



Natural Area
CONSULTING MANAGEMENT SERVICES

Ivan Yujnovich

**Lot 123 Mortimer Road Flora and Vegetation
Survey and Black Cockatoo Habitat
Assessment**

20 December 2018

Natural Area Holdings Pty Ltd
99C Lord Street, Whiteman, WA, 6076
Ph: (08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au



Disclaimer

Natural Area Holdings Pty Ltd, trading as Natural Area Consulting Management Services (Natural Area), has prepared this report for the sole use of the Client and for the purposes as stated in the agreement between the Client and Natural Area under which this work was completed. This report may not be relied upon by any other party without the express written agreement of Natural Area.

Natural Area has exercised due and customary care in the preparation of this document and has not, unless specifically stated, independently verified information provided by others. No other warranty, expressed or implied, is made in relation to the contents of this report. Therefore, Natural Area assumes no liability for any loss resulting from errors, omission or misrepresentations made by others. This document has been made at the request of the Client. The use of this document by unauthorised third parties without written permission from Natural Area shall be at their own risk, and we accept no duty of care to any such third party.

Any recommendations, opinions or findings stated in this report are based on circumstances and facts as they existed at the time Natural Area performed the work. Any changes in such circumstances and facts upon which this document is based may adversely affect any recommendations, opinions or findings contained in this document.

No part of this document may be copied, duplicated or disclosed without the express written permission of the Client and Natural Area.

Document Title		YUJN-R- Lot 123 Mortimer Rd Flora and Habitat Survey V1.docx			
Location		Client Folders NAC/Yujnovich, Ivan/Report/			
Draft/Version No.	Date	Changes	Prepared by	Approved by	Status
V1	21 December 2018	New Document	SH, SB	LS	Final

Executive Summary

Natural Area Consulting Management Services (Natural Area) was contracted by Ivan Yujnovich to undertake a level 2 spring flora and vegetation survey and black cockatoo habitat assessment within Lot 123 Mortimer Rd, Casuarina during September 2018. The survey aimed to determine:

- flora species present
- the extent and boundaries of vegetation type and condition
- the location of declared rare or priority flora and/or ecological communities
- the presence and extent of threatened black cockatoo habitat.

Survey outcomes provided in this report will inform the environmental approvals process associated with the future development of the site.

The level 2 flora and vegetation survey within Lot 123 Mortimer Rd, Casuarina confirmed:

- a total of 219 flora species present from 51 families
- a total of 41 weeds and 178 native flora species
- no priority or threatened flora species were found
- three vegetation types occur within the lot, with Banksia Woodland being the most dominant
- vegetation across the site ranges from Degraded to Excellent with the majority of the site in Excellent condition
- the presence of the endangered ecological community 'Banksia Woodlands of the Swan Coastal Plain', covering 37.9 ha (84%) of the site.

When combined with the Bioscience (2006, 2015) survey data, this means a total of 248 species on site, of which 202 are native species and 46 are weeds.

The black cockatoo habitat assessment within Lot 123 Mortimer Rd, Casuarina confirmed:

- evidence of foraging by the threatened Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (Endangered) and the Forest Red-tailed Black Cockatoos (*Calyptorhynchus banksii naso*) (Vulnerable)
- a total of 28 trees with hollows that are of a suitable size to be utilised for nesting and a further 12 trees that were suitable roosting trees for black cockatoos.

Opportunistic sightings of the Priority 4 Western Brush Wallaby (*Macropus irma*) and diggings of the Priority 4 Southern Brown Bandicoot (*Isodon obesulus fusciventer*) were also recorded during the 2018 spring flora and habitat survey. These two conservation significant species are listed under the *Biodiversity Conservation Act 2016* (WA) and will influence State environmental approvals processes.

An assessment of data obtained during the survey process, DBCA database search outcomes and previous surveys by Bioscience in relation to the clearing principles was carried out, with Natural Area considering variance with several of the principles likely. The presence of the conservation category wetland, threatened ecological community and threatened black cockatoo habitat on site, with portions of each within proposed clearing areas, a referral under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) is required ahead of development activities.

Contents

Executive Summary	3
1.0 Introduction.....	6
1.1 Location	6
1.2 Scope	6
2.0 Site Characteristics	8
2.1 Regional Context	8
2.2 Climate.....	8
2.3 Topography and soils.....	8
2.4 Vegetation Complex	10
2.5 Hydrology	10
2.6 Bush Forever Sites	10
3.0 Methodology	12
3.1 Objectives	12
3.2 Desktop and Literature Review	12
3.3 On-ground Methodology.....	12
3.3.1 Flora Species.....	13
3.3.2 Vegetation Type.....	13
3.3.3 Vegetation Condition.....	14
3.3.4 Black Cockatoo Habitat Assessment.....	14
3.4 Statistical Data Analysis and TEC Determination	14
3.5 Limitations	15
4.0 Flora Survey Results.....	17
4.1 Desktop Survey	17
4.1.1 Significant Flora	17
4.1.2 Threatened Ecological Communities.....	17
4.1.3 Black Cockatoo Habitat Assessment.....	17
4.2 On-ground Flora Survey.....	17
4.2.1 Flora	17
4.2.2 Vegetation Types	19
4.2.3 Statistical Analysis – Gibson <i>et al</i> Data.....	20
4.2.4 Assessment Against EPBC Act 1999 Banksia Woodland Listing Information	20

4.2.5	Vegetation Condition.....	24
4.3	Black Cockatoo Habitat Assessment.....	27
4.3.1	Opportunistic Conservation Significant Fauna Observations.....	27
5.0	Implications of Results.....	29
5.1	Flora species	29
5.2	Significant Flora	29
5.3	Threatened Ecological Community	29
5.4	Black Cockatoo Habitat.....	29
5.5	Significant Fauna	30
5.6	Assessment Against Clearing Principles	30
6.0	References	34
Appendix 1:	NatureMap Report	36
Appendix 2:	Protected Matter Search Tool Report	40
Appendix 3:	Potential Priority and Threatened Flora.....	51
Appendix 4:	Conservation Codes.....	59
	Western Australia	59
	Commonwealth.....	60
Appendix 5:	Flora Species List.....	61
Appendix 6:	Quadrata Data	72

1.0 Introduction

Natural Area Consulting Management Services (Natural Area) was commissioned by Mr Ivan Yujnovich to undertake a level 2 flora and vegetation survey as well as a black cockatoo habitat assessment within Lot 123 Mortimer Road, Casuarina. The survey area is approximately 45.14 ha of remnant bushland that includes a Conservation Category and portions of two Resource Enhancement Wetlands. This survey was undertaken to inform environmental approvals associated with clearing of some or all of the site for development.

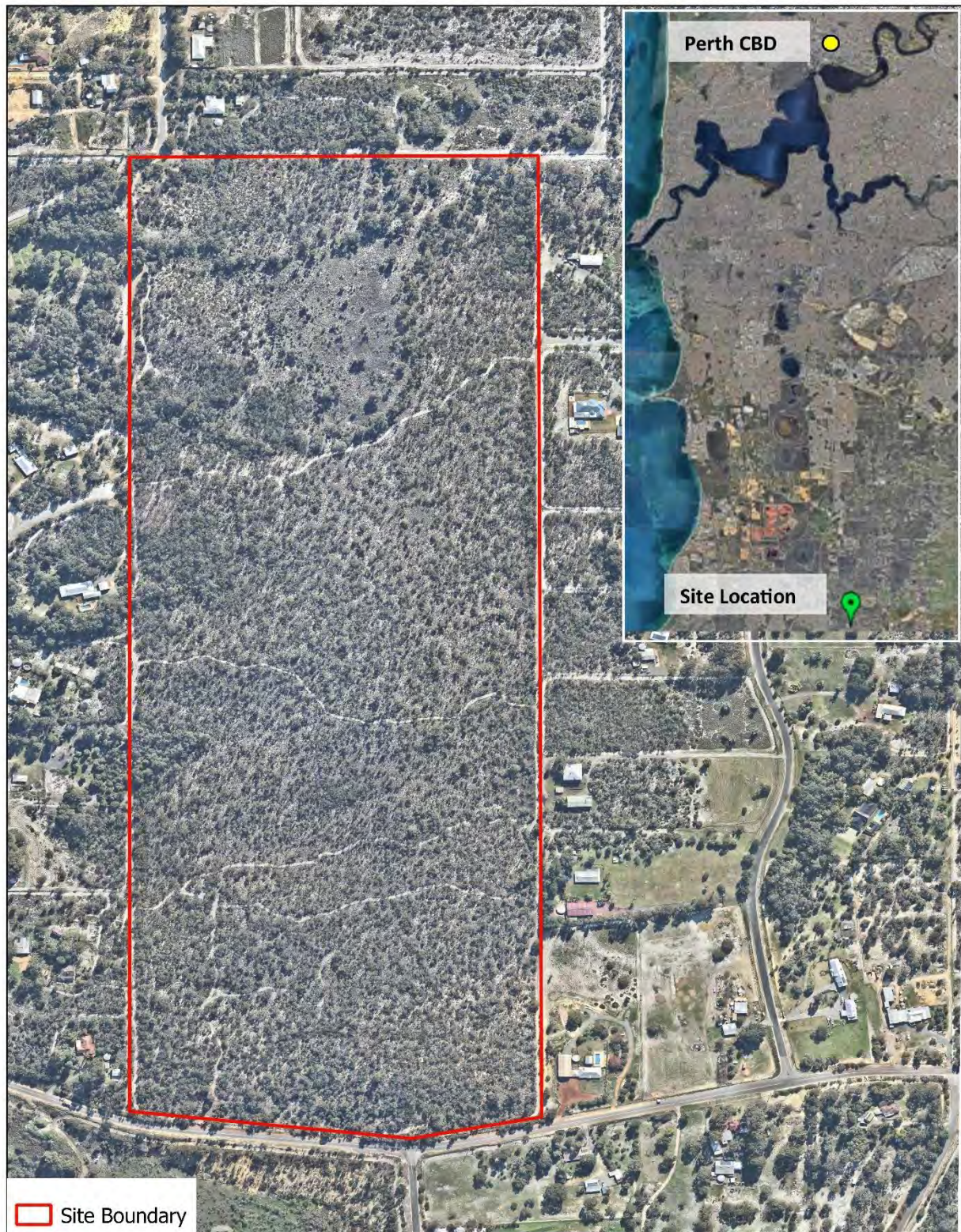
1.1 Location

Lot 123 Mortimer Road is located approximately 32 km south of the Perth Central Business District (Map 1). The site is a single, large Lot zoned urban and which is currently surrounded by rural residential Lots to the west, north and east.

1.2 Scope

Activities undertaken by Natural Area personnel included:

- desktop database searches to identify potential conservation significant flora species occurring within the proposed clearing area
- desktop search to determine habitat suitability of conservation significant flora potentially occurring within the proposed clearing area
- a targeted search for conservation significant flora, with a focus on species in which the habitat type is suitable
- verification of any species collected
- reporting outcomes of the survey.



Site Boundary

Map 1: Site Location
Lot 123 Mortimer Rd, Casuarina

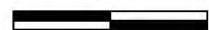


Natural Area
CONSULTING MANAGEMENT SERVICES

99C Lord Street
Whiteman WA 6068
(08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au



0 75 150 m



Client: Yujnovich, John
Date: 19/10/18
Created by: SH
Image Source: Nearmap
Datum: WGS 84
Version: V1

2.0 Site Characteristics

The characteristics of a site have a strong bearing on the flora, vegetation, fauna, and ecological communities present. Key characteristics of Lot 123 are outlined in this section.

2.1 Regional Context

According to Interim Biogeographical Regionalisation of Australia (IBRA) descriptions, Casuarina is located in the Perth Swan Coastal Plain 2 (SWA 2 – Swan Coastal Plain subregion). This area is described as being a low-lying coastal plain with sands of colluvial and aeolian origin. The region is dominated by Banksia and/or Jarrah Woodland over sandy soils associated with the dune systems, with Paperbark (*Melaleuca*) in swampy/damp areas and Jarrah Woodland to the east where the Swan Coastal Plain rises (Mitchell, Williams & Desmond, 2002).

2.2 Climate

The climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters.

According to the Bureau of Meteorology (Perth Airport, Station ID 009021, 2018):

- average rainfall is 771.6 mm pa, with the majority falling between May and August;
- average maximum temperature ranges from 17.9 °C in winter to 31.9 °C in summer, with the highest recorded maximum being 46.7 °C;
- average minimum temperatures range from 8.0 °C in winter to 17.5 °C in summer, with the lowest recorded minimum being -1.3 °C; and
- predominant wind directions include morning easterlies and westerly sea breezes during summer months, with an average wind speed of 23.8 km/h and gusts of more than 100 km/h.

2.3 Topography and soils

Topography across the site ranges from 16 m AHD in the north to 38 m AHD in the south-east. Two distinct soil types were identified using the NRInfo Portal (Department of Primary Industries and Regional Development, 2018, Map 2):

- Bassendean B1 Phase (212Bs_B1) – Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m; Banksia dominant.
- Bassendean B3 Phase (212Bs_B3) – Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with iron-organic hardpan 1-2 m or clay subsoils. Surface soils are dark grey sand or sandy loam.



Map 2: Soil Types
Lot 123 Mortimer Rd, Casuarina



Natural Area
CONSULTING MANAGEMENT SERVICES

99C Lord Street
Whiteman WA 6068
(08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au



0 75 150 m



Client: Yujnovich, John
Date: 24/10/18
Created by: SH
Image Source: Nearmap
Datum: WGS 84
Version: V1

2.4 Vegetation Complex

The vegetation complex indicated by the WALGA Environmental Planning Tool (2018) as occurring within the site is the *Bassendean Complex – Central and South* (WALGA, 2018). The Complex comprises vegetation ranging from Jarrah, Sheoak and Banksia on sand dunes to low woodlands of Melaleuca species, and sedgelands on the low-lying depressions and swamps. It also includes transitional areas of Jarrah and Coastal Blackbutt in the vicinity of Perth. *Banksia attenuata*, *B. grandis* and *B. menziesii* are common on upper slopes, with *B. menziesii* decreasing towards the southern limit of its range near Mandurah. *Banksia ilicifolia*, *B. littoralis* and *Melaleuca preissiana* are common in low-lying moister soils, where Marri replaces Jarrah as the dominant species. Common shrub species include *Kunzea ericifolia*, *Hypocalymma angustifolium*, *Adenanthos obovatus* and *Verticordia* spp. (Hedde, Loneragan and Havel, 1980).

2.5 Hydrology

A conservation wetland occurs in the central northern portion of the site within the *Melaleuca preissiana* Woodland vegetation type, resource enhancement wetlands occur along the western boundary of the where the three southern portions of Corymbia and Melaleuca Woodland occur (Department of Biodiversity, Conservation and Attractions, 2018c; Map 3). Depth to ground water ranges from 2 m in the conservation wetland to 16 m in the south-west corner of the site (Department of Water and Environmental Regulation, 2018).

2.6 Bush Forever Sites

Lot 123 is located within 5 km of ten Bush Forever sites (Figure 1), with the closest approximately 1.5 km to the north-east (Site 273):

- Bush Forever Site 67 – Parmelia Ave Bushland, Parmelia, 6.8 ha
- Bush Forever Site 68 – Jackson Road Bushland, 19.3 ha
- Bush Forever Site 70 – Duckpond Bushland, 8.8 ha,
- Bush Forever Site 269 – The Spectacles, 349.7 ha (including lake)
- Bush Forever Site 270 – Sandy Lake and Adjacent Bushland, Anketell, 181.3 ha
- Bush Forever Site 272 – Sicklemore Road Bushland, Parmelia/Casuarina, 84.6 ha
- Bush Forever Site 273 – Casuarina Prison Bushland, Casuarina, 116.9 ha
- Bush Forever Site 348 – Modong Nature Reserve and Adjacent Bushland, Oakford, 242.0 ha
- Bush Forever Site 349 – Leda and adjacent bushland, Leda, 959.8 ha
- Bush Forever Site 353 – Banksia Road Nature Reserve, Wellard, 32.3 ha.

All except Site 68 contain some portion of the *Bassendean Complex – Central and South* vegetation complex that is located on Lot 123 (Government of Western Australia, 2000; National Map, 2018).

