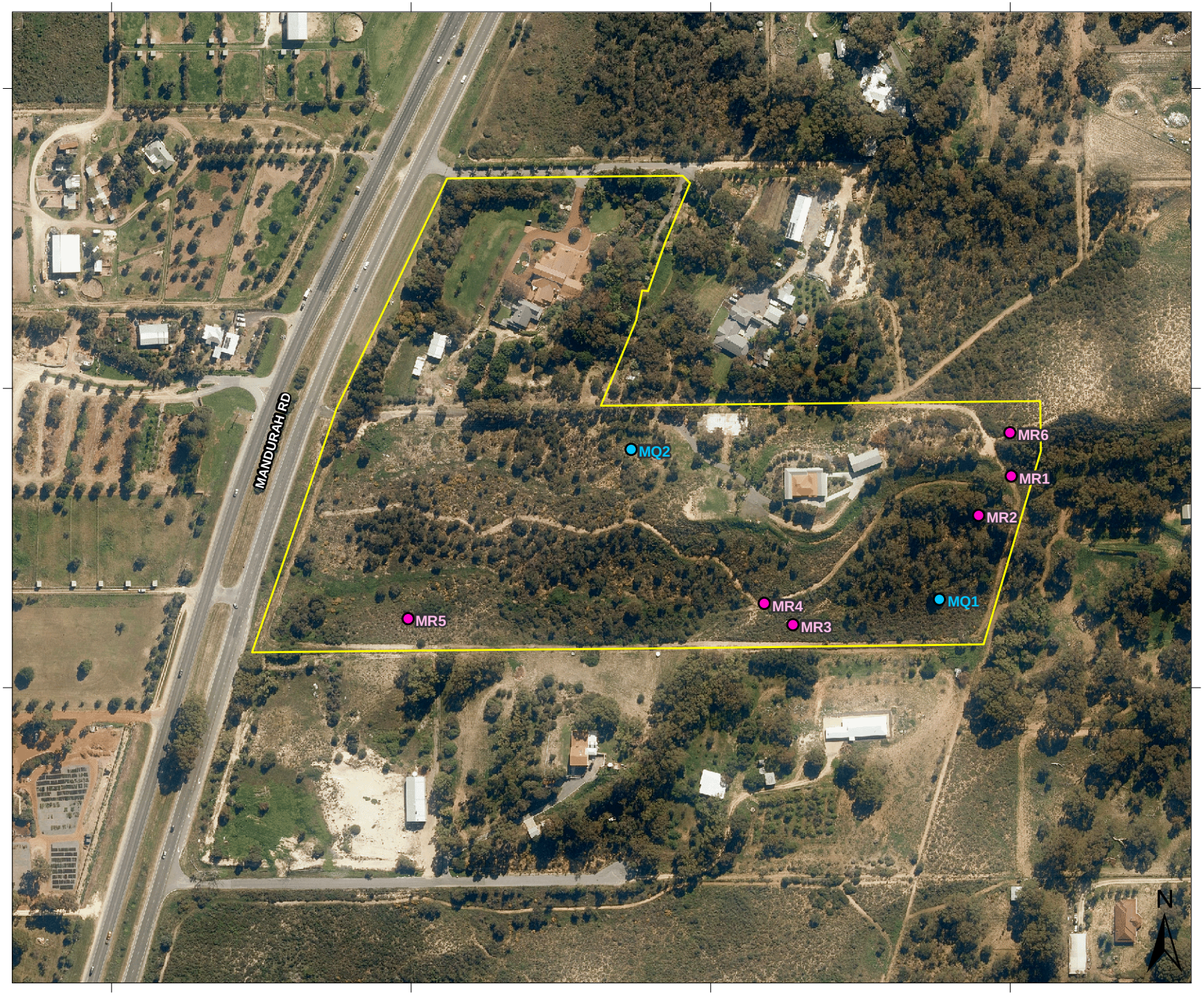
Flora, Vegetation and Black Cockatoo Report

Figure 5 -
TECs, PECs and Flora



Legend

- Survey Area
- Quadrat
- Releve

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE AUG 2014 (© Western Australian Land Information Authority 2014)

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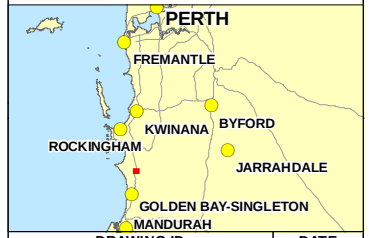
LOCALITY MAP



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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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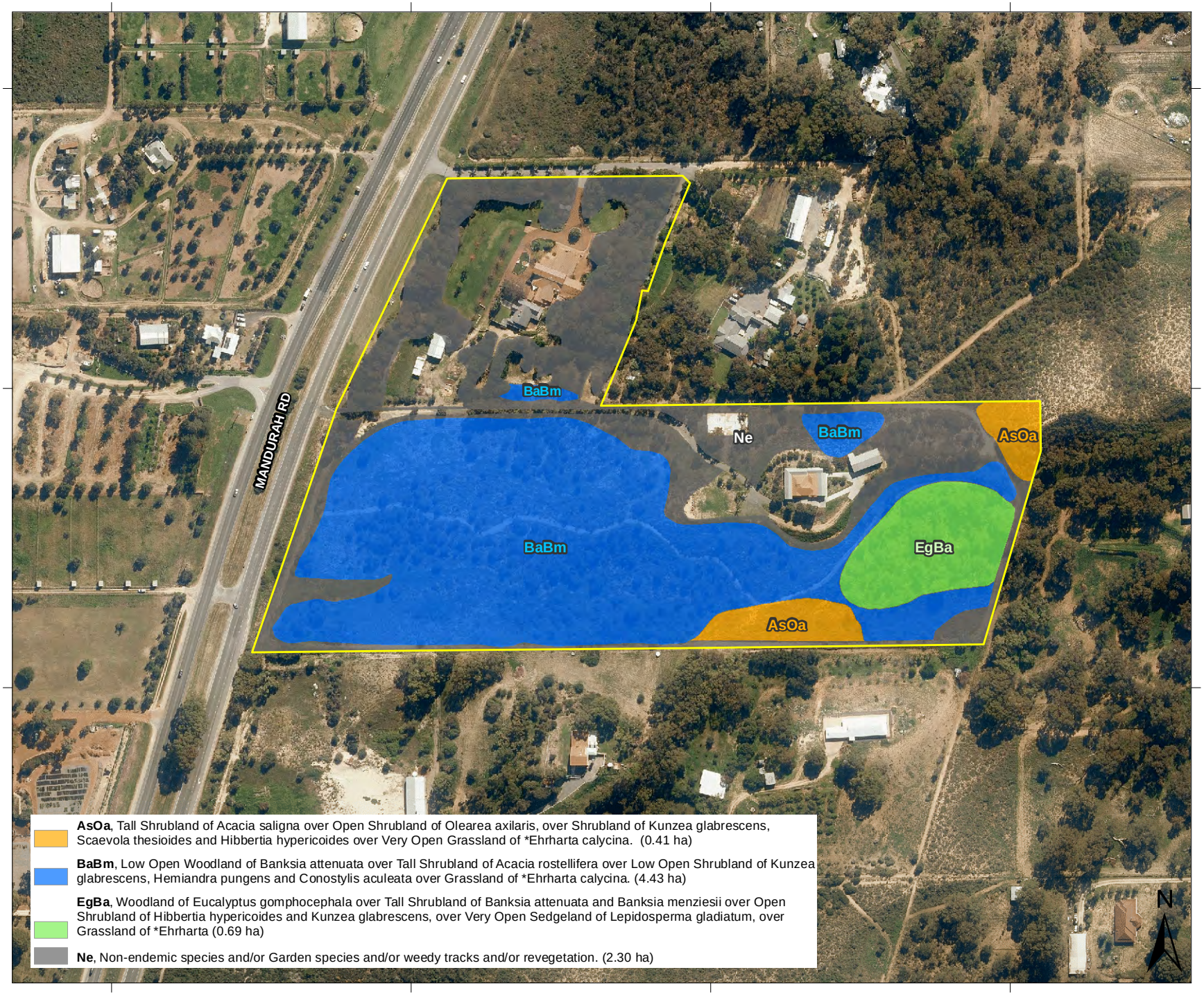
Figure 6 -
Quadrat and Releve Locations



AsOa, Tall Shrubland of Acacia saligna over Open Shrubland of Olearea axilaris, over Shrubland of Kunzea glabrescens, Scaevola thesioides and Hibbertia hypericoides over Very Open Grassland of *Ehrharta calycina. (0.41 ha)

BaBm, Low Open Woodland of Banksia attenuata over Tall Shrubland of Acacia rostellifera over Low Open Shrubland of Kunzea glabrescens, Hemiandra pungens and Conostylis aculeata over Grassland of *Ehrharta calycina. (4.43 ha)

EgBa, Woodland of Eucalyptus gomphocephala over Tall Shrubland of Banksia attenuata and Banksia menziesii over Open Shrubland of Hibbertia hypericoides and Kunzea glabrescens, over Very Open Sedgeland of Lepidosperma gladiatum, over Grassland of *Ehrharta (0.69 ha)

Ne, Non-endemic species and/or Garden species and/or weedy tracks and/or revegetation. (2.30 ha)

Legend

Survey Area

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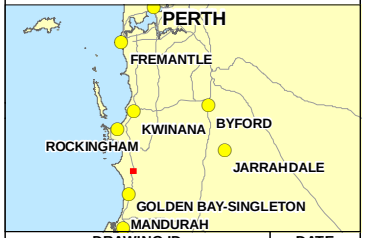

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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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CS	LS/SF	RF	0

