

Targeted Fauna Survey: Black Cockatoo

Vasse – Yallingup Siding Road (4.1 – 5.8 SLK)

Marybrook

OCTOBER 2024



Version control

Project number:	SW579			
Project file path:	SW579 Vasse-Yallingup Siding Road BC Survey			
Client:	Accendo Australia			

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Abbreviations and acronyms

Common terms	
DBCA	WA Department of Biodiversity, Conservation and Attractions
DCCEEW	Federal Department of Climate Change, Energy, the Environment and Water
DWER	WA Department of Water and Environmental Regulation
EN	Endangered species
FRTBC	Forest Red-tailed Black Cockatoo
Locality / Study area	A 12 km buffer around the Survey area
Project	The proposed action
Survey area	26 trees along the Vasse – Yallingup Siding Road between 4.1 – 5.8 SLK, Marybrook
Suitable DBH tree	Tree of a suitable species and size Diameter at Breast Height (DBH) to develop large hollows: ≥30 cm for most Wheatbelt species (e.g. Wandoo, Salmon Gum) ≥50 cm most trees in the Southwest (e.g. Jarrah, Marri, Tuart) ≥75 cm for fast growing species (e.g. Karri or Eastern States Eucalypts)
VU	Vulnerable species
WA	Western Australia
Legislation	
BC Act	WA <i>Biodiversity Conservation Act 2016</i>
EP Act	WA <i>Environmental Protection Act 1986</i>
EPBC Act	Federal <i>Environment Protection and Biodiversity Conservation Act 1999</i>

Measurements	
DBH	Diameter at Breast Height in centimetres
cm	Centimetre
ha	Hectare
km	Kilometre
m	Metre

Executive summary

The City of Busselton proposes to widen and seal the Vasse – Yallingup Siding Road (4.1 – 5.8 SLK), Marybrook, within the City of Busselton. SW Environmental was commissioned by Accendo Australia on behalf of City to undertake a targeted black cockatoo¹ survey of 26 trees growing close to the road shoulder. The trees may need to be cleared to allow for the widening of the new road shoulder. The black cockatoo survey results were required to inform the environmental impact assessment process.

The Survey Area falls within the modelled distribution for all three black cockatoo species, within the known breeding range of Carnaby's cockatoos, with Baudin's cockatoos and FRTBC being likely to occur. All three species have been recorded locally.

The survey included the assessment of five Peppermint trees (0.03 ha canopy), 18 Marri (0.18 ha canopy), one Jarrah (0.01 ha canopy) and one dead tree. The trees occur within the edge of the vegetated road reserve. Of 26 trees only 13 trees were over 50 cm DBH and a type that may develop large hollows.

- T6, 7, 13, 14, 17, 20, 22, 24, 25, 26 were *Trees with suitable DBH without hollows*.
- T5, (with a WRP) - *Tree with potentially suitable size hollow with no signs of use*.
- T21 contained a hollow that was too small for black cockatoo breeding, assessed as *Tree with suitable DBH with unsuitable hollow*.
- T16 was assessed as a *Tree with suitable size hollow with no signs of use* as it contained several large hollows and was being actively used by ducks and Australian ringneck.

The site contains black cockatoo foraging habitat mostly associated with the Jarrah and Marri (up to 0.19 ha of quality foraging habitat for Carnaby's cockatoo and FRTBC and slightly less (0.018 ha) for Baudin's cockatoo.

No evidence of night roosts were observed within the Survey Area during the surveys.

The following recommendations should be considered:

- Clearing should be minimised where possible.
- Suitable hollows with no evidence of use could still be used by black cockatoos in the future. T16 should be retained given the significant age of the tree, its use by multiple species for breeding and considering it has large hollow(s) that could potentially be used by black cockatoos.
- An authorised fauna spotter should be present during clearing of the five hollow bearing trees manage hollow dependant fauna (including WRP).

Final impact footprints should be checked against the significant impact criteria for black cockatoos to determine the need to refer the project to DCCEEW.

¹ Black cockatoos collectively refer to

- Forest red-tailed black cockatoo (*Calyptorhynchus banksii subsp. naso*)
- Baudin's cockatoo (*Zanda baudinii*)
- Carnaby's cockatoo (*Zanda latirostris*)

1 Introduction

1.1 Project background

The City of Busselton (the City) proposes to widen and seal the Vasse – Yallingup Siding Road (4.1 – 5.8 SLK), Marybrook, within the City of Busselton, for the purpose of road safety. Marybrook is approximately 10 kilometres (km) west of Busselton (Appendix A – Figure 1). SW Environmental was commissioned by Accendo Australia on behalf of City to undertake a targeted black cockatoo survey of 26 trees growing near the edge of the seal that may need to be cleared for the construction of the road shoulder. The location of the trees is shown in Appendix A – Figure 2. The black cockatoo survey results were required to inform the environmental impact assessment process.

1.2 Scope

SW Environmental was engaged to conduct a targeted black cockatoo survey to identify black cockatoo habitat values of the 26 trees. The survey included a desktop review and field survey in line with relevant State and Commonwealth guidelines. Black cockatoos collectively refer to

- Forest red-tailed black cockatoo (*Calyptorhynchus banksii subsp. naso*)
- Baudin's cockatoo (*Zanda baudinii*)
- Carnaby's cockatoo (*Zanda latirostris*)

1.3 Regulatory context

Fauna in WA may be afforded protection under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or Western Australia (WA) *Biodiversity Conservation Act 2016* (BC Act). At a federal level, any action likely to have a significant impact on a matter listed under the EPBC Act requires Ministerial approval. It is also an offence to 'take' or 'disturb' threatened fauna in WA without Ministerial approval.

All three black cockatoo species targeted in this survey are listed under the EPBC and BC Acts as:

- EN: Endangered species (Baudin's cockatoo and Carnaby's cockatoo)
- VU: Vulnerable species (Forest Red-tailed Black-Cockatoo (FRTBC))

Key environmental legislation relevant to the survey is outlined in Table 1-1.

Table 1-1 Environmental legislation that may be relevant to the Project

Legislation	Responsible Government Department	Aspect
Federal <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Matters of National Environmental Significance including threatened fauna and environmental offsets.
<i>Biodiversity Conservation Act 2016</i> (BC Act)	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Threatened species habitats, threatening processes, environmental pests and weeds.
<i>Environmental Protection Act 1986</i> (EP Act)	Environmental Protection Authority or Department of Water and Environmental Regulation (DWER)	Environmental impact assessment, management and offsets.

1.3.1 Guidelines

Black cockatoo habitat is typically assessed by considering breeding, roosting and foraging habitat. The survey methodologies were developed with consideration of:

- Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3, EPA (2002).
- Environmental Protection Authority (2020) Technical Guidance – Terrestrial Guidance for Fauna Surveys for Environmental Impact Assessment. Perth, Western Australia.
- Commonwealth Matters of National Environmental Significance – *Significant impact guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999*, Department of the Environment, Water, Heritage and the Arts (DEWHA)', (2009).
- Commonwealth *Referral guideline for 3 WA threatened black cockatoo species Carnaby's Cockatoo (Zanda latirostris), Baudin's Cockatoo (Zanda baudinii) and the Forest Red-tailed Black-cockatoo (Calyptorhynchus banksii naso)* Department of Agriculture, Water and the Environment (2022).
- Commonwealth *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered), Zanda latirostris, Baudin's cockatoo (vulnerable), Zanda baudinii, and Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC 2012).
- Department of Parks and Wildlife (2013). *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan*. Department of Parks and Wildlife, Perth, Western Australia.
- Department of Environment and Conservation (2008) *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan*

1.3.2 EPBC Act considerations

The Commonwealth of Australia (2022) guideline applies to the three WA black cockatoo species listed as threatened species under the EPBC Act. The guideline provides guidance on what actions are likely or unlikely to require referral to the Minister for the Environment regarding significant impact on black cockatoos (SEWPAC 2012):

- Currently, the overall population trend for all three black cockatoo species is declining and is expected to continue to decline.
- The loss of breeding habitat is likely to require a referral.
- The loss of one or more known or suitable nesting trees is likely to require a referral.
- The loss of a known night roosting site is likely to require a referral.
- The loss of equal to or greater than one hectare of high-quality foraging habitat is likely to require a referral (as determined using the foraging quality scoring tool in Appendix B).
- The loss of one or more hectares of predominantly exotic habitat (e.g. pines) known to be utilised by black cockatoos is likely to require a referral.
- The loss of under 10 ha of low-quality foraging habitat is unlikely to require a referral (as determined using the foraging quality scoring tool in Appendix B).
- Light pruning or trimming of a night roosting site is unlikely to require a referral.