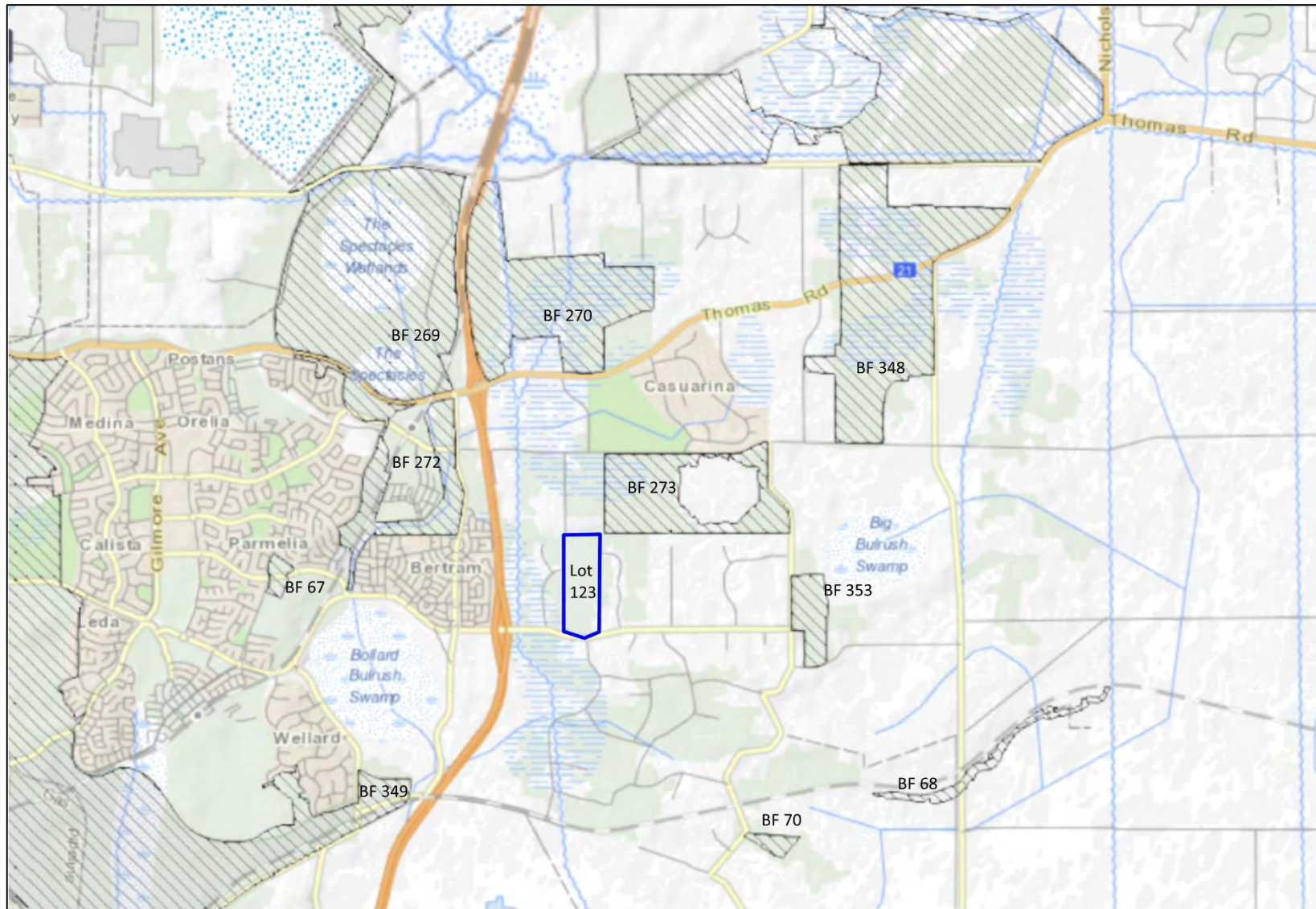


Figure 1: Lot 123 and proximity to Bush Forever sites (Source: National Map, 2018)

3.0 Methodology

3.1 Objectives

The objective of the survey was to collect sufficient data to adequately inform a clearing application for Lot 123, which is a proposed development site. This included undertaking a desktop review, determining flora species present, assessing vegetation type and condition, and recording fauna species noted during assessment.

3.2 Desktop and Literature Review

The desktop flora and vegetation survey was undertaken to determine the:

- likely native and non-native flora species present
- current extent of native vegetation
- general floristic community types
- likely presence of threatened or priority flora species
- likely presence of any threatened or priority ecological communities.

The following databases were accessed to obtain relevant information:

- NatureMap (Department of Biodiversity, Conservation and Attractions, 2018d) (Appendix 1)
- Protected Matters Search Tool (Department of the Environment and Energy (DoEE), 2018a) (Cwlth) (Appendix 2)
- FloraBase (Department of Biodiversity, Conservation and Attractions, 2018b)
- Threatened and priority flora and ecological community database searches (Department of Biodiversity, Conservation and Attractions, 2018e).

Summary sheets of threatened flora potentially occurring in the area were created for quick reference in the field (Appendix 3).

A review of previous flora surveys undertaken within Lot 123 Mortimer Road was also undertaken, namely:

- *Report on Field Investigations: Ground Truthing the Presence and Management Classification of Wetlands Lot 123 Mortimer Rd, Casuarina City of Kwinana* (Bioscience, 2006)
- *Vegetation and Black Cockatoo Assessment* (Bioscience, 2015).

3.3 On-ground Methodology

Natural Area Botanists Sharon Hynes and Harley Taylor traversed the site on foot over three days between 09 – 12 October 2018, with key GPS data recorded using a handheld Samsung tablet and Mappt software, including:

- identification of flora species present by walking the site, including targeting declared rare and priority species indicated as potentially present
- confirming vegetation type using nine 10 m x 10 m quadrats installed across the sites (Map 3)
- the assessment of vegetation condition
- using a GPS to map significant species and boundaries of differing vegetation types and condition
- the presence of any further threatened or priority listed flora species and/or ecological communities listed under the *Biodiversity and Conservation Act 2016* (WA) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

The following were recorded for each quadrat:

- location
- vegetation description
- aspect
- habitat
- soil type and colour
- inundation
- leaf litter depth (cm) and cover (%)
- evidence of disturbance, including fire
- height of species
- percentage foliar cover of each species.

The flora and vegetation survey was carried out in accordance with *Technical Guidance- Flora and Vegetation Surveys for Environmental Impact Assessment* (Environmental Protection Authority, 2016). Samples were collected, or photographs taken of unfamiliar species to enable later identification.

3.3.1 Flora Species

Flora species were recorded on observation within each quadrat and when the remainder of the site was traversed, with the list of potential declared rare or priority flora species used to guide targeted searches for those species (Appendix 3).

3.3.2 Vegetation Type

The vegetation type was determined using the structural classes described in *Bush Forever Volume 2* (Government of Western Australia, 2000), and records dominant over, middle and understorey species (Table 3).

Table 3: Vegetation structural classes

Life Form/Height Class	Canopy Percentage Cover			
	100 – 70%	70 – 30%	30 – 10%	10 – 2 %
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10 – 30 m	Closed forest	Open forest	Woodland	Open woodland
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree Mallee	Closed tree mallee	Tree mallee	Open tree mallee	Very open tree mallee
Shrub Mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee
Shrubs over 2 m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1 – 2 m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1 m	Closed low heath	Open low heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

(Source: Government of Western Australia, 2000)

3.3.3 Vegetation Condition

Vegetation condition was assessed using the rating scale attributed to Keighery in *Bush Forever Volume 2* (Government of Western Australia, 2000). A Trimble GPS unit was used to differentiate the locations of the vegetation condition across the site and assist with mapping outcomes (Table 4).

Table 4: Vegetation condition ratings

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

(Source: Government of Western Australia, 2000)

3.3.4 Black Cockatoo Habitat Assessment

The site was traversed and potential habitat trees for the three black cockatoos and signs of their presence were recorded using a handheld GPS device, including:

- roosting trees with a diameter at breast height (DBH) > 500 mm
- nesting tree with hollows large enough for black cockatoos to utilise
- signs of foraging by black cockatoos in the form of chewed Marri nuts, and Banksia flowers and nuts
- any sightings or calls.

3.4 Statistical Data Analysis and TEC Determination

The identification of the Banksia Woodland community type, as outlined in the EPBC Act's Approved Conservation Advice for Banksia Woodlands of the Swan Coastal Plain (Department of the Environment and Energy, 2016) is determined through:

- location and physical environment
- soils and landform
- structure and composition.

The EPBC Act's Approved Conservation Advice (Department of the Environment and Energy, 2016) outlines the following requirements for the structure of Banksia Woodlands:

- a distinctive upper sclerophyllous layer of low trees (> 2 m) typically dominated or co-dominated by *Banksia attenuata* and/or *B. menziesii*
- the possible presence of emergent medium or tall (> 10 m) trees above the banksia canopy
- a species-rich understorey consisting of a layer of sclerophyllous shrubs of various heights
- an herbaceous ground layer of cord rushes, sedges and perennial and ephemeral herbs that may include grasses; the development of a ground layer depends on the density of the shrub layer and disturbance history.

The EPBC Act's Approved Conservation Advice (Department of the Environment and Energy, 2016) outlined the following requirements for the composition of Banksia Woodlands:

- must include at least one of the following Banksia species: *B. attenuata*, *B. menziesii*, *B. prionotes* or *B. ilicifolia*
- a variety of other species that may occur in the emergent layer, at the main canopy level and understory level are listed in the approved conservation listing advice.

Statistical analysis using PRIMER was undertaken to proof the vegetation types assigned during the field visit. Abundance matrices were created, and a square root transformation assigned to prevent data skew from species with a high abundance. Resemblance matrices were created using the transformed data and a cluster analysis performed to visualise the similarities between quadrats. Quadrats that were more than 30% similar were classified as the same vegetation type.