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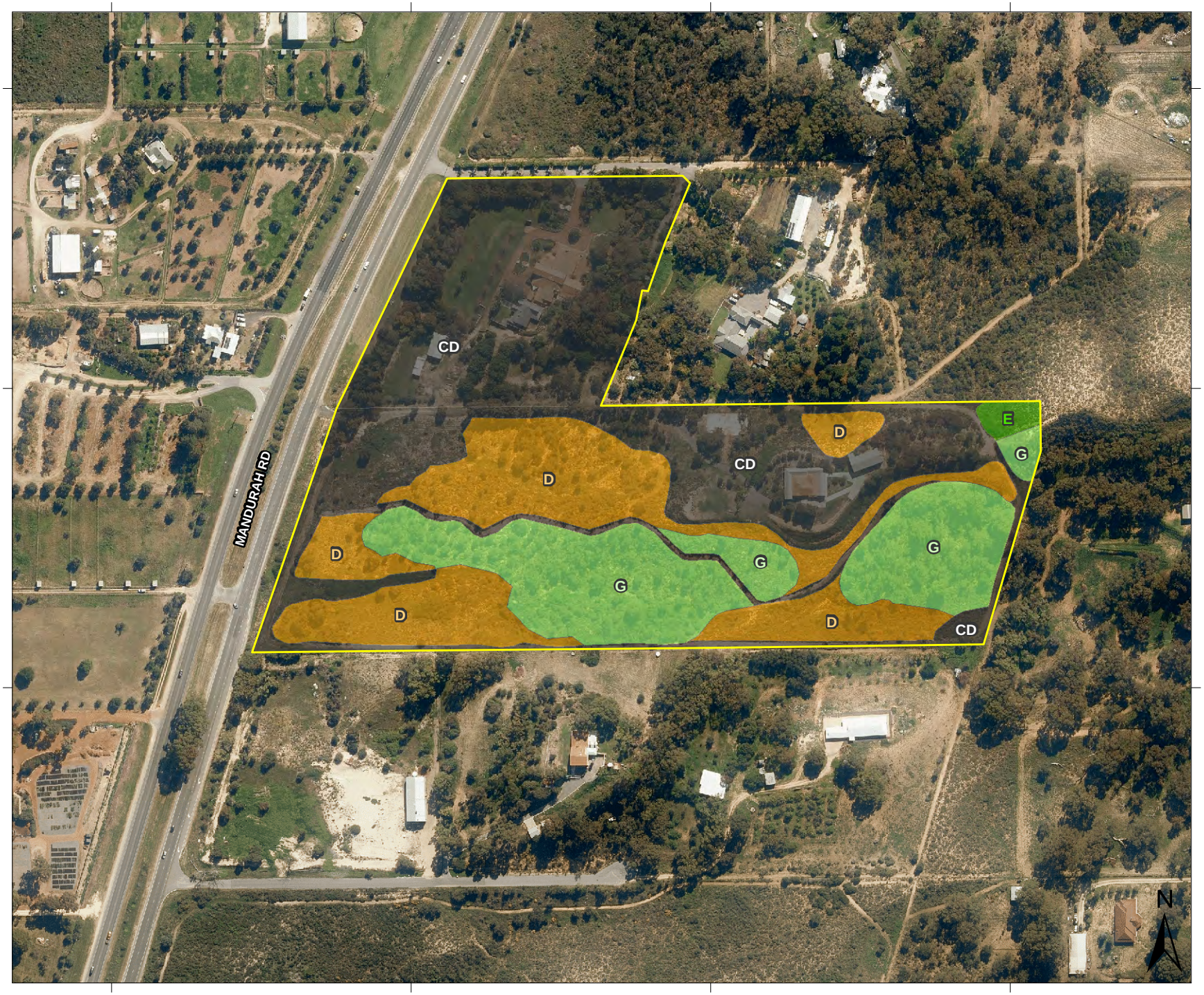
Flora, Vegetation and Black Cockatoo Report

Figure 7 -
Vegetation Association



Legend

Survey Area

Vegetation Condition

- Excellent (0.09 ha)
- Good (2.29 ha)
- Degraded (2.61 ha)
- Completely Degraded (5.44 ha)

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE AUG 2014 (© Western Australian Land Information Authority 2014)

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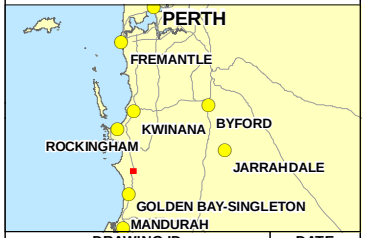

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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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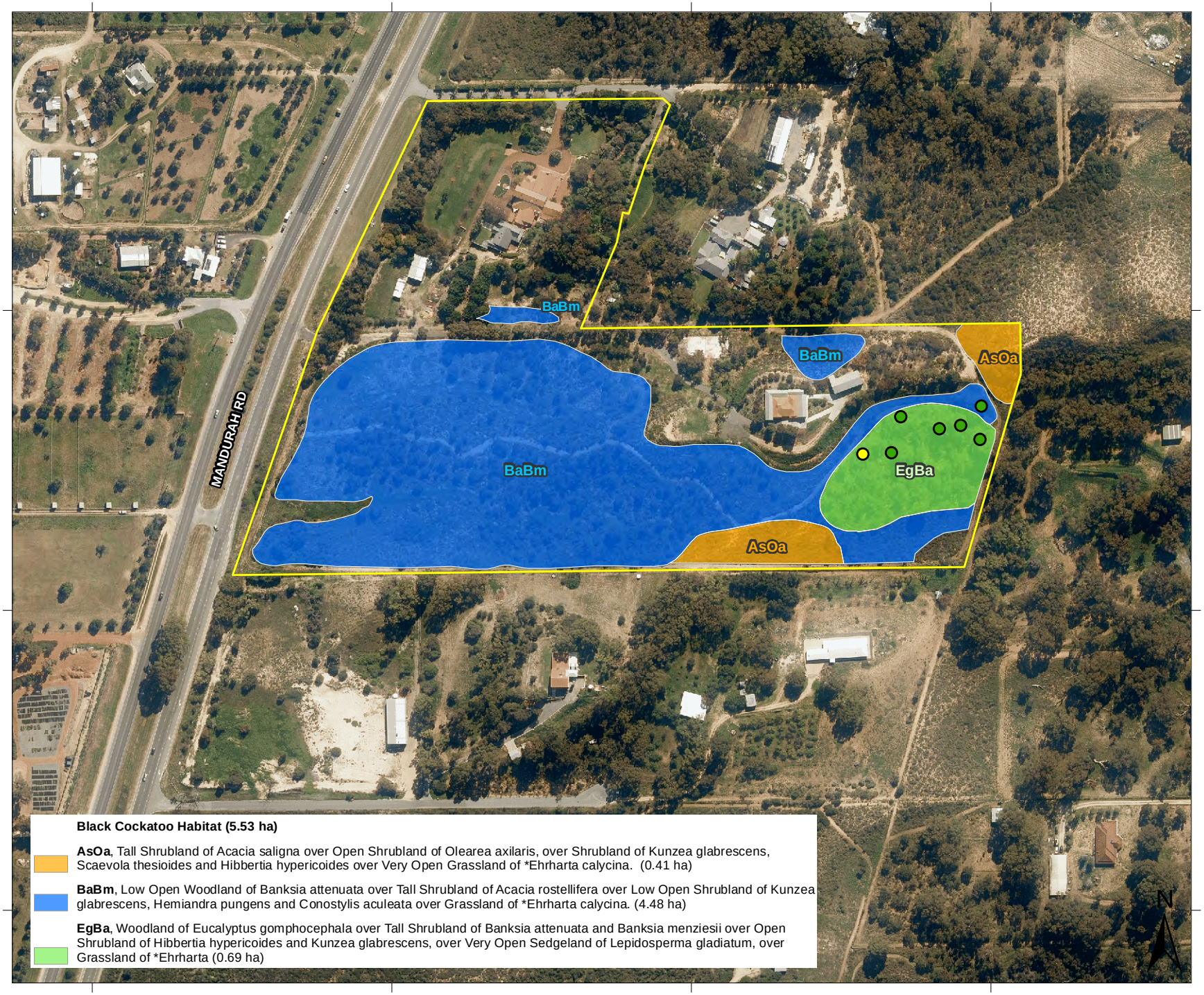
Flora, Vegetation and Black Cockatoo Report

Figure 8 -
Vegetation Condition



Black Cockatoo Habitat (5.53 ha)

AsOa, Tall Shrubland of Acacia saligna over Open Shrubland of Olearea axilaris, over Shrubland of Kunzea glabrescens, Scaevola thesioides and Hibbertia hypericoides over Very Open Grassland of *Ehrharta calycina. (0.41 ha)

BaBm, Low Open Woodland of Banksia attenuata over Tall Shrubland of Acacia rostellifera over Low Open Shrubland of Kunzea glabrescens, Hemiandra pungens and Conostylis aculeata over Grassland of *Ehrharta calycina. (4.48 ha)

EgBa, Woodland of Eucalyptus gomphocephala over Tall Shrubland of Banksia attenuata and Banksia menziesii over Open Shrubland of Hibbertia hypericoides and Kunzea glabrescens, over Very Open Sedgeland of Lepidosperma gladiatum, over Grassland of *Ehrharta (0.69 ha)

Legend

- Survey Area
- *Eucalyptus gomphocephela*
- *Eucalyptus gomphocephela* (dead)

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE AUG 2014 (© Western Australian Land Information Authority 2014)

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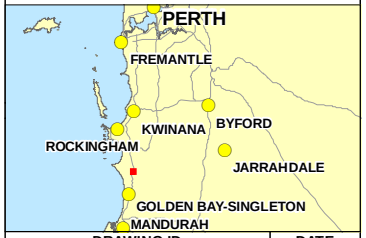
LOCALITY MAP



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GDA 1994 MGA Zone 50

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Flora, Vegetation and Black Cockatoo Report

Figure 9 - Black Cockatoo Habitat

APPENDIX A

Definition of Declared Rare / Priority / Threatened Flora and Fauna Species

Categories of Declared Rare Flora (WC Act) and Priority listings (DPaW)

Conservation Code	Description
X	**Presumed Extinct Flora (Declared Rare Flora – Extinct)** "Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the *Wildlife Conservation Act 1950*)."
T	**Threatened Flora (Declared Rare Flora – Extant)** "Taxa 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 (Schedule 1 under the *Wildlife Conservation Act 1950*)." "Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: 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."
P1	**Priority One: Poorly-known taxa** "Taxa which are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes."
P2	**Priority Two: Poorly-known taxa** "Taxa which are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes."
P3	**Priority Three: Poorly-known taxa** "Taxa which are known from collections or sight records from several localities not under imminent threat, or few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be

	included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them."
P4	**Priority Four: Rare, Near Threatened and other taxa in need of monitoring** a. Rare. "Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands." b. Near Threatened. "Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable." c. "Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy."
P5	**Priority Five: Conservation Dependent taxa** "Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years."

Source: Department of Parks and Wildlife (2014). Online: http://florabase.dpaw.wa.gov.au.

WA Threatened Fauna Categories Wildlife Conservation Act 1950 (WA)

CATEGORY	CODE	DESCRIPTION
Schedule 1	S1	Rare or likely to become extinct.
Schedule 2	S2	Presumed extinct.
Schedule 3	S3	Birds subject to an agreement between the governments of Australia and Japan, the People's Republic of China & the Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.
Schedule 4	S4	Other specially protected fauna.