Once the final impact area of the proposed action is known, the impacts should be assessed against the DAWE (2022) Appendix A: Foraging quality scoring tool (template in Appendix B of this report). The scoring tool aligns with EPBC Act Offsets Assessment Guide (SEWPAC 2012a) by considering habitat quality (site condition, site context and species stocking rate).

2 Methods

2.1 Desktop review

A desktop review on the habitat and breeding, foraging and roosting requirements for all three black cockatoo species within a 12 km radius of the survey site was completed prior to the field survey. It included a review of:

- relevant literature on black cockatoos such as recovery plans, journal articles, survey guidelines and other publications,
- general previous expert consultation (Tony Kirkby),
- spatial datasets, such as:
 - Atlas of Living Australia database (ALA, 2024),
 - BirdLife Australia's Atlas and Birddata datasets (Birdlife Australia, 2024),
 - Protected Matters Database (DCCEEW, 2024), and
 - Department of Biodiversity, Conservation and Attraction's Threatened and Priority Fauna Database and black cockatoo breeding and roosting records (DBCA, 2024).

2.2 Field survey

2.2.1 Site reconnaissance

Field surveys included diurnal surveys on the 19th and 24th of September 2024 by Shane Priddle (Principal Ecologist) and a field assistant. The field surveys were completed to validate the desktop review and ground truth black cockatoo habitat. Evidence of black cockatoos (e.g. feed residue, whitewash, breeding and roosting evidence) and sightings were also noted. The survey methodology for black cockatoos is described below.

2.2.2 Black cockatoo survey methodology

The field survey methodology was based on the Commonwealth referral guidelines for black cockatoos (DAWE 2022, SEWPaC 2012) and black cockatoo species profiles provided in the desktop review (Section 3.2). The profiles are based on literature review and previous work with Tony Kirby, a recognised black cockatoo expert. Black cockatoo habitat surveys included an assessment of suitable DBH tree and hollow surveys, foraging habitat assessment, and roosting habitat.

Twelve km is referenced as a nominal distance in the consideration of site context and local vegetation and habitat values. This distance is considered the maximum range that black cockatoos travel from their nesting site to forage (Commonwealth of Australia 2022).

Suitable DBH tree and hollow survey

Black cockatoos nest in hollows that form in large, typically native eucalypt trees, assessed as potential habitat or “Suitable DBH trees”. In the Southwest, black cockatoos normally breed in *Corymbia calophylla* (Marri) or *Eucalyptus gomphocephala* (Tuart), however sometimes *Eucalyptus marginata* (Jarrah), *Eucalyptus rudis* (Flooded gum) or other native trees are used. Suitable DBH tree refers to a suitable Diameter at Breast Height measurement. Trees with a suitable DBH include those with a measurement ≥ 50 cm for most trees in the Southwest, ≥ 30 cm DBH for most Wheatbelt species (e.g. *Eucalyptus wandoo* (Wandoo) and *Eucalyptus salmonophloia* (Salmon gum)), and ≥ 75 cm for fast growing trees, including eastern states eucalypts or Karri (*Eucalyptus diversicolor*). These are discussed in Section 3.

Mallee form or multi-stem trees typically had the largest stem measured. If they were multi-stemmed at around head height with under sized DBH on the main trunk, they were not recorded. Planted eastern states eucalypts such as blue gums (normally *Eucalyptus saligna* or *Eucalyptus globulus*) are generally unlikely to develop hollows unless they are at an advanced age (Author pers obs.). As such, they were not recorded unless they were visibly senescing or had hollows observed. Trees laying over or considered to have no potential to develop hollows (burnt and close to falling over) were not recorded.

A ground-based assessment of each tree was made using binoculars. The black cockatoo breeding suitability of a hollow was based on an assessment of attributes including, but not limited to, hollow angle, access, entry (aperture) size, chamber size, and use by other animals. Feral bees (*Apis mellifera*) may render a hollow unsuitable for the short term, so bee hives were noted. Trees were mapped by GPS (~2 m accuracy), with notes made on tree species and DBH size class. Hollows that were potentially suitable or likely to provide breeding habitat were further assessed by drone or pole camera. Results noted as *confirmed* or *not confirmed* indicate whether pole cam or drone inspection was conducted. Pole camera and/or use of drones was carried out in line with animal ethics requirements.

The number of hollows (limited to the most suitable hollows), aperture size, angle, height, breeding suitability, evidence of use was recorded. Class and descriptions are provided in Table 2-1.

Table 2-1 Suitable DBH tree and hollow classes and descriptions

Class	Description
Tree with suitable DBH without hollows	Suitable DBH tree (described above) that do not have hollows.
Tree with suitable DBH with unsuitable hollow	Suitable DBH tree with a hollow with multiple attributes that would make the hollow unlikely to be suitable for breeding such as the entry aperture, internal dimensions, height off ground or angle. Unlikely to be used by black cockatoos in the future in its current form.
Tree with potentially suitable size hollow with no signs of use	Suitable DBH tree that may have a suitable hollow but with a single attribute that might reduce the suitability of the hollow for breeding, such as the marginal entry aperture size, coned out internal cavity, low height off ground or oblique angle. The hollow has no evidence of use (chew marks, scarring, eggs, woodchips, etc). Possible but unlikely to be used by black cockatoos in the future in its current form.
Tree with suitable size hollow with no signs of use	Suitable DBH tree with a hollow with suitable attributes for breeding (suitable entry size, internal dimensions, height off ground and angle). The hollow has no evidence of use (chew marks, scarring, eggs, woodchips, etc) and whilst not currently being used could be used in future.

Class	Description
Tree with potentially suitable size hollow with signs of use	Suitable DBH tree that may have a suitable hollow but with a single attribute that might reduce the suitability of the hollow for breeding, such as the marginal entry aperture size, coned out cavity, low height off ground or oblique angle. The hollow has evidence of use (chew marks, scarring, eggs, woodchips, etc). The evidence is more likely to be caused by other species, but black cockatoo use could not be ruled out without further surveys.
Tree with suitable size hollow with signs of use	Suitable DBH tree with a hollow with suitable attributes for breeding (suitable entry size, internal dimensions, height off ground and angle). The hollow has evidence of use (chew marks, scarring, eggs, woodchips, etc) consistent with black cockatoo use (previous or current).
Known nesting tree	Suitable DBH tree with a known nesting hollow (cockatoos observed using the hollow and assumed to be breeding).