Quadrats were also compared to the Gibson *et al.* dataset (1994) from *A Floristic Survey of the Southern Swan Coastal Plain* to assign comparable vegetation types. A Present/absent (PA) matrix was created for the Preston Beach quadrat data collected and the Gibson *et al.* (1994) dataset. Taxa names from Gibson *et al.* (1994) that were no longer current were updated to match current taxa names from the data collected. The P/A matrices were inputted into the statistical analysis package PRIMER (version 7) and resemblance matrices were created to determine the similarities in species composition between quadrats. The cophenetic correlation was checked on the analysis to ensure there it is a valid statistical test (> 0.75 as outlined by NCSS Statistical Software Manual)

As outlined by the EPBC Act's Approved Conservation Advice (Department of the Environment and Energy, 2016), there are minimum size thresholds, which are based on the vegetation condition, and are:

- 'Pristine' – no minimum patch size applies
- 'Excellent' – 0.5 ha or 5,000 m² (e.g. 50 m x 100 m)
- 'Very Good' – 1 ha or 10,000 m² (e.g. 100 m x 100 m)
- 'Good' – 2 ha or 20,000 m² (e.g. 200 m x 100 m).

A patch of *Banksia* Woodland must meet at least the 'Good' condition to potentially trigger the definition of the TEC, noting that the patch may contain small-scale (< 30 meter) breaks, gaps and disturbances.

3.5 Limitations

The survey was carried out towards the end of the spring flora season, with annuals and geophytes potentially senescing and unable to be identified. Other limitations include:

- database searches only provide an indication of what flora species may be present, with on ground surveys required to confirm those present
- the differing databases are reliant on information submitted via various reporting mechanisms, so all records of a flora species or ecological community in a specified area may not be complete
- on-ground surveys indicate species present at the time of the assessment, with species flowering at different times not always able to be identified
- not all species flower every year

Despite these limitations, Natural Area believes 80 – 90% of flora species were identified.

4.0 Flora Survey Results

Assessment of flora at the site included desktop and field activities, outcomes for both are provided in this section.

4.1 Desktop Survey

4.1.1 Significant Flora

A review of NatureMap indicated three conservation significant flora species listed under the *Biodiversity Conservation Act 2016* (WA) as potentially occurring within 2 km of the site (Department of Biodiversity Conservation and Attractions, 2018d). A review of the Protected Matters Search Tool (PMST) (Department of the Environment and Energy, 2018) indicated nine threatened flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* (Cwlth) as potentially occurring within a 2 km radius of the site. Species information, including description, habitat requirements and photographs (where possible) of the 11 conservation significant species potentially found in the area was summarised into a reference sheet for the field survey. It was determined that the site conditions (soil type, drainage, location) may be suitable for six of these species (Appendix 3). A review of the DBCA's threatened and priority flora indicated that the Priority 3 species *Cyathochaeta teretifolia* was previously recorded 236 m south of the Lot, with no other species recorded nearby.

4.1.2 Threatened Ecological Communities

A review of the PMST report indicated the potential for the threatened ecological community Banksia Woodlands of the Swan Coastal Plain to occur. This community is listed as endangered under the *EPBC Act 1999* (Cwlth) (Department of Environment and Energy 2018; Department of Environment and Energy, 2016). A review of the DBCA threatened ecological communities database indicated that this community does occur within the site (DBCA, 2018e).

4.1.3 Black Cockatoo Habitat Assessment

A review of the NatureMap and PMST reports indicated the potential presence of the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), and the endangered Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Baudin's Cockatoo (*Calyptorhynchus baudinii*) within the site. These species are listed as threatened under the *Biodiversity Conservation Act 2016* (WA), and as vulnerable (Forest Red-tailed Black Cockatoo and Baudin's Cockatoo) and endangered (Carnaby's Cockatoo) under the *EPBC Act 1999* (Cwlth). A review of the Environmental Planning Tool indicated that the site was within a broader confirmed roosting area and a potential feeding area for Carnaby's Cockatoos (Western Australian Local Government Association, 2018). A review of the DBCA's priority and threatened fauna database indicated that the Carnaby's Cockatoo has been found within the site previously (DBCA, 2018e).

4.2 On-ground Flora Survey

4.2.1 Flora

The field survey was undertaken on 09, 10 and 12 October 2018 by botanists Sharon Hynes and Harley Taylor from Natural Area. The soil types identified during the desktop survey were confirmed. A total of 219 flora species were identified from 51 families. Of these 41 were weeds and 178 were native species. No conservation significant flora species were found on site. Examples of native flora species are shown in

Figure 2, with weed species shown in Figure 3. When combined with the Bioscience survey results (2006 and 2015), the number of flora species recorded on site is 248, of which 202 are native species with 46 weeds. The flora list is provided in Appendix 5.

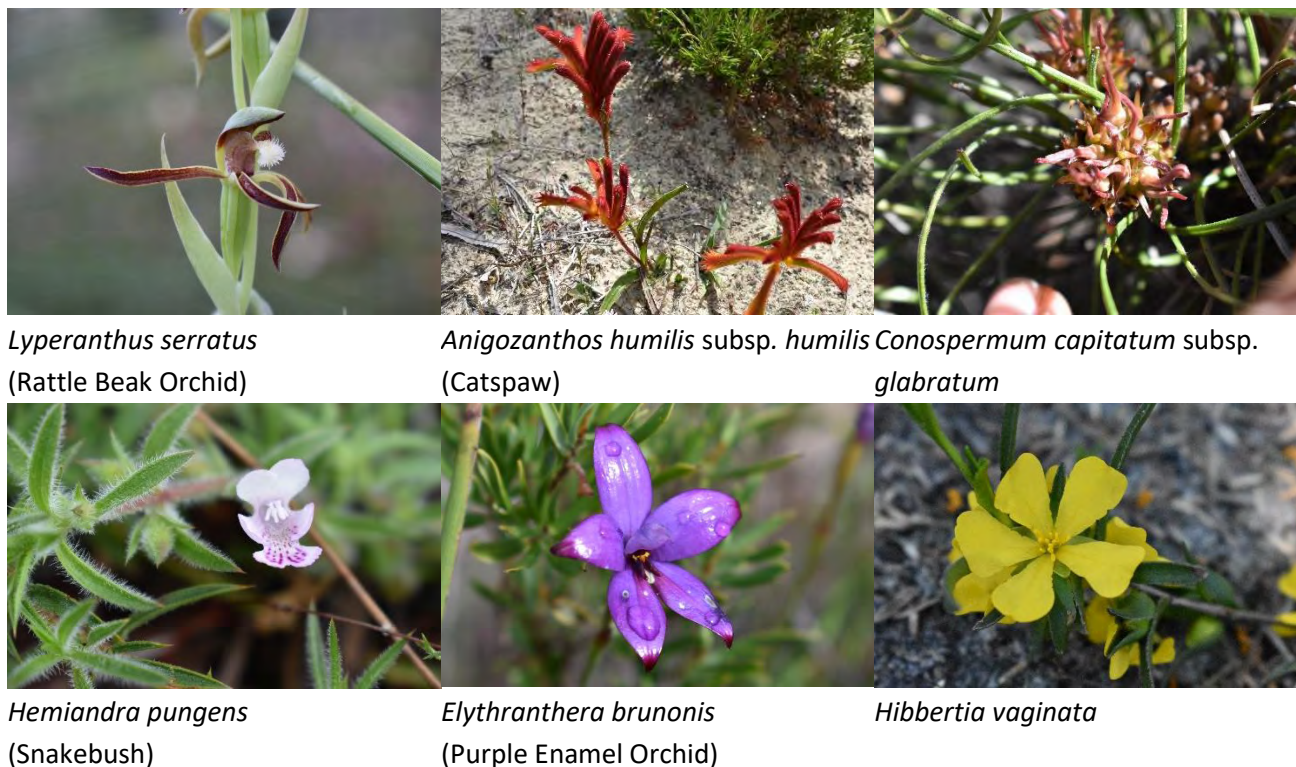


Figure 2: Examples of native flora species recorded during the survey






Figure 3: Examples of weed species found on site

4.2.2 Vegetation Types

Three vegetation types were recorded on site during the September 2018 survey with Banksia Woodland being the dominant type throughout the Lot (Table 5, Map 3).

Table 5: Vegetation types

Vegetation Type	Description	Photograph
Banksia Woodland	<i>Banksia attenuata</i> and <i>Banksia menziesii</i> Woodland over <i>Kunzea glabrescens</i> and <i>Hibbertia hypericoides</i> shrubland, and an understorey of <i>Desmocladius flexuosus</i> and mixed herbs and sedges; this vegetation type covered majority of the site.	
Corymbia and Melaleuca Woodland	A woodland of <i>Corymbia calophylla</i> and <i>Melaleuca preissiana</i> over <i>Xanthorrhoea preissii</i> and mixed shrubland and a mixed understorey usually dominated by <i>Phlebocarya ciliata</i> ; this vegetation type occurred in low-lying dune swales across the site.	
<i>Melaleuca preissiana</i> Woodland	Open Woodland of <i>Melaleuca preissiana</i> over <i>Xanthorrhoea preissii</i> and <i>Astartea scoparia</i> shrubland and an understorey of <i>Phlebocarya ciliata</i> and mixed sedges and herbs; this vegetation type occurred in the dampland area to the north of the site.	

4.2.3 Statistical Analysis – Gibson *et al* Data

Quadrat data was compared with the Gibson *et al* data using Primer (V7). Results of the statistical data analysis process determined that the vegetation communities on site were most similar to SCP21a for the Banksia Woodland, SCP4 for the *Melaleuca preissiana* Woodlands and SCP3b (with 30% similarity) for the Corymbia and Melaleuca Woodland (Table 6).

