EPBC 2023/09639 & CPS 10418/1
Offset Management Strategy – Waddi Wind Farm

Source: Bamford Consulting Ecologists, 2025

Prepared for:

Waddi Wind Farm Pty Ltd

as Trustee of the Waddi Wind Farm Project Trust

Prepared by:

Surefire Environmental Pty Ltd

[redacted]

Surefire Environmental Pty Ltd

Offset Management Strategy

[redacted]

Distribution List:

Company	Contact name	Date
Waddi Wind Farm Pty Ltd	Peta Brunel	26 May 2025

Version

Version		Prepared and Authorised By	Date
0	Draft for Client Review	Sue Brand	19 May 2025
1	Final for submission	Sue Brand	26 May 2025

Disclaimer

Table of Contents

Tables

Figures

1. Background

1.1 Project Overview

Waddi Wind Farm Pty Ltd (as trustee of the Waddi Wind Farm Project Trust) (the Proponent) seeks to construct and operate the Waddi Wind Farm. The Waddi Wind Farm is a proposed renewable energy development comprising up to 18 wind turbines and associated infrastructure, including an overhead 132 kilovolt (kV) transmission line from an on-site substation into Western Power's existing transmission network. The proposed Waddi Wind Farm is located approximately 12 kilometres (km) north-west of Dandaragan in Cooljarloo, Western Australia (Figure 1).

The Waddi Wind Farm project includes the following components:

- Wind farm:
  - Up to 18 wind turbines, with a maximum turbine blade tip height of 220 m. The wind turbines will have a total installed indicative capacity of up to 108 megawatts (MW).
  - Up to two permanent meteorological monitoring masts for wind speed verification, weather and general monitoring purposes.
  - Internal access tracks, hardstand areas and other associated on-site infrastructure.
  - Underground electrical cabling linking the wind turbines to each other and the on-site substation.
  - An on-site substation.
  - Temporary construction facilities, including a concrete batching plant, construction compound, laydown areas and gravel borrow pits.
  - Minor upgrades to local roads, as required for the delivery, installation and maintenance of wind turbines and the related facilities.
  - An operations and maintenance facility incorporating a control room and equipment storage facilities.
- Transmission line infrastructure:
  - Up to approximately 8 km of overhead double circuit 132 kV transmission line from the on-site substation into Western Power's existing South West Interconnected System (SWIS) transmission network, west of the Brand Highway and north of the Cataby substation (Figure 1).
  - Cut-in/cut-out connection arrangements to the Pinjar – Eneabba/Emu Downs Transmission Line (PJR-ENB/EMD 81) at the point of connection to the SWIS.
  - Underground fibre optic cabling of up to approximately 1.5 km in length from the point of connection at the SWIS to the existing Western Power-operated Cataby Substation.

The Waddi Wind Farm and transmission line infrastructure will be located within the Indicative Works Area, shown in Figure 1. The precise location of these components will be confirmed as part of detailed design. Western Power will be responsible for the ongoing operation and maintenance of the transmission line infrastructure.

1.2 Offset Requirement

While the Waddi Wind Farm is primarily located on pastureland, some patches of remnant bushland present within the Project Area will be impacted by the proposal. An assessment carried out by RPS (2025) indicated that the proposal will result in the following residual impacts once all avoidance and mitigation measures are implemented:

- Threatened flora:
  - Permanent loss of up to 1.21ha of proteaceous heath vegetation which is potential habitat for the star sun-orchid and the Lesueur hakea.
  - Permanent loss of up to 3.88 ha of the banksia low open woodland vegetation, which is potential habitat for the dwarf green kangaroo paw.
- Banksia woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC):
  - Permanent loss of up to 0.3 ha of Banksia woodlands of the Swan Coastal Plain TEC in Excellent condition.
- Carnaby's Cockatoo (*Zanda latirostris*):
  - Permanent loss of up to 5.33 ha of native vegetation identified as high-quality Carnaby's cockatoo foraging habitat.
  - Permanent loss of up to 21 pine trees identified as high-quality Carnaby's cockatoo foraging and potential roosting habitat.
  - Permanent loss of up to 3 marri trees identified as potential Carnaby's cockatoo breeding, high-quality foraging and potential roosting habitat. None of the three marri trees have Carnaby's cockatoo nesting hollows.
  - Permanent loss of up to 11 planted trees (non-native eucalypts) identified as low-quality Carnaby's cockatoo foraging and potential roosting habitat.
  - Low risk of collision with turbines and transmission lines.
- Migratory birds:
  - Low risk of collision with turbines and transmission lines.

Informed by the significance of impacts assessment undertaken in RPS (2025), the permanent loss of Carnaby's cockatoo foraging, potential breeding and potential roosting habitat is likely to be a **significant impact**, thus, an offset is required to compensate for that loss.
The **remaining impacts** to threatened flora, TEC, Carnaby's cockatoo and migratory birds are **not expected to be of significance**.

1.3 Proposed Offset Overview

The proposed offset will involve restoration of 20 ha of primarily cleared pastureland on [redacted] Cooljarloo, within the Shire of Dandaragan) (Figure 2) to a self-sustaining vegetation community that will provide good or better quality foraging habitat, together with potential roosting and potential breeding habitat for Carnaby's Cockatoo.

A conservation covenant under either the *Biodiversity Conservation Act 2016* (WA) or *Soil and Land Conservation Act 1945* (WA) will be placed over the offset location to ensure it is retained in perpetuity for conservation purposes.

355,000 360,000 365,000

6,620,000

6,615,000

6,610,000

N

Legend

- WDWF_Site_Boundary_20230803
- WDWF_Native_Vegetation_Clearing_Area_20250313
- WDWF_Indicative Disturbance Area_20250226
- WDWF_Indicative Works Area_20250307
- Hydrography_Linear_Hierarchy_DWER_031

355,000 360,000 365,000

Scale: 1: 52,000
Original Size: A3
Aerial Imagery: Google Satelite
Grid: GDA2020 / MGA zone 50 (EPSG:7850)

0 0.5 1 km

Offset Proposal
EPBC 2023/09639
Waddi Wind Farm Pty Ltd

Figure 1

Proposed Project Layout
Waddi Wind Farm

C:\Users\Sue. B\Documents\My Documents\Surefire Environmental\Client Folders\Tilt Renewables\GIS\Waddi WF Offset.qgz 02/05/2025 Project Layout

2. Regulatory Framework

2.1 Overview

The Waddi Wind Farm requires assessment and approval under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Western Australian *Environmental Protection Act 1986* (EP Act).

The Commonwealth EPBC Act establishes a regulatory framework to oversee proposed activities that could impact Matters of National Environmental Significance (MNES), encompassing critical flora, fauna, ecological systems, and heritage sites of both national and international importance. The Waddi Wind Farm was determined by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) to be a Controlled Action requiring assessment under the EPBC Act by way of Preliminary Documentation on 13 November 2023.

The Western Australian EP Act seeks to provide for the prevention, control and abatement of pollution and environmental harm and for the conservation, preservation, protection, enhancement and management of the environment. Part V of the EP Act sets out the regulatory framework for the removal of native vegetation. An application for clearance of native vegetation associated with the Waddi Wind Farm was lodged with the Department of Water and Environmental Regulation (DWER) on 17 November 2023.

Both the EPBC Act and EP Act provide for the use of environmental offsets in circumstances where significant impacts of a proposed development cannot otherwise be adequately avoided, remedied or mitigated. As outlined in RPS (2025), development of the Waddi Wind Farm has been informed at all stages by the implementation of a mitigation hierarchy which has sought to prioritise actions to avoid environmental harm before sequentially considering opportunities to minimise, restore/mitigate, then offset residual impacts. The development, use and assessment of environmental offsets is informed by relevant Commonwealth and State policy guidance which is summarised below.

2.2 Commonwealth Framework

2.2.1 EPBC Act Environmental Offsets Policy

The *EPBC Act Environmental Offsets Policy* (DSEWPaC, 2012a) outlines the Australian Government's approach to the use of environmental offsets under the EPBC Act. The policy outlines ten overarching principles to be applied in determining the suitability of an offset proposal. These are summarised in Table 1, together with Surefire Environmental's comments on how the proposed Waddi Wind Farm offset proposal meets each of the principles.

Table 1: Offset Principles and Surefire Environmental's Comments

No.	Principle	Surefire Environmental Comment
Suitable offsets must:		
1	Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action.	▪ Based on the findings of the Offset Assessment Guide (Section 4.2) and the scoring of black cockatoo habitat values based on the methodology developed by Bamford Consulting Ecologists (BCE) (2025) (Appendix 1), the proposed restoration of the offset site is expected to restore the land from a 2/10 to a minimum of 4/10, thus increasing the area of Carnaby's Cockatoo and maintaining the viability of Carnaby's Cockatoo populations within the region. ▪ The Site will be managed by the Proponent for the operational life of the proposed development (30 years). ▪ A conservation covenant will be placed over the offset area to ensure its ongoing protection for conservation purposes in perpetuity.
2	Be built around direct offsets but may include other compensatory measures.	▪ The proposed offset is a direct offset, with the Offset Assessment Guide indicating that the proposed site will offset more than 100% of the impact and thus will meet the > 90% direct offset requirement.
3	Be in proportion to the level of statutory protection that applies to the protected matter.	▪ The outcome will result in the restoration of 20 ha of Carnaby's Cockatoo foraging habitat in the short term, with the restoration process including the planting of additional trees that will provide additional potential roosting and nesting habitat in the longer term. ▪ The installation of 7 – 10 artificial nesting boxes will occur to provide a shorter-term option until planted trees reach a suitable diameter and height to produce hollows of a size and orientation preferred by Carnaby's Cockatoos for nesting. ▪ The restoration of the offset site will also provide habitat and protection for flora and fauna species in addition to the Carnaby's Cockatoo. The restored area will have a conservation covenant placed over the site to ensure its ongoing protection for conservation purposes in perpetuity.
4	Be of a size and scale proportionate to the residual impacts on the protected matter.	▪ The Offset Assessment Guide (Section 4.2), along with reviews of various desktop resources carried out by RPS (2025) and a survey of proposed offset site by BCE (2025) (Appendix 1) were used to ensure that the proposed offset site is of a size

No.	Principle	Surefire Environmental Comment
		and scale proportionate to the residual impacts associated with the loss of Carnaby's Cockatoo foraging, potential breeding and potential roosting habitat.
5	Effectively account for and manage the risks of the offset not succeeding.	▪ The proposed offset will include a management component for a time required by DCCEEW and DWER to mitigate risks of the offset failing. ▪ The management proposal will include a range of completion criteria that will need to be met before the offset is considered 'acceptable', as well as a range of strategies to be adopted if there are aspects of the offset that need to be enhanced, such as the need for additional infill planting or weed control.
6	Be additional to what is already required, determined by law, or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action).	▪ Given that State approvals through DWER are also being progressed for the same proposed action and the same matter, the proposed offset has been designed to satisfy Waddi Wind Farm's obligations under both the EPBC Act (Cwlth) and the EP Act (WA). ▪ The proposed offset is expected to be 20 ha and is additional to what is already required or determined by law.
7	Be efficient, effective, timely, transparent, scientifically robust, and reasonable.	▪ Identification of the proposed offset site and development of the offset proposal have been underpinned by expert technical analysis to inform a scientifically robust approach, as outlined in Section 3. ▪ The identification and assessment of the site within has been carried out in association with a range of consultants, including RPS Group (environmental consultants) and Bamford Consulting Ecologists (Carnaby's Cockatoo specialists). ▪ An Offset Management Plan is being prepared that will outline the various management actions that will form the basis of the restoration of the site, with the aim being to improve the condition of the offset from a 2/10 to a 4/10 based on the habitat assessment carried by BCE (2025).
8	Have transparent governance arrangements including being able to be readily measured, monitored, audited, and enforced.	▪ Tenure of the offset site will be secured by the Proponent through a long-term lease arrangement to enable the implementation of the restoration program and for the life of the wind farm (30 years). ▪ A conservation covenant will be placed on the title of the lot to indicate that the area has been set aside for conservation purposes in perpetuity.

No.	Principle	Surefire Environmental Comment
		▪ The Proponent has reviewed all available conservation covenanting mechanisms in the Western Australian jurisdiction and undertaken preliminary engagement relevant agencies, identifying that a conservation covenant under either the *Biodiversity Conservation Act 2016 (WA)* or *Soil and Land Conservation Act 1945 (WA)* would provide an appropriate security mechanism for the offset.' ▪ State and Commonwealth approval conditions are expected to include a monitoring and annual reporting component indicating progress in terms of improved condition, such as a reduction in the weed presence and success of infill planting. ▪ An Offset Management Plan (OMP) is being prepared for the site that will outline ongoing management, monitoring and reporting obligations to ensure the success of management and habitat enhancement activities.
Government Decision Making Relating to Offset Suitability will be:		
9	Informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty.	▪ The Preliminary Documentation prepared by RPS (2025) documents the outcomes of a range of ecological studies undertaken within the project area between 2008 and 2025, thus there is strong body of scientific information to support the decision-making process. ▪ As the proposed offset site is within 1 – 2 km of the Waddi Wind Farm, outcomes of the various assessments can be used to infer projected management and restoration outcomes of the offset site, including the development of restoration species lists and management strategies that will be utilised to improve the offset site from the 2/10 rating determined by BCE (2025, Appendix 1), to a minimum 4/10. ▪ Relevant information is provided in this document to enable DCCEEW and DWER to review and assess the adequacy of this offset proposal. ▪ The information provided in this document should be read in conjunction with the information relating to the broader site characteristics documented in the Preliminary Documentation prepared by RPS (2025).
10	Conducted in a consistent and transparent manner.	

2.2.2 Offsets Assessment Guide

DSEWPaC (2012a) is supplemented by the Offset Assessment Guide (2012c), a calculation tool developed to assist DCCEEW in the assessment of the suitability of offset proposals and to assist proponents with planning and estimating future offset requirements. This tool was used by Waddi Wind Farm to assist with identifying the proposed Offset site, as well as the restoration program that will be implemented when the Site is secured by the proponent to provide additional Carnaby's Cockatoo foraging and potential nesting and roosting habitat to counteract the loss of significant habitat during the wind farm construction process.

2.3 Western Australia

2.3.1 Environmental Offsets Policy

The Western Australian Government's Environmental Offsets Policy (GoWA, 2011) seeks to conserve environmental and biodiversity values, fostering long-term environmental sustainability alongside economic and social progress. The policy sets out six principles which underpin the Western Australian Government's assessment and decision-making processes in relation to the use of environmental offsets. These principles are summarised in Table 2, together with Surefire Environmental's comments on how the proposed Waddi Wind Farm offset meets the requirements.

Table 2: WA Offset Principles and Surefire Environmental's Comments

No.	Principle	Surefire Environmental Comment
1	Environmental offsets will only be considered after avoidance and mitigation options have been pursued.	According to RPS (2025), ▪ The Waddi Wind Farm Project Area will occupy 10 491 ha and will involve the construction and operation of up to 18 wind turbines, primarily in cleared farmland/pastureland. ▪ Within the overall Project Area, 5.5 ha, or 0.05% of the Project Area, comprises Carnaby's Cockatoo habitat that cannot be avoided during construction and will be permanently lost. ▪ The habitat that cannot be avoided is primarily foraging habitat in varying condition range from completely degraded to excellent using the vegetation condition rating scale adapted from Keighery (1994) and Trudgen (1988) in Table 2 of the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (Environmental Protection Authority, 2016) ▪ The loss of some 35 trees, including 21 Pine (*Pinus pinaster*), 3 Marri (*Corymbia calophylla*), and 11 planted non-native Eucalypts mean that some potential roosting and nesting habitat will also be lost. ▪ Note that the development of the Waddi Wind Farm has been informed at all stages by the application of a mitigation hierarchy by prioritising actions to avoid environmental harm before sequentially considering opportunities to

No.	Principle	Surefire Environmental Comment
		minimise, restore, mitigate, and then offset residual impacts (RPS, 2025).
2	Environmental offsets are not appropriate for all projects.	▪ It is recognised that environmental offsets may be appropriate for compensating significant residual environmental impacts and will be considered on a case-by-case basis. ▪ The Waddi Wind Farm project means that the impacts associated with the permanent loss of 5.5 ha of Carnaby's Cockatoo foraging and potential roosting and nesting habitat represents a significant impact to the species. ▪ The proposed offset that will result in the restoration of 20 ha of pastureland in [redacted] less than 2 km from the [redacted] of the Project Area represents a suitable outcome that will enhance the viability of local Carnaby's Cockatoo populations within the immediate vicinity of the and the region, as well being realistic and achievable by the proponent. ▪ Accordingly, the application of an offset requirement is appropriate in this case.
3	Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted.	▪ The cost of the offset will involve the lease of the land on which the offset will located, along the cost of restoring 20 ha of pastureland. ▪ The expected requirement of 20 ha to offset the permanent loss of 5.5 ha of Carnaby's Cockatoo foraging, and potential roosting and nesting habitat is relevant and proportionate to the significance of the environmental value being impacted and has been informed by the application of the WA Offset Assessment Guide calculator.
4	Environmental offsets will be based on sound environmental information and knowledge.	▪ Identification of the proposed offset site and development of the offset proposal have been underpinned by expert technical analysis to inform a scientifically robust approach, as outlined in Section 3. ▪ The identification and assessment of the site within has been carried out in association with a range of consultants, including RPS Group (environmental consultants) and Bamford Consulting Ecologists (Carnaby's Cockatoo specialists). ▪ An Offset Management Plan is being prepared that will outline the various management actions that will form the basis of the restoration of the site, with the aim being to improve the condition

No.	Principle	Surefire Environmental Comment
		of the offset location from completely degraded to a good or better condition.
5	Environmental offsets will be applied within a framework of adaptive management.	▪ An Offset Management Plan is being prepared that will outline the various management actions that will form the basis of the restoration of the site, with the aim being to improve the condition of the offset from a 2/10 to a 4/10 based on the habitat assessment carried by BCE (2025). ▪ The management plan will include a range of completion criteria that will need to be met before the offset is considered 'acceptable', as well as a range of strategies to be adopted if there are aspects of the offset that need to be enhanced, such as the need for additional infill planting or weed control.
6	Environmental offsets will be focussed on longer term strategic outcomes.	▪ The Proponent has commitment to the ongoing management of the offset for the duration of the project, which is expected to be 30 years. ▪ A conservation covenant will be placed over the offset site that will ensure its protection for conservation purposes in perpetuity.

2.3.2 Western Australia Offset Guidelines and Calculator

The Western Australian Environmental Offsets Guidelines (GoWA, 2014) serves as a complement to the Western Australian Environmental Offsets Policy (GoWA, 2011), aiming to provide clarity and consistency in determining and applying environmental offsets within the state. The guidelines are designed to ensure that decisions regarding environmental offsets align with the objectives of the EP Act and are transparent and accountable to stakeholders.

The guidelines provide transparency in regard to the concept of environmental offsets, distinguishing them from on-site mitigation actions and emphasising their role in counterbalancing significant residual environmental impacts or risks of a project. The Western Australian Environmental Offsets Calculator (DWER, 2021a) and accompanying Environmental Offsets Metric Guideline (DWER, 2021b) form a supplement to GOWA (2014) and an assessment tool to help decision-makers, government officers, industry and the community quantify environmental offsets.

Project information was input into the WA Offsets Calculator, with the rationale applied to the environmental values to be offset, considering the conservation significance, the significance of the impact, any rehabilitation credit that could be applied, along with the rationale associated with the proposed offset.

3. Offset Proposal

3.1 Significant Residual Impacts

As outlined in Section 1.2 and informed by the significance of impacts assessment undertaken in RPS (2025), the permanent loss of Carnaby's cockatoo foraging, potential breeding and potential roosting habitat associated with the Waddi Wind Farm is expected to be a significant impact requiring environmental offsets. Residual impacts to Carnaby's cockatoo habitat values are summarised in Table 3.

Table 3: Impacts to Carnaby's Cockatoo Habitat Values

Value	Quantified Impact
Total native vegetation clearing[1]	5.50 ha
Native vegetation clearing comprising Carnaby's Cockatoo (*Zanda latirostris*) high-quality foraging habitat	3.88 ha
Carnaby's Cockatoo high quality foraging habitat and potential roosting habitat	21 pine trees
Carnaby's Cockatoo high quality foraging habitat, potential roosting habitat, potential breeding habitat (no nesting hollows present)	3 Marri trees
Carnaby's Cockatoo low quality foraging habitat and potential roosting habitat	11 planted non-native Eucalypts

3.2 Offset Site Identification

A detailed offset site identification process has been adopted by the Proponent to develop a suitable offset proposal, having regard to the regulatory framework outlined in Section 2.

3.2.1 Background

A draft offset proposal for the Waddi Wind Farm was submitted to DWER and DCCEEW in early 2024. The draft offset proposal proposed ongoing legal protection and maintenance of an area of approximately 29 ha of existing heathland vegetation within [redacted] to protect at-risk high-value foraging habitat for Carnaby's Cockatoo in perpetuity.

In June 2024 DWER requested further information regarding offsets proposed for the Waddi Wind Farm. Amongst other matters, the request sought further consideration of the availability and feasibility of alternative revegetation and/or rehabilitation offset opportunities, either within the Department of Biodiversity, Conservation and Attractions (DBCA) estate, local government authority reserves or private freehold land. As a result of this Proponent commenced a more detailed offset site selection analysis, focusing on sites with revegetation and/or rehabilitation offset potential.

[1] As outlined in RPS (2025) this vegetation is comprised of 0.22ha of *Corymbia calophylla* Woodland, 0.02ha of *Eucalyptus todtiana* Woodland, 0.09 ha of Melaleuca Low Open Woodland, 1.21 ha of Proteaceous Heath and 0.09 ha of native species identified under planted trees' canopy.

3.2.2 Site Identification

3.2.2.1 DBCA Estate and/or local government reserves

Opportunities for revegetation and/or rehabilitation offset opportunities in the local DBCA estate and local government reserves are limited.

In October 2024, following engagement between the Proponent and DBCA, DBCA advised that offsets proposing rehabilitation and revegetation of degraded areas within DBCA managed land is a developing area, with work ongoing to develop and formalise guidance. However, given current limited capacity and resources within DBCA, offsets within DBCA managed reserves in the Turquoise Coast District are unable to be accommodated at this time.

One potential offset site was identified within Reserve [redacted] a local government administered reserve, following engagement between the Proponent and the Shire of Dandaragan. However, this site was ultimately assessed to primarily comprise excellent condition heathland vegetation not under imminent threat, with limited opportunities for further revegetation and/or rehabilitation.

3.2.2.2 Private freehold land

To analyse potential local private freehold offset sites with revegetation and/or rehabilitation potential, the Proponent worked with ecological consultants RPS to undertake a high-level desktop investigation of all areas within 6km and 12km of the Project Area, underpinned by geospatial analysis. The 6km and 12km targeted distances were chosen as representative of the mean daily foraging distance (6 km) and maximum daily foraging distance (12 km) of Carnaby's cockatoo.

The geospatial analysis commenced with the exclusion of land inconsistent with long-term offset use from further consideration. This included all DBCA and Shire of Dandaragan managed reserves, as well as sites subject to existing Mining Leases, existing Western Australia Native Vegetation Clearing Permits, and other extant developments including adjacent wind farms.

The remaining extents were overlain with the Department of Primary Industries and Regional Development's (DPIRD) native vegetation extent dataset to identify patches of remnant vegetation. Patches greater than 30ha (totalling 71 sites) were subject to qualitative review, which involved undertaking a visual comparison of aerial images for each patch against the mapped GIS attributes to qualitatively determine the desktop offset potential. Patches greater than 30 ha were targeted, based on a high-level estimate of the area likely to be required to meaningfully offset the significant residual impacts of the Waddi Wind Farm, subject to more detailed ecological assessment.

The results of this analysis ultimately identified that local revegetation/rehabilitation opportunities are highly constrained with only 10 remnant patches assessed as having 'high' offset potential following the qualitative analysis. Following the qualitative analysis the Proponent then undertook a detailed review of land titles and commenced engagement with the shortlisted landowners to seek to undertake detailed site-based ecological assessments and gauge potential interest in hosting offsets.

Concurrent with the local offset analysis, the Proponent undertook engagement activities with several community stakeholders identified as having an interest in potential offset sites in the region beyond the 12 km target distance. These stakeholders included Greening Australia and the Yued Aboriginal Corporation.

Following completion of these detailed analysis, two potential offset sites with revegetation and/or rehabilitation potential were identified. These sites were subjected to a detailed field assessment of their offset potential, as documented in BCE (2025) (Appendix 1). This detailed assessment confirmed the now proposed offset site [redacted] – see section 3.3.1) as a suitable candidate site for development of a scientifically robust offset proposal, having regard to the applicable Commonwealth and State policies outlined in Section 2.

3.3 Proposed Offset

3.3.1 Overview

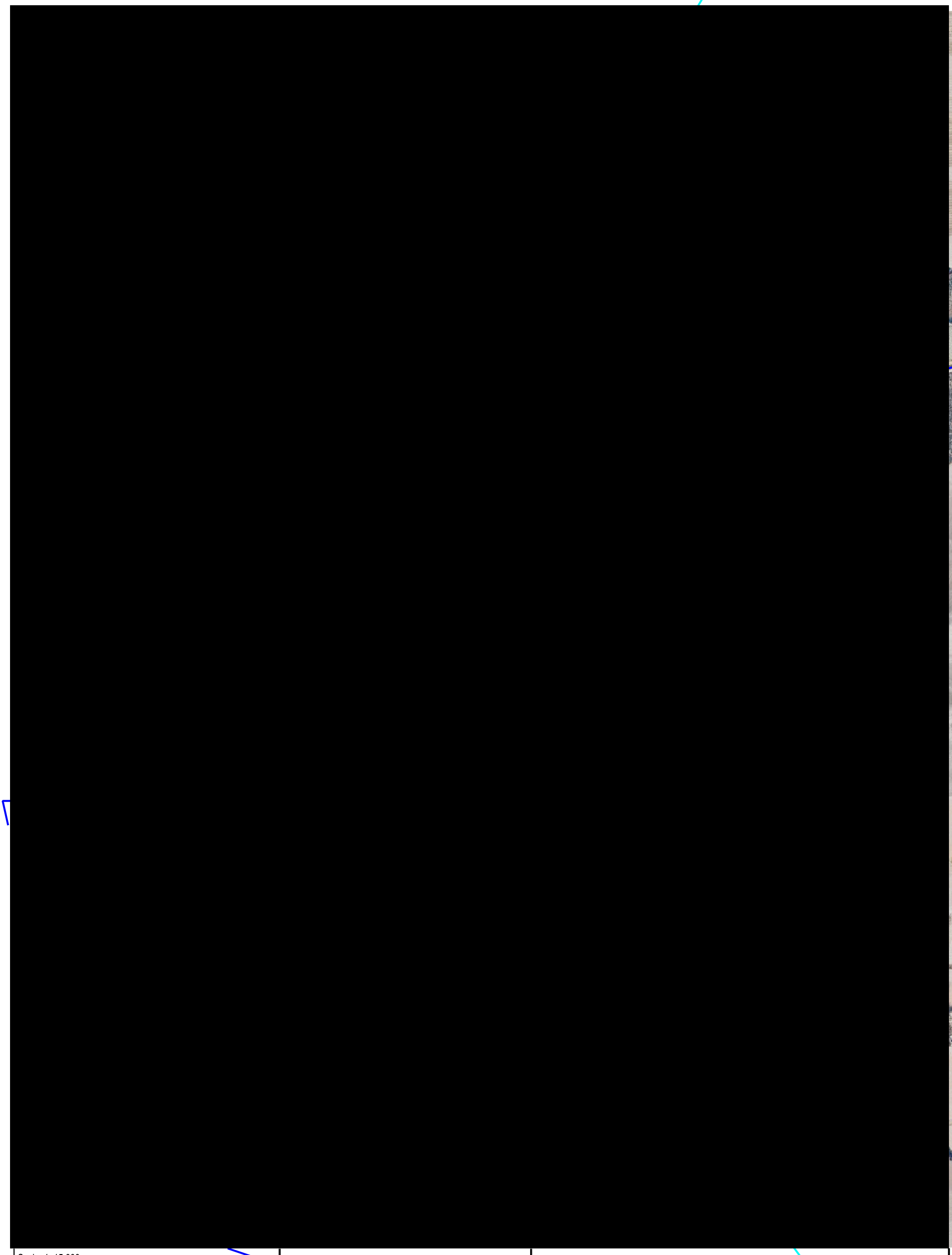
The Proponent proposes to restore 20 ha of [redacted] Cooljarloo) (Figure 2) from primarily cleared pastureland to a self-sustaining vegetation community that will result in an increase of the habitat quality score assessed by BCE (2025) as 2/10 up to a minimum of a 4/10 when implementation requirements are completed.

Key information about the site includes:

- It is located close to the Waddi Wind Farm, approximately [redacted] of the Project Area (Figure 1, Figure 2).
- The site will benefit the regional Carnaby's Cockatoo population by increasing the available foraging habitat area by 20 ha. The land would otherwise continue to be used for agricultural purposes.
- The planned restoration will include the installation of up to 28 tree and shrub species that are known to be preferred Carnaby's Cockatoo foraging species, as well as tree species that could become nesting and roosting trees.
- The installation of 7 – 10 artificial black cockatoo nesting boxes will also occur to counterbalance the loss of the 35 potential roosting and nesting trees.
- The site is immediately adjacent to existing retained vegetation within the same land parcel, and proximate to several other vegetated areas that provide suitable foraging, breeding and roosting habitat for the Carnaby's Cockatoo. BCE (2025) (Appendix 1) observed evidence of recent Carnaby's Cockatoo foraging activity in the immediately adjacent vegetation.
- The vegetation association of the proposed offset site based on the Beard mapping (Department of Primary Industries and Regional Development (DPIRD), 2019) is the same as that for the Project Area (RPS, 2025).
- A seasonal wetland characterised as a dampland with a basin form is present in the southern portion of the site, thus a potential water source is present within the site for at least part of the year, with several more within 2 km of the proposed offset boundary (BCE, 2025) (Appendix 1).
- The proposed offset location represents a like-for-like offset in that the value of the Project Area that requires the offset is primarily Carnaby's Cockatoo foraging habitat and the potential roosting and nesting habitat.

- The proposed offset site will not be used as an offset site for other processes and has historically been used for agricultural purposes with no memorial on the title indicating there is a current conservation covenant over the land.

The proposed offset site will be revegetated by the Proponent, with surveys carried out during the assessment of the Waddi Wind Farm used to develop an inferred species list for revegetation at the site. Appropriately qualified and experienced consultants and contractors will be engaged to carry out works associated with site restoration. A conservation covenant will be placed over the restored area to ensure it is retained for conservation purposes in perpetuity.



Scale: 1: 15,000
Original Size: A3
Aerial Imagery: Google Satelite
Grid: GDA2020 / MGA zone 50 (EPSG:7850)
0 0.5 1 km

Offset Proposal
EPBC 2023/09639
Waddi Wind Farm Pty Ltd

Figure 2

Indicative Offset Site Location, [redacted]

C:\Users\Sue. B\Documents\My Documents\Surefire Environmental\Client Folders\Tilt Renewables\GIS\Waddi WF Offset.qgz 02/05/2025 Offset Loctation

3.3.2 Habitat Quality Score

A habitat quality score provides an indication of how well a particular site supports a specific species or ecological community and contributes to its ongoing viability. A habitat quality score has been calculated for both the Project Area (RPS, 2025) and the proposed offset site (BCE, 2025), with the scores feeding into the impact and offset calculators.

For black cockatoo species, the calculation of the habitat quality score revolves around:

- Determining the site condition based on the community or species through considering characteristics such as vegetation condition and structure based on a series of metrics according to the species of interest.
- Consideration of the site context, such as proximity to known breeding and/or foraging habitat for the species of interest.
- Consideration of the species stocking rate via observation records and/or evidence of foraging.

According to RPS (2025), the Project Area of the Waddi Wind Farm is 10,493.7 ha, with most of that area being cleared for agricultural purposes. Within the overall project area, there is up to 5.5 ha of native vegetation in good or better condition that is proposed for removal as part of the Waddi Wind Farm development (refer Section 4.4.3.1 and Appendix R of RPS, 2025).

As the area of native vegetation that will be cleared represents 0.05% of the Project Area that is of varying quality ranging from Completely Degraded to Excellent using the Vegetation Condition Scale included in EPA (2016). Accordingly, this means that the value of the Carnaby's Cockatoo habitat that will be permanently cleared is also variable. Despite that, the assessments carried out by BCE (2025) (Appendix 1) and RPS (2025) confirm that Carnaby's Cockatoo's are active within the area with known roosting and nesting sites recorded nearby, along with the presence suitable foraging habitat and potential roosting and nesting trees.

BCE (2025) (Appendix 1) carried out an assessment of the Carnaby's Cockatoo habitat at the proposed offset site in March 2025 and determined that foraging value of the site was 2/10 (low) based on the largely cleared area of the site along with the presence of some scattered *Eucalyptus todtiana,* Melaleuca associated with a dampland area to the south, and degraded scrub over grassland (refer Section 3.1.1, and Figure 3.1, BCE, 2025 (Appendix 1)). Evidence of foraging by Carnaby's Cockatoo on *Banksia menziesii* was noted within the Kwongan heath to the immediate west of the proposed offset site (BCE, 2025 (Appendix 1)).

3.3.3 Offset Management Plan

An Offset Management Plan (OMP) is to be prepared to provide a guide as to how the overall offset site will be managed to bring about the targeted habitat improvement. The OMP will be prepared in accordance with the Environmental Management Plan Guidelines (DCCEEW, 2024), and include:

- An overview of the Proposed Action and the proposed offset package.
- Site conditions at the proposed offset site.
- Outcomes of the Carnaby's Cockatoo assessment that have informed the OMP.
- The management framework that will be applied.

- A review of key threats to the values of the offset site.
- Proposed management actions, including key performance indicators and triggers for corrective action.
- Risk review and management.
- Monitoring, evaluation, reporting, and contingency measures.

Proposed management strategies may involve:

- Intensive planting in locations where vegetation coverage is absent, with species, planting densities, and locations to be refined using data from RPS (2025) and BCE (2025) (Appendix 1).
- Weed control.
- Wetland management.
- Fencing repair and/or installation.
- Pest animal control for feral cats and foxes, and rabbits if required.
- The inclusion of completion criteria, key performance indicator and monitoring activities, including annual auditing and reporting in accordance with approval conditions.

3.4 Proposed Offset Site Tenure

The Proponent intends to lease the site from the current owners for the duration of the operational life of the wind farm for the purpose of restoring the area in accordance with this Offset Strategy, with negotiations with the land owner well progressed. The Proponent will be the responsible manager for of the proposed offset site for the operational life of the Waddi Wind Farm. The offset is proposed to be secured by way of conservation covenant under either the *Biodiversity Conservation Act 2016* (WA) or *Soil and Land Conservation Act 1945* (WA) to ensure it is retained in perpetuity.

4. Offset Assessment

4.1 Overview

As outlined in Section 2, both the Commonwealth and Western Australian offset frameworks provide for the use of calculators to support the assessment of suitability of offset proposals. Both the Commonwealth *Offsets Assessment Guide* (DSEWPaC, 2012a) and Western Australian *Environmental Offsets Calculator* (DWER, 2021a) are intended as a guide only, with the final assessment of offset requirements a matter for determination by the relevant authorities, with their use by Surefire Environmental aimed at informing this offset strategy and providing an indication of area that will be restored.

The following subsections provide an assessment of the Proponent's offset proposal in terms of the Commonwealth and Western Australian offset calculators.

4.2 Commonwealth Offsets Assessment Guide

DSEWPaC (2012b) includes the following parts:

- MNES assessment table.
- Impact calculator.
- Offset calculator.
- Summary box.

The *How to Use the Offsets Assessment Guide* (DSEWPaC, 2012c) has been used to inform the inputs to the *Offsets Assessment Guide* for the Waddi Wind Farm offset proposal, with the outcomes of the assessment summarised in Table 4.

Table 4: Summary of Offsets Assessment Guide Inputs for Proposed Land Restoration Offset

Offset Calculator Attribute	Input Value	Rationale
Quantum of impact – area (ha)	5.5 ha 35 trees	▪ This is the area of proposed clearing of Carnaby's Cockatoo foraging habitat associated with the dominant flora species present including *Banksia attenuata* (Slender Banksia) and *Xanthorrhoea preissii* (Grass Tree) and the occasional taller Eucalypts such as *Eucalyptus todtiana* (Pricklybark) (RPS, 2025). ▪ It also includes the permanent loss of 35 potential roosting and nesting trees, with no hollow present in any (RPS, 2025).
Quantum of impact – quality (vegetation condition)	Ranged from Completely Degraded to Excellent 4.05 ha Excellent 0.45 ha Very Good 0.51 ha Good	▪ Site assessment activities carried by RPS (2025) included site surveys and the review of survey reports prepared by others determined that the Carnaby's Cockatoo foraging habitat was of high value based on the presence of known preferred food sources for the Carnaby's Cockatoo such as *Banksia attenuata* (Slender Banksia), and *Banksia menziesii* (Firewood Banksia) and vegetation condition.

Offset Calculator Attribute	Input Value	Rationale
	0.15 ha Degraded 0.35 ha Completely Degraded	▪ In addition, 35 potential roosting and nesting trees will be permanently removed, noting that none include hollows at present (BCE, 2025).
Time over which loss is averted (year)	Up to 20 years	The time over which the loss is averted will be varied according to specific the restoration activities and their success: ▪ The proposed offset is the restoration of completely degraded farmland with species that will include preferred foraging species and potential breeding and roosting habitat suited to the continued presence of the Carnaby's Cockatoo, noting that Banksia Woodland/Kwongan Heath can be successfully restored within 5 – 10 years. ▪ As the proposed offset location includes the presence of the *Eucalyptus todtiana* and it is immediately adjacent to retained native vegetation to the west, there is suitable foraging and potential breeding and roosting habitat in the immediate vicinity of the offset site that provides a current foraging source, with the planned restoration extending and enhancing this habitat over time. As indicated, the benefit of the restoration to the Carnaby's Cockatoo could be realised within as little as 5 – 10 years. ▪ The installation of 7 – 10 nesting boxes on *Eucalyptus camaldulensis* (River Gum) will result in an immediate to short-term benefit to the species. ▪ A conservation covenant will be placed over the offset site to ensure protection in perpetuity of the Carnaby's Cockatoo foraging, and potential breeding and roosting habitat that will be created. The restoration works will also contribute to other regional measures aimed at protecting habitat for this and other fauna species.

Offset Calculator Attribute	Input Value	Rationale
Time until ecological benefit (years)	Up to 10	▪ As previously indicated, the offset site is immediately adjacent to native vegetation that includes known flora species favoured by the Carnaby's Cockatoo, as well as potential breeding and roosting trees in the form of Eucalyptus todtiana (Pricklybark), it provides a like-for-like offset in terms of counterbalancing residual risks associated with the loss of habitat from the proposed action area. ▪ Accordingly, the offset site will result in variable times until an ecological benefit is achieved according to the activities undertaken, as indicated above. ▪ The proposed offset will be set aside for conservation in perpetuity through the placement of a conservation covenant on the title, meaning that the existing habitat immediately to the west of the offset site will be increased through the restoration that will occur within the offset site and providing an ongoing ecological benefit to the cockatoo population through the retention of a sizable, vegetated area that will provide additional benefits to the broader ecological community and its components, resulting in a net conservation gain. ▪ It is expected that the offset site restoration will take a minimum of five to ten years to result in a self-sustaining community that will provide additional Carnaby's Cockatoo habitat.
Start quality of the site (scale 1 – 10)	BCE HQS: 2	▪ As the offset site is pastureland with the occasional tree present, an assessment of the proposed offset location was carried out by BCE (2025) (Appendix 1) which considered the Carnaby's Cockatoo habitat values of the proposed offset site, with the overall rating being 2/10, consistent with its degraded nature. ▪ The habitat features present include small areas of existing degraded *Melaleuca* scrub and heath over grassland, as well as scattered planted eucalypts, including several suitable for roosting. A seasonal wet seep is also present with several alternative water sources close by.

Offset Calculator Attribute	Input Value	Rationale
Future quality of the site without offset (scale 1 – 10)	BCE HQS: 1	▪ At present, management of the site is associated with ongoing agricultural/pastoral land uses (sheep grazing). In addition, the assessment carried out by BCE (2025) noted indications of foxes, feral cats, and rabbits (Appendix 1) that could prove a threat to the presence of conservation significant fauna species. ▪ Without the planned restoration and the setting aside of the site for conservation purposes, the future quality of the site is expected to reduce to a 1.
Future quality of the site with offset (scale 1 – 10)	BCE HQS: 4	▪ The offset site has significant potential for enhancement. Through active management the future quality of the site is expected to increase enhancing its suitability to support use for foraging, and in time, potential breeding and roosting by Carnaby's Cockatoo. ▪ Given that the site has a starting quality of 2/10 (BCE, 2025), it is expected that the condition of the offset site will increase to at least a 4/10. ▪ This will be achievable through active management activities such as but not limited to the removal of pasture, weed management, extensive planting, and pest animal management. Additional methods of enhancing suitability for use by Carnaby's Cockatoos could also include the installation of up to 7 – 10 Cockatoo nesting boxes. ▪ Activities will be outlined in the OMP that will be prepared.
Size of offset area (ha)	20 ha	▪ The minimum indicative offset area of 20 ha was arrived at using the DCCEEW offset calculator.
Risk of loss (%) without the offset	1%	▪ The average annual background rate of loss for the Shire of Dandaragan is listed as 0.37% (Maseyk, Evans, and Maron, 2017). ▪ The risk of loss is estimated at 1% in the calculator based on the applied value for the area where the offset site is located as well as the potential for continued degradation in the form of its continued use for agricultural purposes.
Risk of loss (%) with the offset	20%	▪ While the proponent will lease the Site for the duration of the wind farm life (30 years) and will be responsible for implementing the offset management plan that will be prepared and managing the site, there are other reasons for restoration failure such as fire and other natural events such as severe storms.

Offset Calculator Attribute	Input Value	Rationale
Confidence in result – averted loss (%)	80%	▪ Despite the intent that the site will provide Carnaby's Cockatoo habitat on an ongoing basis, there are other reasons for 'failure', such as fire or damage from storm events that could compromise the site and its use by Carnaby's Cockatoo. Thus, the confidence in the outcome of the process cannot be 100%.
Confidence in result – change in habitat quality (%)	85%	▪ The proposed offset site is in a degraded condition with the offset process aiming to restore a typical ecological community that is recorded within the nearby areas that provide suitable habitat species suited for use by the Carnaby's Cockatoo. ▪ The intensive revegetation program is expected to improve the condition of the site from a 2/10 to a 4/10 based on the BCE (2025) habitat quality assessment, meaning an enhanced and increased area of Carnaby's Cockatoo habitat in the region.
Percentage (%) of impact offset	> 100%	▪ Based on the DCCEEW Offset calculator outputs, the proposed offset compensates for more than 100% of the impact associated with the clearing of 5.5 ha of Carnaby's Cockatoo foraging, and the loss of 35 potential breeding and potential roosting trees.

Based on the findings of Table 4, the Waddi Wind Farm offset proposal is expected to provide an adequate direct offset for the anticipated residual impacts to Carnaby's Cockatoo foraging, potential breeding and potential roosting habitat that will be acceptable to DCCEEW.

4.3 Western Australia Environmental Offsets Calculator

The Western Australia Environmental Offsets Calculator involves three key steps:

- Step 1: Determining conservation significance.
- Step 2: Calculating significant residual impact.
- Step 3: Calculating offsets.

The inputs and rationale associated with the Western Australian Environmental Offsets Calculator are provided in Table 5.

Table 5: Application of WA Offsets Calculator and Associated Rationale

Environmental Value to be Offset		
Calculation	**Score (Area)**	**Rationale**
Conservation Significance		
Description	Carnaby's Cockatoo (*Zanda latirostris*)	Review of likely presence of conservation species, surveys by RPS and others
Type of environmental value	Species dependent on vegetation/ecological community that will be cleared	Primarily foraging habitat, with some potential roosting and nesting trees

Environmental Value to be Offset		
Calculation	**Score (Area)**	**Rationale**
Conservation significance of environmental value	Listed as Endangered under the EPBC Act and as Threatened under the EP Act	Habitat that will be lost was assessed as being of high biodiversity and ranging in quality by RPS (2025)
Landscape-level value impacted	Yes/no	No
Significant Impact		
Description	Permanent loss of 5.5 ha of native vegetation providing Carnaby's Cockatoo foraging habitat along with 35 trees that provide potential roosting and nesting habitat	Overall project area > 10,000 ha, with the 5.5 ha of native vegetation being the habitat areas that could not be avoided by the project design
Significant impact (hectares)/ Type of features	5.50 ha Loss of 35 trees	Impacts remaining after application of avoidance and mitigation measures
Quality (scale)/Number	Ranges from Completely Degraded to Excellent based on vegetation condition rating scale included in EPA (2016)	Assessed by RPS (2025)
Rehabilitation Credit		
Description	0	Not applicable – no onsite revegetation will occur
Proposed rehabilitation (area in hectares)	0	
Current quality of rehabilitation site/Start number of type of feature)	0	
Future quality without rehabilitation (scale)/Future number without rehabilitation	0	
Future quality with rehabilitation (scale)/Future number with rehabilitation	0	
Time until ecological benefit (years)	0	
Confidence in rehabilitation result (%)	0	
Offset		
Description	Revegetation of Carnaby's Cockatoo habitat	Restoration of cockatoo foraging habitat in the form of Kwongan Heath, along with some trees that could provide roosting and nesting habitat; will include the installation of artificial nesting boxes that will provide an immediate benefit

Environmental Value to be Offset		
Calculation	**Score (Area)**	**Rationale**
Proposed offset (area in hectares)	20.00	Determined by calculator as being sufficient offset
Current quality of offset site/start number (of type of feature)	2.00	Habitat quality assessment carried out by Bamford Consulting Ecologists (2025)
Future quality without rehabilitation (scale)/Future number without rehabilitation	1.00	Current land use is pasture for grazing sheep, without active management of cockatoo habitat values
Future quality with rehabilitation (scale)/Future number with rehabilitation	4.00	Minimum expected increase in future quality expected based on BCE (2025) Carnaby's Cockatoo habitat assessment method
Time until ecological benefit (years)	10.00	Restoration of Banksia Woodland/Kwongan heath can be successful within 5 – 10 years
Confidence in offset result (%)	0.8	Restoration methods well known, reputable restoration contractor will be used
Duration of offset implementation (maximum 20 years)	20.00	Offset will be maintained/managed by the proponent for the life of the project, which is expected to be 30 years
Time until offset site secured (years)	1.00	Negotiations with landowner well advanced
Risk of future loss without offset (%)	100.0%	Current land use is pasture for grazing sheep, without active management of cockatoo habitat values
Risk of future loss with offset (%)	20%	Failure or loss can occur due to uncontrollable factors, such as fire or other forms of natural disaster
Offset ratio (Conservation area only)	N/A	
Landscape level values of offset	N/A	

The findings summarised in Table 5 indicate that the Waddi Wind Farm offset proposal is expected to provide an adequate direct offset for the anticipated residual impacts to Carnaby's Cockatoo foraging, potential breeding and potential roosting habitat that will be acceptable to DWER.

5. Conclusion

The preparation of this Offset Strategy for the Waddi Wind Farm has demonstrated that:

- The Project is suitable for offsetting to counterbalance significant impacts associated with the permanent loss of 5.5 ha of Carnaby's Cockatoo foraging habitat and the loss of 35 potential roosting and nesting trees, though there were no hollows present in any.
- The proposed offset is the lease and restoration of 20 ha of pastureland in [redacted] with the aim of increasing the habitat quality score of the Site from a 2/10, as assessed by BCE (2025), to a 4/10 through the creation of a self-sustaining ecological community consistent with the vegetated area to the immediate east of the offset site.
- The offset location has been identified through a thorough process backed up by Scientific data, including the site assessment carried out by BCE (2025).
- As Banksia Woodland/Kwongan Heath restoration is well established, there is the potential that a self-sustaining ecological community can be restored within 5 – 10 years.
- The species list will include up to 28 flora species that are preferred Carnaby's Cockatoo foraging species, with the overall species list being compiled from the outcomes of the various surveys reported by RPS (2025) and supplemented by online information available from the Dandjoo Biodiversity Data Repository (Department of Biodiversity, Conservation and Attractions (DBCA), 2025).
- Installation of 7 – 10 Carnaby's Cockatoo artificial nest boxes, with *Eucalyptus camaldulensis* (River Gum) on site being suitable for this purpose.
- The application of both the Western Australian and Commonwealth offset calculators have indicated that:
  - a suitable offset site will be 20 ha
  - the offset is a like-for-like offset in that it will restore foraging habitat and replace the potential roosting and nesting trees that will be permanently removed when the project is implemented
  - the offset is a direct offset
  - it will provide more than 100% offset required to be acceptable to both DCCEEW and DWER.
- An Offset Management Plan (OMP) will be developed that documents the restoration program that will be implemented within the offset site. The OMP will document will be based on a strong body of scientific data, and will include but not be limited to information relating to:
  - the proposed action
  - an overview of the offset package
  - current site conditions of the offset site
  - outcomes of BCE's 2025 assessment that have informed the OMP
  - the management framework that has been applied
  - potential restoration threats
  - proposed management actions that will achieve the desired outcome of a self-sustaining ecological community that provides suitable foraging habitat for

Carnaby's Cockatoo, as well as potential roosting and nesting trees that add value in time

- identification of completion criteria, key performance indicators, monitoring requirements, and triggers for action that will be implemented in the event completion criteria are not being me
- auditing and reporting requirements.

6. References

Biodiversity Conservation Act 2016 (WA)

Department of Biodiversity, Conservation and Attractions (DBCA), (2025), *Dandjoo Biodiversity Data Repository*, accessed May 2025 via: https://dandjoo.bio.wa.gov.au/.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024) *Environmental Management Plan Guidelines,* accessed May 2025 via: https://www.dcceew.gov.au/sites/default/files/documents/environmental-management-plan-guidelines.pdf.

Department of Primary Industries and Regional Development, (2019), *Pre-European Vegetation (DPIRD_06) Dataset*, accessed May 2025 via: https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), (2012a), *Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, accessed May 2025 via: https://www.dcceew.gov.au/sites/default/files/documents/offsets-policy_2.pdf.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), (2012b), *Referral Guidelines for Three Threatened Black Cockatoo Species: Carnaby's Cockatoo* (endangered) (Calyptorhynchus latirostris), *Baudin's Cockatoo* (vulnerable) (Calyptorhynchus baudinii), *Forest Red-tailed Black Cockatoo* (vulnerable) *Calyptorhynchus banksii naso*, accessed May 2025 via: https://www.agriculture.gov.au/sites/default/files/documents/referral-guidelines-wa-black-cockatoo.pdf.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), (2012c), *How to use the Offsets Assessment Guide*, accessed May 2025 via: https://www.dcceew.gov.au/sites/default/files/documents/offsets-how-use.pdf.

Department of Water and Environmental Regulation (DWER) (2021a), *WA Environmental Offsets Calculator,* accessed May 2025 via: https://www.wa.gov.au/system/files/2021-11/DWER_WA_environmental_offsets_calculator_v1.1.zip

Department of Water and Environmental Regulation (DWER) (2021b) *Environmental Offsets Metric: Quantifying environmental offsets in Western Australia*, accessed May 2025 via: https://www.wa.gov.au/system/files/2021-10/DWER_Environmental_offsets_metric_Quantifying_environmental_offsets_in_WA.pdf

Environmental Protection Act 1986 (WA)

Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)

Environmental Protection Authority, (2016), *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, accessed May 2025 via URL: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf.

Government of Western Australia (GoWA), (2011), *WA Environmental Offsets Policy,* accessed May 2025 via: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/WAEnvOffsetsPolicy-270911.pdf.

Government of Western Australia (GoWA), (2014), *WA Environmental Offsets Guidelines,* accessed May 2025 via: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/WA%20Environmental%20Offsets%20Guideline%20August%202014.pdf.

Maseyk, F., Evans, M., and Maron, M. (2017) *Guidance for Deriving 'Risk of Loss' Estimates when Evaluating Biodiversity Offset Proposals under the EPBC Act, Report to the National Environmental Science Program, Department of the Environment and Energy*, accessed May 2025 via: https://www.nespthreatenedspecies.edu.au/media/zpyajjq1/5-1-guidance-for-deriving-risk-of-loss-report_2017_low-res.pdf.

RPS, (2025), *Preliminary Documentation - Waddi Wind Farm (EPBC 2023/09639)*, unpublished report prepared for Waddi Wind Farm Pty Ltd.

Soil and Land Conservation Act 1945 (WA)

Appendix 1: Waddi Wind Farm – Assessment of Potential Offset Sites (BCE, 2025)

Waddi Wind Farm – Assessment of Potential Offset Sites

Banksia cones chewed by Carnaby's Black-Cockatoo. Photo: Barry Shepherd.

Prepared for: WADDI WIND FARM PROJECT TRUST
L24/600 Bourke St
MELBOURNE VIC 3000

Prepared by: Barry Shepherd and Mike Bamford
M.J. & A.R. BAMFORD CONSULTING ECOLOGISTS
23 Plover Way
KINGSLEY WA 6026

4th April 2025

Executive Summary

Waddi Wind Farm Pty Ltd as trustee for the Waddi Wind Farm Project Trust is proposing to develop the Waddi Wind Farm (the project), near Cooljarloo in Western Australia, and commissioned Bamford Consulting Ecologists (BCE) to conduct a targeted habitat and offset assessment for Carnaby's Black-Cockatoo (*Zanda latirostris*) on two potential offset sites for the project. The two potential offset sites are [redacted] located [redacted], and [redacted]. The assessment includes a brief desktop component and field investigations. The primary purpose of these field investigations is to provide information on the nesting, foraging and roosting value of the potential offset sites to help determine their suitability as offset(s) for possible impacts on Carnaby's Black-Cockatoo from the project. This includes identifying Vegetation and Substate Associations (VSAs) on and adjacent the two sites. VSAs help inform a discussion of other conservation significant fauna that may be present and how they may use the project area. This report presents the results of the targeted Black-Cockatoo assessment for the project areas, along with a discussion of other conservation significant fauna likely to use the project area, patterns of biodiversity across the landscape, and key ecological processes influencing conservation significant fauna. The project areas were visited on 4th March 2025.

Carnaby's Black-Cockatoo is listed as Endangered under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* and Schedule 2, Division 2 (Endangered) under the *WA Biodiversity Conservation (BC) Act 2016.*

Description of [redacted] and [redacted] potential offset sites

The [redacted] site covers approximately 50 ha and is comprised primarily of cleared pasture with scattered Dwutta (*Eucalyptus todtiana*), small patches of native scrub, some mature ornamental eucalypts (probably *Eucalyptus camaldulensis*) and a seasonal drainage line with patches of Melaleuca. It is located [redacted] in the Geraldton Sandplains bioregion (GS) and towards the south of the Leseur Sandplain (GS2) subregion. The Leseur Sandplain is formed on an undulating lateritic sandplain with predominant vegetation of proteaceous-rich heath containing high levels of botanic endemism. The area also contains woodlands of York Gum, Wandoo and occasional Marri. [redacted] is used for grazing sheep and the region has a warm Mediterranean climate.

[redacted] is not within the range of Baudin's Black-Cockatoo (*Zanda baudinii*). Carnaby's Black-Cockatoo is a regular visitor to the project area and is known to breed along Minyulo Brook (c. 12 km from the project area). It is also within the known range of Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) and signs of their foraging were recently found nearby during the Waddi Wind Farm surveys. This species is only likely to be an irregular visitor at this location.

The [redacted] offset site also covers an area of approximately 50 ha and is comprised wholly of cleared, disused pasture with scattered Dwutta. [redacted] is a commercial operation in the process of restoring native vegetation for the purpose of carbon offsets. Occasional native plants have established from a previous attempt to direct-seed for native plant species restoration. [redacted] lies approximately [redacted] in the Geraldton Sandplains bioregion, and towards the south of the Leseur Sandplain subregion. The Leseur Sandplain is formed on an undulating lateritic sandplain with predominant vegetation of proteaceous-rich heath containing high levels of botanical endemism. The area also contains woodlands of York Gum, Wandoo and occasional Marri. It has a warm Mediterranean climate.

[redacted] is not within the range of the Forest Red-tailed Black-Cockatoo or Baudin's Black-Cockatoo. It is within the range of Carnaby's Black-Cockatoo but at this location it is only likely to be an irregular visitor with the nearest known breeding site at Coorow [redacted] This area is also on the margins of the range of the western subspecies of the Red-tailed Black-Cockatoo (*Calyptorhynchus banksii escondidus*), which is not conservation significant.

Vegetation and Substrate Associations (VSAs)

VSAs combine vegetation types, the soils or other substrate with which they are associated, and the landform. In the context of fauna assessment, VSAs are the environments that provide habitats for fauna. Five VSAs were identified in relation to fauna in the [redacted] offset site and one VSA in the [redacted] The majority of [redacted] site and all of [redacted] site consists of pasture with scattered Dwutta on sandplain (VSA 1). The remainder of the [redacted] Site comprises three small areas of parkland woodland over scrub and grassland (VSA 2), an area of degraded Melaleuca scrub over grassland (VSA 3), a small area of Melaleuca dampland along a wet seep (VSA 4), and a small patch of very degraded heath over grassland on exposed laterite. Soils on both sites are loamy sands.

Key species of conservation significance

The areas around both offset sites are expected to support four key conservation significant vertebrate species: the Jewelled Ctenotus (CS2 (P3)), Black-striped Burrowing Snake (CS2 (P3), Carnaby's Black-Cockatoo (CS1 (EN, S2D2)) and the Brush Wallaby (CS2 (P4)). The targeted black-cockatoo assessment is summarised below.

It is likely that the Banksia heath and woodlands adjacent to both sites will support a variety of conservation significant invertebrates, including species listed under federal and/or state publications, as well as a suite of short-range endemic (SRE) or potential SRE species.

Black-cockatoo presence

Carnaby's Black-Cockatoo was not observed on either site during the site inspection, but old and recent foraging evidence were found on both. Surveys conducted in support of the Waddi Wind Farm development [redacted] frequently recorded Carnaby's and confirmed active roosts and breeding in the area. It is concluded that Carnaby's is a regular visitor to the [redacted] site.

Black-cockatoo assessment

- Foraging value – both sites offer low foraging value for Carnaby's Black-Cockatoo, but [redacted] is somewhat more attractive due to existing scrub and mature planted Eucalypts. [redacted] scored a weighted (rounded) average foraging score of 2/10, while [redacted] scored 1/10. [redacted] also lies in an area where Carnaby's Black-Cockatoo is regularly present and breeding, so [redacted] potentially helps to support an important population.
- Breeding value – large eucalypts present on [redacted] were not suitable for nesting but could be fitted with artificial hollows; nesting sites are considered one of the most limited of all resources on which black-cockatoos depend. The closest known breeding sites to [redacted] are within Minyulo Brook, [redacted]. No large trees were present on [redacted] offset site, but large eucalypts were present within on the property and within 1 km of the offset site. These could also be fitted with artificial hollows. The nearest known breeding is in Coorow, [redacted].
- Roosting value – Several trees deemed suitable for roosting were present on [redacted], and though none existed on [redacted], suitably large ornamental trees were present within

1 km. Several known and confirmed roosts from survey work conducted in spring 2024 occur near [redacted] including 3 km to the north and 8 km to the east. These had between 5 and 25 individuals. A larger roost of up to 250 birds was confirmed in spring 2024 just 12 km to the southwest of [redacted] site. The closest known roost to [redacted] lies c. 29 km southwest and was also confirmed active in spring 2024 (P. Smith pers. com. 2025).

Offset Site Management

Both potential offset sites offer low value foraging habitat for Carnaby's and would need to be restored through extensive replanting of native vegetation. The presence of scrub, trees and a seasonal wet seep on [redacted] increases its value over the [redacted] site. Returning the sites to native vegetation with a plant species assemblage similar to that in the adjacent heaths would be a net gain once site restoration is achieved. Both sites would benefit from provision of standing water, though adequate supplies exist around [redacted]. Roosting trees are present on [redacted] (though no roosting was observed) and suitable trees lie within 1 km of the [redacted] offset site. Both sites could be made more attractive to Carnaby's through the installation of artificial nesting hollows in suitable trees present on or close by.

Both sites would need to employ a feral and pest species control programme for cats, foxes, rabbits and Corellas to maximise the attractiveness for Carnaby's and reduce the threats known to constrain the recovery of this species.

Patterns of biodiversity

The vegetation on both sites is relatively uniform, being comprised mostly of pasture and scattered Dwutta. Scrub, small stands of eucalypts and a wet seep also occur on [redacted] which adds to the baseline value to native wildlife and to the complexity and opportunities for diversity. [redacted] was an agricultural paddock but has been cultivated in recent years to restore native vegetation and is therefore more disturbed than [redacted]. The open paddocks offer very little shelter for ground-dwelling fauna but once the vegetation has been restored, the areas are likely to support once again a diverse fauna including conservation significant species such as the Black-striped Burrowing Snake and Jewelled Ctenotus. Once Banksia heath and woodland is restored and matured to self-sustaining vegetation, the foraging for Carnaby's Black-Cockatoo will increase in value, and is also likely to provide habitat for other fauna.

Key ecological processes.

The main ecological processes which have affected and continue to affect fauna assemblages in this region are likely to be: (i) drought and extreme weather events, (ii) existing habitat loss, (iii) landscape connectivity, (iv) the presence and abundance of feral and over-abundant native species (eg Western Corellas), (v) local hydrological changes, and (vi) bush fire. Individually, these can influence fauna significantly but can also act in concert and have additive effects on individual species. Carnaby's is known to be vulnerable to several of these and instances of impacts from fire, drought and feral species have been documented in the region in recent years. These factors will need to be considered in management plans for the offset sites.

Table of Contents

List of Tables

List of Figures

List of Plates

List of Appendices

1 Introduction

Bamford Consulting Ecologists (BCE) was commissioned by Waddi Wind Farm Pty Ltd as trustee of the Waddi Wind Farm Project Trust to conduct a targeted habitat and offset assessment for Carnaby's Black-Cockatoos (*Zanda latirostris*) on two potential offset sites in support of the Waddi Wind Farm which is located near Cooljarloo in Western Australia. [redacted] is located [redacted] while [redacted] lies approximately [redacted].

The assessment includes a brief desktop component and field investigations. The primary purpose of these field investigations is to provide information on the nesting, foraging and roosting value of the two potential offset sites to help determine the sites' suitability as offset(s) for the loss of Carnaby's Black-Cockatoo foraging habitat required in constructing the Waddi Wind Farm. This includes identifying and assessing the condition of Vegetation and Substate Associations (VSAs) on and adjacent to the two sites. VSAs help inform a discussion of other conservation significant fauna that may be present and how they may use the project area. It also involves assessing the potential for restoring the native vegetation to the benefit of Carnaby's Black-Cockatoo. During field investigations, information regarding black-cockatoo nesting, foraging and roosting habitat was obtained opportunistically. This report presents the results of the targeted Black-Cockatoo assessment for the project areas, along with a discussion of other conservation significant fauna likely to use the project area, patterns of biodiversity across the landscape, and key ecological processes influencing conservation significant fauna. The project areas were visited on 4th March 2025.

Carnaby's Black-Cockatoo is listed as Endangered under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* and Schedule 2, Division 2 (Endangered) under the *WA Biodiversity Conservation (BC) Act 2016*

1.1 Black-Cockatoos

While the two potential offset sites are within the range of Carnaby's, their occurrences are expected to be different. The [redacted] lies very close to known Carnaby's breeding and roosting areas and is partially surrounded by foraging habitat. Carnaby's have been recorded throughout several surveys that were conducted in support of the adjacent Waddi Wind Farm, including during the spring and summer of 2024/25. This species is expected as a regular visitor of the [redacted] area for a substantial part of the year. Conversely, [redacted] lies further from breeding and roosting locations and it is unclear from records how often they may occur on site (see Section 3.2.1.1). This species appears to be an irregular visitor at this location.

The range of the Forest Red-tailed Black-Cockatoo extends to the [redacted] site and foraging evidence of their presence was found 8 km to the east in spring 2024. Local landowners have confirmed they see or hear Forest Red-tailed Black-Cockatoo only occasionally in the [redacted] area. This species is considered an irregular visitor. [redacted] lies outside of the range of the Forest Red-tailed Black-Cockatoo but is on the south-western extremity of the range of the Western Red-tailed Black-Cockatoo (*Calyptorhynchus banksii escondidus*), and therefore this sub-species may be present at least occasionally. It is not threatened and therefore not a matter of national environmental significance.

Both offset areas are out of range for Baudin's Black-Cockatoo.

Figure 1-1. Location of the two potential offset areas.

1.2 Project areas

The [redacted] site covers approximately 50 ha and is comprised primarily of cleared pasture currently used for grazing sheep. It is located [redacted]

The [redacted] offset site also covers an area of approximately 50 ha and is comprised wholly of cleared, disused pasture with scattered Dwutta. [redacted] is a commercial operation in the process of restoring native vegetation for the purpose of carbon offsets. [redacted] lies approximately [redacted].

The Interim Biogeographic Regionalisation of Australia (IBRA v7) has identified 27 bioregions in Western Australia which are further divided into subregions (DCCEEW, 2023a). Bioregions are classified on the basis of climate, geology, landforms, vegetation and fauna (Thackway & Cresswell, 1995).

Both potential offset sites lie in the Geraldton Sandplains bioregion (GS) and towards the south of the Leseur Sandplain (GS2) subregion. The Leseur Sandplain (GS2) subregion was described by Desmond and Chant.(2001) and key points are summarised in the following. The Leseur Sandplain subregion is formed on an undulating lateritic sandplain comprised of coastal Aeolian, limestones, siltstones and sandstones, and are alluvial in origin in the drainage systems. The predominant vegetation type for the subregion is proteaceous-rich heath containing high levels of botanical endemism. The area also contains extensive areas of York Gum and Jam woodlands in outwash drainage areas, with areas of Wandoo woodlands also occurring. This subregion also includes a complex series of seasonal wetlands.

The dominant land uses within the Leseur Sandplains subregion (GS2) are dry land agriculture (69.34% with areas of Conservation, UCL and Crown reserves. The offset areas are both comprised mostly of grazing pasture with scattered Dwutta (*Eucalyptus todtiana*), and both lie immediately adjacent or in close proximity to intact native vegetation comprised mostly of shrubby heath with scattered Eucalypts. Existing development within 15 km of the [redacted] site consists of a mining operation, cleared agricultural land and a network of sealed and unsealed roads. Existing development within 15 km of [redacted] consists of cleared agricultural land and a network of sealed and unsealed roads.

The Geraldton Sandplains bioregion has a Mediterranean climate. Average annual rainfall for the station closest to the project area is 517 mm at Badgingarra Station (Number: 009037, BOM, 2025), 417 mm at Watheroo Station (Number: 008132, BOM, 2025) and 375 mm at Carnamah Station (Number: 008025, BOM, 2025). The first two of these stations lie between the two offset sites, while the latter lies approximately 42 km northeast of [redacted].

Within 15 km of the project area, the landscape comprises 39 soil subsystems, from six systems within four zones (details from Schoknecht *et al.*(2004):

1. Northern Zone of Rejuvenated Drainage (characterised by erosional surface of gently undulating rises, active colluvial processes and soils formed in colluvium or rock weathered in-situ): Carrolup System
2. Northern Zone of Ancient Drainage (characterised by Lateritic uplands dominated by yellow sandplain): Trayning and Tandegin Systems
3. Bassendean Zone (fixed dunes inland from coastal dune zone, characterised by non-calcareous sands and podsolised soils with low-lying wet areas): Bassendean system
4. Dandaragan Plateau Zone (characterised by areas of sandplain and some laterite on a gently undulating plateau): Capitella and Rowes systems
5. Arrowsmith Zone (sandy and gravelly soils on a lateritic sandplain): Boothendarra system

[redacted] lies within the Arrowsmith Zone and the [redacted] lies within the Dandaragan Plateau Zone. The Arrowsmith subsystem (DPIRD, 2023c) is described as an undulating to flat sandplain with minor swamps, and pale to yellow deep sands (Schoknecht et al., 2004). The Dandaragan Plateau Zone is described as a gently undulating plateau with sandplain areas and some laterite (Schoknecht et al., 2004).

The Pre-European vegetation within 15 km of [redacted] is thought to have consisted of four vegetation types (3, 4, 9 and 108) **(Beard *et al*., 2013; DPIRD, 2023b)** with type 108 scrub-heath covering the largest area, and type 9 forming a large swathe along the west. Pre-European vegetation across [redacted] was thought to have comprised of two vegetation types; low or open woodland dominated by Acacia, Peppermints and Banksia, and scrub heath. Areas of York Gum woodlands would have existed on the higher well-drained grounds, with Salmon and Wandoo woodlands along the valleys and creeklines. The Pre-European vegetation within 15 km of [redacted] is thought to have consisted of six vegetation types (4, 14, 18, 42, 51 and 108) **(Beard *et al*., 2013; DPIRD, 2023b)** with type 18 scrub-heath covering the largest area. Most of the 15 km buffer, including the entirety of the offsets area, was thought to have consisted of vegetation type 18: mixed heath with scattered tall Myrtaceae and Proteaceae (Banksias). [redacted] was thought to have comprised mixed heath and scattered tall shrubs.

1.3 Recognised sensitive sites

A number of recognised sensitive sites occur within 15 km of the two potential offset areas, including Environmentally Sensitive Areas (ESAs) **(DWER, 2025a, 2025b)** and several national and state protected terrestrial reserves **(DCCEEW, 2020, 2025)**. Badgingarra National Park which is also classified as an ESA lies [redacted]. This national Park is a large, near-continuous area of native vegetation comprised mostly of Kwongan Heath and is contiguous with other stands of heath lying outside of the Park. Wongonderrah Nature Reserve lies some [redacted] site and contains a cross-section of the vegetation types found on the Bassendean sands, including winter-wet swamps with paperbark forest, and heathlands. Minyulo Nature Reserve is a small stand of Wandoo Woodland that lies approximately [redacted]. This is also a known breeding area for Carnaby's. Pinjarrega Nature Reserve lies [redacted] and is comprised mostly of Dwutta and Callitrix woodland over Banksia heath. The Watheroo National Park lies [redacted] and is also comprised mostly of intact Kwongan heath. Capamauro Nature Reserve lies [redacted].

It is likely that two TECs occur within 15 km of the [redacted] and [redacted] sites. The Protected Matters Search Tool (DCCEEW, 2025), identifies that Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered) and Eucalypt Woodland of the Western Australian Wheatbelt (Critically Endangered) lie within the buffer zones. Neither site appear to contain either of these two ecological communities.

No Key Biodiversity Area **(KBA, 2025)** falls within 15 km of either offset site, but several key features in the region are of significance for Carnaby's. The Cataby, Koobabbie, Moora and Coomallo IBA/KBA have all been identified as important for Carnaby's and demonstrate the importance of the region for this species. These areas are significant because they individually support a significant portion of the breeding population of Carnaby's Black-Cockatoo, with nesting trees and foraging habitat distributed throughout remnant vegetation and isolated paddock trees **(KBA, 2025)**. There are no Ramsar Sites **(DBCA, 2025d)** within 15 km but there are Important Wetlands some 12 km [redacted] site (DBCA 2025c). Sensitive sites and protected areas within 15 km are shown on Figure 1-2.

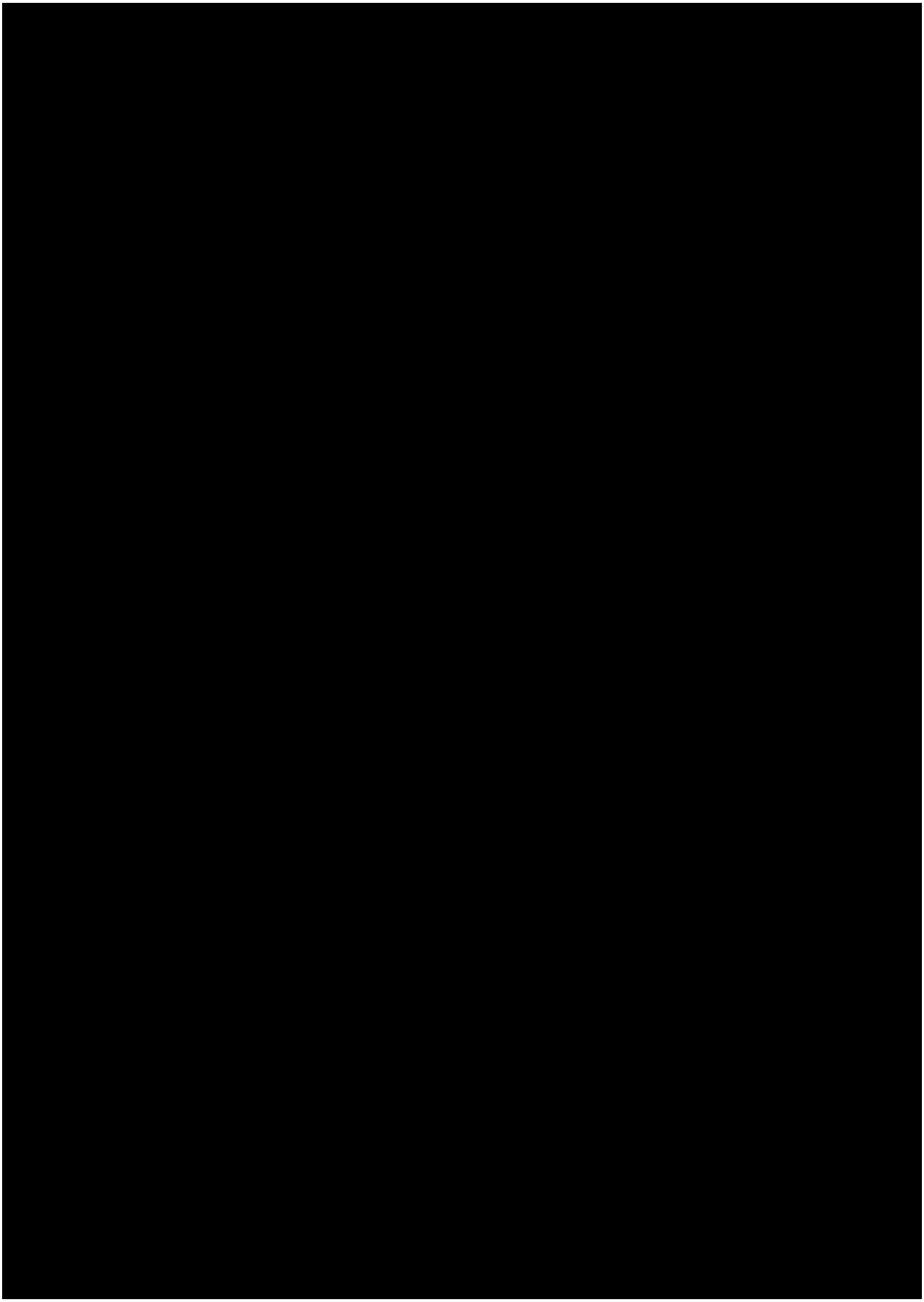


Figure 1-2. Recognised sensitive sites and protected areas within 15 km of the two potential offset sites.

2 Methods

2.1 Overview

The primary objective when assessing the value of offset properties for black-cockatoos is to assess the foraging value of existing vegetation. As a score is given for each 'type' of vegetation present, this first requires identification of the broad Vegetation and Substrate Associations (VSAs) present at the site. The foraging preferences of each species of black-cockatoo differ, therefore the foraging value is calculated separately for each black-cockatoo species under consideration. These methods are described in detail in Section 2.5 below and in Appendix 3. Identification of the VSAs in the project area also informs the discussion of conservation significant fauna likely to be present, and how they are expected to use the project area.

2.2 Dates and personnel

Personnel involved in the field investigations and report preparation (including desktop review) are listed in Table 2-1. The potential offset site was visited on the 4th March 2025. The purpose of the field investigations was to provide the following information:

- Identification of Vegetation and Substrate Associations (VSAs) for which foraging value is calculated (a separate score is calculated for each VSA for each black-cockatoo species) and which informs a discussion of conservation significant species likely to be present;
- Assessment of foraging value across the site (described in Section 2.5.2.2); and
- Opportunistic assessment of potential nesting trees, if present, and opportunistic observations of potential roosting sites.

The [redacted] area was familiar to the project team having conducted targeted survey for Carnaby's between August 2024 and January 2025 [redacted]. [redacted] was unfamiliar to the team and therefore site staff were questioned about the presence of black-cockatoos in the area.

Table 2-1. Personnel involved in the field investigations and report preparation.

Personnel	EIA Experience	Field Investigations	Report Preparation
Dr Mike Bamford *BSc (Biology), Hons (Biology), PhD (Biology)*	40 years		+
Dr Barry Shepherd *BSc Hons (Env. Biol.), PhD (Ecology)*	31 years	+	+

2.3 Identification of vegetation and substrate associations (VSAs)

Vegetation and substrate associations (VSAs) combine vegetation types, the soils or other substrate with which they are associated, and the landform. In the context of fauna assessment, VSAs are the environments that provide habitats for fauna.

For the current assessment, VSAs were identified based on observations made during the field investigations and are described in Section 3.1 below. These VSAs were mapped using aerial imagery as a guide, and this formed the basis for the mapping of foraging scores presented in Section 3.2.

2.4 Opportunistic observations

At all times, observations of fauna or fauna signs were noted when they contributed to the accumulation of information on the fauna of the site.

2.5 Black-cockatoo habitat analysis

2.5.1 Desktop review

Databases were queried for information regarding black-cockatoos, including records of individuals or flocks, known roosting sites and known breeding sites. Previous reports including black-cockatoo habitat assessment within 15 km were obtained and summarised to supplement information available in databases. These sources of information are summarised in Table 2-2 and Table 2-3.

Table 2-2. Databases searched for records relating to black-cockatoos.

Database	Type of records obtained	Area searched
Atlas of Living Australia (ALA, 2025)	Observations of black-cockatoos and general fauna	15 km buffer around boundary of project area.
DBCA breeding sites publicly available (DBCA, 2025a)	Known breeding sites for Carnaby's Black-Cockatoo	Broad region.
Roosting sites dataset (BirdLife Australia, 2024)	Records of known roosting sites from the Great Cocky Count (Bird Life Western Australia).	Broad region.
EPBC Protected Matters Search Tool (DCCEEW, 2025)	Records on MNES protected under the EPBC Act.	15 km buffer around boundary of project area.
Index of Biodiversity Surveys for Assessment (IBSA) (DWER, 2025c)	Previous reports relating to black-cockatoo habitat assessment.	15 km buffer around boundary of project area.

Table 2-3. Reports relating to black-cockatoo habitat assessment, returned from IBSA search during desktop review. Listed reports are relevant to the [redacted] site only; no reports were returned during the search from within 15 km of the [redacted] site.

[redacted]

2.5.2 Field investigations

2.5.2.1 Guidelines

The Department of Climate Change, Energy, the Environment and Water (DCCEEW, formerly DAWE) provides guidelines for the referral of actions that may result in impacts to black-cockatoos (for assessment under the EPBC Act). The survey and analysis reported here have been conducted with strong reference to both the referral guidelines provided by DSEWPaC (2012) and DAWE (2022). This includes application of the foraging habitat scoring tool in DEE (2017). In addition, survey methodology followed the recommendations listed on the DCCEEW's Species Profile and Threats Database (DCCEEW, 2023b, 2023c). Ecological values for black-cockatoos within the site were based on the definitions of breeding, foraging and roosting habitat as per the EPBC Act referral guidelines for black-cockatoos (DSEWPaC, 2012).

Actual scoring of foraging value and assessment of potential breeding habitat was based on systems developed by BCE that are outlined below and in Appendix 3. The DBCA has indicated that the methodology developed and applied previously by BCE (e.g. Bancroft & Bamford, 2021), and as described below, to score nesting value and foraging habitat, is an acceptable approach. BCE has used this system previously in reports and it has been accepted by the regulator.

2.5.2.2 Assessment of foraging value

The foraging value of the study area was assessed by calculating a foraging score for each VSA (areas of similar vegetation type/condition, see Appendix 3). The foraging score provides a numerical value that reflects the significance of vegetation as foraging habitat for black-cockatoos, and this numerical value is designed to provide the sort of information needed by federal DCCEEW, the state Department of Water and Environmental Regulation (DWER) and Department of Energy, Mines, Industry Regulation and Safety (DMIRS), and the WA Environmental Protection Authority (EPA) to assess impact significance and offset requirements. The foraging value (also referred to as 'habitat quality score' (HQS)) of the vegetation depends upon the type, density and condition of trees and shrubs in an area and can be influenced by the context such as the availability of foraging habitat nearby. The BCE scoring system for value of foraging habitat has three components as detailed in Appendix 3. These three components are drawn from the DCCEEW offset calculator (DCCEEW, undated) but with the scoring approach developed by BCE:

- A score out of six for the vegetation composition, condition and structure.
  This is based on the presence, abundance and condition of vegetation that is used for foraging by the black-cockatoo under consideration (as described in Appendix 3).
- A score out of three for the context of the site.
  The context score is a function of the proportion of native vegetation within the local area that lies within the offset area, and is also affected by the vegetation condition score (as described in Appendix 3. The local area for site context is considered to be a 15 km radius around the offset area. Native vegetation within the local area (15 km radius) is based on the Department of Primary Industry and Regional Development's online shapefile of native remnant vegetation polygons in Western Australia (DPIRD, 2025a).
- A score out of one for species density.
  As described in Appendix 3, the species density score (out of 1) is assigned on the basis of observed or predicted regular presence of foraging birds. For example, birds may not be observed and foraging evidence may not be found during a short site visit, but if there are birds and/or foraging evidence nearby, and the habitat has a moderate to high vegetation condition score, then it is certain to be visited regularly by foraging birds and is given a density score of 1 accordingly. If birds or foraging evidence are not observed, and the regular presence of foraging birds is not expected, then the area is given a stocking rate score of 0.

The combination of the vegetation condition score, the context score and the species density score provides an overall foraging value score (the overall HQS) out of 10. A higher score represents better foraging value. A score out of 10 is presented for the purposes of aiding offset calculations. The approach to assigning scores for vegetation, context and species density are outlined in Appendix 3. Foraging value scores are calculated separately for the two black-cockatoo species (Appendix 3) depending upon the vegetation present; thus a separate score is given for each VSA for each species.

An overall foraging score for the project area was calculated based on the individual HQS of each VSA and the proportion of the project area made up of each VSA. This provides an average weighted habitat quality score (HQS) for the project area as a whole, which is always rounded up for comparative purposes; conventional rounding rules could lead to very different sites being considered to be similar.

Black-cockatoo foraging signs were also recorded in conjunction with the foraging value assessments. When foraging signs were observed, the location and tree species were recorded. Black-cockatoo foraging evidence may persist for some months or years after the foraging event. Factors that help to establish the time since foraging include: the colour of nuts/foliage, the degree of weathering or decay of debris, the presence of small fragments of nut debris, the position/compression of the foraging debris relative to surrounding vegetation and leaf litter, and the strength of the eucalypt smell emitted. Despite the absence of empirical data, four categories of foraging activity were recognised, based on the time since foraging:

(i) Active – where birds were observed in the act of foraging;
(ii) Recent – foraging signs (e.g. chewed nuts or vegetation) were 'fresh' (i.e. foraging was likely to have occurred within days to weeks). Recent foraging signs were typically green and/or with very little sign of weathering. Approximately less than four weeks old;
(iii) Intermediate – foraging was likely to have occurred within weeks to months previously. Approximately one to six months old; and

(iv) Old – foraging was likely to have occurred months to years previously. Approximately more than six months old.

2.5.2.3 *Black-cockatoo breeding*

The aim of the breeding surveys was to opportunistically record presence of potential hollow-bearing trees (suitable for black-cockatoo nesting) within the project area. A potential nesting tree is considered any tree with a diameter at breast height (DBH) equal to or greater than 500 mm (or 300 mm for Wandoo/Salmon Gum) (DCCEEW, 2023b, 2023c). The following information was recorded for suitable trees:

- tree location;
- tree species;
- life status;
- DBH; and
- nest-tree rank: trees were assessed (from the ground) for the potential presence/quality of nest-hollows and allocated a nesting rank (developed by BCE) as described in Table 2-4.

Table 2-4. Ranking system for the assessment of potential nest-trees for black-cockatoos (revised 21/08/2023).

As per information from DCCEEW (2023b, 2023c), a potential nest-tree is any tree with a diameter at breast height >500 mm (or >300 mm for *Eucalyptus salmonophloia* and *E. wandoo*). Note that black-cockatoos favour vertical hollows for the nest chamber, but the hollow entrance may be vertical (a chimney hollow), have a side entrance or have a horizontal spout entrance.

Rank	Description of tree and hollows/activity
1	Activity at hollow observed; adult (or immature) bird seen entering or emerging from hollow. Can also be used for a known nest tree active in the previous 12 months (although this should be noted in the description). Note that activity at a hollow does not absolutely mean that breeding is occurring unless a young bird in hollow is observed.
2	Hollow of suitable size visible with chew marks around entrance. Record if chew-marks are recent or old.
3	Potentially suitable hollow visible but no chew marks present at entrance; or potentially suitable hollow suspected to be present - as suggested by structure of tree, such as large, vertical trunk broken off at a height of >8m; but note that hollow height is contextual. Carnaby's Black-Cockatoo will nest in hollows <5m so in a Wheatbelt breeding site a lower criterion may be more appropriate.
4	Tree with large hollows or broken branches that might contain large hollows, but hollows or potential hollows (nest chamber) are not vertical or near-vertical; thus, a tree with or likely to have hollows of sufficient size but not to have hollows of the angle preferred by Black-Cockatoos. Trees with low but otherwise suitable hollows can also be assigned a rank or 4, depending on the species of Black-Cockatoo likely to be present.
5	Tree lacking large hollows or broken branches that might have large hollows; a tree with more or less intact branches and a spreading crown.

2.5.2.4 Black-cockatoo night roosting

As per the guidance of DAWE (2022), areas likely to be used as night roosting sites were noted during field investigations, based on the topographical, physical and vegetation characteristics present (such as sites adjacent to watercourses with large trees) and/or indirect evidence of roosting (e.g. guano deposits, discarded feathers).

2.5.2.5 Potential watering points

During the desktop review and site inspection, any potential watering points for black-cockatoos were noted and details are presented in the relevant sections below.

2.6 Conservation significant fauna

A list of conservation significant vertebrate and invertebrate fauna expected in the project areas was compiled based on previous BCE surveys nearby, general literature regarding expected distributions of species, and the consultants' extensive previous experience and familiarity with the fauna of this region. This list is provided in Appendix 4 and key conservation significant species are discussed in Section 3.3 below. Several conservation significant species are considered locally extinct in this region; these are detailed in Appendix 4.

2.7 Mapping

Low resolution maps (300-400dpi) have been provided within the body this report. As per the recommendation of EPA (2020), maps use the GDA2020 datum and are projected into the appropriate Map Grid of Australia (MGA94) zone.

2.8 Survey Limitations

The EPA Guidance Statement 56 (EPA, 2004) and the EPA (2020) outline a number of limitations that may arise during field investigations for Environmental Impact Assessment. These survey limitations are discussed in the context of the BCE investigation of the project area in Table 2-5. No limitations were identified.

Table 2-5. Survey limitations as outlined by EPA (2020).

EPA Survey Limitations	BCE Comment
Availability of data and information	Sufficient information from databases and previous studies. Not a limitation.
Competency/experience of the survey team, including experience in the bioregion surveyed	The ecologists have had extensive experience in conducting field surveys for environmental impact assessment fauna studies, particularly for black-cockatoo habitat assessments and have undertaken a number of studies

EPA Survey Limitations	BCE Comment
	within the region. Not a limitation.
Scope of the survey (e.g. where faunal groups were excluded from the survey)	The scope of the assessment was a targeted survey for black-cockatoo foraging habitat, and identification of fauna habitats. The latter informs a discussion of conservation significant fauna likely to be present. Not a limitation.
Timing, weather and season	Seasonality is not of great importance for this type of assessment. Not a limitation.
Disturbance that may have affected results	None. Not a limitation.
The proportion of fauna identified, recorded or collected	All fauna observed were identified. Not a limitation.
Adequacy of the survey intensity and proportion of survey achieved (e.g. the extent to which the area was surveyed)	The project area was adequately surveyed to the level appropriate for a black-cockatoo foraging values assessment. Not a limitation.
Access problems	No access problems were encountered. Not a limitation.
Problems with data and analysis, including sampling biases	There were no data problems. Not a limitation.

3 Results

3.1 Vegetation and Substrate Associations

3.1.1 [redacted]

Based on observations made during the site inspection of the [redacted] site, three broad VSAs were identified in relation to fauna in the project area:

VSA 1: Pasture with scattered Dwutta. Pasture grassland with scattered Dwutta (*Eucalyptus todtiana*) with infrequent shrubs on white sands sandplain. This VSA makes up c. 91% of the offset site. See Plate 1. Signs of rabbits were recorded.

VSA 2: Parkland woodland over scrub. Planted large Eucalypts (probably *Eucalyptus camaldulensis*) over degraded scrub and pasture grassland on sandplain. Trees slightly taller than in VSA 1 as well as at a higher density. This VSA makes up 5.9% of the project area. See Plate 2.

VSA 3: Melaleuca dampland. Patchy *Melaleuca preissiana* over pasture with reeds along damp soakline. Dark, peaty soil. A slight depression retains water but was dry at the time of the site inspection. This VSA makes up c. 1.2% of the project area. See Plate 3.

VSA 4: Degraded scrub over grassland. Patch of degraded Melaleuca scrub over grassland. This VSA makes up around 1.5% See Plate 4.

VSA 5: Degraded heath over grassland. Small patch of degraded, low heath over grassland on exposed laterite making up c. 0.5% of the overall site. See Plate 5

3.1.2 [redacted]

Based on observations made during the site inspection of the [redacted] site, one broad VSA was identified in relation to fauna in the project area:

VSA 4: Pasture with scattered Dwutta. Pasture grassland with scattered Dwutta (*Eucalyptus todtiana*) with infrequent shrubs and occasional stands of Lupins on white sands sandplain. This pasture has been modified by being cultivated and directly seeded with native plant species. However, the seeding has not taken. Lupins were recorded in the pasture. This VSA makes up 100 % of the project area. See Plate 6.

The distribution of VSAs across the two offset sites is shown in Figure 3-1.

Plate 1. Representative photograph of VSA 1 (Pasture with scattered Dwutta) looking from the [redacted]

Plate 2. Example of VSA 2 (Parkland woodland over pasture). This photograph was taken from the [redacted].

Plate 3. Example of VSA 3 (Melaleuca Dampland) occurring towards the [redacted] site.

Plate 4. Example of VSA 4 (Scrub over grassland) that lies [redacted].

Plate 5. VSA 5 (Degraded low heath over sparse grassland) a small patch that lies on northern boundary and abuts the low heath road reserve [redacted]

Plate 6. Examples of VSA 1 (Pasture with scattered Dwutta) that occurs across the entire [redacted] site. This pasture was cultivated and sown with native seed in 2023 but the vast majority didn't take. Note the remains of Lupin plants in the fore-ground of the lower image as a legacy of the site's agricultural history.

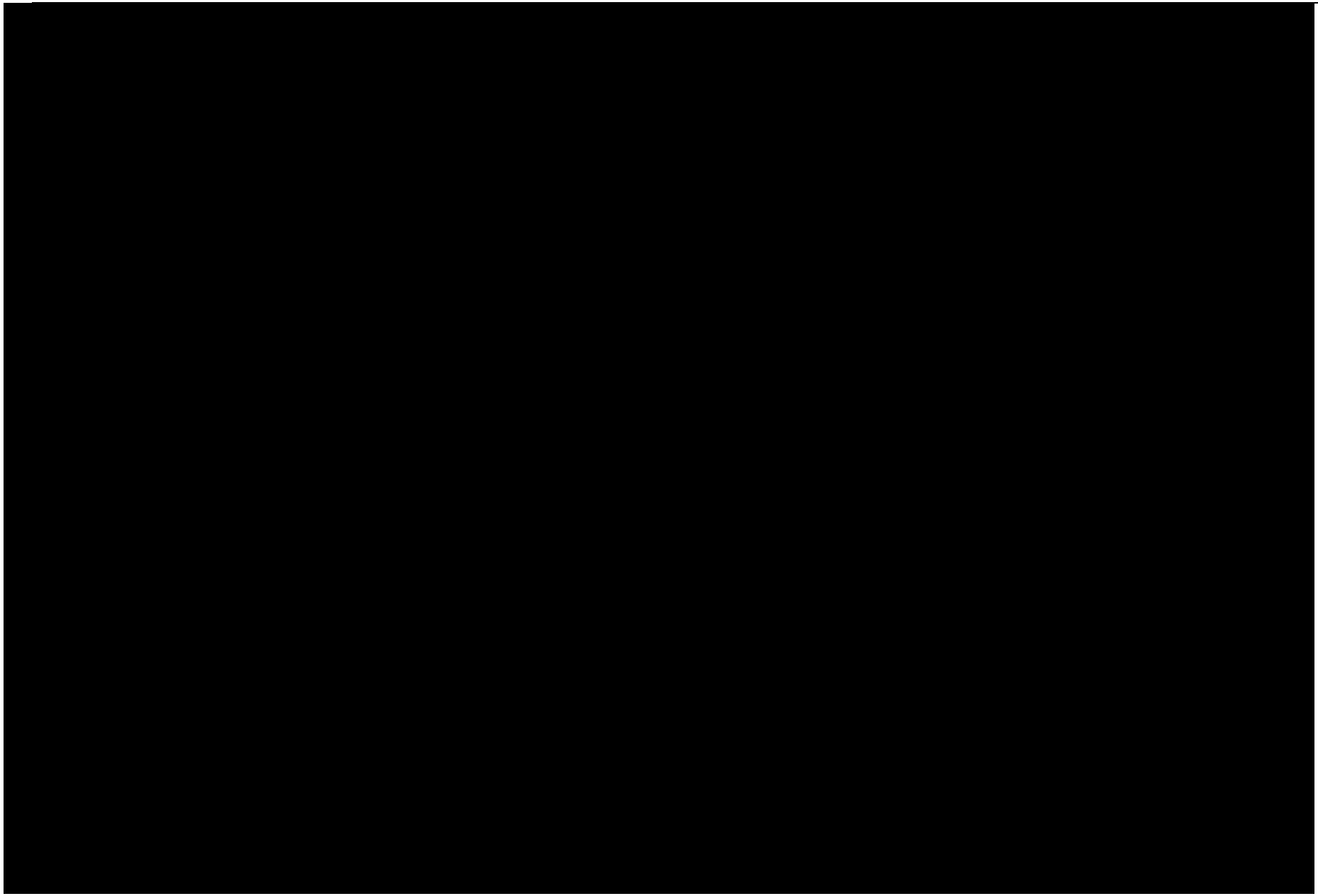


Figure 3-1. Distribution of VSAs within the two potential offset sites.

3.2 Black-cockatoo habitat assessment

3.2.1 Black-cockatoo presence

3.2.1.1 Observations of black-cockatoos at [redacted] site

Carnaby's Black-Cockatoo is known from the [redacted] area, with many records of individuals and flocks (of up to 52 birds) [redacted]. In winter and spring 2024, the authors observed up to 250 individuals in separate roosting flocks near Cooljarloo and Badgingarra town. Furthermore, species foraging, roosting and breeding activities were recorded during surveys supporting the [redacted], and there are many records of occurrence in the 15 km buffer (DCCEEW, 2025). A sampling location for the [redacted] overlooked the [redacted] site and during approximately 22 hours of observations, no Carnaby's were recorded in this area. No Carnaby's Black-Cockatoos were observed during the site inspection either in the project area or nearby, but the birds are highly mobile and cannot be expected to be present at all times.

3.2.1.2 Observations of black-cockatoos at [redacted] site

There are records of Carnaby's Black-Cockatoo from within the 15 km buffer of the [redacted] site, but details of flock size and frequency of occurrence are scant. Site staff at [redacted] were not aware of the frequency of occurrence of Carnaby's but were aware that Western Corellas and Galahs frequented the area. No Carnaby's Black-Cockatoos were observed during the site inspection either in the project area or nearby, but the birds are highly mobile and cannot be expected to be present at all times.

3.2.1.3 Black-cockatoo foraging evidence on [redacted]

No evidence of foraging by Carnaby's Black-Cockatoo was found during the site inspection within the [redacted] offset site boundary. However, in adjacent Kwongan heath west of the site, several *Banksia menziesii* cones with chew marks consistent with Carnaby's were found, and during the [redacted], various items of evidence were found of their presence and foraging along [redacted]. Plate 7 shows an example of the foraging evidence observed on 4th March. The foraging evidence on *B. menziesii* was recent (probably weeks old) and old (possibly around a year old). Marri trees are also present along the creeklines of the Minyulo Brook and Mullering Brook.

3.2.1.4 Black-cockatoo foraging evidence on [redacted]

No evidence of foraging by Carnaby's Black-Cockatoo was found during the site inspection within the [redacted] offset site boundary. However, in Banksia woodland immediately east of the site's boundary, a single *B. menziesii* cone was found with relatively new chew marks consistent with Carnaby's. No further evidence of their presence was found in this area. Plate 8 shows the foraging evidence observed on 4th March. Extensive stands of Banksia heath and woodland abut the site to the northeast.

Plate 7. Slender Banksia (*Banksia attenuata*) cones chewed by Carnaby's Black-Cockatoo found in Kwongan heath reserve 20 m outside the western boundary of [redacted] site. Some were relatively recent and some old.

Plate 8. *Banksia prionotes* cone with chew marks consistent with Carnaby's.

3.2.2 Foraging value (Habitat Quality Score (HQS)) on [redacted] and [redacted]

Foraging habitat on both potential offset sites was limited to the scattered Dwutta (*Eucalyptus todtiana*). These trees had heights of between 4 and 6 m and the density and number of trees on [redacted] was greater than on [redacted]. This eucalypt is known as a valuable food resource for Carnaby's (Groom 2011). The foraging scores for Carnaby's Black-Cockatoo for each VSA are presented in Table 3-1 and Figure 3-2, and details regarding the different elements (vegetation condition, context and stocking rate) are described in detail in Sections 3.2.2.1, 3.2.2.3 and 3.2.2.5.

The overall (rounded) weighted habitat quality score (HQS) for the [redacted] project area is 2/10.

Table 3-1. Foraging scores for each VSA for Carnaby's Black-Cockatoo

Vegetation and Substrate Association (VSA)	Area (ha)	% of total area	Veg'n (/6)	Context (/3)	Density (/1)	HQS (/10)
[redacted]						
VSA 1 – Pasture grassland with scattered Dwutta	45.5	91	1	0	1	**2**
VSA 2 – Parkland woodland over scrub	2.9	6	1	0	1	**2**
VSA 3 – Melaleuca dampland	0.6	1.2	0	0	1	**1**
VSA 4 – Degraded scrub over grassland	0.8	1.5	0	0	1	**1**
VSA 5 – Degraded heath over grassland	0.2	0.5	0	0	1	**1**
Total	50	100.0	Rounded weighted average HQS			**2/10**
[redacted]						
VSA 1 – Pasture grassland with scattered Dwutta	50	100	1	0	0	**1**
Total	50	100.0	Rounded weighted average HQS			**1/10**

3.2.2.1 Vegetation condition score for [redacted]

The [redacted] offset site consists primarily of VSA 1 (Pasture Grassland with scattered Dwutta), with a projected foliage coverage of suitable foraging species (wholly *E. todtiana*) of about 2%. Furthermore, there were several native understorey plants, including *Hakea* sp and *Macrozamia* sp, that occur as part of the surrounding heath and that have self-sown. As a result, a vegetation condition score of 1/6 was assigned to this VSA. Restoration to better quality foraging habitat is discussed in Section 3.3.

The woodland areas of VSA 2 contain several mature and spreading River Red Gums which offer low value foraging for Carnaby's, but has a relatively high foliage cover and also scores 1/6.

Small areas of VSA 3 (Melaleuca Dampland) and VSA 4 (Degraded scrub over grassland) occur in the centre of the site, do not contain food plants for Carnaby's and were therefore assigned a vegetation condition score of 0/6.

VSA 5 (Degraded heath over grassland) contained understorey species from the adjacent heath but none that appeared to be foraging species for Carnaby's. Furthermore, these plants offered very little foliage cover and was assigned a vegetation score of 0/6.

3.2.2.2 Vegetation condition score for [redacted]

The [redacted] offset site consists solely of VSA 1 (Pasture with scattered Dwutta). This site had several stands of Lupins and Wild Radish, both known to be weed species on which Carnaby's have become reliant when native food species are in short supply (Murdoch University 2024). With a projected foliage coverage of suitable foraging species (*E. todtiana*) of about 1% due to the relatively low density of trees and only small areas of weed species, a vegetation condition score of 1/6 was assigned to this VSA. Restoration to better quality foraging habitat is discussed in Section 3.3.

3.2.2.3 Calculation of context score for [redacted]

Based on the native vegetation dataset from DPIRD (2025a) the amount of native vegetation remaining within 15 km of the [redacted] site is c. 30, 688 ha. Therefore, the project area (c. 50 ha) comprises 0.16% of the native vegetation in the 'local area' (see Appendix 3).

For VSA 1 a context score of 0/3 was given. While breeding does occur within 12 km of the site, the vegetation condition score is very low. Vegetation in VSAs 2, 3, 4 and 5 also scored zero for context. This recognises that the vegetation in [redacted] offset site, while providing some foraging value, is less important in the local landscape given the abundance of higher quality foraging habitat nearby.

3.2.2.4 Calculation of context score for [redacted]

Based on the native vegetation dataset from DPIRD (2025a) the amount of native vegetation remaining within 15 km of the [redacted] site is c. 52, 429 ha. Therefore, the project area (c. 50 ha) comprises 0.1% of the native vegetation in the 'local area' (see Appendix 3).

For VSA 1 a context score of 0/3 was given. This VSA as a low condition score, and the project area is adjacent to large swathes of cleared land to the north and west. In addition, breeding is not known to occur within 15 km of the site. This recognises that the vegetation on the [redacted] offset site offers little to Carnaby's in the context of large areas of higher quality foraging habitat nearby.

3.2.2.5 Species density score for [redacted]

Evidence of foraging was not observed within this offset site, but several examples of foraging were present just outside the site boundary, and there are abundant records of Carnaby's Black-Cockatoo nearby (see Section 3.2.1.1). Therefore, it is considered that this species is likely to be regularly present on this site. A species density score of 1 was given only for VSA 1 since it provides foraging habitat.

3.2.2.6 Species density score for [redacted]

Evidence of foraging was not observed within this offset site, and only one example of foraging was found just outside the site boundary. There are few records of Carnaby's Black-Cockatoo nearby, and site staff were not aware of a regular presence (see Section 3.2.1.2). Therefore, it is considered that this species is unlikely to be regularly present in the project area, and a species density score of 0 was given.

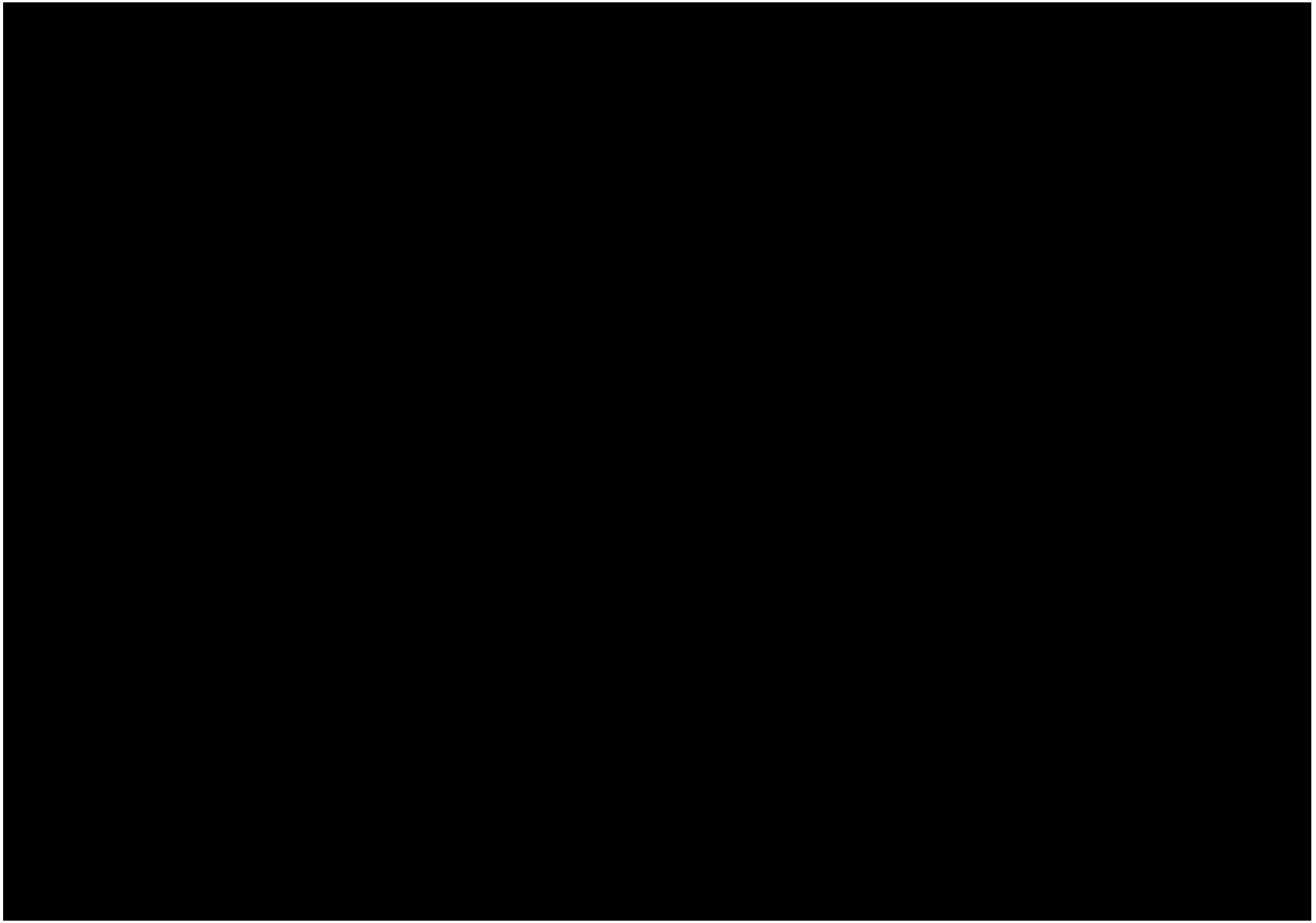


Figure 3-2. Distribution of foraging scores (HQS out of 10) for Carnaby's Black-Cockatoo.

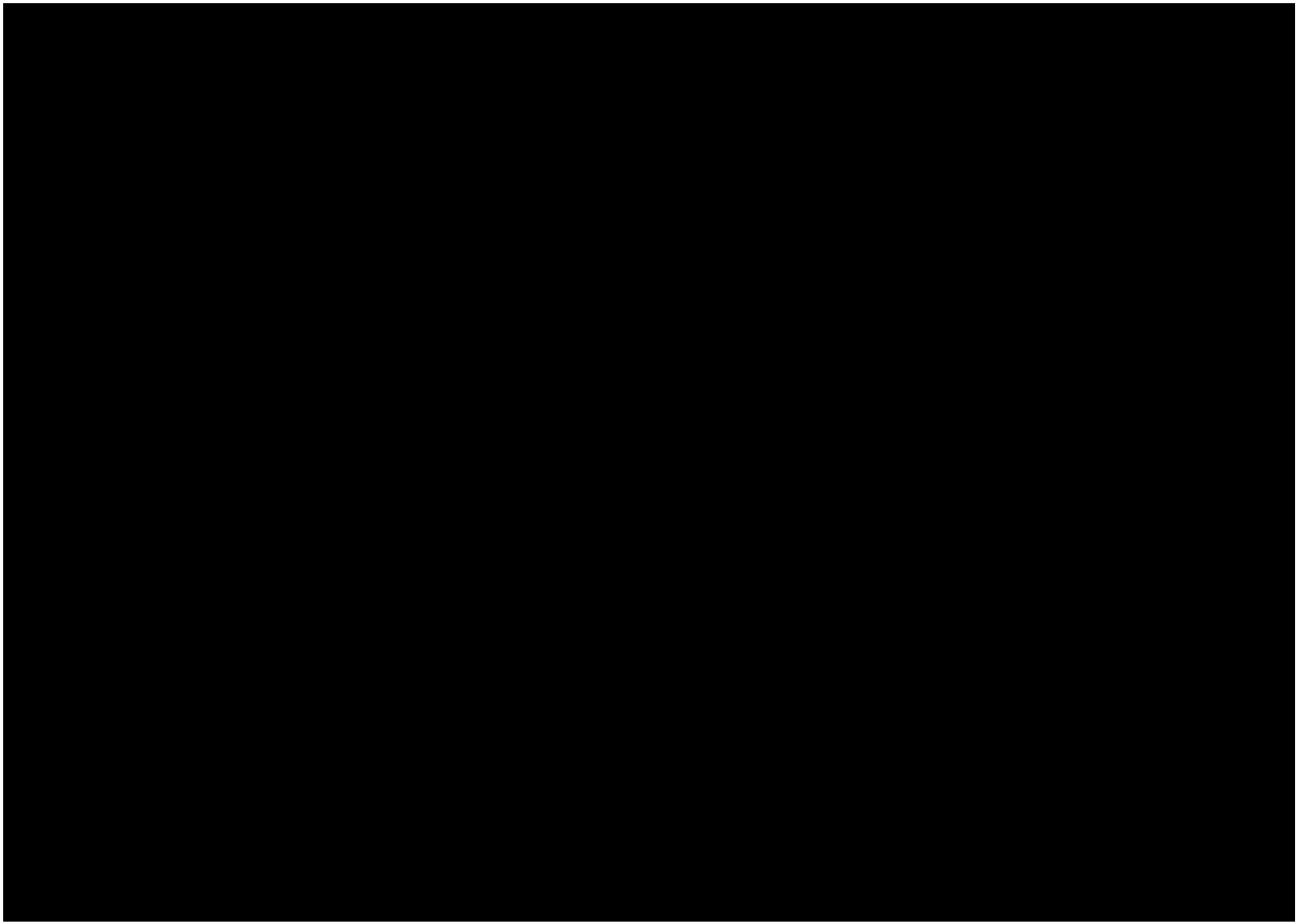


Figure 3-3. Estimated native vegetation in the local area (15 km buffer around each offset site).

3.2.3 Black-cockatoo breeding

3.2.3.1 Black-cockatoo breeding

While there are several large trees on the with diameter at breast height (DBH) of around 800 mm, their trunks divide low down and don't offer large boughs at suitable height. Furthermore, River Red Gums aren't a species known to regularly form hollows suitable for nesting black-cockatoos. There are known breeding sites within 15 km of the site and one pair was recorded to breed successfully in the spring of 2024/25 in the Minyulo Nature Reserve (Shepherd and Bamford 2025). Other known breeding sites occur within

Known breeding areas in the region are shown on Figure 3-4.

3.2.3.2 Black-cockatoo breeding

There are no known roosts or nesting sites within 15 km of the site but the buffered area of the Coomallo breeding area . Breeding is also known to occur in Coorow and Koobabbie respectively (KBA 2025). Known breeding areas in the region are shown on Figure 3-4.

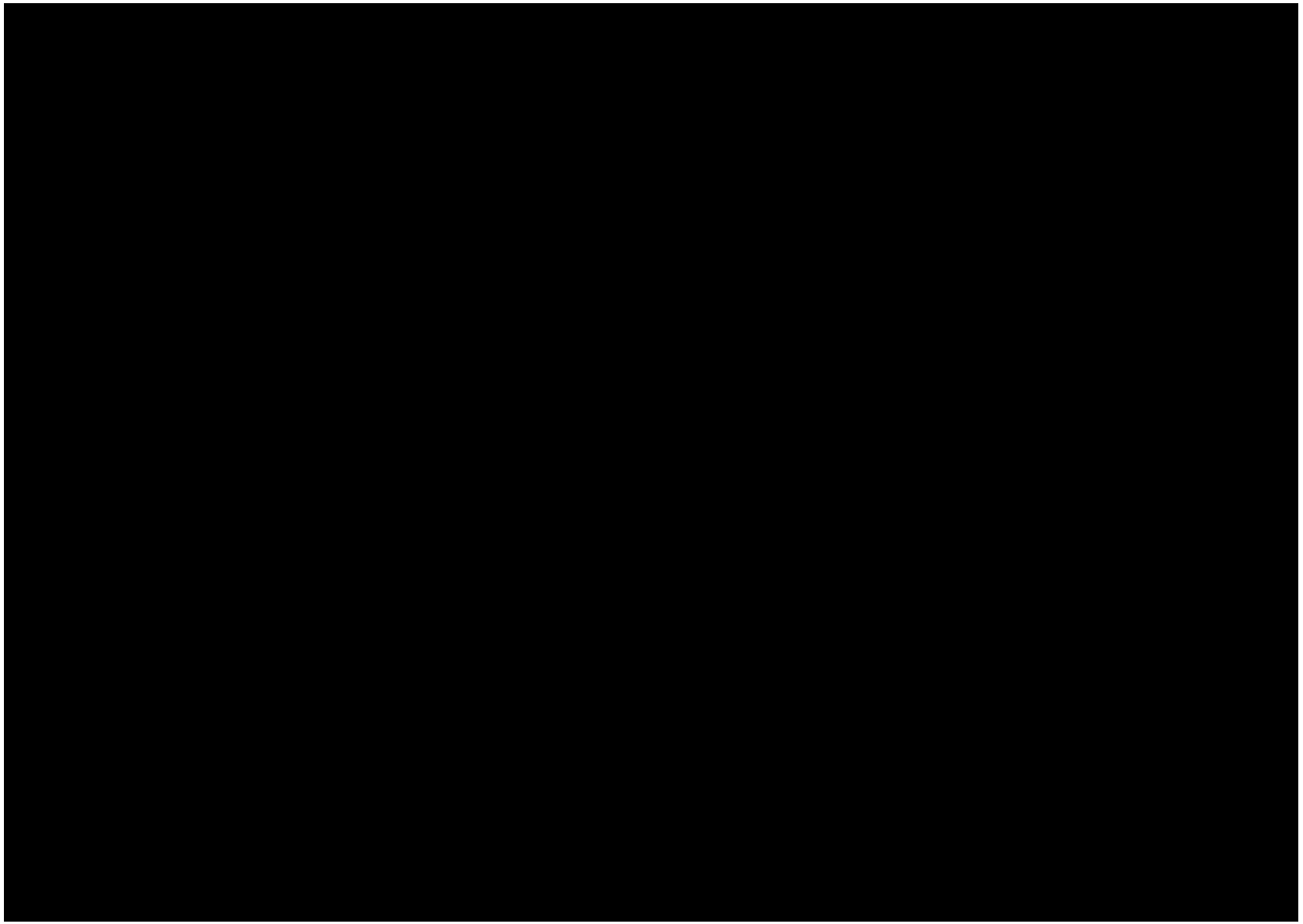


Figure 3-4. Known Carnaby's breeding and roosting sites in the region.

3.2.4 Black-cockatoo night roosting

3.2.4.1 [redacted] Roosts

Despite the River Red Gums on [redacted] being tall enough for roosting Carnaby's, there were no signs of roosting during the site inspection, and none was detected during the [redacted].

BCE identified several previously unknown roosts within 15 km of the [redacted] site during the winter and spring 2024, and confirmed that several other known roosts were being used. These include a small roost of several birds at Waddi Bush Retreat [redacted] on one night only, and another lying just south of [redacted] with an estimated 40 birds maximum. A larger winter-roost of around 250 birds was confirmed active at Cooljarloo Farm in August 2024. It is notable that a known roost at the Billinue Community that lies between the Brand Highway and Cooljarloo Mine Site was not occupied through Winter 2024. A bushfire had swept through the heath to the east of the Brand Highway a year prior and offered little foraging support to birds using the roost trees at the Billinue Community. Several other known roosts within 15 km have been previously identified in the wider region (BirdLife Australia, 2023; Murdoch University 2024; DBCA, 2025b). Known roost locations within the region are shown on Figure 3-4.

3.2.4.2 [redacted] Roosts

There are no trees on the [redacted] site considered suitable for roosting Carnaby's, with the tallest Dwutta being around 6 m high. A number of ornamental River Red Gums have been planted [redacted], and is adequately close to the offset site to be considered a potential roosting location if the foraging and water resources were improved.

The limited number of known roosts within 15 km of the site is potentially due to a lack of survey effort but may also be a reflection of the lack of large trees. Roosting is likely to take place closer to the project area than available data indicate; but the lack of strong foraging evidence or lack of confirmation by site staff that Carnaby's frequent the site, suggest they may not be common and that roosting is farther than the 6 km average range the birds have been recorded from roosts when foraging (Murdoch University 2024). The presence of roost sites nearby could be determined by conducting evening roost site surveys in the appropriate season.

3.2.5 Black-cockatoo watering points

3.2.5.1 [redacted] watering points

The creekline towards the southern end of the [redacted] site contained a small amount of water at the time of survey (see Plate 3), as it had been raining at the start of the site inspection. This is unlikely to be a permanent body of water and is instead likely to be a seasonal seep, offering water only during the wetter periods of the year. A search of aerial photography has identified a number of field dams and watering points in adjacent paddocks. Several sources of standing water and extensive stands of foraging habitat (Kwongan heath and Marri Woodland) lie within the 6 km average flight distance that Carnaby's have been recorded to take (Murdoch University 2024).

3.2.5.2 [redacted] watering points

No permanent water sources were recorded on or close by the [redacted] site. The nearest was a seasonally wet seep and two small ponds that lay circa 1.5 km southeast of the site boundary. Workers on the [redacted] advised that these features would contain water for only three to four months of

the year. From an inspection of aerial photography of the [redacted] area, there are several field dams and water troughs approximately 5.7 km southwest of the site. Pinjarrega Lake lies some [redacted]

Plate 9. Dried seasonal seep approximately 1.5 km southwest of the [redacted] site.

3.3 Offset Site Management

Both sites scored very low on the foraging scoring for Carnaby's. For either of the two sites to prove useful as an offset for the loss of foraging habitat, extensive restoration of native vegetation needs to be undertaken. Provision of offsets will be delayed by some years before restored vegetation is mature enough to offer foraging opportunities for Carnaby's, but will be eventually be a net increase in the area. That the sites can be restored is evidenced by a small number of native plant specimens that have either self-seeded (see Plate 10 for an example on [redacted]) or have been planted as part of a restoration project; although direct seeding was not successful within the offset site on [redacted], planting with stems on an adjacent property has worked as shown in Plate 11. [redacted] offset site would need to be fenced to keep livestock and rabbits out. The site at [redacted] is not grazed by livestock and may not need to be fenced, depending on levels of grazing by rabbits and kangaroos.

Adequate water sources appear to be present at [redacted] and are located within suitable distances to support Carnaby's using the site. There is insufficient year-round water resources available on [redacted] and are only present towards the average range from foraging or roosting areas. Water can be supplied in the form of troughs and may be an appropriate option for both sites to attract birds into each area.

The trees on [redacted] appear suited to a roosting site and have readily accessible and plentiful foraging and water resources in the surrounding landscape. Restoration of the vegetation with a wide variety of food plants is likely to encourage birds in to use as a roost. Furthermore, the artificial nesting tubes could also be installed in the taller trees which may encourage the offset site to become a breeding site as well. The use of wooden tubes would be preferential to prevent overheating of the nest should spring temperatures increase or breeding be delayed. Measures to prevent feral cats from accessing the artificial nests such as wire frames around the trunks would be needed if this measure is adopted.

[redacted] site does not offer roosting or nesting potential at the moment but site staff were supportive of considering the area around the offices for roosting purposes.

Plate 10. Self-seeded *Hakea sp.* within VSA 1 (Pasture) on [redacted] offset site.

Plate 11. Native species replanting on a property adjacent to [redacted].

Other measures that would need to be undertaken include feral predator control. Both Foxes (*Vulpes vulpes*) and Feral Cat (*Felis catus*) are expected to occur on both sites and would need controlling to give all fauna the optimal chances of recolonising the offset sites.

Western Corella were present in high numbers near the [redacted] site and seen to be roosting in several to many hundreds along Mullering Brook. Landowners in the area have advised that both Galah and Western Corellas act aggressively towards black-cockatoos and have [anecdotally] seemed to depress their numbers over the last two decades. The aggressive actions of Corellas and Galahs are well-documented and have been identified as a potential threat to a sustainable population (DPaW 2013). For this reason, measures that may constrain or limit Corellas and Galahs benefiting from the provision of offsets at [redacted] and [redacted] would improve the chances of the offsets being successful.

3.4 Conservation significant fauna

3.4.1 Vertebrate fauna

Key conservation significant fauna expected in the two areas of the offset sites, other than Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo [redacted] only), include the Jewelled Ctenotus (Swan Coastal Plain) (*Ctenotus gemmula*), Black-striped Burrowing Snake (*Neelaps calonotos*) and Brush Wallaby (*Notamacropus irma*), which are all expected to occur within 15 km of one or both the project areas. The Quenda, Woylie and Tammar Wallaby were recorded in Nambung National Park in the early 2000s as part of a translocation project but are otherwise not expected in the project area as they are all considered locally extinct. The Peregrine Falcon is known from the area and may utilise the project area when foraging, but the project area does not contain suitable nesting sites (tall trees or cliff faces). Information on the conservation status, distribution and habitat, salient ecology and expected occurrence within the project area is provided below for key conservation significant vertebrate fauna, including Carnaby's Black-Cockatoo.

Jewelled Ctenotus (Swan Coastal Plain subpopulation) (*Ctenotus gemmula*) CS2 (P3)

Conservation status: Listed as Priority 3 by DBCA.

Distribution and habitat: The Jewelled Ctenotus occurs in two isolated subpopulations in Western Australia: one on the Swan Coastal Plain from Cataby south to Perth, and another along the south coast (IUCN, 2017). The Swan Coastal Plain subpopulation is listed as Priority 3 by DBCA, and is threatened by habitat loss associated with mining and urbanisation (IUCN, 2017). Typical habitat for this species includes *Banksia* and Mallee woodlands and heath on sandplains (IUCN, 2017).

Ecology: A fossorial skink that shelters in leaf litter (Huang, 2009).

Expected occurrence: **Resident.** This species has been recorded by BCE during trapping in Cooljarloo [redacted]. The *Banksia* woodland and heath on sandy soil that lies adjacent both sites provides suitable habitat for this species. The [redacted] project area is probably out of range for the species.

Black-striped Burrowing Snake (*Neelaps calonotos*) CS2 (P3)

Conservation status: Listed as Priority 3 by DBCA.

Distribution and habitat: Restricted to coastal sandplains from near Dongara to Mandurah (Bush *et al*., 2010). Appears to be absent from the eastern coastal plain (M. Bamford pers. obs.). Within the Perth Metropolitan area this species may be restricted to large reserves (How & Shine, 1999).

Ecology: A fossorial species that preys upon small, fossorial skinks in the upper layers of loose sand (Bush *et al*., 2010).

Expected occurrence: **Resident.** This species has been recorded by BCE during trapping in Cooljarloo [redacted] is within the distribution of this species but [redacted] is probably outside its range. Clearing and grazing probably mean that the environment at [redacted] is currently unsuitable.

Brush Wallaby (*Notamacropus irma*) CS2 (P4)

Conservation status: Listed as Priority 4 by DBCA.

Distribution and habitat: Endemic to the South-West more or less south of line from Geraldton to Esperance, although it has disappeared from much of the Wheatbelt due to clearing. Occurs in a wide range of vegetation types from Eucalypt Woodland to Banksia Woodland, Shrublands and Kwongan. Locally common in dry sclerophyll forest and woodland in the south-west however it has declined in recent decades due to predation and habitat destruction (Menkhorst & Knight, 2011).

Ecology: Based on detailed radio-tracking study in Banksia Woodland in Whiteman Park (Bamford & Bamford, 1999), a largely solitary species that browses on shrubs and bushes; rarely on grass. Rarely drinks free-standing water and rarely ventures from dense vegetation. Individuals occupy home ranges of up to c. 10 ha; larger in males than females and those of females overlap.

Expected occurrence: **Resident.** It is expected to be present in native vegetation lying adjacent both offset sites, in areas where the understorey is dense and provides sufficient shelter. It is regularly recorded in the Cooljarloo area (BCE database). Individuals could move into the offset areas to graze, although the animals are cautious about venturing far from cover (M. Bamford pers. obs.).

Carnaby's Black-Cockatoo (*Zanda latirostris*) CS1 (E, S2D2)

Conservation status: Endangered under the EPBC Act and Schedule 2 Division 2 under the BC Act.

Distribution and habitat: Endemic to south-western Western Australia, from Kalbarri in the north, east to Merredin and Ravensthorpe, and then further east along the south coast to the Esperance area (DCCEEW, 2023c; Johnstone & Storr, 1998). Breeds (July to December) predominantly in the east of its range with a migration to coastal areas in the non-breeding period. In recent years, however, the species has expanded 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 (DCCEEW, 2023c). Heavily reliant on areas of Banksia woodland and proteaceous shrubland/heath for foraging (DCCEEW, 2023c; Johnstone & Storr, 1998).

Ecology: Diurnal granivore, feeding predominantly on the seeds of the Proteaceae (especially banksias) but also known to feed on a very wide variety of plants, including non-native ornamentals and plantation species such as pine (DCCEEW, 2023c; DPaW, 2013; Groom, 2011; Johnston *et al*., 2016; Valentine & Stock, 2008). Reliant on large tree-hollows in eucalypts (especially smooth-barked species such as Wandoo and Salmon Gum) for breeding (DCCEEW, 2023c; Johnstone & Storr, 1998; Saunders, 1974). Threatened by habitat loss, habitat degradation, nest hollow shortage, and competition for available nest hollows from other parrots and feral Honeybees, illegal shooting and illegal trade (Burbidge, 2004; DCCEEW, 2023c).

Expected occurrence: Regular visitor to [redacted], Irregular Visitor to [redacted]. There is moderate quality foraging habitat in the project area and evidence of foraging was observed during the site inspection in March 2024, as well as a feather from an individual. It is likely that Carnaby's Black-Cockatoo visits the project area regularly to forage, but there were no potential nest trees and no signs of roosting observed in the project area. Full details of the black-cockatoo habitat assessment are provided below in Section 3.2

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) CS1 (E, S2D2)

Conservation status: Endangered under the EPBC Act and Schedule 2 Division 2 under the BC Act.

Distribution and habitat: Endemic to south-western Western Australia, traditionally from Dandaragan in the north, east to Narrogin and Gnowellen along the south coast (DCCEEW, 2025). In recent years, however, the species has expanded its range northwards as far as Jurien Bay and into the Swan Coastal Plain where it can be seen daily throughout much of the year. Breeds throughout the year but with a peak between April and June and mostly within the Jarrah and Marri forrests. Heavily reliant on areas of Marri for foraging with increasing reliant on exotics including Cape Lilac (DCCEEW, 2023b; Johnstone & Storr, 1998). This species is unlikely to extend as far north as [redacted].

Ecology: Diurnal granivore, feeding predominantly on the seeds of the Eucalypts (especially Marri, Jarrah, Sheoak) but also known to feed on a very wide variety of plants, including non-native ornamentals and plantation species such as pine (DCCEEW, 2023b; DPaW, 2013; Groom, 2011; Johnston *et al*., 2016; Valentine & Stock, 2008). Reliant on large tree-hollows in eucalypts for breeding (DCCEEW, 2023b; Johnstone & Storr, 1998; Saunders, 1974). Threatened by habitat loss, habitat degradation, nest hollow shortage, and competition for available nest hollows from other parrots and feral Honeybees, illegal shooting and illegal trade (Burbidge, 2004; DCCEEW, 2023b).

Expected occurrence: **Irregular visitor.** There is very little foraging habitat on either site for this species but the Waddi woodlands along nearby creeklines to the [redacted] offers some foraging and evidence was found in 2024. It is likely that Forest Red-tailed Black-Cockatoo visits the [redacted] area irregularly in transiting. [redacted] lies outside of the range of this species and therefore unlikely to occur here.

3.4.2 Invertebrate fauna

Invertebrate fauna of conservation significance include listed threatened species and short-range endemic (SRE) (or potential SRE) species; although it should be noted that SRE and potential SRE species are often not well documented. The project area sits within DBCA's Midwest management region (DBCA, 2023), within which DBCA (2025e) has listed 22 threatened or priority invertebrate fauna. The project area is not within the range of all 22 species. Based on previous surveys and records within the region, some of these listed species may be present in the project area.

Bothriembryon perobesus (a bothriembryontid land snail (Moore River), P1) was collected about 20 km south of the project area in 2012 (Bennelongia, 2013). Suitable habitat includes *Banksia* woodland and low shrubland on sandy soils (Bennelongia, 2021), similar to that adjacent to [redacted].

Native vegetation broadly in the region of both offset areas may therefore provide suitable habitat for several conservation significant insects, possibly including:

- *Austrosaga spinifer*, spiny katydid (Swan Coastal Plain) (P2)
- *Hemisaga vepreculae*, thorny bush katydid (Moora) (P2)
- *Hylaeus globuliferus*, woolybush bee (P3)
- *Synemon gratiosa*, Graceful Sunmoth, (P4), dependent on presence of host plant species (*Lomandra hermaphrodita* or *Lomandra maritima*)

These species, however, rely on intact native vegetation and the level of degradation in both offset areas makes their presence unlikely. Similarly, several mygalomorph spiders (genera include *Aname, Idiosoma, Kwonkan, Aganippe*) and several *Antichiropus* millipedes thought to be SRE species have been recorded in the Cooljarloo region in previous surveys by BCE (Bamford *et al*., 2012). The level of clearing and degradation in both offset areas makes the presence of such species unlikely, but they may occur in adjacent areas.

3.5 Patterns of biodiversity

Investigating patterns of biodiversity can be complex and are often beyond the scope even of detailed or targeted investigations, but it is possible to draw some general conclusions based upon the VSAs present on the two offset sites. More importantly, it is what the two sites may offer if vegetation is restored similar to that in the adjacent Banksia heath and woodlands.

The landscape on both sites is relatively uniform, being comprised mostly of pasture and scattered Dwutta. [redacted] also includes scrub, small stands of eucalypts and a wet seep thus adding to the complexity and opportunities for faunal diversity. [redacted] pastoral grassland has been cultivated for native seeding in recent years which has added to its levels of disturbance. The open paddocks offer very little shelter for ground-dwelling fauna (such as reptiles, frogs, and small mammals), but some reptile burrows were noted on [redacted], mostly associated with Dwutta and scrub. It is unlikely that [redacted] currently supports the conservation significant Black-striped Burrowing Snake or Jewelled Ctenotus. However, once vegetation has been restored to heath or Banksia woodland, these species may eventually return to the site. [redacted] is likely to be outside of the range of these two species. Once Banksia heath has been restored, the foraging value for Carnaby's Black-Cockatoo will increase substantially, and likely to provide habitat for other fauna. The *Melaleuca* dampland of VSA 3 is expected to have a lower fauna species richness but the heavier and seasonally damp soils may be important for range restricted invertebrates, and the small area of seasonal inundation may be sufficient for frogs to breed. The plant species present provide low value foraging habitat for Carnaby's Black-Cockatoo, in the form of *Melaleuca* shrubs. The substrate here may be less suitable for the Black-striped Burrowing Snake and Jewelled Ctenotus, particularly during inundation. It is possible that the Brush Wallaby will utilise denser areas of vegetation where sufficient shelter is provided.

3.6 Ecological processes

The nature of the landscape and the fauna assemblage indicate some of the ecological processes that may be important for ecosystem function (see Appendix 1 for descriptions and other ecological processes). The main ecological processes which have affected and continue to affect the fauna assemblage are likely to be: (i) drought and extreme weather events, (ii) existing habitat loss, as the region has experienced very high levels of land clearing historically, and only small, generally isolated patches of remnant vegetation remain; (iii) landscape connectivity, because of the highly fragmented nature of vegetation in the area; and (iv) the presence and abundance of feral and some overly abundant native species (eg Western Corellas), (v) local hydrological changes, and (vi) bush fire. These and additional ecological processes which are affecting fauna are discussed here:

Drought and extreme weather events

The extreme heat and dryness of the summer of 2023/24 has impacted native vegetation across the south-west of Western Australia. This has been expressed in areas around both sites, whereby

Banksias, Hakeas, acacias and eucalypts failed to flower, and large stands of pine trees have perished. Since Carnaby's in particular are dependent on the flowers and seed cones of these plants, their food resources will likewise be limited for a time in these areas, placing added pressure on remaining habitat.

Existing habitat loss

The region in which the two offset sites are located has had large areas of native vegetation cleared for agriculture. While both sites have been largely cleared of native vegetation, large swathes of native vegetation remain within 15 km. However, the high level of land clearing in the region will have contributed to the loss and decline of many fauna species, such as the locally extinct species detailed in Appendix 6. As the current project area is being considered as an offset and vegetation will need to be restored to make them viable as offsets, there is no proposed reduction in existing habitat. However, localised events such as bushfires can temporarily result in habitat loss for native fauna. The connection between the two sites and the large area of native vegetation nearby is likely to provide a buffer against such events, as fauna can escape into adjacent habitat and return once the habitat has regenerated.

Temporary loss of habitat through bushfire will also affect ecological processes and reduce the habitat for some species including Carnaby's. Bushfire in Banksia heath was extensive in the spring of 2024 across the Nambung National Park. Fire events in Banksia heath will prevent the majority of Carnaby's foodplants from flowering for a number of years and likely lead to regional changes in abundance, or use of traditional roosts and breeding sites. In turn, this will place greater pressure on the tree hollows that are in range of suitable foraging habitat.

Landscape connectivity

In the broader region, habitat loss has led to fragmentation of vegetation and loss of landscape connectivity, which has also contributed to the loss and decline of many fauna species, as indicated by the large number of species (especially mammals) that are considered locally extinct in the area. Despite the two sites being largely devoid of native vegetation, they both lie adjacent to large areas of native vegetation (that includes several protected areas in the form of National Parks and Nature Reserves), and landscape connectivity to native vegetation on a local scale is therefore expected to be good.

Feral/introduced species and interactions with over-abundant native species

Introduced species occur throughout Western Australia and it is expected that species such as the Feral Cat, Red Fox, European Rabbit and House Mouse are present on or adjacent to both potential offset sites. Introduced species are likely to add considerable pressure on the native fauna in the region, including the key conservation significant species supported by the project area. Foxes and Feral Cats impact native fauna via predation, and Rabbits may compete with native fauna for resources and cause degradation of vegetation. Increasingly, Western Corellas and Galahs are aggressively competing with Carnaby's for tree hollows in particular. Western Corellas also seem to damage large trees to the extent they won't provide habitat as long as they otherwise would.

Local hydrology

The *Melaleuca* dampland appears to be subject to seasonal inundation and this may influence the fauna assemblage supported by the project area. The fauna assemblage may vary seasonally depending on inundation. Banksias can also be sensitive to local hydrology. Extensive planting as part of the vegetation restoration and subsequent evapotranspiration, may also influence local water table and affect the seasonality of water in the seep.

Fire

Native vegetation in the survey areas is subject to fire and while appropriate fire regimes can benefit biodiversity, inappropriate regimes can lead to a loss of biodiversity. There is probably no current managed fire regime. No signs of burnt vegetation were observed on either site during the visit.

4 Summary of fauna values

Vegetation and Substrate Associations (VSAs). Five VSAs were identified in relation to fauna in the [redacted] potential offset site, while only one made up the [redacted] potential offset site. The majority of the two sites is made up of pasture comprised of sown grasses for grazing livestock, with scattered Dwutta (VSA 1). Both sites have some other plants including self-seeded natives on [redacted] and Lupins (sown as nitrogen fixer) on [redacted]. [redacted] has greater VSA diversity with three small stands of eucalypt woodland over scrub (VSA 2), Melaleuca dampland (VSA 3) which has both grassland and reeds for ground cover, degraded Melaleuca scrub over grassland (VSA 4), and a small patch of degraded heath on grassland (VSA 5). The soils on both sites are similar with loamy sands throughout, but [redacted] also has a laterite outcrop under VSA 5. Both sites are adjacent to large stands of native Banksia heath.

Key species of conservation significance. The two sites are expected to support four key conservation significant vertebrate species: the Jewelled Ctenotus (CS2 (P3)), Black-striped Burrowing Snake (CS2 (P3), Carnaby's Black-Cockatoo (CS1 (EN, S2D2)) and the Brush Wallaby (CS2 (P4)). The targeted black-cockatoo assessment is summarised below.

It is likely that the Banksia heath and woodlands adjacent the two sites will support a variety of conservation significant invertebrates, including species listed under federal and/or state publications, as well as a suite of short-range endemic (SRE) or potential SRE species.

Black-cockatoo assessment. The [redacted] offset site is outside of range for Baudin's Black-Cockatoo. Carnaby's Black-Cockatoo is expected as a regular visitor while Forest Red-tailed Black-Cockatoo is an irregular visitor. Carnaby's roost and breed within 11 km of [redacted] Suitable foraging habitat for Carnaby's Black-Cockatoo is present adjacent [redacted] in the form of Kwongan heath, rich in food plants of *Banksia* and *Hakea,* and woodlands containing Marri lie along the Mullering and Minyulo brooks. Forest Red-tailed Black-Cockatoo are expected to be an irregular visitor to woodland in the [redacted] area.

[redacted] lies outside of the range of Baudin's and Forest Red-tailed Black-Cockatoos. The western form of the Red-tailed Black-Cockatoo (*Calyptorhynchus banksii escondidus*) (Least Concern), may occur as an irregular visitor to the [redacted] area. While [redacted] lies inside the range of Carnaby's, there appears to be little Carnaby's activity in the area and is outside of foraging range from known roosts and breeding areas. It also lies some 56 km from the habitat to be cleared and unlikely to directly benefit the groups of Carnaby's that may be impacted by the proposed vegetation clearance. Consequently, [redacted] is less attractive than [redacted] as an offset site, and potentially carries high risk that it will not benefit Carnaby's to the extent desired.

Both sites offer low value foraging habitat for Carnaby's and would need to be restored through extensive replanting of native vegetation. The presence of scrub, trees and a seasonal wet seep on [redacted] increases its baseline value slightly over the [redacted] site. Returning the sites to native vegetation similar in plant species assemblage to that in the adjacent heaths would be a net gain once site restoration is achieved. Both sites would benefit from provision of standing water, though adequate supplies are in existence around [redacted]. Roosting trees are present on [redacted] (though no roosting was observed) and suitable trees lie within 1 km of the [redacted] offset site. Both sites could be made more attractive to Carnaby's through the installation of artificial nesting hollows in suitable trees present on or close by.

Both sites would need to employ a feral and pest species control programme for cats, foxes, rabbits and Corellas to maximise the attractiveness for Carnaby's and reduce the threats known to constrain the recovery of this species.

Summary of black-cockatoo assessment:

- Foraging value – both sites offer low foraging value for Carnaby's Black-Cockatoo, but [redacted] is slightly more attractive due to existing scrub and mature planted Eucalypts. [redacted] scored a weighted (rounded) average foraging score of 2/10, while [redacted] scored 1/10.
- Breeding value – large Eucalypts present on [redacted] were not suitable for nesting, but could be fitted with artificial hollows. Nesting hollows are considered one of the most limited of all resources on which black-cockatoos depend. No large trees were present on the [redacted] site, but large Eucalypts were present on the property and within 1 km. These could also be fitted with artificial hollows. The closest known breeding sites are within [redacted] and [redacted].
- Roosting value – Several trees deemed suitable for roosting were present on [redacted], and though none existed on [redacted], suitably large ornamental trees were present within 1 km. Several known and confirmed roosts from survey work conducted in spring 2024 occur near [redacted] including 3 km to the north, and 8 km to the east. These had between 5 and 25 individuals. A larger roost of up to 250 birds was confirmed in spring 2024 just [redacted] offset site. The closest known roost to [redacted] lies [redacted] and was also confirmed active in spring 2024 with a maximum of around 250 birds (P. Smith personal communication, 26 March 2025).

Patterns of biodiversity. The vegetation on both sites is relatively uniform, being comprised mostly of pasture and scattered Dwutta. Scrub, small stands of Eucalypts and a wet seep also occurs on [redacted] which adds to the baseline value to native wildlife and to the complexity and opportunities for diversity. [redacted] has been cultivated for native seeding in recent years which has increased the level of disturbance on this site. The open paddocks otherwise offer very little shelter for ground-dwelling fauna but once the vegetation has been restored, both areas have the potential of supporting a diverse fauna, including conservation significant species. Once Banksia heath and woodland is restored and matured to self-sustaining vegetation, the foraging for Carnaby's Black-Cockatoo will increase in value.

Key ecological processes. The main ecological processes which have affected and continue to affect fauna assemblages in this region are likely to be: (i) drought and extreme weather events, (ii) existing habitat loss, (iii) landscape connectivity, (iv) the presence and abundance of feral and overly-abundant native species (eg Western Corellas), (v) local hydrological changes, and (vi) bush fire. Individually, these can influence the presence of fauna significantly, but can also act in concert and additively affect individual species. Carnaby's is known to be vulnerable to several of these and instances of impacts from fire, drought and feral species have been documented in the region in recent years. These factors will need to be considered in management plans for the offset sites.

5 References

ALA. (2025). *Atlas of Living Australia*. http://www.ala.org.au

Bamford, M. J., & Bamford, A. R. (1999). *A study of the Brush or Black-gloved Wallaby Macropus irma (Jourdan 1837) in Whiteman Park. Report. Whiteman Park.*

Bamford, M. J., & Calver, M. C. (2012). Cat predation and suburban lizards; a 22 year study at a suburban Australian property. *The Open Conservation Biology Journal*, *6*, 1–11.

Bamford, M. J., Everard, C., & Bancroft, W. J. (2012). *Tiwest Joint Venture. Annual Progress Report—2011. Fauna Investigations at Cooljarloo: Falcon North, North Mine and South Mine*. Unpublished report prepared for Tiwest Joint Venture, Cooljarloo, by M. J. and A. R. Bamford Consulting Ecologists.

Bancroft, W. J., & Bamford, M. J. (2021). *Perth Airport Pty Ltd: Fauna Impact Assessment for the Airport North Project*. Unpublished report to Perth Airport Pty Ltd by M. J. and A. R. Bamford Consulting Ecologists.

Beard, J. S., Beeston, G. R., Harvey, J. M., Hopkins, A. J. M., & Shepherd, D. P. (2013). The vegetation of Western Australia at the 1:3,000,000 scale. Explanatory memoir. Second edition. *Conservation Science Western Australia*, *9*, 1–152.

Bennelongia. (2013). *Cooljarloo West Proposal: Short Range Endemic Fauna, Pilot and Targeted Surveys. Final report, prepared for Tronox Pty Ltd*.

Bennelongia. (2021). *Arrowsmith North Project SRE Invertebrate Desktop Assessment. Prepared for VRX Silica Limited.*

BirdLife Australia. (2024). *Black-cockatoo roosting dataset up to 2023*. BirdLife Australia.

BOM. (2023). *Climate Data Online*. Commonwealth of Australia, Bureau of Meteorology. http://www.bom.gov.au/climate/data/index.shtml?bookmark=200&view=map

Burbidge, A. A. (2004). *Threatened Animals of Western Australia.* Department of Conservation and Land Management.

Bush, B., Maryan, B., Browne-Cooper, R., & Robinson, D. (2010). *Field Guide to Reptiles and Frogs of the Perth Region*. Western Australian Museum.

Calver, M. C., Lymbery, A. J., McComb, J., & Bamford, M. J. (2009). *Environmental Biology*. Cambridge University Press.

DAWE. (2022). *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black-cockatoo*. Department of Agriculture, Water and the Environment.

DBCA. (2023). *Priority Ecological Communities for Western Australia Version 35*. Species and Communities Program, Department of Biodiversity, Conservation, and Attractions. www.dbca.wa.gov.au/media/1730/download

DBCA. (2025a). *Black Cockatoo Breeding Sites—Buffered (DBCA-063)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/dataset/black-cockatoo-breeding-sites-buffered

DBCA. (2025b). *Black Cockatoo Roosting Sites—Buffered (DBCA-064)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/dataset/black-cockatoo-roosting-sites-buffered

DBCA. (2025c). *Directory of Important Wetlands in Australia—Western Australia (DBCA-045)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/tr/dataset/directory-of-important-wetlands-in-western-australia

DBCA. (2025d). *Ramsar Sites (DBCA-010)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/tr/dataset/ramsar-sites

DBCA. (2023e). *Threatened and Priority Fauna Database*. Department of Biodiversity, Conservation and Attractions.

DBCA. (2023f). *Threatened Ecological Communities (DBCA-038)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/tr/dataset/threatened-ecological-communities

DCCEEW. (2020). *Collaborative Australian Protected Areas Database (CAPAD) 2020*. https://www.dcceew.gov.au/environment/land/nrs/science/capad/2020

DCCEEW. (2023a). *Australia's bioregions (IBRA)*. Department of Climate Change, