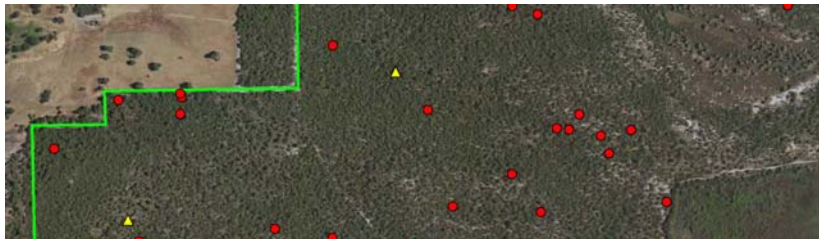
Biota Environmental Sciences

Targeted Fauna Survey: Lots 267, 268 and 153 Ducane Road, Gelorup



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Ducane Road Targeted Fauna Survey

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1.0 Introduction

1.1 Background and Scope

Main Roads Western Australia (Main Roads) is considering environmental offset options for future road projects in the Southwest region. One such offset option is the purchase of the largely vegetated Lot 153, Lot 267 and Lot 268 Ducane Road Gelorup, or part thereof. The lots comprise 167.15 ha in total and are collectively referred to throughout this report as 'the study area' (location shown in Figure 1.1).

Biota Environmental Sciences (Biota) was commissioned to assess the study area as habitat for four conservation significant fauna species with the potential to occur:

- the Western Ringtail Possum (*Pseudocheirus occidentalis*; Schedule 1, Critically Endangered); and
- three black-cockatoo species:
    - Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*; Schedule 2, Endangered),
    - Baudin's Black-Cockatoo (*Calyptorhynchus baudinii;* Schedule 2*,* Endangered), and
    - Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksia naso*; Schedule 3, Vulnerable).

The scope of the work included:

- identification and mapping of black-cockatoo habitat trees (those with Diameter at Breast Height (DBH) >50 cm), particularly those that may contain hollows suitable for breeding;
- conducting a Line-transect Distance Sampling exercise targeting the Western Ringtail Possum; and
- reporting of the survey findings, including discussion of habitat significance and linkages.

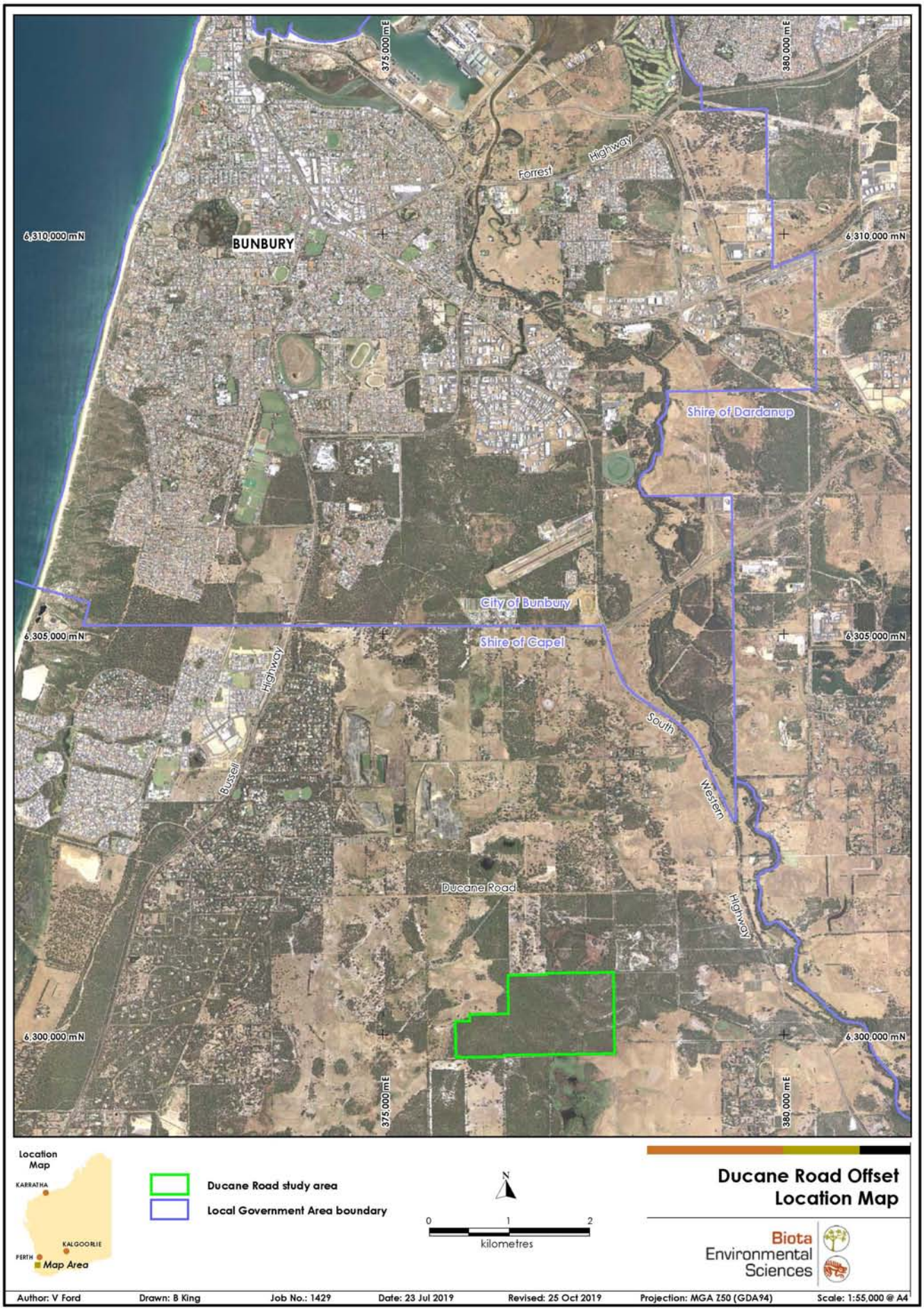

Figure 1.1: Location of the study area.

2.0 Methods

2.1 Timing and Team

The field survey was conducted in two phases in 2019. The first field phase in June primarily consisted of the black-cockatoo habitat assessment, together with a spotlighting exercise to determine whether the Western Ringtail Possum was present (and if present, in which habitat types). The second field phase in early July was a dedicated distance sampling exercise for the Western Ringtail Possum.

Dates and personnel conducting the work are detailed in Table 2.1, along with weather data obtained from the nearest Bureau of Meteorology[1] weather station (at Bunbury, station no. 009965). Conditions during the survey were generally cool and significant rain fell during the black-cockatoo habitat assessment; however, perhaps more pertinent, the nights on which the Western Ringtail Possum was surveyed (in Phase 2) were dry.

Table 2.1: Summary of survey timing, personnel and weather conditions.

	Date	Methods	Personnel	Minimum Temperature (°C)	Maximum Temperature (°C)	Rainfall (mm)
Phase 1	20/06/19	Black-cockatoo habitat assessment, Nocturnal searches	Joshua Keen & Ayesha Lapinski, Michael Greenham (20 June only)	2.6	15.7	0.0
	21/06/19			9.2	21.7	0.0
	22/06/19			9.2	17.8	15.8
	23/06/19			11.2	19.3	44.8
			Average/Total	**8.1**	**18.6**	**60.6**
Phase 2	01/07/19	Western Ringtail Possum Distance Sampling	Dr Victoria Ford & Brandon King	13.6	17.5	1.2
	02/07/19			11.2	19.2	1.2
	03/07/19			4.7	20.4	0.0
	04/07/19			11.7	14.2	6.0
			Average/Total	**10.3**	**17.8**	**8.4**

2.2 Black-cockatoos

2.2.1 Breeding Habitat Assessment

The field assessment aimed to determine whether suitable breeding habitat for black-cockatoos was present within the study area. The Commonwealth *Revised draft referral guideline for three black cockatoo species* (DotEE 2017) defines breeding habitat as those "species of trees known to support breeding within the range of the species, which either have a suitable nest hollow or are of a suitable diameter at breast height to develop a nest hollow" (being greater than 50 cm DBH for most Eucalypts, or 30 cm in the case of Wandoo and Salmon Gum).

Larger areas of continuous vegetation were identified from aerial imagery and overlain with 25 m spaced transects in GIS. Using a GPS, a biologist walked up the middle of each 25 m wide transect, assessing all trees within it. The locations of all individual trees of species with the potential to form hollows (primarily Jarrah, Marri, Tuart and Flooded Gum) and with sufficient diameter to be considered breeding habitat trees (DBH >50 cm) were recorded using a GPS (accurate to within 3 m). Furthermore, the positions of trees observed to contain hollows that were potentially suitable for black-cockatoo nesting were recorded using a differential GPS (accurate to less than 1 m) and the following parameters were scored:

- DBH (diameter measured approximately 1.3 m above the ground);
- tree height (using a laser rangefinder);

[1] www.bom.gov.au

- tree species;
- the number and estimated height above the ground of observed hollows;
- visual estimate of the diameter of each hollow;
- signs of cockatoo use (including wear around hollows, nut chews, scarring, scratch marks on trunks and branches, secondary evidence of feeding sites and moulted feathers); and
- photographs were also taken as a visual reference and to aid future identification of the tree.

2.2.2 Foraging Habitat Assessment

Foraging habitat is defined as areas including plants of species known to support foraging within the range of each cockatoo species (DSEWPaC 2012). While a broader range of species is utilised for foraging (including introduced species such as pines, **Pinus* spp.), Marri and Jarrah woodlands are particularly important to Baudin's Black-Cockatoo and the Forest Red-tailed Black-Cockatoo, while proteaceous heaths (i.e. shrublands dominated by *Banksia, Hakea* and *Grevillea* species) are also utilised by Carnaby's Black-Cockatoo (DSEWPaC 2012).

While conducting assessments of breeding habitat in the study area, foraging habitat and foraging evidence were opportunistically recorded. The quality of the habitat for foraging was then scored using the elements of the Foraging Habitat Scoring Tool described in the referral guideline (DotEE 2017) (see Appendix 1).

2.3 Western Ringtail Possum

During the Phase 1 field survey (20/06/2019), three biologists conducted a three-hours of nightspotting reconnoitre in the most prospective Western Ringtail Possum habitat within the study area, to determine whether the Western Ringtail Possum was present. During this exercise, 10 individual Western Ringtail Possums were recorded from eight observations. Based on this result, the decision was made to undertake a thorough Distance Sampling exercise to obtain an estimate of density and total abundance.

In Phase 2, Line-transect Distance Sampling was undertaken over all habitat with the potential to support the Western Ringtail Possum. Transects were oriented north-south and spaced at 75 m intervals (distribution of transects over the study area is illustrated in Figure 2.1). Each transect was walked by one observer using a high-powered head torch. The survey was undertaken over three consecutive nights from 1–4 July 2019 by Dr Victoria Ford and Mr Brandon King (of Biota), both of whom have previous experience conducting distance sampling for the Western Ringtail Possum. Transects generally commenced at 6:00 pm and ended prior to 2:00 am.

The locations of observed Western Ringtail Possums, Common Brushtail Possums and Wambenger Brush-tailed Phascogales were recorded using a high-accuracy GPS, typically providing accuracy to within 1.5 m. In total, 24 transects comprising 19.05 km were walked. In addition to species and location, the following information was also recorded; observer, time, number of individuals, age class, and dominant habitat at the point of observation.

The perpendicular distances of each observation from the transect were plotted as frequency histograms and examined to determine whether evasive movement of animals was occurring prior to detection. Stepped lower initial intervals that increase away from the centreline can indicate movement away from the observers, while initially high then decreasing intervals indicate relatively little movement away from the observers. Both can lead to bias in density estimation.

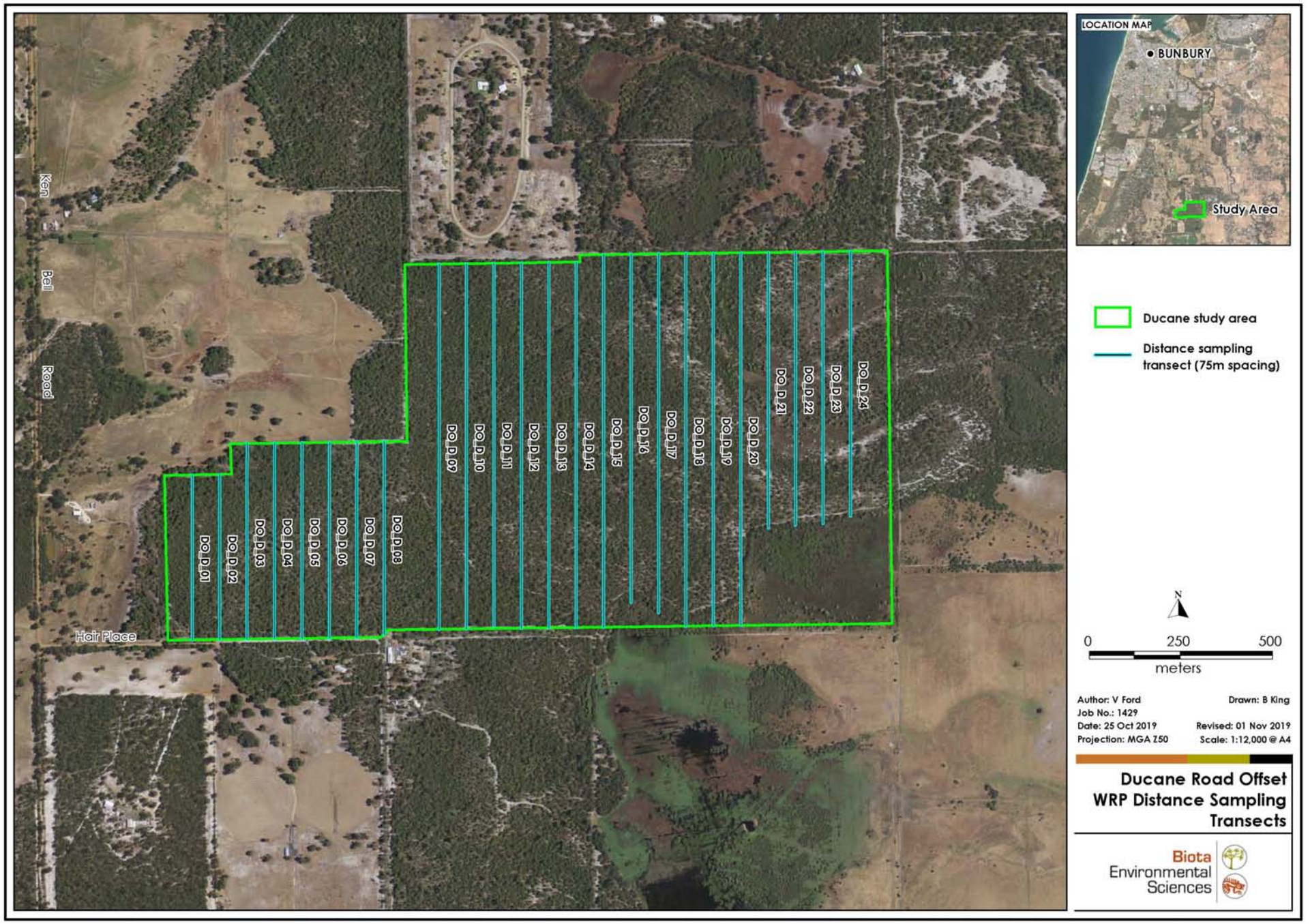

Figure 2.1: Distribution of distance sampling transects over the study area.

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3.0 Results

3.1 Habitats

Preliminary vegetation descriptions were completed by Webb (2018) following a short site-visit. These descriptions were used in conjunction with field observations to broadly map the following habitat types, ordered from most common to least:

1. Jarrah-*Banksia* woodland (132.0 ha): dominates the large majority of the upland study area. When intact, the lower stratum comprised a diverse heath (Plate 3.1); this was absent in heavily grazed areas (Plate 3.2).
2. Dampland *Melaleuca* tall shrubland and/or low open forest (18.5 ha) (Plate 3.3 and Plate 3.4). The southern extent of this habitat type appeared heavily grazed, while the northern extent included scattered Flooded Gum (*Eucalyptus rudis*).
3. Wetland (12.3 ha): occurs in the southeast of the study area, comprising a small section of the larger wetland occurring south of the study area. Seasonally inundated, supporting scattered *Melaleuca* over heath and sedges (Plate 3.5 and Plate 3.6).
4. Dampland heath (2.6 ha): occurs in the northeast of the study area, and was dominated by heath with scattered *Melaleuca* trees (Plate 3.7).
5. Peppermint fringing wetland (1.9 ha). An approximately 100 m wide stretch of woodland fringing the wetland in the southeast corner of the study area (Plate 3.8).

The occurrence of the habitat types is mapped in Figure 3.1.

Plate 3.1: Jarrah-*Banksia* woodland (example 1: intact understorey).

Plate 3.2: Jarrah-*Banksia* woodland (example 2: grazed understorey).

Plate 3.3: Dampland with tall shrubland of *Astartea* and *Melaleuca*.

Plate 3.4: Dampland with low open forest of *Melaleuca*.