Table 6: Statistical analysis of Lot 123 community types compared to Gibson *et al*.

Vegetation type	Most similar community type (from Gibson <i>et al</i> . 1999)	Similarity	Comments	Community Type determined
Banksia Woodland	Central <i>Banksia attenuata</i> – <i>Eucalyptus marginata</i> Woodland – SCP21a	51%	Species composition listed typical of quadrats surveyed. Vegetation structure consistent, with Jarrah scattered throughout, although <i>B. menziesii</i> dominant at all quadrats (not listed in listed composition)	SCP21a
	Central <i>Banksia attenuata</i> – <i>B. menziesii</i> Woodlands – SCP23a	53%	Species composition listed typical of quadrats, vegetation structure consistent	
<i>Melaleuca preissiana</i> Woodland	Mixed shrub damplands – SCP5	41%	Typical species present although missing overstory	SCP4
	<i>Melaleuca preissiana</i> damplands – SCP4	39%	Most likely community type – structure and species composition fits description	
Marri Woodland	Central <i>Banksia attenuata</i> – <i>Eucalyptus marginata</i> Woodland – SCP21a	54%	Similar understory however missing key overstory species	SCP3b (upland areas) or SCP3c (lowland areas). Structure more typical of 3c, although species composition more similar to 3b.
	<i>Banksia attenuata</i> – <i>B. menziesii</i> Woodlands – SCP23a	51%	Similar understory however missing key overstory species	

4.2.4 Assessment Against EPBC Act 1999 Banksia Woodland Listing Information

The survey confirmed the presence of the threatened ecological community Banksia Woodlands of the Swan Coastal Plain listed as endangered under the *EPBC Act 1999*, with 37.9 ha of the site (approximately 84%) covered by this vegetation community. The minimum patch size for referral for vegetation community in

Excellent condition is 0.5 ha. When reviewed against the EPBC listing criteria for this community type, its condition and patch size mean that the proposed development will have a significant impact, and that a referral to the Department of the Environment and Energy will be required. Other considerations according to the listing advice for this site included:

- large size and/or large area to boundary ratio – due to the large patch size there is a large area/boundary ratio, making the site less exposed and more resilient to edge effects such as weed invasion.
- Evidence of recruitment of key native plant species following disturbance – recent fires within the site show successful recruitment of native species and resilience to disturbance.
- Faunal habitat as indicated by patches that meet diversity of habitat requirements, and that contribute to movement corridors – Brush Tailed Wallaby, Bandicoot, black cockatoos as well as a range of species that were not conservation significant were observed within the lot. Fauna diversity was not assessed. There is a Bush Forever site to the North-east and remnant vegetation to the south and the site may act as a corridor between the two.
- High species richness – variety of native species and a high number of native fauna species were observed on site.
- Presence of listed threatened species or key functional species such as key pollinators and dispersal animals – conservation significant fauna such as the Southern Brown Bandicoot, Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo, and Brush-Tailed Wallaby were observed, or evidence of their occurrence was recorded.
- A Scarcity of weeds and feral animals or opportunities to manage them efficiently – minimal weeds were noted throughout the majority of the site, with some areas of high grass cover at the southern end in the more disturbed areas. Little evidence of feral fauna was noted with rabbit diggings and scats observed, although no formal survey was undertaken.
- Absence or limited symptoms of dieback – one small area may have been impacted by dieback but was not assessed; the majority of the site showed no symptoms of dieback.
- Connectivity to other native vegetation remnants or restorations works - there is a Bush Forever site to the north-east and remnant vegetation to the south and the site may act as a corridor between these areas.
- Linear roads often act as important connections – the site is not a linear road site, so is not applicable.
- Occurrence of the patch is
 - in an area where this TEC has been most heavily cleared – this TEC was upgraded to threatened under the EPBC Act 1999 as there is only 10% of its original extent remaining on the Swan Coastal Plain due to clearing for urban expansion
 - of a sub community that is recognised as conservation significant by the WA Government – this ecological community is listed as a Priority 3 under the *Biodiversity Conservation Act 2016* (WA)
 - at the end of the range of the TEC – the Lot is not situated towards the end of the range of this TEC.

The vegetation within the Lot was compared to the key diagnostic characteristics of Banksia Woodlands on the Swan Coastal Plain (Table 7) and compared to typical species found within this ecological community (Table 8).

Table 7: Comparison of vegetation in Lot 123 Mortimer Rd to the TEC listing advice

Key Diagnostic Characteristics (KDC)		Does the vegetation at Lot 123 Mortimer Road fit this KDC?
Local and physical environment	Swan coastal Plain IBRA bioregion	Yes
Soils and Landforms	Well Drained, low nutrient soils, particularly on Bassendean and Spearwood Sands	Yes, located in Bassendean Soil System
Structure	Distinctive upper sclerophyllous layer of low trees dominated by <i>Banksias</i>	Yes, dominant overstory species were <i>Banksia</i> species outlined
	Emergent tall <i>Eucalyptus</i> or <i>Allocasuarina</i> may be present	Yes, was present at site
Composition	Canopy dominated by <i>B. attenuata</i> and/or <i>B. menziesii</i> (although other <i>Banksias</i> can be dominant)	Yes, both species dominant species
	Patch must include one of the following diagnostic species: - <i>Banksia attenuata</i> - <i>B. menziesii</i> - <i>B. prionotes</i> - <i>B. illicifolia</i>	Yes, both <i>Banksia attenuata</i> and <i>B. menziesii</i> dominant, and <i>B. illicifolia</i> present.
	If present emergent tree layer often includes <i>Corymbia calophylla</i> , <i>Eucalyptus marginata</i> , or less commonly <i>E. gomphocephala</i>	Yes, both <i>Corymbia calophylla</i> and <i>Eucalyptus marginata</i> present
	Other trees of a medium height that may be present, and may be codominant with the <i>Banksia</i> species include - <i>Eucalyptus tottiana</i> - <i>Nuytsia floribunda</i> - <i>Allocasuarina fraseriana</i> - <i>Callitris arenaria</i> - <i>Callitris pyramidalis</i> - <i>Xylomelum occidentale</i>	Yes, medium height tree species present: - <i>Eucalyptus tottiana</i> - <i>Nuytsia floribunda</i> - <i>Allocasuarina fraseriana</i>
	Very high diversity of understory species that vary from patch to patch. See the description above and vegetation types that relate to <i>Banksia</i> Woodlands (Gibson <i>et al</i> 1994)	All understory species listed in the conservation advice were located within the site.

The species composition for the vegetation community of *Banksia* Woodland on site has majority of the understorey and middle story species listed for this community in the listing advice (Table 8).

Table 8: Species listed for Banksia Woodlands of the Swan Coastal Plain

Species in listing information	Layer	Presence at Lot 123 Mortimer Road
<i>Adenanthos cygnorum</i>	Lower	Y
<i>Allocasuarina fraseriana</i>	Medium	Y
<i>Allocasuarina humilis</i>	Lower	Y
<i>Amphipogon turbinatus</i>	Ground	Y
<i>Banksia attenuata</i>	Upper	Y
<i>Banksia burdettii</i>	Medium	No, outside of natural range
<i>Banksia ilicifolia</i>	Upper	Y
<i>Banksia littoralis</i>	Upper	Y
<i>Banksia menziesii</i>	Upper	Y
<i>Banksia prionotes</i>	Upper	No, soil type not suitable
<i>Bossiaea eriocarpa</i>	Lower	Y
<i>Burchardia congesta</i>	Ground	Y
<i>Caladenia spp.</i>	Ground	Y
<i>Callitris arenaria</i>	Medium	No, outside of natural range
<i>Callitris pyramidalis</i>	Medium	No, drainage unsuitable
<i>Conostephium pendulum</i>	Lower	Y
<i>Corymbia calophylla</i>	Upper	Y
<i>Dasypogon bromeliifolius</i>	Ground	Y
<i>Daviesia spp.</i>	Lower	Y
<i>Desmocladius flexuosus</i>	Ground	Y
<i>Drosera erythrorhiza</i>	Ground	Y
<i>Eremaea pauciflora</i>	Lower	Y
<i>Eucalyptus gomphocephala</i>	Upper	No, soil type not suitable
<i>Eucalyptus marginata</i>	Upper	Y
<i>Eucalyptus tottiana</i>	Medium	Y
<i>Gompholobium tomentosum</i>	Lower	Y
<i>Hibbertia hypericoides</i>	Lower	Y
<i>Hypolaena exsulca</i>	Lower	Y
<i>Jacksonia spp.</i>	Lower	Y
<i>Kunzea glabrescens</i>	Lower	Y
<i>Lepidosperma squamatum</i>	Ground	Y
<i>Lomandra hermaphrodita</i>	Ground	Y
<i>Lyginia barbata</i>	Ground	Y
<i>Lyginia imberbis</i>	Ground	Y
<i>Mesomelaena pseudostygia</i>	Ground	Y
<i>Nuytsia floribunda</i>	Medium	Y
<i>Patersonia occidentalis</i>	Ground	Y