Foraging habitat assessment

The quality of potential black cockatoo foraging habitat was described based on presence or absence of key feed species. Key feed species are defined in the species' profiles in Section 3 and from the plant list classified as primary or secondary foraging plants provided in Appendix C. Foraging habitat scores should be used as a high level guide and with consideration of site context, timing and other factors. For example,

- lower quality foraging habitat may be important during breeding periods if it is located near breeding habitat (the closer the foraging resource the more important it may be),
- certain feed species may be used in some geographical regions but not in others due to a preference for other available plants – the same feed species in the Jarrah Forest may not be used as heavily on the Swan Coastal Plain,
- as primary feed plants may flower or fruit at certain times, secondary plants may become more important when they are not available.

Foraging habitat and canopy area was derived from digitising the tree canopy based on estimates. Tree canopy was mapped by drone and an orthophoto (circa 3 cm resolution) produced. Feed residue was noted if observed. Foraging categories were assigned to each tree in line with Table 2-2. The estimates are an overestimation of canopy loss at a plan view, given most of the canopy has overhanging areas that will be retained.

Table 2-2 Foraging habitat category and description

Category	Description
No foraging habitat	Dead trees, or plant species that are not known to be frequently fed on.
Low quality foraging habitat	Low quality foraging habitat includes secondary foraging species such as trees that are not frequently fed on or are not considered a sustaining resource, or known feed species that are isolated or disease affected, or vegetation in a Completely Degraded to Degraded condition. Examples include dieback (e.g. <i>Phytophthora</i> spp.) affected Jarrah or <i>Banksia</i> , severe Marri Canker (<i>Quambalaria coyrecup</i>) affected Marri or very sparse primary or secondary feed species, or vegetation communities with few if any primary feed species present.
Moderate foraging habitat quality	Moderate quality foraging habitat includes primary feed species (e.g. <i>Banksia</i> , Jarrah, Marri or pine trees) but patchy or as paddock trees, not near (within 6 km) any breeding hollows (known or likely), or native vegetation in Degraded or Good

	condition (EPA 2016) with suitable shrub or tree species e.g. <i>Callistemon</i> , <i>Hakea</i> , <i>Grevillea</i> spp., or only secondary feed species present.
High foraging habitat quality	High quality foraging habitat includes primary feed species (e.g. <i>Banksia</i> , <i>Hakea</i> Jarrah, Marri or pine trees) in patches or as healthy paddock trees near other large patches, or breeding hollows (known or likely) or native vegetation dominated by primary feed species in Good or better condition (EPA 2016).

Roosting habitat survey

The presence of tall native and non-native trees may provide potential roosting habitat. Direct and indirect evidence of black cockatoo roosting within trees on site was noted if observed. Secondary evidence was also noted, such as the presence of moulted or preened feathers or down, clipped branches and whitewash. A dusk survey was undertaken on 30th September 2024 which involved checking the trees for roosting birds.

2.2.3 Animal ethics

The survey conformed to Section 4 of the *Australian code of practice for the care and use of animals for scientific purposes* (National Health and Medical Research Council 2004). No animals were captured or collected during the survey. Surveys were also carried out under Scientific Use License *Animal Welfare Act 2002* Licence to use animals for scientific purposes: Licence No: U285/ 2022-2024 and Wildlife Animal Ethics Committee (WAEC) Permit: WAEC 22-08-88. No nesting black cockatoos were directly disturbed during this survey.

2.3 Limitations

Survey limitations are identified in Table 2-3 in accordance with *Technical Guidance* (EPA 2020).

Table 2-3 Survey limitations and constraints assessed against the EPA’s Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)

Aspect	Constraint	Comment
Competency / experience	No	Suitably qualified individuals carried out the work. Shane Priddle (Ba Science; Certified Environmental Practitioner No.310) undertook the survey and has nearly 25 years’ experience conducting black cockatoo surveys throughout NSW and WA.
Scope	No	A targeted fauna survey scope is adequate to provide information to support impact assessment and approvals of black cockatoo habitat.
Adequacy of the survey intensity and proportion of survey achieved	No	Suitable survey effort has been adopted to identify black cockatoo habitat values associated with the Survey Area. All 26 trees were assessed.
The proportion of the task achieved and further work	No	The surveys were completed adequately, to a sufficient level with respect to the scope.

Aspect	Constraint	Comment
Timing/weather/season	No	The surveys were completed in suitable weather in spring.
Disturbances	No	There were no disturbances that affected the survey.
Intensity	No	The survey effort was adequate to meet the project scope.
Completeness	No	All 26 trees were assessed (GPS track logged).
Resources	No	The surveys were completed adequately.
Access problems	No	The site was within local government road reserve and accessible.
Identification of hollows	Low	<p>Known limitations inherent in the survey of hollows include bias with surveyors, times, differing familiarity with tree types, levels of expertise, survey conditions such as weather and time of day, and survey technique (Gorrod & Keith 2008, Rayner et al. 2011).</p> <p>Ground counts of hollows are subjective. Some hollows may be missed, obscured, particularly hollows in branches and vertical hollows. As well as providing inaccurate counts of hollow abundance, ground surveys provide incomplete or inaccurate information on hollow dimensions and use of hollows by fauna (Koch 2008). Generally, ground-based surveys lead to overestimation of hollows (Rayner et al. 2011, Author pers obs.). This limitation was reduced by checking hollows with a pole camera or drone for suitability where possible.</p> <p>Hollows are dynamic and characteristics may change over time. There is a low risk that black cockatoos may be breed in a hollow where there is no obvious evidence of use or hollow characteristics are atypical. Not all cockatoo hollows show signs of heavy chewing, and active or past breeding hollows may be missed. Also, other animals such as Little corella (<i>Cacatua sanguinea</i>) or Galah (<i>Eolophus roseicapilla</i>) may use black cockatoo hollows at other times of the year or between years.</p> <p>The author has extensive experience in the identification and assessment of hollows in the Southwest of WA and is considered competent in relation to this skill. The results are provided based on experience and professional judgement.</p>

3 Desktop review

The Survey Area falls within the Region 1 Swan Coastal Plain referral guideline region (DAWE 2022), within the modelled distribution for all three black cockatoo species, within the known breeding range of Carnaby's cockatoos, with Baudin's cockatoos and FRTBC being likely to occur (DAWE 2022). There are scattered records for all three black cockatoo species locally (ALA 2024) (Birdlife Australia, 2024) (DBCA 2024). Species profiles are provided below for further context.

3.1 Black cockatoo species profiles

Baudin's cockatoo (*Zanda baudinii*)

EN (EPBC Act), EN (BC Act)

Baudin's cockatoo is a large, iconic forest cockatoo endemic to the southwest corner of WA. Depending on their region of origin, Baudin's cockatoo is a resident, a post nuptial nomad or migrant, with the bulk of the population vacating the coldest parts of their range (the Karri Forest) in the autumn and migrating northwards during the non-breeding season. Small numbers also appear resident in a few places, including Leeuwin – Naturaliste Ridge and Manjimup (Johnstone and Kirkby 2008). Flock sizes vary from small family groups to large aggregations at roosting sites.

Breeding mainly takes place in forested areas from August to November (egg laying dates) (Tony Kirkby pers comm.) (DAWE 2022). Baudin's cockatoo breeds in woodland or forest but may also breed in partially cleared woodland or forest, including isolated trees. Nest in hollows in live or dead trees (many *Eucalyptus* species may provide suitable hollows), particularly Karri, Marri, Jarrah, Wandoo, Bullich and Tuart (DAWE 2022).