Plate 3.5: **Seasonally inundated wetland (example 1).**

Plate 3.6: **Seasonally inundated wetland (example 2).**

Plate 3.7: **Dampland heath and emergent *Melaleuca* trees.**

Plate 3.8: **Peppermint fringing wetland.**

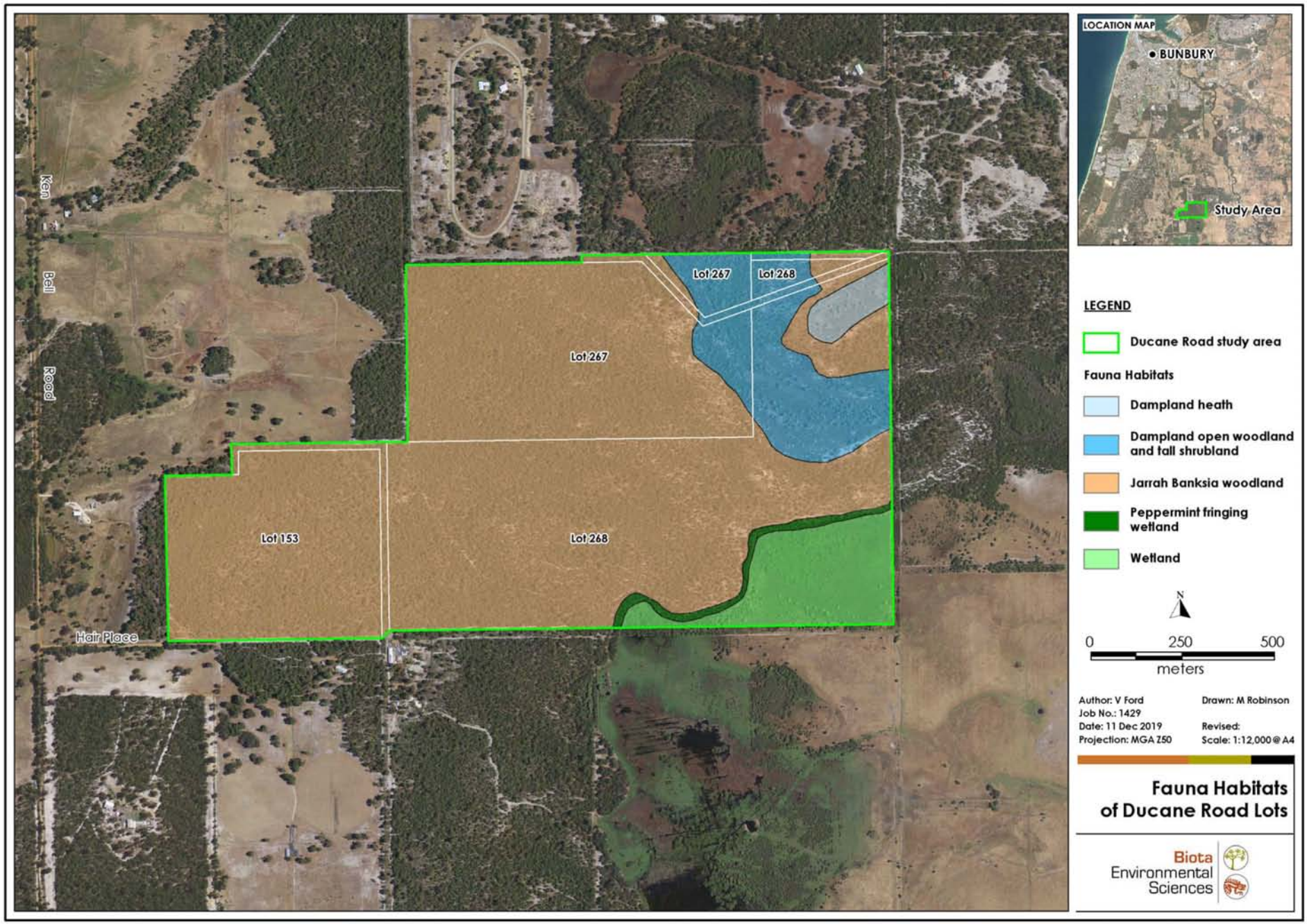

Figure 3.1: Fauna habitats of the study area.

3.2 Black-cockatoos

3.2.1 Breeding Habitat Assessment

A total of 1,243 trees of suitable hollowing-forming species (DSEWPaC 2012) with DBH of 50 cm or greater were recorded within the study area. The distribution of these habitat trees is illustrated in Figure 3.2. The large majority of the habitat trees recorded were Jarrah (n=1,173), with a much smaller number of Marri (n=58), and 12 trees that could not be identified to species (seven of which were dead stags).

With respect to the trees with greater than 50 cm DBH, 154 hollows from 133 trees were described as potentially suitable for breeding (as far as could be determined from ground level).

3.2.2 Foraging Habitat

The Jarrah-*Banksia* woodland in the study area (132.0 ha) represents a large area and contains a high density of foraging plants, including small patches of Marri at the northwestern corner of Lot 153 and the northeastern corner of Lot 267.

Foraging evidence in the form of chewed *Banksia* cones was prevalent throughout the study area (Plate 3.9), consistent with being one of the most common food resources present within the study area. Bite marks indicative of Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo were also recorded on Marri nuts (Plate 3.10 and Plate 3.11).

Plate 3.9: Chewed *Banksia* cone.

Plate 3.10: Marri nut chewed by Forest Red-tailed Black-Cockatoo.

Plate 3.11: Marri nut chewed by Carnaby's Black-Cockatoo.

The results of the application of the Foraging Habitat Scoring Tool from the draft Commonwealth referral guidelines for black-cockatoos (DotEE 2017) are shown in Table 3.1. To apply the criteria of the tool, the nearest general locations of breeding and roosting were obtained via the breeding distributions mapped in the draft referral guidelines (DotEE 2017) and suburb localities listed in *The 2018 Great Cocky Count* report (Peck et al. 2018).

Table 3.1: Application of Foraging Habitat Scoring Tool (DotEE 2017).

Species	Carnaby's Black-cockatoo	Baudin's Black-cockatoo	Forest Red-tailed Black-cockatoo
Starting Score	7: Proteaceous heath, shrubland or woodland.	7: Native eucalypt woodlands and forest, and proteaceous woodland and heath, particularly Marri, including along roadsides. Does not include orchards or areas under a RFA.	7: Jarrah and Marri woodlands and edges of Karri forests.
Additions	+3: Is within the Swan Coastal Plain (important foraging area).	+3: Contains trees with suitable nest hollows.	+3: Jarrah shows good recruitment.
	+2: Contains trees with potential to be used for breeding (DBH ≥ 500 mm).	+2: Contains trees with potential to be used for breeding (DBH ≥500 mm).	+2: Contains trees with potential to be used for breeding (DBH ≥500 mm).
Subtractions	None.	None.	None.
Final Score:	**10+: Very high quality**	**10+: Very high quality**	**10+: Very high quality**

3.2.3 Individuals

Two white-tailed black-cockatoos were recorded from calls at a single location within the study area; these calls were thought to be of Carnaby's Black-Cockatoo, although the similarity to calls of the Baudin's Black-Cockatoo is noted (see Figure 3.2).