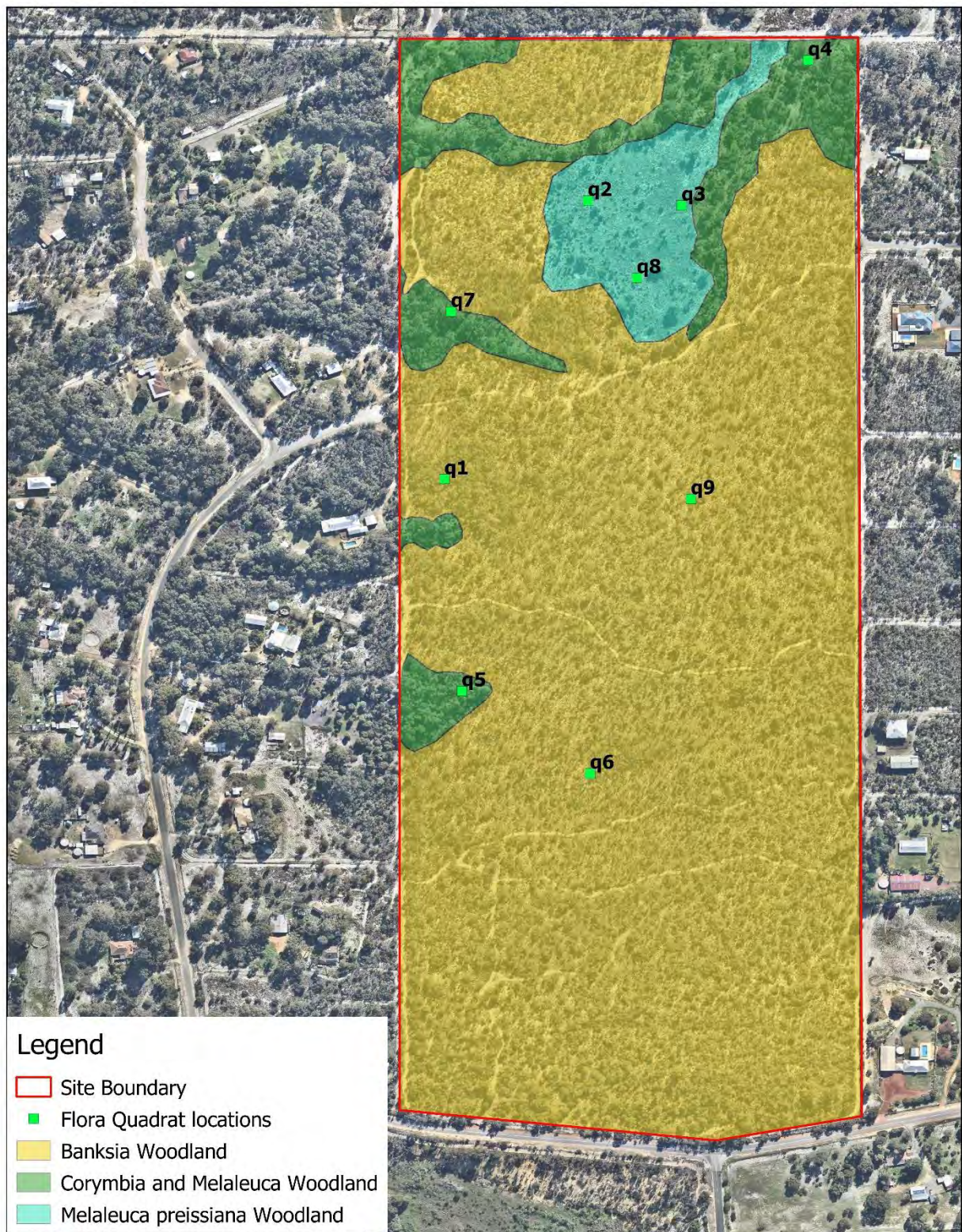
Species in listing information	Layer	Presence at Lot 123 Mortimer Road
<i>Petrophile linearis</i>	Lower	Y
<i>Philotheca spicata</i>	Lower	Y
<i>Phlebocarya ciliata</i>	Lower	Y
<i>Podolepis spp.</i>	Ground	Y
<i>Stirlingia latifolia</i>	Lower	Y
<i>Stylidium brunonianum</i>	Ground	Y
<i>Stylidium piliferum</i>	Ground	Y
<i>Trachymene pilosa</i>	Ground	Y
<i>Xanthorrhoea preissii</i>	Lower	Y
<i>Xanthosia huegelii</i>	Ground	Y
<i>Xylomelum occidentale</i>	Medium	Y

4.2.5 Vegetation Condition

Vegetation condition ranged from Degraded to Excellent, with majority of the site (87.7%) in Excellent condition (Table 9, Map 4). Degraded areas occurred along sandy vehicle tracks and at the southern end of the site where areas had been previously cleared for buildings/sheds, with remnants of old buildings and dumped rubbish present.

Table 9: Vegetation condition

Vegetation Condition	Excellent	Very Good	Good	Degraded	Completely Degraded	Totals
Area (ha)	39.61	2.75	0.46	2.75	0	45.17
Area (%)	87.7	6.1	1	5.2	0	100



Map 3: Vegetation Types
Lot 123 Mortimer Rd, Casuarina



Natural Area
CONSULTING MANAGEMENT SERVICES

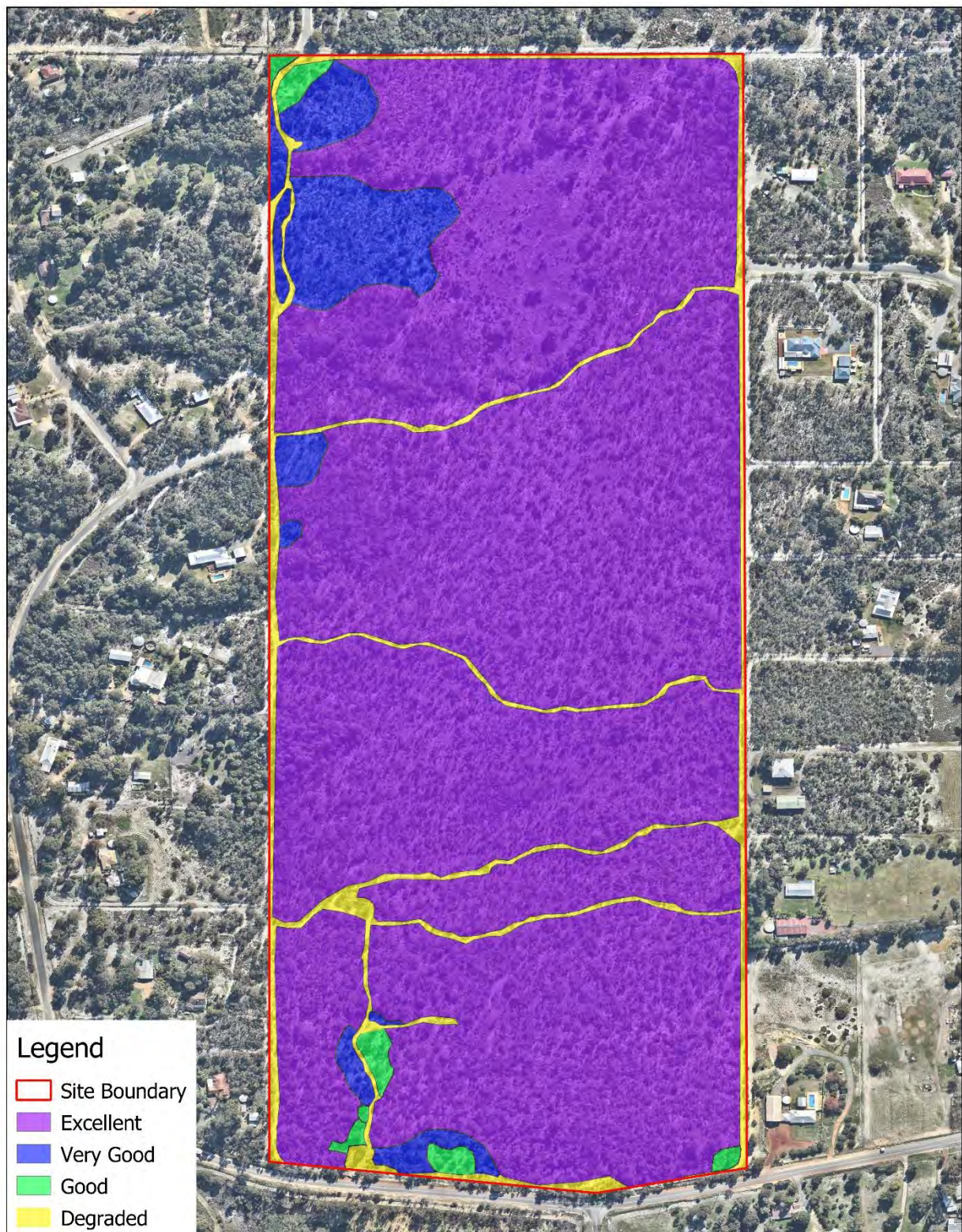
99C Lord Street
Whiteman WA 6068
(08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au