Department of Environment and Conservation Fauna Priority Codes

CATEGORY	CODE	DESCRIPTION
Priority 1	P1	Taxa with few, poorly known populations on threatened lands.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	P4	Taxa in need of monitoring: not currently threatened or in need of special protection, but could become so. Usually represented on conservation lands.

Priority 5	P5	Taxa in need of monitoring: not considered threatened, but the subject of a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Categories of Threatened Flora and Fauna Species under the EPBC Act

CONSERVATION CODE	DESCRIPTION
Ex	**Extinct** Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or 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.
CE	**Critically Endangered** Taxa which at a particular 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.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, 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 within a period of 5 years.

Source: *Environment Protection and Biodiversity Conservation Act 1999*

APPENDIX B

Definition of Threatened and Priority Ecological Communities

Definitions of Threatened Ecological Communities as Endorsed by the WA Minister for the Environment

Presumed Totally Destroyed (PD)

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 or known or likely habitats or

B) All occurrences recorded within the last 50 years have since been destroyed.

Critically Endangered (CR)

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 5 years)

ii) modification throughout its range is continuing such that in the immediate future (within approximately 5 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 5 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 which may be capable of being rehabilitated if such work begins in the immediate future (within approximately 5 years)

Endangered (EN)

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 estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 70% 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 likely in the short term (within approximately 10 years)

ii) modification throughout its range is continuing such that in the short term future (within approximately 10 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 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 which may be capable of being rehabilitated if such work begins in the short term future (within approximately 10 years).

Vulnerable (VU)

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 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 which are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community can be modified or destroyed 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 still be 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.

Source: Department of Environment and Conservation (2010). Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Department of Environment and Conservation, Perth, WA. Online: www.naturebase.net/

Definitions of Priority Ecological Communities as listed DPaW

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

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:

(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 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.

(a) 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.

(b) 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.

(c) 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.

Source: Department of Parks and Wildlife (2013). Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Department of Environment and Conservation, Perth, WA. Online: www.naturebase.net/

APPENDIX C

Environmental Weeds and Declared Plant Categories

Criteria used for Ranking Environmental Weeds

The Weed Prioritisation Process for DPaW contains criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity. These criteria are as follows:

- **Potential Distribution** – Area of potential habitat in the Region that could be occupied or the area at risk of invasion by the weed.
- **Current Distribution -** Area of habitat in the Region currently occupied by the weed, in relation to the habitat that it could invade.
- **Ecological Impact -** Impact of species within the Region, from low impact (causes minimal disruption to ecological processes or loss of biodiversity) to high (causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure, composition and function of ecosystems).
- **Invasiveness** – rate of spread of a weed in native vegetative, encompassing factors of establishment, reproduction and long distance dispersal (>100m).
- **Feasibility of Control** - The longer a coordinated control program takes to achieve its desired goal, the more expensive and less feasible it becomes. Is it feasible to eradicate or at least contain the infestation?

Source: DPaW (2013). Weed Prioritisation Process for DPaW (formerly DEC) – "An integrated approach to Weed Management on DPaW-managed lands in WA"

Standard Meanings of Declared Plant Categories

Under the Biosecurity and Agriculture Management Act 2007 (the BAM Act), all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management).

C1 category (Exclusion) - Pests will be assigned to this category if they are not established in WA and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.

C2 category (Eradication) – Pests will be assigned to this category if they are present in WA in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.

C3 category (Management) – Pests will be assigned to this category if they are established in WA but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Source: Department of Agriculture and Food, WA. Online:
http://www.biosecurity.wa.gov.au/western-australian-organism-list-waol

APPENDIX D

Vegetation Condition Scale

Condition Scale Code	Condition Scale
P	**Pristine (1)** Pristine or nearly so, no obvious signs of disturbance
E	**Excellent (2)** Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
VG	**Very Good (3)** Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
G	**Good (4)** Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
D	**Degraded (5)** Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
CD	**Completely Degraded (6)** The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Source: Bush Forever Vegetation Condition Scale as developed by Keighery (1994) and summarized in Bush Forever (Government of WA (2000b)

APPENDIX E

Flora Inventory

Family	Species
Aizoaceae	**Carpobrotus edulus*
Anacardiaceae	**Schinus molle*
Anarthriaceae	*Lyginia imberbis*
Asparagaceae	*Acanthocarpus preissii*
	Thysanotus arbuscula
	Thysanotus dichotomus
Asteraceae	**Arctotheca calendula*
	**Ursinia anthemoides*
	Asteridea pulverulenta
	Olearia axillaris
	Pithocarpha sp.
Campanulaceae	*Lobelia tenuior* subsp. *tenuior*
Casuarinaceae	*Allocasuarina humilis*
Colchicaceae	*Burchardia congesta*
Cyperaceae	*Lepidosperma gladiatum*
Dilleniaceae	*Hibbertia hypericoides*
Ericaceae	*Leucopogon propinquus*
Euphorbiaceae	**Euphorbia peplus*
Fabaceae	*Acacia cochlearis*
	Acacia pulchella
	Acacia rostellifera

	Acacia saligna
	Bossiaea eriocarpa
	Gompholobium tomentosum
	Hardenbergia comptoniana
	Jacksonia furcellata
	Kennedia coccinea
Geraniaceae	**Pelargonium capitatum*
Goodeniaceae	*Scaevola canescens*
	Scaevola thesioides
Haemodoraceae	*Conostylis aculeata*
Hemerocallidaceae	*Dianella revoluta* var. *divaricata*
	Tricoryne elatior
Lamiaceae	*Hemiandra pungens*
Lauraceae	*Cassytha flava*
	Cassytha sp.
Meliaceae	**Melia azedarach*
Myrtaceae	*Eucalyptus gomphocephala*
	Kunzea glabrescens
Oleaceae	**Olea europaea*
Papaveraceae	**Fumaria capreolata*
Phyllanthaceae	*Phyllanthus calycinus*
Pinaceae	**Pinus pinaster*
Poaceae	**Avena barbata*

	**Briza maxima*
	**Briza minor*
	**Ehrharta calycina*
	**Lagurus ovatus*
	Austrostipa flavescens
	**Bromus diandrus*
Proteaceae	*Banksia attenuata*
	Banksia menziesii
	Banksia nivea subsp. *nivea*
	Hakea prostrata
	Hakea varia
Restionaceae	*Desmocladus flexuosus*
Santalaceae	*Santalum acuminatum*
Thymelaeaceae	*Pimelea leucantha*
Zamiaceae	*Macrozamia fraseri*

APPENDIX F

Flora Site Data Sheets

Site MQ1

Described by: SF

Date	13/11/2014
Type	Q 10 x 10 m
Location	Lot 1809 Karnup
MGA Zone	50 385153 **mE** 6415859 **mN**
Habitat	Midslope, undulating plain
Vegetation	AhKg - Low Open Shrubland of *Allocasuaring humilis*, *Kunzea glabrescens*, *Hibbertia hypericoides* over weedy grasses.
Veg Condition	Good
Fire Age	>12 years
Notes	Disturbance: weeds Aspect: SW 0% bare ground 40% leaf litter 5% twigs 0% logs

SPECIES LIST:

Name	Cover	Height	Coll. No	Notes
Acacia pulchella	3%	1.2m	MQ1-03	Acacia sp. fruit
Allocasuarina humilis	40%	2m	MQ1-01	Allocasuarina sp.
**Avena barbata*	5%	0.8m	nc	Avena sp.
Banksia nivea subsp. *nivea*	<1%	0.3m	MQ1-02	Banksia nivea
**Briza maxima*	5%	0.3m	nc	Briza maxima
**Briza minor*	<1%	0.1m	nc	Brizor minor
Burchardia congesta	<1%	0.4m	nc	Burchardia sp.
Conostylis aculeata	1%	0.1m	MR2-01	Conostylis sp.
**Ehrharta calycina*	80%	1.8m	MR1-09	Eriachne sp.
Hibbertia hypericoides	20%	1m	MR2-02	Hibbertia sp.
Kunzea glabrescens	15-20%	1m	MR1-08	Myrtaceae sp.
**Lagurus ovatus*	25%	0.4m	nc	Lagurus ovatus

Site MQ2

Described by: SF

Date	13/11/2014
Type	Q 10 x 10m
Location	Lot 1809 Karnup
MGA Zone	50 384947 **mE** 6415959 **mN**
Habitat	Midslope
Soil	sand
Rock Type	n/a
Vegetation	BaBm - Open Woodland of *B.attenuata* and *B.menziesii* over Low Open Shrubland of *Hibbertia hypericoides*, *Kunzea glabrescens* over mixed shrubs and weedy grasses
Veg Condition	Degraded
Fire Age	>12 years
Notes	Disturbance: Aspect: west 30% leaf litter 1% bare ground 1% twigs <1% logs

SPECIES LIST:

Name	Cover	Height	Col. No	Notes
Acacia pulchella	1%			Acacia sp.
**Avena barbata*	1%	0.6m		Avena sp.
Banksia attenuata attenuata	1%	1.2m		Banksia
Banksia menziesii menziesii	20%	4.5m		Banksia
Bossiaea eriocarpa	<1%	0.1m	MQ2-07	shrub
**Briza maxima*	1%	0.2m		Briza maxima
Cassytha flava	<1%	0.5m	MQ2-04	Cassytha sp.?
Conostylis aculeata	<1%	0.2m		Conostylis sp.
**Ehrharta calycina*	25%	1.6m	MR1-09	Eriachne sp.
**Euphorbia peplus* peplus	1%	0.2m		Euphorbia
Hakea prostrata prostrata	5%	3m		Hakea
Hemiandra pungens	1%	0.1m		Hemiandra sp.
Hibbertia hypericoides	1%	0.5m		Hibbertia sp.
Jacksonia furcellata furcellata		2.5m		Jacksonia
Kunzea glabrescens	10%	1.1m		Myrtaceae sp.
Leucopogon propinquus	<1%	1m	MQ2-06	Astroloma sp.
Lyginia imberbis	<1%	1m	MQ2-02	Sedge sp. Q2
Macrozamia fraseri	1%	1.5m		Macrozamia
Olearia axillaris Olearia	<1%	1.5m		Rhagodia sp.?
**Pelargonium capitatum*	2%	0.3m		Pelargonium
Pithocarpa sp. sp.	<1%	0.1m		Goodeniaceae
Scaevola canescens	<1%	0.5m	MR2-01	fluffy
Thysanotus dichotomus	<1%	0.7m	MQ2-05	Thysanotus sp.
**Ursinia anthemoides*	2%	0.2m		Ursinia