In the non-breeding season, Baudin's cockatoo is mainly an inhabitant of Jarrah Marri Forest but is also frequently in farmland and orchards. Overall, its main food is Marri, from which it takes seeds, flowers, grubs, and nectar. Its long bill is adapted to removing seeds from Marri fruit capsules (DAWE 2022). It feeds on a variety of other foods, including nectar and seeds from *Hakea* and *Banksia* spp., rarely Jarrah, the pith of Kangaroo Paw (*Anigozanthos flavidus*); tips of *Pinus* spp.; *Macadamia* spp., almonds and pecans, seeds and fruit of apples and pears.

Roost sites are usually in or near riparian environments or other permanent water sources in tall trees; any tree may provide roosting habitat, but particularly Jarrah, Flooded Gum, Blackbutt, Tuart and introduced *Eucalyptus* species (Blue Gum, Lemon Scented Gum) (DAWE 2022) (Johnstone and Kirkby 2008).

Carnaby's cockatoo (*Zanda latirostris*)

EN (EPBC Act), EN (BC Act)

Carnaby's cockatoo mainly occurs in or near eucalypt woodlands, especially those dominated by Wandoo or Salmon Gum, and sometimes reported in forests of Marri, Jarrah, Karri and Tuart. The species is a postnuptial nomad, tending to move west after breeding. Nesting occurs mainly in the Wheatbelt but is increasingly occurring on the west and south coast. This species is currently expanding its breeding range westward and south into the Jarrah Marri Forests of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain. This may be due to climate change (Cale 2003, SPRAT 2019, WA Museum 2010).

Breeding occurs mainly from early July to mid-December normally in woodland or forest, but also breeds in partially cleared woodland or forest, including isolated trees. Nest in hollows in live or dead trees (many eucalypt species may provide suitable hollows), particularly Salmon Gum, Wandoo, Tuart, Jarrah, Flooded Gum, York Gum,

Powderbark, Karri and Marri (DAWE 2022). Breeding success is largely dependent on suitable feeding habitat adjacent to the nest site to provide the necessary food for the survival of the chick. For example, the presence of adjacent pine forest or remnant vegetation existing adjacent to the nest site (Johnstone and Kirkby, Undated).

The species prefers to forage in native shrubland, kwongan heathland and woodland dominated by proteaceous plant species on seeds, flowers and nectar of *Banksia* spp., *Hakea* spp. and *Grevillea* spp., as well as *Callistemon* spp. and Marri, in pine plantations, eucalypt woodland and forest that contains foraging species, individual trees and small stands of these species. It also feeds on seeds of introduced species including *Pinus* spp., *Erodium* spp., wild radish, canola, almonds, macadamia and pecan nuts; insects and insect larvae; occasionally apples and persimmons; and liquidambar (DAWE 2022).

Carnaby's cockatoos roost near riparian environments or natural and artificial permanent water sources. Any tall trees may provide roosting habitat, but particularly Flat-topped Yate, Salmon Gum, Wandoo, Marri, Karri, Blackbutt, Tuart, introduced *Eucalyptus* spp. and introduced pines (DAWE 2022).

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

VU (EPBC Act), VU (BC Act)

The FRTBC is a large, iconic forest cockatoo, endemic to the southwest corner of WA. FRTBC occurs throughout the Jarrah Marri Karri forested areas but in recent years has been foraging out on to the Swan Coastal Plain. Group sizes vary from small family groups and pairs to larger gatherings at roost sites.

FRTBC generally breed in woodland or forest but may also breed in partially cleared woodland or forest, including isolated trees. They nest in hollows in live or dead trees (many *Eucalyptus* species may provide suitable hollows), particularly Marri, Karri, Wandoo, Bullich, Blackbutt, Tuart and Jarrah (DAWE 2022) (Johnstone Kirkby and Sarti 2015). FRTBC have been recorded breeding in all months but with peaks in Spring and Autumn following Marri fruit flushes. There are also years when very little - if any - breeding takes place (Johnstone and Kirkby unpublished data).

FRTBC diet is mostly (90%) seeds of Jarrah and Marri in woodlands and forest, and in the edges of Karri forests, with the remainder made up of Blackbutt, *E. staeri* (Albany Blackbutt), Bullich, *Hakea* spp, Tuart, Western Sheoak (*Allocasuarina fraseriana*), Snottygobble (*Persoonia longifolia*) and the non-indigenous native and *Melia azederach* (Cape Lilac) (Johnstone and Kirkby, 1999). The species forage on cones, the fruits of Snottygobble and Mountain Marri. On the Swan Coastal Plain, the species often feed on introduced *E. maculata* (Spotted Gum), Cape Lilac, *Eucalyptus caesia*, *E. erythrocorys*, Lemon-scented Gum and Kaffir Plum (DAWE 2022).

FRTBC are known to roost within any tall trees that may provide roosting habitat, particularly tall Jarrah, Marri, Blackbutt, Tuart and introduced *Eucalyptus* trees or large trees on the edges of forests (DAWE 2022).

3.2 Black cockatoo breeding requirements

All three black cockatoos rely on large hollows for breeding which take many years to form. The onset of hollow formation is dependent on damage to the tree, from animals (normally termites) or snapped / dropped branches, then further rotting. Fire does not appear to be a hollow-forming process; it may reduce the quality and number of hollows over time (Author pers obs.). Young and healthy trees can quickly heal after damage - trees less than 100 years old are unlikely to contain large hollows. For nesting, black cockatoos show a preference for:

- Large senescing trees,
- Hollows not angled more than 45 degrees from vertical,

- Entrances of at least 12 cm but usually much larger (20-30 cm),
- Deep or well-sheltered hollows in main trunks, or large branches which can provide a floor space of at least 30 cm diameter or more.

All three species of black cockatoo are of similar size and utilise similar types of hollows when breeding. The actual species of tree is likely unimportant to each species. For example, Carnaby's cockatoo nest in Marri trees in the Marri Forest and Wandoo in the Wheatbelt. All three species are known to use the same individual hollows when not occupied in the breeding season by another black cockatoo species (Kirkby pers comm, 2019). Suitable hollows may be used interchangeably with other medium sized birds such as corellas, Galah, ducks and owls. Marri and Jarrah trees are considered by Commonwealth of Australia (SEWPAC 2012, DAWE 2022) to be large enough to develop hollows once they are >50 cm DBH. Wheatbelt species such as Wandoo and Salmon Gum may develop hollows at 30 cm DBH (DAWE 2022). Planted eastern states *Eucalyptus* spp. such as blue gums are generally unlikely to develop hollows unless they are at an advanced age (at least 75cm DBH but usually much larger).

Hollows suitable for use by black cockatoos are usually in trees that are at least 120 years old but usually much older. Supporting literature identifies suitable breeding hollows as occurring in

- Trees over 150 years old (Koch 2009),
- Marri trees of a mean age of ~200 years and Jarrah (~300 years), with an average tree being inhabited at ~400 years for Marri and ~500 years for Jarrah (Inions et al. 1989),
- Marri trees aged between 140 and 410 years of age (Johnstone et al 2015),
- Jarrah trees aged between 120 and 150 years (Whitford et al 2013),
- Marri trees aged at ~450 years, utilised by the medium sized Long-billed Corella (smaller than black cockatoos) (Mawson et al. 1994), and
- Jarrah trees of over 1000 years (as stags) (Wayne 2005).

While breeding, black cockatoos will generally forage within a 6–12 km radius of their nesting site. Following breeding, birds assemble into flocks and move through the landscape searching for food, usually foraging within 6 kms of a night roost (Commonwealth of Australia 2012). Black cockatoos rely on access to watering points in selecting night roost sites, with roost sites usually within 2 kms of a watering point where they often drink in the afternoon following daytime feeding (DAWE 2022).

3.3 Roosting behaviour

Roosting trees need to be a suitable height, have a leafy canopy to shield the birds and help retain body heat. Most roosts are in a large stand of tall trees, with a dense canopy and close to permanent water. Smaller roost sites up to 8 km away from the main roosts are sometimes used, when foraging distances from the main roost become too great. Most roost sites are in tall emergent eucalypts (often smooth-barked including exotic eucalypts), often near watercourses and in sheltered gullies (Johnstone et al. 2010).

Baudin's and Carnaby's cockatoos often roost as individuals (about 30 cm or more apart) in the outermost thin branches of the canopy, often among a clump of dense leaves, and generally in positions that are wind affected. FRTBC however roost side-by-side in family groups and on thick, protected perches under the canopy of tall trees (Johnstone et al. 2010).

3.4 Habitat in a local context

3.4.1 Local habitat remaining

The Survey Area is located on the Southern Swan Coastal Plain, in an area that has been historically over cleared for farming and where most of the remnant native vegetation is associated with local road reserves. Native vegetation remaining within 6 and 12 kms of the project (the extent typically travelled by breeding black cockatoos) accounts for approximately 14 % of the area within 6 km and 20 % within 12 km, with only 2 % within 6 km and 3 % of land within 12 kms reserved (refer to Appendix A, Figure 3) (Table 3-1). The total canopy area of the 26 trees is estimated at 0.23 ha which is negligible in a local context.

Table 3-1 Areas of DBCA reserves and native vegetation remaining within the foraging distances (6-12 km) from the Survey Area (SLIP 2024)

Foraging range	Total area (ha)	Reserved (DBCA) %, Area (ha)	Native vegetation (including regrowth) remaining % of total area, Area (ha)
6 km	10,615 ha	2 % (205 ha)	14 % (1,460 ha)
12 km	34,200 ha	3 % (1,040 ha)	20 % (6,945 ha)

3.4.2 Important Bird Areas

Important Bird Areas (IBAs) are defined by Birdlife International as conservation priorities. The Busselton Wetlands IBA is nearly 7 km east of the Survey Area. This IBA regularly holds large numbers of waterbirds, including more than 1% of the global populations of Banded Stilt and Red-necked Avocet, occasionally more than 1% of the global populations of Australian Shelduck and Sharp-tailed Sandpiper, and regularly more than 1% of the Australian population of Black-winged Stilt (BirdLife International 2024).

3.4.3 Existing records

The DBCA (2024) database provides the following local black cockatoo records (within 12 km):

- A total of 195 black cockatoo records (105 records of Baudin’s cockatoo between 1998-2021, 36 Carnaby’s cockatoo records between 1953-2023, and 54 FRTBC between 2009-2021),
- One 1998 breeding record of Baudin’s/Carnaby’s cockatoo (not defined) in natural hollows (no FRTBC breeding sites recorded) within 8 km west of the Survey Area, and
- Numerous (9) roosts to the west and south of the Survey Area (Table 3-2). The abbreviation WT below refers to White-tailed (either or both Baudin’s and Carnaby’s cockatoo).

Table 3-2 DBCA recorded roost sites within 12 km of the Survey Area

SITE CODE	WT total	WT Max count	FRTBC total	FRTBC max count	No. of surveys
BUSCARR001	233	121	0	0	3
BUSJINR001	40	30	0	0	3
BUSJINR002	1	1	2	2	3
BUSJINR003	0	0	0	0	1
BUSQUIR001	691	251	0	0	7
BUSQUIR002	0	0	0	0	2
BUSQUIR003	0	0	5	5	1
BUSQUIR004	0	0	9	9	1
BUSYELR001	0	0	7	7	1

4 Results and discussion

4.1 Black cockatoo observations

No black cockatoos were observed within the Survey Area during the surveys.

4.2 Habitat types



4.2.1 *Trees surveyed*



The survey included the assessment of



- Five *Agonis flexuosa* (Peppermint) (approximately 0.03 ha canopy),
- 18 Marri (approximately 0.18 ha canopy),
- one Jarrah (approximately 0.01 ha canopy)
- and one dead tree.



Photos and tree descriptions with an estimate of canopy areas are provided in Table 4-1 (Appendix A Figure 3).



Table 4-1 Trees within the Survey Area

Tree ID	Description	Representative Photos
T1	<i>Agonis flexuosa</i> tree	
T2	<i>Corymbia calophylla</i> sapling (<50 cm DBH)	

<p>T3 T4</p>	<p>Two <i>Corymbia calophylla</i> trees (<50 cm DBH)</p>	 A photograph showing two tall, slender trees with dense green foliage, identified as Corymbia calophylla. The trees are situated in a clearing with dry grass and other vegetation in the foreground.
<p>T5</p>	<p><i>Corymbia calophylla</i> tree (104 cm DBH)</p>	 A photograph of a single, large tree with a thick, dark trunk and dense green foliage, identified as Corymbia calophylla. The tree is situated in a clearing with dry grass and other vegetation in the foreground.

<p>T6</p>	<p><i>Eucalyptus marginata</i> tree (86 cm DBH)</p>	
<p>T7</p>	<p><i>Corymbia calophylla</i> tree (69 cm DBH)</p>	



<p>T8</p>	<p><i>Corymbia calophylla</i> tree (<50 cm DBH)</p>	 A photograph showing a cluster of trees with dense, dark green foliage. The ground is covered with dry, brownish leaves and twigs. The trees have thick, greyish-brown trunks and a canopy of fine, needle-like leaves.
<p>T9</p>	<p><i>Agonis flexuosa</i> tree</p>	 A photograph of a single tree with a thick, dark trunk and a spreading canopy of green, needle-like leaves. The tree is situated in a field of tall, dry, yellowish-brown grass under a clear blue sky.



<p>T10</p>	<p><i>Agonis flexuosa</i> sapling</p>	
<p>T11</p>	<p><i>Corymbia calophylla</i> tree (<50 cm DBH)</p>	



T12



Corymbia calophylla tree
(<50 cm DBH)







<p>T13</p>	<p><i>Corymbia calophylla</i> tree (53 cm DBH)</p>	
<p>T14</p>	<p><i>Corymbia calophylla</i> tree (63 cm DBH)</p>	

<p>T15</p>	<p><i>Agonis flexuosa</i> tree</p>	
<p>T16</p>	<p><i>Corymbia calophylla</i> tree (113 cm DBH)</p>	

<p>T17</p>	<p><i>Corymbia calophylla</i> tree (81 cm DBH)</p>	
<p>T18</p>	<p><i>Agonis flexuosa</i> tree</p>	

<p>T19</p>	<p><i>Corymbia calophylla</i> sapling (<50 cm DBH)</p>	
<p>T20</p>	<p><i>Corymbia calophylla</i> tree (82 cm DBH)</p>	

<p>T21</p>	<p><i>Corymbia calophylla</i> tree (104 cm DBH)</p>	
<p>T22</p>	<p><i>Corymbia calophylla</i> tree (102 cm DBH)</p>	

<p>T23</p>	<p>Dead tree (<50 cm DBH)</p>	
<p>T24 T25</p>	<p><i>Corymbia calophylla</i> trees (78 cm and 81 cm DBH)</p>	

T26

Corymbia calophylla tree
(78 cm DBH)



4.3 Habitat trees and breeding

4.3.1 Habitat trees and hollow assessment

Only the 26 trees assessed only 13 trees (12 Marri and one Jarrah) were trees that were species that were over 50 cm DBH and may develop large hollows (listed in Appendix D and mapped in Appendix A Figure 4). An assessment of the potentially suitable black cockatoo hollows is summarised in Table 4-2. Of these trees only two trees contained potentially suitable size hollows for breeding back cockatoos (T5 and T16). Tree T5, within which a Western Ringtail Possum (WRP) (*Pseudocheirus occidentalis*) was observed, is considered unlikely to be used as a black cockatoo breeding hollow, due to the small size of the tree and low height. One tree, T21, also contained a hollow that was too small for black cockatoo breeding.