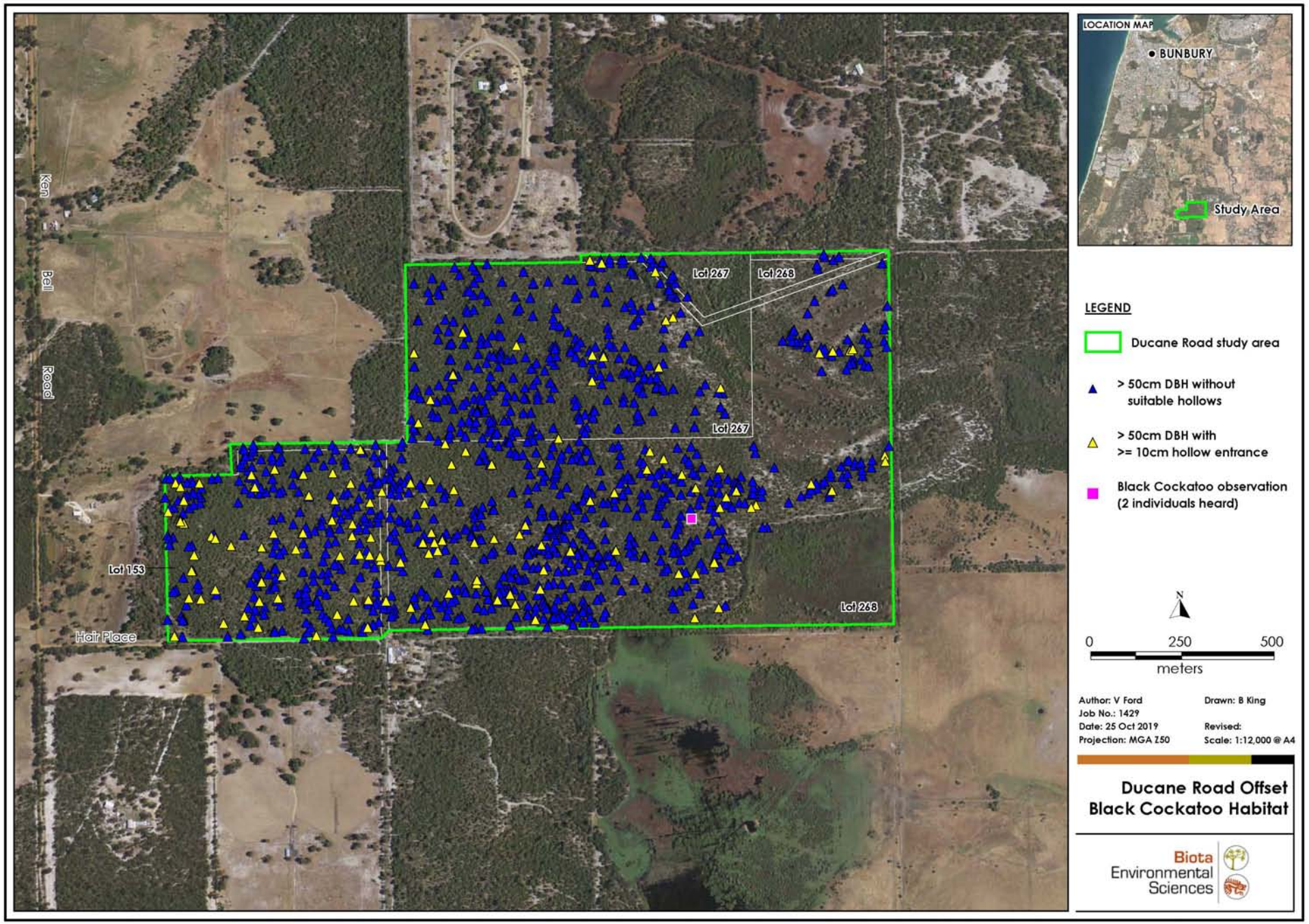

Figure 3.2: Nesting habitat trees and black-cockatoo individuals recorded within the study area.

3.3 Western Ringtail Possum

During the line-transect distance sampling exercise, 41 individual Western Ringtail Possums were recorded from 34 observations (27 single adults, four observations of mother with juvenile, and three observations of two adults). The distribution of observations over the study area is shown in Figure 3.3.

The 34 observations of Western Ringtail Possums were too few to robustly model detection probability. The data were therefore combined with the regional data set (Biota internal database) for the Swan Coastal Plain, and results were post-stratified by locality to obtain parameter estimates for the study area. Furthermore, the histogram of detection distances showed a distinct spike at around 6 m from transect, which may reflect movement of animals off the transect prior to detection. Such movement would result in an under-estimate of the true density.

Based on the combined South-west detection function, the density estimate for the study area was 0.61 ± 0.11 per hectare, yielding an abundance estimate of 99.67 ± 19.12 (95% confidence interval 76 - 148).

3.4 Other Fauna Recorded

In addition to the Western Ringtail Possum, four Common Brushtail Possum (*Trichosurus vulpecula hypoleucus*) and two Wambenger Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*; listed as Conservation Dependent under the WA *Biodiversity Conservation Act 2016*) were recorded during spotlighting.

The *wambenger* subspecies (Aplin et al. 2015) is known to occur in dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover in the South-west of Western Australia (DBCA 2012). Records are less common from wetter forests. Brush-tailed Phascogales are nocturnal arboreal carnivores that forage for food under the bark of trees (van Dyck and Strahan 2008). This feeding mode and the use of tree hollows for shelter results in a preference for large trees, particularly Jarrah and Marri with DBH over 95 cm (Rhind 1996).