Site MR1

Described by: SF

Date	13/11/2014
Type	R 10m x 10m
Location	Lot 1809 Karnup
MGA Zone	50 385201 **mE** 6415941 **mN**
Soil	sand
Rock Type	n/a
Vegetation	ArHc - Shrubland of *Acacia rostellifera* with *Hardenbergia comptoniana* over Low Shrubland of *Phyllanthus calycinus*, over Sedgeland of *Lepidosperma gladiatum* over weedy grasses
Veg Condition	Good
Fire Age	>12 years
Notes	Disturbance: weeds, fence Aspect: east, midslope 70% leaf litter 10% twigs 0% bare ground 1% logs Total pfc 100% TEC

SPECIES LIST:

Name	Cover	Height	Col. No	Notes
Acacia rostellifera	35%	3m	MR1-01	Acacia rostellifera?
Acanthocarpus preissii	2%	0.8m	MR1-05	A. preissii
Austrostipa flavescens	2%	1.2m	MR1-04	
**Avena barbata*	2%	1m	nc	Avena sp.
**Bromus diandrus*	<1%	1m	MR1-10	Poaceae sp.
Desmocladus flexuosus	<1%	0.2m	MR1-06	Little sedge sp.
**Ehrharta calycina*	20%	1m	MR1-09	Eriachne sp.
**Euphorbia peplus*	2%	0.4m	nc	Euphorbia peplus
**Fumaria capreolata*	<1%	0.3m	nc	Fumaria sp.
Hardenbergia comptoniana	25%	3m	MR1-07	Hardenbergia sp.?
Kunzea glabrescens	<1%	1.2m	MR1-08	Myrtaceae sp.
**Lagurus ovatus*	10%	0.3m	nc	Lagarus ovatus
Lepidosperma gladiatum	10%	1.5m	MR1-02	Sedge sp.?
**Pelargonium capitatum*	5%	0.3m	nc	Pelargonium
Phyllanthus calycinus	1%	0.5m	MR1-03	Pimelea sp.?

Site MR2

Described by: SF

Date	13/11/2014
Type	R 20 x 20m
Location	Lot 1809 Karnup
MGA Zone	50 385179 **mE** 6415915 **mN**
Soil	sandy loam
Rock Type	n/a
Vegetation	EgBa - Open Woodland of *E.gomphocephala*, *B.attenuata* and *B.menziesii*, over Open Shrubland of *H. hypericoides, K.glabrescens*, over Sedgeland of *L. gladiatum* over Grassland of weedy grasses.
Veg Condition	Good
Fire Age	>12 years
Notes	Disturbance: - weedy grass Aspect: SE 0% bare ground 70% leaf litter 10% twigs 1% logs

SPECIES LIST:

Name	Cover	Height	Col. No	Notes
Acacia pulchella	<1%	1.6m	MR2-03	Acacia sp.
Allocasuarina humilis	<1%	1m	MR2-05	Allocasuarina sp.
Banksia attenuata	20%	4.5m	nc	
Banksia menziesii	20%	4.5m	nc	
**Briza maxima*	5%	0.2m	nc	
Conostylis aculeata	<1%	0.3m	MR2-01	Conostylis sp.
**Ehrharta calycina*	50%	1.5m	MR1-09	Eriachne sp.
Eucalyptus gomphocephala	20%	18m	nc	
**Euphorbia peplus*	1%	0.2m	nc	
Hardenbergia comptoniana	<1%	0.1m	MR1-07	
Hibbertia hypericoides	1%	1.2m	MR2-02	Hibbertia sp.
Kunzea glabrescens	1%	1m	MR1-08	Myrtaceae sp.
**Lagurus ovatus*	5%	0.2m	nc	
Lepidosperma gladiatum	5%	1.4m	MR1-02	Sedge sp.
Macrozamia riedlei	<1%	1.1m	MR2-04	Macrozamia sp.

Site MR3

Described by: SF

Date	13/11/2014
Type	R 20 X 20m
Location	Lot 1809 Karnup
MGA Zone	50 385055 **mE** 6415842 **mN**
Habitat	Midslope
Soil	sand
Rock Type	n/a
Vegetation	OaKg - Open Shrubland of *Olearia axillaris* over Low Open Shrubland of *K.glabrescens*, *H. hypericoides* over Grassland of weedy grasses
Veg Condition	Degraded
Fire Age	>12 years
Notes	Disturbance: weeds, near the fence and track Aspect: SW 40% leaf litter 0% bare ground 5% twigs 0% logs

SPECIES LIST:

Name	Cover	Height	Col. No	Notes
Acacia saligna	<1%	1.1m	nc	
Acanthocarpus preissii	1%	0.5m	MR1-05	
Austrostipa flavescens	10%	1.2m	MR1-04	
**Avena barbata*	<1%	1m	nc	
Cassytha sp.	2%	1.6m	MR3-04	Climber sp.
Dianella revoluta	<1%	1m	nc	
**Ehrharta calycina*	70%	1.6m	MR1-09	Eriachne sp.?
**Euphorbia peplus*	<1%	0.2m	nc	
**Fumaria capreolata*	<1%	0.5m	nc	
Hardenbergia comptoniana	1%	0.05m	MR1-07	
Hemiandra pungens	3%	0.2m	MR3-03	Hemiandra sp.?
Hibbertia hypericoides	6%	1.1m	MR2-02	Hibbertia sp.?
Kunzea glabrescens	10%	1.5m	MR1-08	Myrtaceae sp.
**Lagurus ovatus*	25%	1m	nc	
Olearia axillaris	8%	2.5m	MR3-02	Rhagodia sp.?
**Pelargonium capitatum*	1%	0.5m	nc	
Thysanotus arbuscula	<1%	1m	MR3-05	Thysanotus sp.
Tricoryne elatior	<1%	0.1m	MR3-01	

Site MR4

Described by: SF

Date	13/11/2014
Type	R 20 x 20m
Location	Lot 1809 Karnup
MGA Zone	50 385036 **mE** 6415856 **mN**
Habitat	Midslope
Soil	sand
Rock Type	n/a
Vegetation	BaAh - Open Woodland of *B. attenuata* and *B.menziesii* over Low Shrubland of *Allocasuarina humilis*, *H.hypericoides*, *K.glabrescens* over mixed shrubs and weedy grasses
Veg Condition	Good
Fire Age	>12 years
Notes	Disturbance: some weeds due to a weedy track running through the site Aspect: - S 40% leaf litter <1% bare ground 10% twigs 1% logs

SPECIES LIST:

Name	Cover	Height	Col. No	Notes
Acacia pulchella	1%	1.2m		Acacia sp. fruit
Allocasuarina humilis sp.	35%	1.5m	MR2-05	Allocasuarina
Austrostipa flavescens	1%	1.6m	MR1-04	
**Avena barbata*		1.3m		
Banksia attenuata	30%	6m	nc	
Banksia menziesii	15%	5m	nc	
**Briza maxima*				
**Briza minor*				
Conostylis aculeata	<1%	0.2m	MR2-	Conostylis sp.?
Ehrharta calycina	1%	1m	MR1-09	Eriachne sp.?
**Euphorbia peplus*				
Fumaria capreolata		1m		
Hakea prostrata	1%	2m	nc	
Hakea varia	1%	1.6m	nc	
Hardenbergia comptoniana	1%	1m	MR1-07	
Hibbertia hypericoides	10%	0.6m	MR2-02	Hibbertia sp.
Kunzea glabrescens	10%	1.2m	MR1-08	Myrtaceae sp.
Lobelia tenuior subsp. *tenuior* sp.?	<1%	0.1m	MR4-01	Goodeniaceae
Phyllanthus calycinus	<1%	0.2m	MR1-03	Pimelia sp.
Pimelea leucantha white	<1%	1m	MR4-02	Pimelia sp.

Site MR5

Described by: SF

Date	13/11/2014
Type	R 20 x 20m
Location	Lot 1809 Karnup
MGA Zone	50 384798 **mE** 6415846 **mN**
Habitat	open plain, midslope
Soil	sand
Rock Type	n/a
Vegetation	ArBa - Open Shrubland of *A.rostellifera and B. attenuata* over Low Open Shrubland of *Hemiandra pungens* and *K.glabrescens*, over mixed shrubs and weedy grasses
Veg Condition	Degraded
Fire Age	>12 years
Notes	Disturbance: some weeds Aspect: SW 40% leaf litter 5% bare ground 1% twigs <1% logs

SPECIES LIST:

Name	Cover	Height	Col. No	Notes
Acacia cochlearis cochlearis?	<1%	0.5m	MR5-02	Acacia sp.
Acacia rostellifera rostellifera?	15%	2m	MR1-01	Acacia
Acacia sp.	1%	0.3m	MR5-01	Acacia sp. 1
Acanthocarpus preissii	2%	0.4m	MR1-05	
**Avena barbata*	2%	1m	nc	
Banksia attenuata	10%	5m	nc	
Conostylis aculeata	1%	0.3m	MR2-01	Conostylis sp.
Desmocladus flexuosus	1%	0.2m	MR1-06	Little sedge
**Ehrharta calycina*	20%		MR1-09	Eriachne sp.
**Euphorbia peplus*	2%	0.3m	nc	
Hemiandra pungens	20%	0.1m	MR3-03	Hemiandra sp.?
Kennedia coccinea	<1%	0.05m	MR5-03	Kennedia sp.
Kunzea glabrescens	5%	1m	MR1-08	Myrtaceae sp.
**Lagurus ovatus*	30%	0.3m	nc	
Macrozamia riedlei	<1%	1m	MR2-04	Macrozamia sp.
**Olea europaea*	1%	4m	nc	Olive tree
**Pelargonium capitatum*	5%	0.4m	nc	

Site MR6

Described by: SF

Date	13/11/2014
Type	R 20 X 20
Location	Lot 1809 Karnup
MGA Zone	50 **mE mN**
Soil	sand
Vegetation	AsKg – Open Shrubland of *A.saligna* over Low Open Shrubland of *K.glabrescens* and *Scaevola thesioides* over mixed herbs and grasses
Veg Condition	Excellent
Fire Age	>12
Notes	Disturbance: - some weeds Aspect: NW mid slope, sand dune 5% leaf litter 10% bare ground 5% twigs 1% logs

SPECIES LIST:

Name	Cover	Height	Col. No	Notes
Acacia saligna	20%	2.5m	nc	
Acanthocarpus preissii	2%	0.5m		
Asteridea pulverulenta white daisy	1%	0.4m	MR6-03	Asteraceae
Austrostipa flavescens	1%	1m		
**Avena barbata*	<1%	0.6m	nc	
Cassytha sp.	<1%	0.5m		Cassytha sp.
Conostylis aculeata	<1%	0.3m		Conostylis sp.
Dianella revoluta revoluta	<1%	1m	nc	Dianella
**Euphorbia peplus*	1%	0.2m	nc	
Gompholobium tomentosum	2%	0.3m	MR6-02	Hovea sp.
Hemiandra pungens	1%	0.05m		Hemiandra sp.
Hibbertia hypericoides	3%	0.5m		Hibbertia sp.
Kennedia coccinea	<1%	0.05m		Kennedia sp.
Kunzea glabrescens	15%	1m		Myrtaceae sp.
**Ehrharta calycina*	6%	1m	MR1-08	Eriachne sp.
**Lagurus ovatus*	2%	0.2m	nc	
Olearia axillaris	1%	1.2m		Rhagodia sp.
Pelargonium capitatum	<1%	0.3m	nc	
Phyllanthus calycinus	<1%	0.3m		Pimelea sp.
Santalum acuminatum	<1%	1m	SF1	Santalum sp.
Scaevola canescens	1%	1m	MR6-04	little fluffy
Scaevola thesioides	6%	0.5m	MR6-01	Scaevola sp.