Tree T16 was assessed as a *Tree with suitable size hollow with no signs of use* as it contained several large hollows and was being actively used by duck (species not confirmed), Australian ringneck (*Barnardius zonarius*) and possibly other species. One hollow entrance was considered large enough for black cockatoo entry however there was no evidence of current or recent use.

Photo 4-1 Tree T5 with WRP in a potentially large enough hollow but with no evidence of black cockatoo use.



Photo 4-2 Tree T16 Hollow 1 being used by ducks, entry probably too small for black cockatoo access



Photo 4-3 Tree T16 Hollow 2 being used by Australian Ringneck, entry too small for black cockatoo access



Photo 4-4 Tree T16 Hollow 3 entry too small for black cockatoo access



Photo 4-5 Tree T16 Top Hollow 4 suitable for black cockatoo breeding



4.3.2 Foraging habitat

Black cockatoo foraging residue was observed broadly over the site for all three species. Black cockatoo foraging habitat quality is mapped in Appendix A Figure 4 and summarised by species in Table 4-2. At best the total Survey Area is likely to contain up to 0.19 ha of quality foraging habitat (for Carnaby's cockatoo and FRTBC) and slightly less for Baudin's cockatoo.

Table 4-2 Foraging habitat quality across the Survey Area for each black cockatoo species

Cockatoo species	Foraging habitat quality and area (ha)			
	No	Low	Moderate	High
Baudin's cockatoo	Dead	Peppermint 0.03 ha	Jarrah 0.01 ha	Marri 0.18 ha
Carnaby's cockatoo	Dead	Peppermint 0.03 ha	-	Jarrah, Marri 0.19 ha
FRTBC	Dead, Peppermint 0.03 ha	-	-	Jarrah, Marri 0.19 ha

4.4 Roosts

No evidence of black cockatoo night roosts was observed within the Survey Area.

5 Conclusions and recommendations

A summary of the black cockatoo habitat values of the 26 trees assessed along Vasse – Yallingup Siding Road (4.1 – 5.8 SLK), Marybrook is provided below:

- The Survey Area falls within the modelled distribution for all three black cockatoo species, within the known breeding range of Carnaby's cockatoos, with Baudin's cockatoos and FRTBC being likely to occur. All three species have been recorded locally.
- The survey included the assessment of five Peppermint trees (0.03 ha canopy), 18 Marri (0.18 ha canopy), one Jarrah (0.01 ha canopy) and one dead tree. The trees occur within the edge of the vegetated road reserve.
- Of 26 trees only 13 trees (12 Marri and one Jarrah) were over 50 cm DBH and a type that may develop large hollows. Two trees contained potentially suitable size hollows for breeding black cockatoos (T5 and T16).
 - T6, 7, 13, 14, 17, 20, 22, 24, 25, 26 were Trees with suitable DBH without hollows
 - T5, in which a WRP was observed - Tree with potentially suitable size hollow with no signs of use.
 - T21, also contained a hollow that was too small for black cockatoo breeding, assessed as Tree with suitable DBH with unsuitable hollow.
 - T16 was assessed as a Tree with suitable size hollow with no signs of use as it contained several large hollows and was being actively used by ducks and Australian ringneck. One hollow entrance was considered large enough for black cockatoo entry however there was no evidence of current or recent use.
- The site contains black cockatoo foraging habitat mostly associated with the Jarrah and Marri (up to 0.19 ha of quality foraging habitat for Carnaby's cockatoo and FRTBC and slightly less (0.018 ha) for Baudin's cockatoo.
- No night roost evidence was observed within the Survey Area during the surveys.

The following recommendations should be considered:

- Clearing should be minimised where possible.
- Suitable hollows with no evidence of use could still be used by black cockatoos in the future. T16 should be retained given the significant age of the tree, its use by multiple species for breeding and considering it has large hollow(s) that could potentially be used by black cockatoos.
- An authorised fauna spotter should be present during clearing of the five hollow bearing trees manage hollow dependant fauna (including WRP).

Final impact footprints should be checked against the significant impact criteria for black cockatoos to determine the need to refer the project to DCCEEW.

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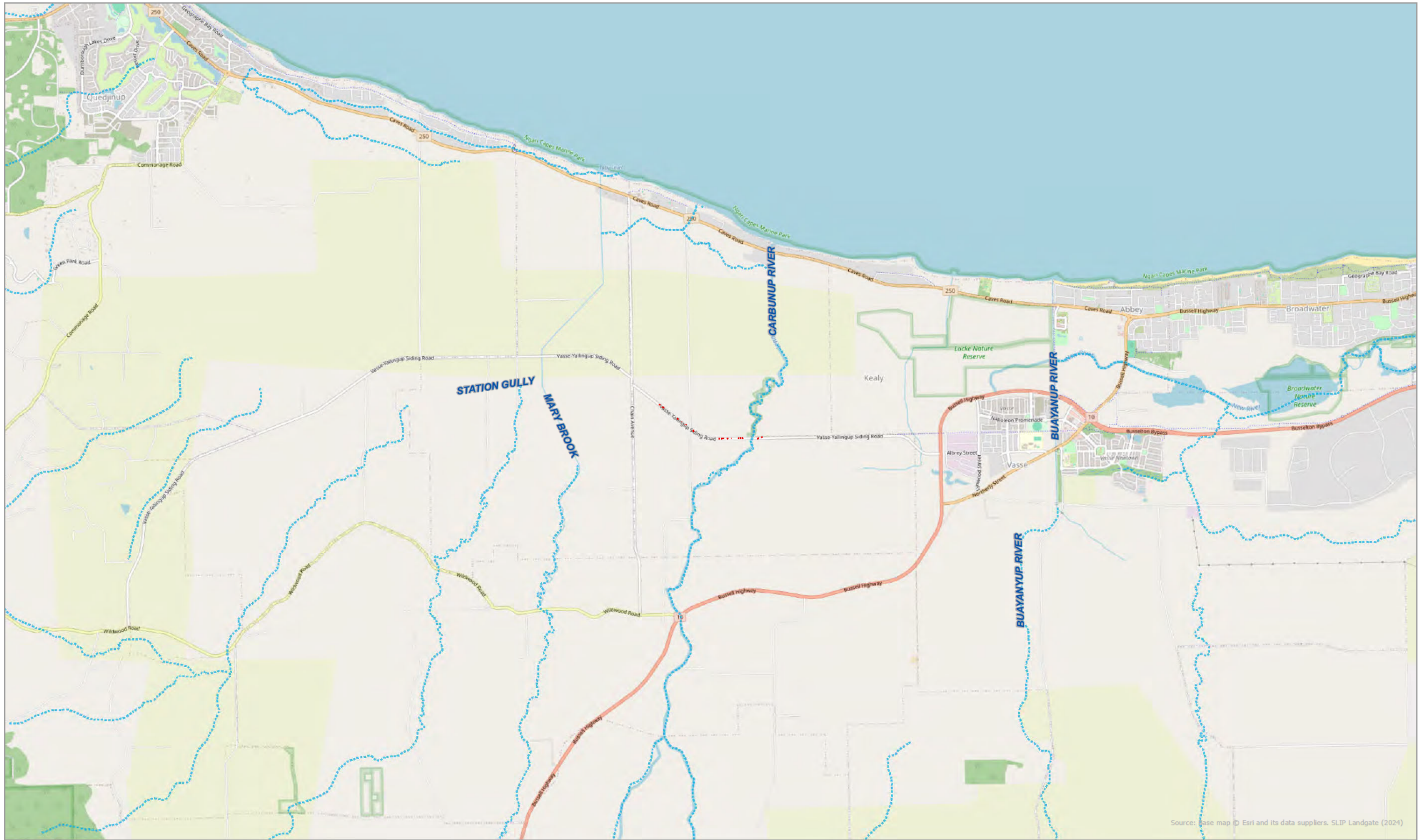
Appendix A Figures

Figure A-1 Location map

Figure A-2 Survey area

Figure A-3 Vegetation remaining within 6 and 12 km of the Survey Area

Figure A-4 Trees types and black cockatoo breeding tree suitability



Source: base map © Esri and its data suppliers, SLIP Landgate (2024)

FIGURE A-1 LOCATION MAP

- Survey Area
- - - Minor drainage line

**VASSE – YALLINGUP SIDING ROAD
(4.1 – 5.8 SLK), MARYBROOK**

Ref: SW579
Date: 26/09/2024 Author: SP



A3 @ 1:50000

0 250 500 1,000 m

GRID: GDA zone 50





FIGURE A-2 SURVEY AREA

**VASSE – YALLINGUP SIDING ROAD
(4.1 – 5.8 SLK), MARYBROOK**

Ref: SW579
Date: 26/09/2024 Author: SP

- Trees surveyed
- Survey Area
- Road
- Minor drainage line

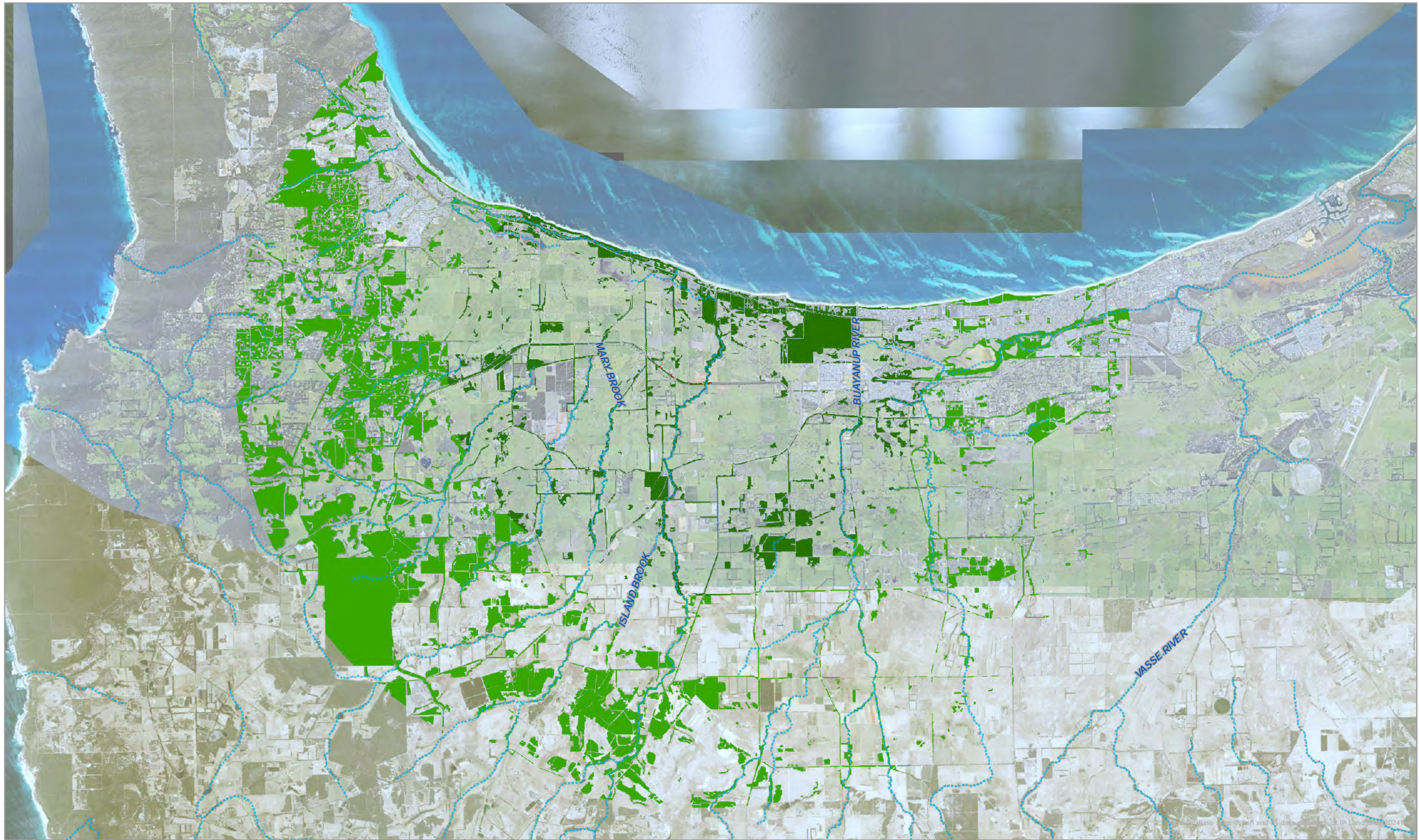


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GRID: GDA zone 50



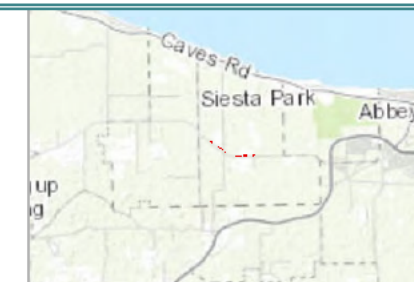


**FIGURE A-3 VEGETATION REMAINING
WITHIN 6 AND 12 KM OF THE SURVEY AREA**

**VASSE – YALLINGUP SIDING ROAD
(4.1 – 5.8 SLK), MARYBROOK**

Ref: SW579
Date: 26/09/2024 Author: SP

- Survey Area
- Minor drainage line
- Native vegetation within 6 km (SLIP 2024)
- Native vegetation within 6-12 km (SLIP 2024)



A3 @ 1:100000

0 500 1,000 2,000 m

GRID: GDA zone 50





FIGURE A-4 TREES TYPES AND BLACK COCKATOO BREEDING TREE SUITABILITY

VASSE – YALLINGUP SIDING ROAD (4.1 – 5.8 SLK), MARYBROOK

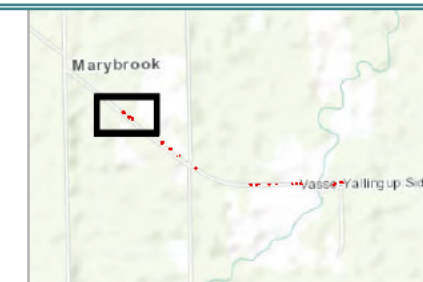
Ref: SW579
Date: 26/09/2024 Author: SP

Tree results

- Not DBH tree
- Trees with suitable DBH without hollows
- Tree with potentially suitable size hollow with no signs of use
- Tree with suitable size hollow with no signs of use
- Unsuitable hollow

Tree type

- Dead
- Jarrah (*Eucalyptus marginata*)
- Marri (*Corymbia calophylla*)
- Peppermint (*Agonis flexuosa*)
- Road