0 75 150 m



Client: Yujnovich, John
Date: 17/10/18
Created by: SH
Image Source: Nearmap
Datum: WGS 84
Version: V1



Map 4: Vegetation Condition
Lot 123 Mortimer Rd, Casuarina



Natural Area
CONSULTING MANAGEMENT SERVICES

99C Lord Street
Whiteman WA 6068
(08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au



0 75 150 m



Client: The Whiteman
Date: 12/06/18
Created by: JY
Image Source: Google Earth
Datum: WGS84
Version: 1.0

4.3 Black Cockatoo Habitat Assessment

During the September 2018 site assessment, a total of 28 trees containing hollows were observed that were of a suitable size to be utilised by black cockatoos for nesting; however, there was no evidence of this occurring. A further 12 trees had a diameter at breast height greater than 500 mm; they are suitable roosting trees for black cockatoos and have the potential develop hollows in time. Evidence of foraging by black cockatoos was recorded on site. Marri nuts showing evidence of Forest Red-tailed Black Cockatoos feeding in the north-east and the central western side of the site, while evidence of Carnaby's Cockatoo feeding was noted on Banksia flowers and cones in the central western side of the Lot. Map 5 shows the locations of the habitat trees and foraging locations.



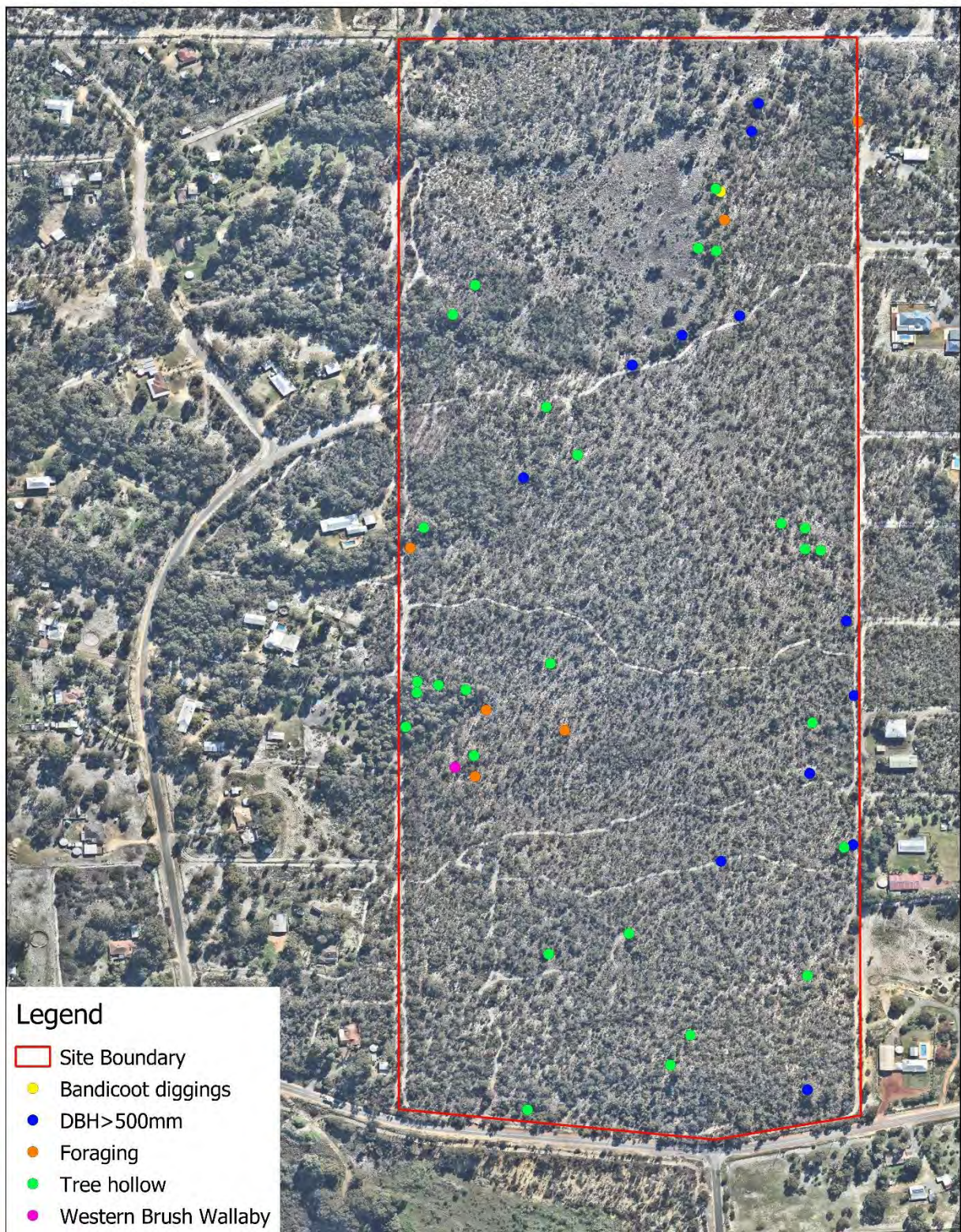
Evidence of Forest Red-tailed Cockatoos feeding on Marri nuts



Evidence of Carnaby's Cockatoo feeding on Banksia flowers and cones

4.3.1 Opportunistic Conservation Significant Fauna Observations

Evidence of the presence of two Priority 4 species presence was recorded during the on-ground assessment. Diggings of the Southern Brown Bandicoot (*Isodon obesulus fusciventer*) was recorded at the north-east of the site (Map 5). The Western Brush Wallaby (*Macropus irma*) was observed at the edge of the Corymbia Melaleuca Woodland in the central western side of the Lot (Map 5). The presence of these species will need to be considered during any State approvals approval but will not influence the Commonwealth approvals process.



Map 5: Vegetation Types
Lot 123 Mortimer Rd, Casuarina



Natural Area
CONSULTING MANAGEMENT SERVICES

99C Lord Street
Whiteman WA 6068
(08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au



Client: Yujnovich, John
Date: 17/10/18
Created by: SH
Image Source: Nearmap
Datum: WGS 84
Version: V1

5.0 Implications of Results

5.1 Flora species

Natural Area's spring survey at Lot 123 Mortimer road, Casuarina record 219 flora species from 51 families, 41 of which were introduced and 178 were native species. Overall, 248 species have been recorded within Lot 123, of which 202 are native and 46 are weeds. The area shows a high level of plant diversity which is typical of Banksia Woodlands of the Swan Coastal Plain.

5.2 Significant Flora

No threatened or priority species were recorded during the on-ground 2018 spring survey, and none were recorded during the 2006 and 2015 surveys undertaken by Bioscience. No declared rare or priority listed species were indicated within the site on the DBCA database search (2018e).

5.3 Threatened Ecological Community

The presence of the threatened ecological community Banksia Woodland of the Swan Coastal Plain was confirmed during the survey, and a referral to the Department of Environment and Energy as a matter of national environmental significance will be required. The amount of clearing is yet to be determined, with the maximum clearing potentially being the entire site. However, portions of this vegetation and ecological community are likely to be retained within Public Open Space (POS) areas. The current indicative proposal for the lot layout indicates that approximately 45 020 m² (4.5 ha) will be retained in restricted POS areas; however, this is subject to further consideration during the development process. A further 33 537 m² (3.35 ha or 8.8% of the TEC) is located in unrestricted POS areas, and may be cleared. The 4.5 ha area makes up approximately 11.9% of the TEC within the Lot.

5.4 Black Cockatoo Habitat

It is noted that Banksia species are a common food source for the Carnaby's Cockatoo, and Marri for the Carnaby's, Baudin's and Forest Red-tailed Black Cockatoos species. The Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is listed as endangered under the *EPBC Act 1999* (Cwlth), with the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*) and the Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) listed as vulnerable; all are listed as threatened under the *Biodiversity Conservation Act 2016* (WA).

While the survey indicated the presence of trees with hollows that could be used for nesting, along with those that could develop hollows over time, there was no evidence of nesting during Natural Area's survey. Similarly, there was no evidence of roosting within the site. This suggests the site is used for foraging only, rather than nesting and roosting.

The site is considered to be a quality foraging habitat due to:

- the presence of a range of known black cockatoo food sources, including marri and four species of banksia
- the site condition being Excellent
- it being located in the Swan Coastal Plain
- the presence of trees containing nesting hollows and those with the potential to produce nesting hollows.