APPENDIX B

DPaW Naturemap Search Report

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 04/07/2017

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 46' 36" E,32° 23' 15" S
Buffer	5km
Group By	Kingdom

Kingdom	Species	Records
Animalia	167	1077
Fungi	3	3
Plantae	288	528
TOTAL	**458**	**1608**

	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.	25536	*Accipiter fasciatus (Brown Goshawk)*			
7.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
8.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
9.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
10.		*Afurcagobius suppositus*			
11.		*Aname mainae*			
12.	24310	*Anas castanea (Chestnut Teal)*			
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.	25670	*Anthus australis (Australian Pipit)*			
21.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
22.	41324	*Ardea modesta (Eastern Great Egret)*		IA	
23.	24340	*Ardea novaehollandiae (White-faced Heron)*			
24.	24341	*Ardea pacifica (White-necked Heron)*			
25.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
26.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
27.	24318	*Aythya australis (Hardhead)*			
28.		*Barnardius zonarius*			
29.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
30.	24319	*Biziura lobata (Musk Duck)*			
31.	25715	*Cacatua roseicapilla (Galah)*			
32.	25716	*Cacatua sanguinea (Little Corella)*			
33.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
34.	24780	*Calidris alba (Sanderling)*		IA	
35.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
36.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
37.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
38.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
39.	25454	*Canis lupus (Dog, Dingo)*	Y		
40.	30883	*Canis lupus subsp. familiaris (Dog)*	Y		
41.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
42.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
43.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
44.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
45.		*Chroicocephalus novaehollandiae*			
46.	24288	*Circus approximans (Swamp Harrier)*			
47.	24289	*Circus assimilis (Spotted Harrier)*			
48.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
49.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
50.	24399	*Columba livia (Domestic Pigeon)*	Y		
51.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
52.	25592	*Corvus coronoides (Australian Raven)*			
53.	25595	*Cracticus tibicen (Australian Magpie)*			
54.	25596	*Cracticus torquatus (Grey Butcherbird)*			
55.	25400	*Crinia insignifera (Squelching Froglet)*			
56.	30893	*Cryptoblepharus buchananii*			
57.	30899	*Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)*			
58.	25027	*Ctenotus australis*			
59.	25039	*Ctenotus fallens*			
60.	24322	*Cygnus atratus (Black Swan)*			
61.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
62.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
63.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
64.		*Egretta novaehollandiae*			
65.		*Elanus axillaris*			
66.	25540	*Elanus caeruleus (Black-shouldered Kite)*			
67.		*Eolophus roseicapillus*			
68.	25621	*Falco berigora (Brown Falcon)*			
69.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
70.	25623	*Falco longipennis (Australian Hobby)*			
71.	24041	*Felis catus (Cat)*	Y		
72.	25727	*Fulica atra (Eurasian Coot)*			
73.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
74.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
75.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
76.	25530	*Gerygone fusca (Western Gerygone)*			
77.	24443	*Grallina cyanoleuca (Magpie-lark)*			
78.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
79.	24295	*Haliastur sphenurus (Whistling Kite)*			
80.	25410	*Heleioporus eyrei (Moaning Frog)*			
81.	25412	*Heleioporus psammophilus (Sand Frog)*			
82.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
83.	25119	*Hemiergis quadrilineata*			
84.	25734	*Himantopus himantopus (Black-winged Stilt)*			
85.	24491	*Hirundo neoxena (Welcome Swallow)*			
86.		*Hydroprogne caspia*			
87.		*Idiommata blackwalli*			
88.	25478	*Isoodon obesulus (Southern Brown Bandicoot)*		P4	
89.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P4	
90.		*Jalmenus inous inous*			Y
91.	25637	*Larus novaehollandiae (Silver Gull)*			
92.	25133	*Lerista elegans*			
93.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
94.	25005	*Lialis burtonis*			
95.	25661	*Lichmera indistincta (Brown Honeyeater)*			
96.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
97.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
98.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
99.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
100.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
101.	25654	*Malurus splendens (Splendid Fairy-wren)*			
102.	24552	*Malurus splendens subsp. splendens (Splendid Fairy-wren)*			
103.	25758	*Megalurus gramineus (Little Grassbird)*			
104.	25184	*Menetia greyii*			
105.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
106.		*Microcarbo melanoleucos*			
107.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
108.	24223	*Mus musculus (House Mouse)*	Y		
109.	24738	*Neophema elegans (Elegant Parrot)*			
110.		*Nicodamus mainae*			
111.	25252	*Notechis scutatus (Tiger Snake)*			
112.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
113.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
114.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
115.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
116.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
117.	25682	*Pardalotus striatus (Striated Pardalote)*			
118.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
119.	48061	*Petrochelidon nigricans (Tree Martin)*			
120.	48066	*Petroica boodang (Scarlet Robin)*			
121.	25697	*Phalacrocorax carbo (Great Cormorant)*			
122.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
123.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
124.	25699	*Phalacrocorax varius (Pied Cormorant)*			
125.	24409	*Phaps chalcoptera (Common Bronzewing)*			
126.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
127.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
128.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
129.	25720	*Platycercus icterotis (Western Rosella)*			
130.	24747	*Platycercus spurius (Red-capped Parrot)*			
131.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
132.	24750	*Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)*			
133.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
134.	25704	*Podiceps cristatus (Great Crested Grebe)*			
135.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
136.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
137.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
138.	25722	*Polytelis anthopeplus (Regent Parrot)*			
139.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
140.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
141.	25511	*Pseudonaja affinis (Dugite)*			
142.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
143.		*Purpureicephalus spurius*			
144.	24245	*Rattus rattus (Black Rat)*	Y		
145.		*Raveniella peckorum*			
146.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
147.	48096	*Rhipidura albiscapa (Grey Fantail)*			
148.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
149.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
150.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
151.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
152.	30948	*Smicrornis brevirostris (Weebill)*			
153.	24522	*Sterna bergii (Crested Tern)*			
154.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
155.	25518	*Strophurus spinigerus*			
156.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
157.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
158.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
159.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
160.		*Thalasseus bergii*			
161.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
162.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
163.	25519	*Tiliqua rugosa*			
164.	25207	*Tiliqua rugosa subsp. rugosa*			
165.	24386	*Vanellus tricolor (Banded Lapwing)*			
166.	24040	*Vulpes vulpes (Red Fox)*	Y		
167.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
Fungi					
168.		*Candelariella sp.*			
169.		*Gymnopilus allantopus*			
170.	38832	*Resupinatus cinerascens*			
Plantae					
171.	15466	*Acacia applanata*			
172.	3237	*Acacia benthamii*		P2	
173.	3262	*Acacia cochlearis (Rigid Wattle)*			
174.	3409	*Acacia lasiocarpa (Panjang)*			
175.	11611	*Acacia lasiocarpa var. lasiocarpa*			
176.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
177.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
178.	30033	*Acacia saligna subsp. lindleyi*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
179.	30032	*Acacia saligna subsp. saligna*			
180.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
181.	3602	*Acacia willdenowiana (Grass Wattle)*			
182.	1208	*Acanthocarpus preissii*			
183.	4582	*Adriana quadripartita (Bitter Bush)*			
184.	6565	*Alyxia buxifolia (Dysentery Bush)*			
185.	1409	*Anigozanthos humilis (Catspaw)*			
186.	6949	*Anthocercis littorea (Yellow Tailflower)*			
187.	202	*Anthoxanthum odoratum (Sweet Vernal Grass)*	Y		
188.	3688	*Aotus gracillima*			
189.	1117	*Aphelia cyperoides*			
190.	6210	*Apium annuum*			
191.	6211	*Apium prostratum (Sea Celery)*			
192.	8779	*Asparagus asparagoides (Bridal Creeper)*	Y		
193.	1364	*Asphodelus fistulosus (Onion Weed)*	Y		
194.	20283	*Astartea scoparia (Common Astartea)*			
195.	6323	*Astroloma ciliatum (Candle Cranberry)*			
196.	2471	*Atriplex prostrata (Hastate Orache)*	Y		
197.	2480	*Atriplex suberecta*			
198.	17234	*Austrostipa compressa*			
199.	17240	*Austrostipa flavescens*			
200.	233	*Avena barbata (Bearded Oat)*	Y		
201.	15037	*Bartsia trixago*	Y		
202.	741	*Baumea articulata (Jointed Rush)*			
203.	743	*Baumea juncea (Bare Twigrush)*			
204.	744	*Baumea laxa*			
205.	4594	*Beyeria cinerea*			
206.	34236	*Beyeria cinerea subsp. cinerea*		P3	
207.	749	*Bolboschoenus caldwellii (Marsh Club-rush)*			
208.	30142	*Brachyloma preissii subsp. obtusifolium*			
209.	30136	*Brachyloma preissii subsp. preissii*			
210.	247	*Bromus arenarius (Sand Brome)*			
211.	249	*Bromus diandrus (Great Brome)*	Y		
212.	1383	*Burchardia bairdiae*			
213.	1276	*Caesia micrantha (Pale Grass Lily)*			
214.	3002	*Cakile maritima (Sea Rocket)*	Y		
215.	15330	*Caladenia arenicola*			
216.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
217.	15361	*Caladenia longicauda subsp. calcigena*			
218.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
219.	2856	*Calandrinia liniflora (Parakeelya)*			
220.	44226	*Calandrinia oraria*		P3	
221.	40827	*Calandrinia tholiformis*			
222.	5439	*Calytrix angulata (Yellow Starflower)*			
223.	43241	*Carex thecata*			
224.	2798	*Carpobrotus virescens (Coastal Pigface, Kolboko, Bain)*			