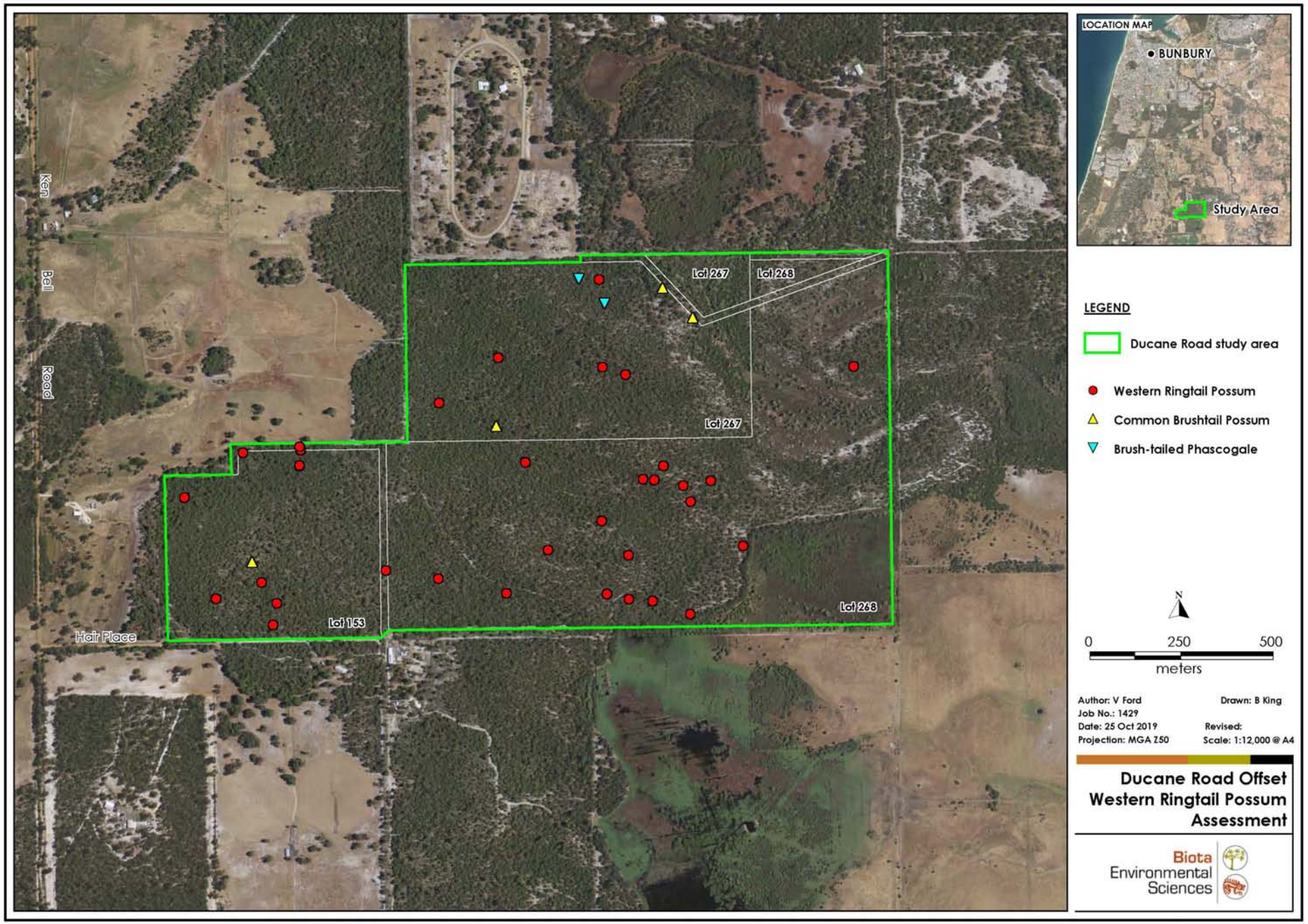

Figure 3.3: Observations of Western Ringtail Possum, Common Brushtail Possum and Brush-tailed Phascogale within the study area.

4.0 Discussion

The study area contained a diverse range of habitat types, ranging from woodland in upland areas through to dampland and deeply inundated wetland, and is expected to support a relatively high fauna biodiversity. The study area is located amongst a number of other privately owned lots, which similarly comprise largely intact vegetation; taken together, these lots are continuous in the east with the Franklandia Nature Reserve and riparian vegetation of the Preston River. As noted by Webb (2018), overgrazing by kangaroos has diminished the understorey in a significant portion of the Jarrah-*Banksia* woodland habitat (compare Plate 3.1 and Plate 3.2) and along the fringes of the wetland habitat.

The Jarrah-*Banksia* habitat of the study area represented high quality foraging habitat for all three black-cockatoo species and evidence of foraging was common. White-tailed black-cockatoos (most likely Carnaby's Black-Cockatoo) were heard during the current survey, and Webb (2018) also noted hearing calls of black-cockatoos in the study area. A total of 133 trees (mainly Jarrah, with a smaller number of Marri) appeared from the ground to support hollows. Although ground assessments typically overestimate the quality of breeding hollows (Johnstone et al. 2013), some of these trees would be expected to support quality hollows.