Current EPBC Act referral guidelines (DSEWPaC, 2012) for black cockatoos indicate that the clearing of one or more hectares of quality feeding habitat is likely to be considered significant in terms of impact to these species. Based on the current indicative subdivision design, the extent of Banksia Woodland proposed to be cleared within Lot 123 is more than 30 ha, the impact to these species is considered significant and will require a referral to the Department of the Environment and Energy. At an appropriate stage of the development process, consideration of the presence and impact to black cockatoos will be considered by State government agencies.

5.5 Significant Fauna

Opportunistic sightings of conservation significant fauna were recorded during the 2018 spring survey, with two Priority 4 species listed under the *Biodiversity Conservation Act 2016* (WA) being observed. These were the Western brush Wallaby which was observed within the western portion of the Lot, and Southern Brown Bandicoot diggings found at the northern end of the site adjacent the conservation category wetland.

5.6 Assessment Against Clearing Principles

An assessment of information obtained during the 2018 spring flora and habitat assessment has been made against the Western Australian clearing principles (Table 10).

Table 10: Assessment against clearing principles

Principle	Comment
A	<p>Native vegetation should not be cleared if it comprises a high level of biological diversity.</p> <p>Clearing is likely to be at variance with this principle:</p> <ul style="list-style-type: none"> the area survey was approximately 45 ha, the proposed development A total of 173 native flora species were recorded within Lot by Natural Area in October 2018, with a combined total of 202 native species including the Bioscience data (2008 and 2015) DBCA flora database searches indicated there were no recorded declared rare or priority listed flora species within the survey site and proposed clearing area the DBCA ecological community database search indicated the presence of the Banksia Woodlands on the Swan Coastal Plain there were no observations of declared rare or priority listed flora species by Natural Area (2018) or Bioscience (2008 and 2015) the PMST report indicated the likely presence of the threatened ecological community Banksia Woodlands of the Swan Coastal Plain the endangered listed ecological community 'Banksia Woodlands of the Swan Coastal Plain' (listed as threatened at a Commonwealth level) was noted as the dominant vegetation type within the Lot, covering 37.9 ha of the site, thus meeting Commonwealth referral triggers.
	<p>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.</p> <p>Clearing is likely to be at variance with this principle:</p> <ul style="list-style-type: none"> a review of available fauna data in the form of NatureMap (DBCA) and Protected Matter Search Tool (Department of the Environment and Energy) reports indicated the presence of the Carnaby's Cockatoo which was previously recorded within the site, and the potential for the Forest Red-tailed Black Cockatoo, Baudin's Cockatoo, Southern Brown Bandicoot and the Western Brush Wallaby to occur on the site signs of foraging for the Carnaby's Cockatoo and the Forest Red-tailed Black Cockatoo, as well as potential hollows and roosting trees were recorded during the black cockatoo habitat assessment additionally, the Priority 4 list Western Brush Wallaby (<i>Macropus irma</i>) was observed during the survey and Southern Brown Bandicoot (<i>Isodon obesulus fusciventer</i>) diggings were observed.

Principle	Comment
C Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	<p>Clearing is not likely to be at variance with this principle:</p> <ul style="list-style-type: none"> the DBCA declared rare and priority listed flora search indicated there were no recorded observations within the proposed clearing site boundary; the closest record was <i>Cyathochaeta teretifolia</i> 236 m to the south of the site a spring flora survey carried out by Natural Area botanists (2018) and Bioscience (2008 and 2015) did not identify any conservation significant species within the proposed clearing area.
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.	<p>Clearing is likely to be at variance with this principle:</p> <ul style="list-style-type: none"> the ecological community 'Banksia Woodlands of the Swan Coastal Plain' listed as Priority 3 under the <i>Biodiversity Conservation Act 2016</i> (WA) and endangered under <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth) is present within the proposed clearing area, with a condition rating of Excellent for the majority of the community. Accordingly, the significance criteria published by the Department of the Environment and Energy has been exceeded and referral to the Commonwealth is required.
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.	<p>Clearing is not likely to be at variance with this principle:</p> <ul style="list-style-type: none"> the extent of the Vegetation Complex Bassendean – Central and South remaining is 41.65% of the pre-European extent within the local government area (Kwinana), and 27.7% of the pre-European extent for the Swan Coastal Plain (SCP) the area proposed to be cleared within the site equates to 0.14% of the 24 206.24 ha remaining for the SCP, and 1.7% of the 1 948.45 ha remaining for the City of Kwinana.
F Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse of wetland.	<p>Clearing is likely to be at variance with this principle as a conservation category wetland is present, with a portion 1469.5 m² (0.15 ha) of this vegetation type within the proposed clearing area.</p>

	Principle	Comment
G	Native Vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Clearing is likely to be at variance with this principle as the proposed clearing area is indicated to have a high to extreme potential for wind erosion for the entire Lot, and the potential for high to extreme potential for water erosion in the wetland area (Department of Primary Industry and Regional Development, 2018).
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.	Clearing is not likely to be at variance with this principle as the surrounding properties are all privately owned and there is no conservation area in close proximity to the site.
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.	Clearing is not likely to be at variance with this principle as: <ul style="list-style-type: none"> the wetland areas are damplands and rarely contain open water the wetlands and their vegetation are currently proposed to be retained as public open space, with area affected yet to be quantified depth to groundwater is a minimum of 2 m, thus impacts to groundwater are unlikely.
J	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	Clearing is not likely to be at variance with this principle as the wetland areas are damplands (seasonally wet areas) and rarely contain open water; there have been no reports of flooding on site by the landowner.

6.0 References

Bioscience, (2006), *Report on Field Investigations: Ground Truthing the Presence and Management Classification of Wetlands Lot 123 Mortimer Rd, Casuarina City of Kwinana*, unpublished report prepared by Bioscience for Yujnovich I.

Bioscience (2015), *Vegetation and Black Cockatoo Assessment*, unpublished report prepared by Bioscience for Yujnovich I.

Department of Biodiversity, Conservation and Attractions, (2018a), *Conservation Codes*, viewed October 2018 via https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/conservation_code_definitions.pdf.

Department of Biodiversity, Conservation and Attractions, (2018b), *FloraBase – The Western Australian Flora*, accessed July 2018 via <https://florabase.dpaw.wa.gov.au/>.

Department of Biodiversity, Conservation and Attractions, (2018c), *Geomorphic Wetlands of the Swan Coastal Plain Database (DBCA 019)*, accessed October 2018 via <https://nationalmap.gov.au/>.

Department of Biodiversity, Conservation and Attractions, (2018d), *NatureMap*, viewed September 2018 <http://naturemap.dpaw.wa.gov.au/default.aspx>.

Department of Biodiversity, Conservation and Attractions, (2018e), *Threatened and Priority Flora and Ecological Communities Database Searches*, personal communication.

Department of Environment and Conservation, (2011), *Plants Used by Carnaby's Black Cockatoo*, viewed December 2018 via <https://www.dpaw.wa.gov.au/apps/plantsforcarnabys/index.html>.

Department of the Environment and Energy, (2016) *Approved Conservation Advice for Banksia Woodlands of the Swan Coastal Plain*, viewed September 2018 via <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservation-advice.pdf>.

Department of the Environment and Energy, (2018) *Protected Matters Search Tool*, viewed September 2018 via <http://www.environment.gov.au/epbc/pmst/>.

Department of Primary Industries and Regional Development, (2018), *NRInfo for Western Australia: map application*, accessed October 2018 via <https://www.agric.wa.gov.au/resource-assessment/nrinfo-western-australia>.

Department of Sustainability, Environment, Water, Population and Communities, (2012), *EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species*, accessed October 2018 via <https://www.environment.gov.au/system/files/resources/895d4094-af63-4dd3-8dff-ad2b9b943312/files/referral-guidelines-wa-black-cockatoo.pdf>.

Department of Water and Environmental Regulation, (2018), *Perth Groundwater Map – Depths*, accessed November 2018 via <https://maps.water.wa.gov.au/#/webmap/gwm>.

Environmental Protection Authority, (2016), *Technical Guidance: Flora and Vegetation survey for Environmental Impact Assessment*, accessed July 2018 via http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf.

Government of Western Australian, (2000), *Bush Forever, Volume 2*, Government of Western Australia, Perth, Western Australia.

Hedde, E., Loneragan, O., and Havel, J, (1980), Vegetation Complexes of the Darling System Western Australia. In *Atlas of Natural Resources - Darling System, Western Australia* (pp. 37 - 72), Department of Conservation and Environment, Western Australia.

Mitchell, D., Williams, K., and Desmond, A., (2002), *Swan Coastal Plain 2 (SWA – Swan Coastal Plain subregion)*, accessed November 2018 via https://www.dpaw.wa.gov.au/images/documents/about/science/projects/waaudit/swan_coastal_plain02_p606-623.pdf.

Western Australian Local Government Association, (2018), *Environmental Planning Tool – Environmental Considerations*, accessed October 2018 via <http://lbp.asn.au/module/enviro#map>.

Western Australian Local Government Association (WALGA), (2018), *Environmental Planning Tool – Vegetation Complexes*, accessed October 2018 via: <http://lbp.asn.au/module/enviro#map>.