225.	1162	*Cartonema philydroides*			
226.	2951	*Cassytha flava (Dodder Laurel)*			
227.	2957	*Cassytha racemosa (Dodder Laurel)*			
228.	11799	*Cassytha racemosa forma racemosa*			
229.	259	*Cenchrus echinatus (Burrgrass)*	Y		
230.	6542	*Centaurium tenuiflorum*	Y		
231.	6214	*Centella asiatica*			
232.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
233.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
234.	2490	*Chenopodium glaucum (Glaucous Goosefoot)*	Y		
235.	763	*Chorizandra enodis (Black Bristlerush)*			
236.	10804	*Clematis linearifolia*			
237.	4552	*Comesperma confertum*			
238.	4564	*Comesperma virgatum (Milkwort)*			
239.	1885	*Conospermum triplinervium (Tree Smokebush)*			
240.	6349	*Conostephium preissii*			
241.	1418	*Conostylis aculeata (Prickly Conostylis)*			
242.	11826	*Conostylis aculeata subsp. aculeata*			
243.	1427	*Conostylis candicans (Grey Cottonhead)*			
244.	12027	*Conostylis candicans subsp. calcicola*			
245.	1443	*Conostylis pauciflora (Dawesville Conostylis)*			
246.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
247.	3137	*Crassula colorata (Dense Stonecrop)*			
248.	11563	*Crassula colorata var. colorata*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
249.	3140	*Crassula glomerata*	Y		
250.	15706	*Crassula natans var. minus*	Y		
251.	4802	*Cryptandra mutila*			
252.	768	*Cyathochaeta avenacea*			
253.	285	*Cynosurus echinatus (Rough Dogstail)*	Y		
254.	783	*Cyperus congestus (Dense Flat-sedge)*	Y		
255.	7484	*Dampiera trigona (Angled-stem Dampiera)*			
256.	6218	*Daucus glochidiatus (Australian Carrot)*			
257.	3845	*Daviesia triflora*			
258.	17663	*Desmocladus asper*			
259.	17691	*Desmocladus fasciculatus*			
260.	16595	*Desmocladus flexuosus*			
261.	299	*Deyeuxia quadriseta (Reed Bentgrass)*			
262.	3863	*Dillwynia dillwynioides*		P3	
263.	4454	*Diplolaena dampieri (Southern Diplolaena)*			
264.	18541	*Diplopeltis huegelii subsp. huegelii*			
265.	7054	*Dischisma arenarium*	Y		
266.	7055	*Dischisma capitatum (Woolly-headed Dischisma)*	Y		
267.	3106	*Drosera macrantha (Bridal Rainbow)*			
268.	3114	*Drosera nitidula (Shining Sundew)*			
269.	3131	*Drosera stolonifera (Leafy Sundew)*			
270.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
271.	6131	*Epilobium billardiereanum (Glabrous Willow Herb)*			
272.	17175	*Eremophila glabra subsp. albicans*			
273.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
274.	15446	*Eryngium pinnatifidum subsp. pinnatifidum*			
275.	5649	*Eucalyptus foecunda (Narrow-leaved Red Mallee)*			
276.	20808	*Eucalyptus petiolaris*	Y		
277.	4648	*Euphorbia terracina (Geraldton Carnation Weed)*	Y		
278.	3880	*Eutaxia virgata*			
279.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
280.	20216	*Ficinia nodosa (Knotted Club Rush)*			
281.	20473	*Gastrolobium ebracteolatum*			
282.	20482	*Gastrolobium nervosum*			
283.	4339	*Geranium molle (Dove's Foot Cranesbill)*	Y		
284.	4340	*Geranium retrorsum*			
285.	4341	*Geranium solanderi (Native Geranium)*			
286.	10909	*Gompholobium confertum*			
287.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
288.	7538	*Goodenia pulchella*			
289.	1982	*Grevillea crithmifolia*			
290.	15839	*Grevillea preissii subsp. preissii*			
291.	1472	*Haemodorum simplex*			
292.	2197	*Hakea prostrata (Harsh Hakea)*			
293.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
294.	3016	*Heliophila pusilla*	Y		
295.	6839	*Hemiandra pungens (Snakebush)*			
296.	5117	*Hibbertia cuneiformis (Cutleaf Hibbertia)*			
297.	5172	*Hibbertia stellaris (Orange Stars)*			
298.	13758	*Histiopteris incisa*			
299.	6222	*Homalosciadium homalocarpum*			
300.	6229	*Hydrocotyle diantha*			
301.	6241	*Hydrocotyle tetragonocarpa*			
302.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
303.	17841	*Hypolaena pubescens*			
304.	910	*Isolepis cernua (Nodding Club-rush)*			
305.	20200	*Isolepis cernua var. setiformis*			
306.	917	*Isolepis marginata (Coarse Club-rush)*			
307.	921	*Isolepis producta*			
308.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
309.	8092	*Ixiolaena viscosa (Sticky Ixiolaena)*			
310.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
311.	4027	*Jacksonia sericea (Waldjumi)*		P4	
312.	20454	*Juncus acutus subsp. acutus*	Y		
313.	1185	*Juncus kraussii (Sea Rush)*			
314.	11922	*Juncus kraussii subsp. australiensis*			
315.	1188	*Juncus pallidus (Pale Rush)*			
316.	4044	*Kennedia prostrata (Scarlet Runner)*			
317.	13562	*Lachenalia aloides*	Y		
318.	467	*Lagurus ovatus (Hare's Tail Grass)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
319.	1309	*Laxmannia squarrosa*			
320.	44490	*Leontodon rhagadioloides*	Y		
321.	925	*Lepidosperma angustatum*			
322.	42742	*Lepidosperma calcicola*			
323.	932	*Lepidosperma effusum (Spreading Sword-sedge)*			
324.	933	*Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)*			
325.	940	*Lepidosperma pubisquameum*			
326.		*Lepidosperma sp.*			
327.	945	*Lepidosperma squamatum*			
328.	1078	*Leptocarpus coangustatus*			
329.	1080	*Leptocarpus scariosus*			
330.	17852	*Leptorhynchos scaber (Lanky Buttons)*			
331.	1085	*Lepyrodia glauca*			
332.	6360	*Leucopogon australis (Spiked Beard-heath)*			
333.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
334.	7677	*Levenhookia stipitata (Common Stylewort)*			
335.	36160	*Liparophyllum capitatum*			
336.	36179	*Liparophyllum violifolium*			
337.	9289	*Lobelia anceps (Angled Lobelia)*			
338.	7408	*Lobelia tenuior (Slender Lobelia)*			
339.	6515	*Logania vaginalis (White Spray)*			
340.	476	*Lolium perenne (Perennial Ryegrass)*	Y		
341.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
342.	11073	*Lolium x hybridum*	Y		
343.	1231	*Lomandra maritima*			
344.	1232	*Lomandra micrantha (Small-flower Mat-rush)*			
345.	14542	*Lomandra micrantha subsp. micrantha*			
346.	8564	*Lotus subbiflorus*	Y		
347.	36375	*Lysimachia arvensis (Pimpernel)*	Y		
348.	4961	*Malva parviflora (Marshmallow)*	Y		
349.	34676	*Meionectes brownii (Swamp Raspwort)*			
350.	13273	*Melaleuca incana subsp. incana*			
351.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
352.	5952	*Melaleuca preissiana (Moonah)*			
353.	18598	*Melaleuca systena*			
354.	4085	*Melilotus indicus*	Y		
355.	6886	*Mentha x piperita*	Y		Y
356.	955	*Mesomelaena pseudostygia*			
357.	15419	*Microtis media subsp. media*			
358.	1660	*Microtis orbicularis (Dark Mignonette Orchid)*			
359.	16693	*Minuartia mediterranea*	Y		
360.	37440	*Monopsis debilis var. depressa*	Y		
361.	2412	*Muehlenbeckia adpressa (Climbing Lignum)*			
362.	7289	*Myoporum caprarioides (Slender Myoporum)*			
363.	8127	*Olearia axillaris (Coastal Daisybush)*			
364.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
365.	18255	*Opercularia vaginata (Dog Weed)*			
366.	4113	*Ornithopus compressus (Yellow Serradella)*	Y		
367.	7089	*Parentucellia latifolia (Common Bartsia)*	Y		
368.	7090	*Parentucellia viscosa (Sticky Bartsia)*	Y		
369.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
370.	4346	*Pelargonium littorale*			
371.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
372.	19825	*Petrorhagia dubia*	Y		
373.	18529	*Philotheca spicata (Pepper and Salt)*			
374.	1478	*Phlebocarya ciliata*			
375.	16177	*Phyllangium paradoxum*			
376.	4675	*Phyllanthus calycinus (False Boronia)*			
377.	5252	*Pimelea lanata*			
378.	18117	*Pimelea rosea subsp. rosea*			
379.	573	*Poa drummondiana (Knotted Poa)*			
380.	577	*Poa poiformis (Coastal Poa)*			
381.	578	*Poa porphyroclados*			
382.	8175	*Podolepis gracilis (Slender Podolepis)*			
383.	8182	*Podotheca angustifolia (Sticky Longheads)*			
384.		*Podotheca sp.*			
385.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
386.	1670	*Prasophyllum drummondii (Swamp Leek Orchid)*			
387.	1672	*Prasophyllum fimbria (Fringed Leek Orchid)*			
388.	1686	*Pterostylis barbata (Bird Orchid)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
389.	17267	*Pterostylis brevisepala*			
390.	12217	*Pterostylis sanguinea*			
391.	2718	*Ptilotus drummondii (Narrowleaf Mulla Mulla)*			
392.	2938	*Ranunculus trilobus (Buttercup)*	Y		
393.	19183	*Retama raetam*	Y		
394.	11341	*Rhagodia baccata subsp. baccata*			
395.	11930	*Rhagodia baccata subsp. dioica (Sea Berry Saltbush)*			
396.	13300	*Rhodanthe citrina*			
397.	1556	*Romulea rosea (Guildford Grass)*	Y		
398.	2433	*Rumex crispus (Curled Dock)*	Y		
399.	40426	*Rytidosperma occidentale*			
400.	6483	*Samolus junceus*			
401.	2593	*Sarcocornia quinqueflora (Beaded Samphire)*			
402.	7595	*Scaevola anchusifolia*			
403.	7603	*Scaevola canescens (Grey Scaevola)*			
404.	980	*Schoenus capillifolius*		P3	
405.	986	*Schoenus efoliatus*			
406.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
407.	1004	*Schoenus nitens (Shiny Bog-rush)*			
408.	1018	*Schoenus subfascicularis*			
409.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
410.	6	*Selaginella gracillima (Tiny Clubmoss)*			
411.	32433	*Sematophyllum homomallum*			
412.	25878	*Senecio condylus*			
413.	20161	*Senecio pinnatifolius*			
414.	8224	*Siloxerus filifolius*			
415.	8230	*Sonchus asper (Rough Sowthistle)*	Y		
416.	9367	*Sonchus hydrophilus (Native Sowthistle)*			
417.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
418.	20348	*Sphaerolobium calcicola*		P3	
419.	624	*Spinifex hirsutus (Hairy Spinifex)*			
420.	8710	*Sporobolus africanus (Parramatta Grass)*	Y		
421.	635	*Sporobolus virginicus (Marine Couch)*			
422.	4828	*Spyridium globulosum (Basket Bush)*			
423.	9069	*Stackhousia huegelii*			
424.	4733	*Stackhousia monogyna*			
425.	7712	*Stylidium despectum (Dwarf Triggerplant)*			
426.	7717	*Stylidium divaricatum (Daddy-long-legs)*			
427.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
428.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
429.	2329	*Synaphea spinulosa*			
430.	20135	*Taxandria linearifolia*			
431.	4256	*Templetonia retusa (Cockies Tongues)*			
432.	2820	*Tetragonia decumbens (Sea Spinach)*	Y		
433.	1036	*Tetraria octandra*			
434.	1708	*Thelymitra fuscolutea (Chestnut Sun Orchid)*			
435.	20730	*Thelymitra paludosa*			
436.		*Thelymitra sp.*			
437.	1318	*Thysanotus arbuscula*			
438.	1319	*Thysanotus arenarius*			
439.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
440.	1357	*Thysanotus thyrsoideus*			
441.	32445	*Tortula muralis*			
442.	1368	*Trachyandra divaricata*	Y		
443.	19041	*Trachymene coerulea subsp. coerulea*			
444.	6280	*Trachymene pilosa (Native Parsnip)*			
445.	4292	*Trifolium campestre (Hop Clover)*	Y		
446.	4295	*Trifolium dubium (Suckling Clover)*	Y		
447.	4297	*Trifolium glomeratum (Cluster Clover)*	Y		
448.	151	*Triglochin striata*			
449.	152	*Triglochin trichophora*			
450.	11665	*Trymalium ledifolium var. ledifolium*			
451.	7107	*Verbascum virgatum (Twiggy Mullein)*	Y		
452.	11137	*Vulpia fasciculata*	Y		
453.	33101	*Vulpia myuros forma myuros*	Y		
454.	7389	*Wahlenbergia preissii*			
455.	1398	*Wurmbea monantha*			
456.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
457.	6289	*Xanthosia huegelii*			
458.	36218	*Zygodon menziesii*			

Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area

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.

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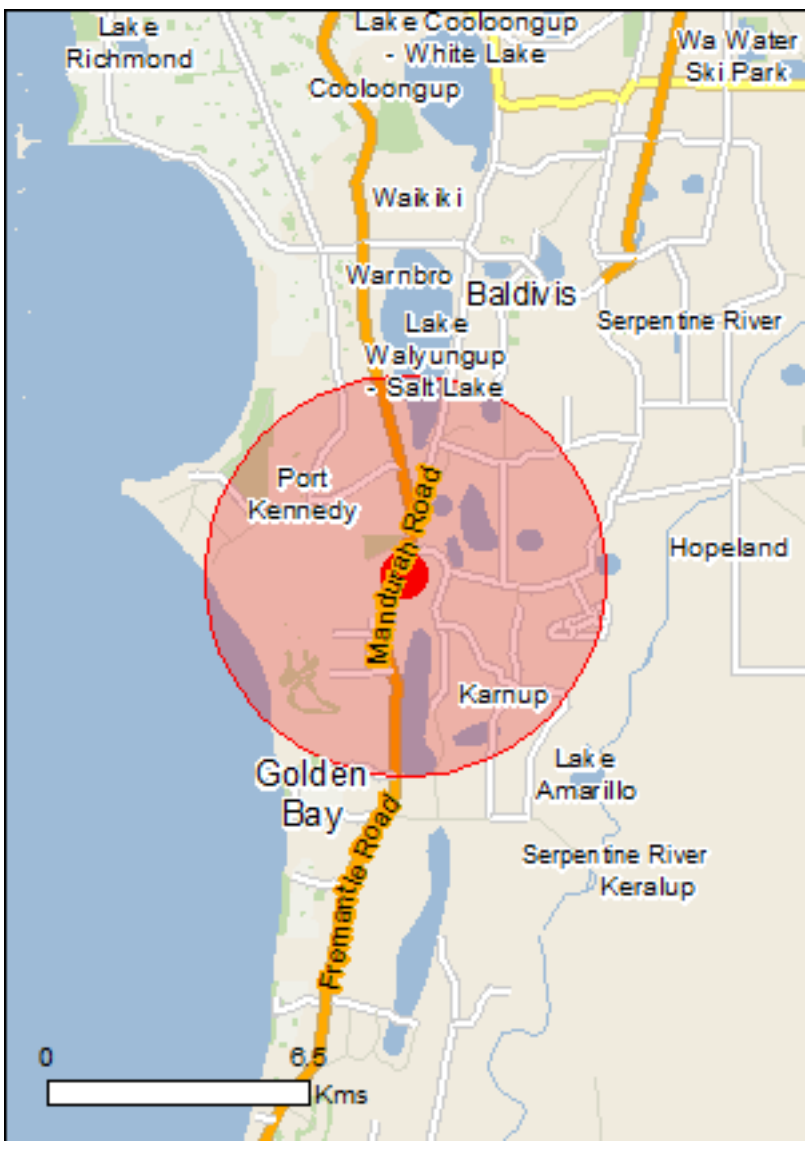
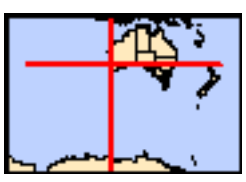


This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

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:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	47
Listed Migratory Species:	39

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:	68
Whales and Other Cetaceans:	12
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:	1
Regional Forest Agreements:	None
Invasive Species:	33
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Becher point wetlands	Within Ramsar site
Peel-yalgorup system	10 - 20km upstream

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
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known 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 baudinii		
Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris		
Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Bettongia penicillata Brush-tailed Bettong, Woylie [213]	Endangered	Species or species habitat known to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may 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 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
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		

Name	Threatened	Type of Presence
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known 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
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known 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 known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known 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
[Diomedea amsterdamensis](#) Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
[Diomedea dabbenena](#) Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pachyptila turtur](#) Fairy Prion [1066]		Species or species habitat likely to occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat likely to occur within area
[Phoebetria fusca](#) Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

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

Name	Status	Type of Presence
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Port Kennedy Scientific Park	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 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
Turdus merula		
Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur

Name	Status	Type of Presence 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		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area

Name	Status	Type of Presence
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Becher Point Wetlands	WA

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

-32.38753 115.77638

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	Nearest Record (km)	Likelihood
Andersonia gracilis (Slender Andersonia)	Threatened	Endangered	42.65	Unlikely
Caladenia huegelii (King Spider Orchid)	Threatened	Endangered	11.73	Possible
Diuris micrantha (Dwarf Bee-orchid)	Threatened	Vulnerable	16.96	Unlikely
Diuris purdiei (Purdie's Donkey-orchid)	Threatened	Endangered	21.53	Unlikely
Drakaea elastica (Glossy-leafed Hammer Orchid)	Threatened	Endangered	6.58	Unlikely
Drakaea micrantha (Dwarf Hammer Orchid)	Threatened	Vulnerable	28.67	Possible
Lepidosperma rostratum (Beaked Lepidosperma)	Threatened	Endangered	19.16	Unlikely
Thelymitra variegata	Priority 2	-	30.39	Unlikely
Acacia benthamii	Priority 2	-	1.13	Unlikely
Beyeria cinerea subsp. cinerea	Priority 3	-	1.71	Unknown
Calandrinia oraria	Priority 3	-	4.43	Unknown
Dillwynia dillwynioides	Priority 3	-	4.66	Likely
Schoenus capillifolius	Priority 3	-	4.48	Unlikely
Sphaerolobium calcicola	Priority 3	-	1.64	Possible
Jacksonia sericea (Waldjumi)	Priority 4	-	2.25	Likely
Stylidium longitubum	Priority 4	-	3.82	Unlikely
Dodonaea hackettiana	Priority 4	-	12.87	Possible

TAXA	STATE STATUS	EPBC STATUS	LIKELIHOOD
Forest Red-tailed Black Cockatoo *(Calyptorhynchus banksii naso)*	Threatened	Vulnerable	Likely
Baudin's Cockatoo *(Calyptorhynchus baudinii)*	Threatened	Vulnerable	Likely
Carnaby's Cockatoo *(Calyptorhynchus latirostris)*	Threatened	Endangered	Likely
Brush-tailed Bettong *(Bettongia penicillata)*	Threatened	Endangered	Unlikely
Chuditch *(Dasyurus geoffroii)*	Threatened	Vulnerable	Possible
Western Ringtail Possum *(Pseudocheirus occidentalis)*	Threatened	Vulnerable	Possible
Lined Skink *(Lerista lineata)*	Priority 3	-	Possible
Southern Brown Bandicoot *(Isoodon obesulus)*	Priority 4	-	Unlikely
Quenda *(Isoodon obesulus fusciventer)*	Priority 4	-	Unlikely
Graceful Sun Moth *(Synemon gratiosa)*	Priority 4	-	Unlikely
Red-necked Stint *(Calidris ruficollis)*	International Agreement	Marine/Migratory	Unlikely
Rainbow Bee-eater *(Merops ornatus)*	International Agreement	Marine	Possible
Grey Plover *(Pluvialis squatarola)*	International Agreement	Marine/Migratory	Unlikely

APPENDIX E

2017 Targeted Flora Survey

Our Ref: 2459AB

23 November 2017

Neil Campbell
Director of Finance & Administration
Project Development Supervisor
Rockingham Montessori School
Via Email: neil@ncampbell.com.au

Dear Neil

Targeted Flora Survey – Lot 11 Mandurah Road, Karnup

1. Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by Rockingham Montessori School to prepare a Native Vegetation Clearing Permit (NVCP) application to facilitate the development of a Montessori School at Lots 11 and 700 Mandurah Road, Karnup (the Proposal) (Figure 1). A component of the NVCP was to undertake a Targeted Flora Survey, which is the basis of this letter report.

The development will require the clearing of 3.48 ha of native vegetation to facilitate the construction of the Montessori School and to satisfy bushfire protection requirements. Lot 11 is currently zoned 'Rural' under the Metropolitan Region Scheme (MRS) and under the City of Rockingham's Town Planning Scheme No. 2 (TPS 2).

360 Environmental undertook a Level 2 Flora and Vegetation Survey for the proposed development on 13 November 2014, which involved a database and desktop study. No Threatened species pursuant to the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 and/or gazetted as Declared Rare Flora (DRF) pursuant to the Wildlife Conservation (WC) Act 1950 or Priority species were recorded during the 2014 survey.

Results from the 360 Environmental (2015) report identified nineteen conservation significant species that are either Threatened by the EPBC Act, listed under the WC Act, or are Priority that could potentially occur in the Survey Area. Four of these species

Caladenia huegelii, Dillwynia dillwynioides, Sphaerolobium calcicola and *Jacksonia sericea*; are considered likely to occur within the Survey Area due to the presence of suitable habitat and the close proximity to the site of previous records. *Drakaea micrantha* was also considered possible due to the presence of suitable habitat and the proximity of previous records to the Survey Area.

Dillwynia dillwynioides, *Sphaerolobium calcicola* and *Jacksonia sericea* are perennials and would have been able to be located at the time the 2014 survey was undertaken. The survey, however, was undertaken in November which is outside the optimum flowering time for *Caladenia huegelii* and *Drakaea micrantha*. For this reason, a second spring survey was warranted to search for these two species.

2. Methods

As part of the recommended outcomes from the 2014 survey a second targeted search was undertaken on 6 October 2017. The survey involved traversing the Survey Area on foot to search for species of conservation significance, particularly *Drakaea micrantha, Caladenia huegelii* and other species identified during the 2014 desktop assessment.

For each population of suspected significant flora located in the Survey Area the following was recorded:

- Co-ordinate locations (using handheld GPS units);
- Photographs; and
- Estimation of population size.

3. Results

3.1. Vegetation Description

Three natural vegetation associations were described for the Survey Area:

- Low Open Woodland of *Banksia attenuata* over Tall Shrubland of *Acacia rostellifera* over Low Open Shrubland of *Kunzea glabrescens*, *Hemiandra pungens* and *Conostylis aculeata* over Grassland of **Ehrharta calycina*;
- Woodland of *Eucalyptus gomphocephala* over Tall Shrubland of *B. attenuata* and *B. menziesii* over Open Shrubland of *Hibbertia hypericoides* over Very Open Sedgeland of *Lepidosperma gladiatum* over Grassland of **Ehrharta calycina*; and
- Tall Shrubland of *Acacia saligna* over Open Shrubland of *Olearia axillaris* over Shrubland of *Scaevola thesioides* and *Hibbertia hypericoides* over Very Open Grassland of **Ehrharta calycina*.

3.2. Vegetation Condition

Vegetation condition ranged from Excellent to Completely Degraded condition. The extent of each vegetation condition is presented in Table 1.

Table 1: Vegetation Condition and Extent in the Survey Area.

CONDITION	EXTENT (HA)
Excellent	0.08
Good	2.2
Degraded	2.6
Completely Degraded	2.1
Cleared	0.66
TOTAL AREA	7.64

Tracks and invasive weed species were the most common form of disturbance in the Survey Area. The low percentage of vegetation considered in Excellent or Good condition can be attributed to the location and surrounding land uses of the Survey Area. The surrounding urban development and roads is a potential source of weeds, plus the resided privately owned property contains informal tracks, rubbish and building material piles.

3.3. Flora of Conservation Significance

The aim of this survey was to undertake a targeted search for *Drakaea micrantha*, *Caladenia huegelii* and other species identified in the database searches; however, no Threatened species pursuant to the EPBC Act and/or gazetted as Declared Rare Flora (Threatened) pursuant to the WC Act or Priority flora were recorded during the survey.

4. Discussion

No threatened species pursuant to the EPBC Act or to the WC Act or priority species were recorded in the Survey Area during the 2017 field survey.

Caladenia huegelii is a tuberous, perennial orchid that grows to 0.6 m high that is easily recognizable during its flowering period from September to October (WAH 2017). Outside of this period *C. huegelii* remains as an underground tuber and is difficult to detect in the field. The vegetation in the Survey Area does contain tree species that

Caladenia huegelii is associated with, however the understorey lacks the majority of typical species. The understory in the Survey Area is regarded as being open whereas *Caladenia huegelii* tends to favour areas of thick undergrowth. Soil preferable for the species is usually deep grey-white sand associated with the Bassendean sand-dune system. However, specimens have been known to extend into the Spearwood system in some areas. As the Survey Area was extensively searched at the optimal time for this species it can be concluded that *Caladenia huegelii* is not present.

Drakaea micrantha is a tuberous, terrestrial herb which has a diminutive flower and a heart shaped leaf which is silvery grey with prominent green veins. The species flowers from September to October. The vegetation in the Survey Area does contain tree species that *Drakaea micrantha* is associated with and there are sporadic occurrences of *Kunzea glabrescens* present, which, is typically associated with the species. The sands occurring at the site belong to the Spearwood and Quindalup system and therefore are generally calcareous yellow to brown sands. *Drakaea micrantha* is usually found on cleared firebreaks or open sandy patches that have been disturbed, where competition from other plants has been removed (Brown et al. 1998; Hearn et al. 2006). The Survey Area was extensively searched and no specimens were found.

The 2017 targeted flora survey was completed within the recommended season and optimum flowering period for the south west botanical province and the targeted conservation significant species in *Caladenia huegelii* and *Drakaea micrantha*. The project area was sufficiently surveyed and as such the following conclusions can be drawn:

- No Threatened species are present in the Survey Area; and
- No Priority species are present in the Survey Area

We trust this meets your requirements at this time. Should you have any questions or require further action please do not hesitate to contact Narelle Whittington on (08) 9388 8360.

For and on behalf of

360 Environmental Pty Ltd

Narelle Whittington - Principal Botanist

Enc:
Attachment 1.0 – Figure 1

5. References

Brown, A., C. Thomson-Dans & N. Marchant, eds. (1998). Western Australia's Threatened Flora. Como, Western Australia: Department of Conservation and Land Management.

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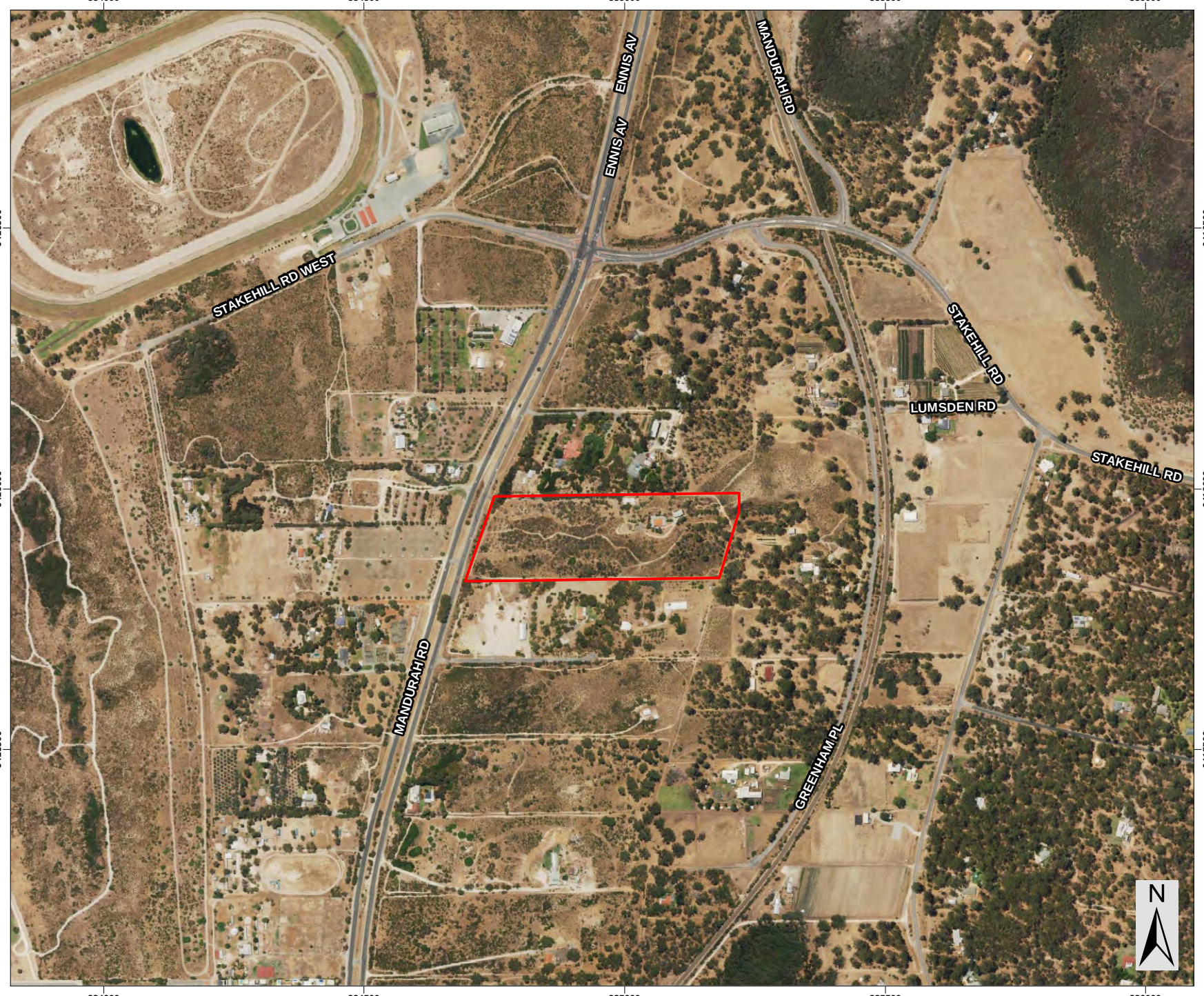
FIGURES



Legend

- Site Boundary (7.83 ha)
- Major Roads

- 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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Metres

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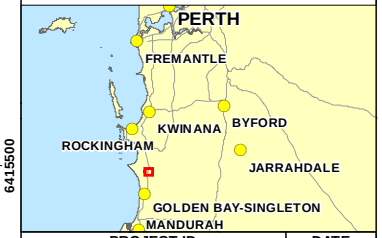
LOCALITY MAP



PROJECT ID	DATE
2541	23/11/2017

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
EW	NW	NW	0

Rockingham Montessori School

Targeted Flora Survey, Lot 11 Mandurah Road, Karnup

Figure 1
Targeted Flora Search

K:\Projects\1.0 EBS\2459 Montessori School Orchid Count\Figures\2459 Figure 1 Site Location.mxd

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