The Western Ringtail Possum was recorded within Jarrah-*Banksia* woodland and Peppermint fringing wetland habitat types. Density, suitable habitat area and estimated abundances are compared between the study area and three local sites that have recently been surveyed as part of a separate study (Biota in prep.); Reserve 23000 is 4.5 km west of the study area, Manea Park 4.8 km north-northwest and Lot 2 Boyanup-Picton Road is 6.6 km north (see Table 4.1). The density of possums within the Ducane Lots study area is similar to that of Reserve 23000 (Shire of Capel).

Table 4.1: Western Ringtail Possum density and abundance from recent local studies.

Study Area	Density per ha	Habitat Area (ha)	Abundance
Ducane Lots (this study)	0.61 ± 0.11	167.15	99.67 ± 19.12
Contextual Sites			
Reserve 23000 Shire of Capel			
Feb 2018	0.78 ± 0.20	146.1	114.07 ± 28.94
Aug 2018	0.56 ± 0.11	146.1	82 ± 16
Manea Park Oct 2018	1.20 ± 0.27	155.0	186 ± 41.45
Lot 2 Boyanup-Picton Road			
Feb 2018	1.50 ± 0.25	87.62	131.51 ± 21.92
Aug 2018	1.37 ± 0.19	87.62	121 ± 17

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Appendix 1

Foraging Habitat Scoring Tool (DotEE 2017)

Table 3: Foraging habitat scoring tool

Starting Score	Foraging habitat for Carnaby's Cockatoo	Foraging habitat for Baudin's Cockatoo	Foraging habitat for Forest Red-tailed Black cockatoo
10 (Very high quality)	Foraging habitat that is being managed for black cockatoos such as habitat that is the focus of successful **rehabilitation**, and/or has some level of **protection** from clearing, and/or is quality habitat described below with attributes contributing to meet a sore of ≥10.	Foraging habitat that is being managed for black cockatoos such as habitat that is the focus of, successful **rehabilitation**, and/or has some level of **protection** from clearing, and/or is quality habitat described below with attributes contributing to meet a sore of ≥10.	Foraging habitat that is being managed for black cockatoos such as habitat that is the focus of successful **rehabilitation**, and/or has some level of **protection** from clearing, and/or is quality habitat described below with attributes contributing to meet a sore of ≥10.
7 (High quality)	Native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as *Banksia* spp. (including *Dryandra* spp.), *Hakea* spp. and *Grevillea* spp., as well as native eucalypt woodland and forest that contains foraging species, including along roadsides. Does not include orchards, canola, or areas under a RFA.	Native eucalypt woodlands and forest, and proteaceous woodland and heath, particularly marri, including along roadsides. Does not include orchards or areas under a RFA.	Jarrah and marri woodlands and forest, and edges of karri forests, including wandoo and blackbutt, within the range of the subspecies, including along roadsides. Does not include areas under a RFA.
5 (Quality)	Pine plantation or introduced eucalypts.	Pine plantation or introduced eucalypts.	Introduced eucalypts as well as the introduced Cape lilac (*Melia azedarach*).
1 (Low quality)	Individual foraging plants or small stand of foraging plants.	Individual foraging plants or small stand of foraging plants.	Individual foraging plants or small stand of foraging plants.
Additions	**Context adjustor - attributes improving functionality of foraging habitat**	**Context adjustor - attributes improving functionality of foraging habitat**	**Context adjustor - attributes improving functionality of foraging habitat**
+3	Is within the Swan Coastal Plain (important foraging area).	Is within the known foraging area (see map).	Jarrah and/or marri show good recruitment (i.e. evidence of young trees).
+3	Contains trees with suitable nest hollows.	Contains trees with suitable nest hollows.	Contains trees with suitable nest hollows.
+2	Primarily comprises marri.	Primarily contains marri.	Primarily contains marri and/or jarrah.
+2	Contains trees with potential to be used for breeding (dbh ≥ 500 mm or ≥ 300 mm dbh for salmon gum and wandoo).	Contains trees with potential to be used for breeding (dbh ≥ 500 mm or ≥ 300 mm dbh for salmon gum and wandoo).	Contains trees with potential to be used for breeding (dbh ≥ 500 mm or ≥ 300 mm dbh for salmon gum and wandoo).
+1	Is known to be a roosting site.	Is known to be a roosting site.	Is known to be a roosting site.
Subtractions	**Context adjustor - attributes reducing functionality of foraging habitat**	**Context adjustor - attributes reducing functionality of foraging habitat**	**Context adjustor - attributes reducing functionality of foraging habitat quality**
-2	No clear evidence of feeding debris.	No clear evidence of feeding debris.	No clear evidence of feeding debris.
-2	No other foraging habitat within 6 km.	No other foraging habitat within 6 km.	No other foraging habitat within 6 km.
-1	Is > 12 km from a known breeding location.	Is > 12 km from a known breeding location.	Is > 12 km from a known breeding location.
-1	Is > 12 km from a known roosting site.	Is > 12 km from a known roosting site.	Is > 12 km from a known roosting site.
-1	Is > 2 km from a watering point.	Is > 2 km from a watering point.	Is > 2 km from a watering point.
-1	Disease present (e.g. *Phytophthora cinnamomi* or marri canker).	Disease present (e.g. *Phytophthora cinnamomi* or marri canker).	Disease present (e.g. *Phytophthora cinnamomi* or marri canker).