A3 @ 1:1000

0 5 10 20 m

GRID: GDA zone 50





FIGURE A-4 TREES TYPES AND BLACK COCKATOO BREEDING TREE SUITABILITY

VASSE – YALLINGUP SIDING ROAD (4.1 – 5.8 SLK), MARYBROOK

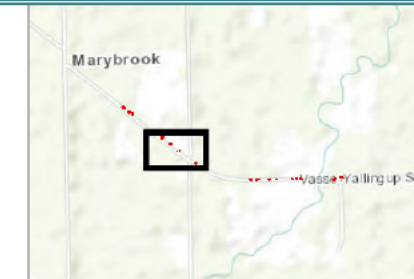
Ref: SW579
Date: 26/09/2024 Author: SP

Tree results

- Not DBH tree
- Trees with suitable DBH without hollows
- Tree with potentially suitable size hollow with no signs of use
- Tree with suitable size hollow with no signs of use
- Unsuitable hollow

Tree type

- Dead
- Jarrah (*Eucalyptus marginata*)
- Marri (*Corymbia calophylla*)
- Peppermint (*Agonis flexuosa*)
- Road



A3 @ 1:1000

0 5 10 20 m

GRID: GDA zone 50





FIGURE A-4 TREES TYPES AND BLACK COCKATOO BREEDING TREE SUITABILITY

VASSE – YALLINGUP SIDING ROAD (4.1 – 5.8 SLK), MARYBROOK

Ref: SW579
Date: 26/09/2024 Author: SP

Tree results

- Not DBH tree
- Trees with suitable DBH without hollows
- Tree with potentially suitable size hollow with no signs of use
- Tree with suitable size hollow with no signs of use
- Unsuitable hollow

Tree type

- Dead
- Jarrah (*Eucalyptus marginata*)
- Marri (*Corymbia calophylla*)
- Peppermint (*Agonis flexuosa*)
- Road



A3 @ 1:1000

0 5 10 20 m

GRID: GDA zone 50





FIGURE A-4 TREES TYPES AND BLACK COCKATOO BREEDING TREE SUITABILITY

VASSE – YALLINGUP SIDING ROAD (4.1 – 5.8 SLK), MARYBROOK

Ref: SW579
Date: 26/09/2024 Author: SP

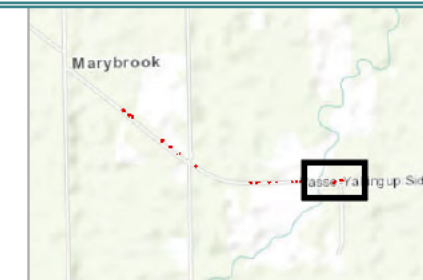
Tree results

- Not DBH tree
- Trees with suitable DBH without hollows
- Tree with potentially suitable size hollow with no signs of use
- Tree with suitable size hollow with no signs of use
- Unsuitable hollow

Tree type

- Dead
- Jarrah (*Eucalyptus marginata*)
- Marri (*Corymbia calophylla*)
- Peppermint (*Agonis flexuosa*)
- Road

— Minor drainage line



A3 @ 1:1000



GRID: GDA zone 50



Appendix B Commonwealth black cockatoo foraging quality scoring tool template (SEWPAC 2012)

Table A1 Foraging quality scoring tool template

Starting score	Baudin's Cockatoo	Carnaby's Cockatoo	Forest Red-tailed Black-Cockatoo	
10	Start at a score of 10 if your site is native eucalypt woodlands and forest, and proteaceous woodland and heath, particularly Marri, within the range of the species, including along roadsides and parkland cleared areas. Can include planted vegetation. This tool only applies to sites equal to or larger than 1 hectare in size.	Start at a score of 10 if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as <i>Banksia</i> spp. (including <i>Dryandra</i> spp.), <i>Hakea</i> spp. and <i>Grevillea</i> spp., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. This tool only applies to sites equal to or larger than 1 hectare in size.	Start at a score of 10 if your site is Jarrah or Marri woodland and/or forest, or if it is on the edge of Karri forest, or if Wandoo and Blackbutt occur on the site, within the range of the subspecies, including along roadsides and parkland cleared areas. This tool only applies to sites equal to or larger than 1 hectare in size.	
Attribute	Sub-tractions	Context adjustor (attributes reducing functionality of foraging habitat)		
Foraging potential	-2	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Subtract 2 from your score if there is no evidence of feeding debris on your site.
Connectivity	-2	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.

Proximity to breeding	-2	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.
Proximity to roosting	-1	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.
Impact from significant plant disease	-1	Subtract 1 if your site has disease present (e.g. <i>Phytophthora</i> spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	Subtract 1 if your site has disease present (e.g. <i>Phytophthora</i> spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	Subtract 1 if your site has disease present (e.g. <i>Phytophthora</i> spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.
Total score		8	10	10
Appraisal	To support your habitat score, you should provide an overall appraisal of the habitat on the impact site and within 20km of the impact area to clearly explain and justify the score. It should include discussion on the foraging habitat's proximity to other resources (e.g. exact distance to proximate resources), frequency of use of proximate sites, the degree of evidence and description of vegetation type and condition.			

Appendix C Black cockatoo foraging plants

Species	Common name	Habit	Baudin's cockatoo	Carnaby's cockatoo	FRTBC	Reference
<i>Agonis flexuosa</i>	Peppermint tree	Tree	Secondary	Secondary	Not used	Groom 2011; Valentine and Stock 2008
<i>Corymbia calophylla</i>	Marri	Tree	Primary	Primary	Primary	DoEE 2017; DSEWPac 2012; Johnstone et al. 2010; Johnstone et al. 2017; Johnstone & Kirkby 1999; Johnstone & Kirkby 2008; Johnstone & Storr 1998; Saunders 1979; Valentine and Stock 2008
<i>Eucalyptus marginata</i>	Jarrah	Tree	Secondary	Primary	Primary	Birds Australia (undated); DSEWPac 2012; DoEE 2017; Groom 2011; Johnstone et al. 2010; Johnstone et al. 2017; Johnstone & Kirkby 1999; Johnstone & Storr 1998; Saunders 1980; Valentine and Stock 2008

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Appendix D Tree survey

Tree	Species	DBH	Comments	Hollows	H1 size	H1 type	H1 height	H1 Note	Longitude	Latitude
T5	Marri	59	Potential size no signs	1	10 to 15cm	Vertical	to 10m	No evidence of use. WRP	115.2023	-33.6759
T6	Jarrah	86	Suitable DBH no hollows						115.2021	-33.676
T7	Marri	69	Suitable DBH no hollows						115.1998	-33.6759
T13	Marri	53	Suitable DBH no hollows						115.1968	-33.6759
T14	Marri	63	Suitable DBH no hollows						115.1966	-33.6759
T16	Marri	113	Potential size no evidence	3	10 to 15cm	Fissure	15m plus	No evidence of use. Ringneck and duck	115.1973	-33.6759
T17	Marri	81	Suitable DBH no hollows						115.1924	-33.6749
T20	Marri	82	Suitable DBH no hollows						115.1904	-33.6736
T21	Marri	104	Unsuitable hollow	1	to 10cm	Knot angle suitable	to 10m	Too small	115.1898	-33.6733
T22	Marri	102	Suitable DBH no hollows						115.1878	-33.6718
T24	Marri	78	Suitable DBH no hollows						115.1873	-33.6715
T25	Marri	81	Suitable DBH no hollows						115.1873	-33.6715
T26	Marri	78	Suitable DBH no hollows						115.1873	-33.6715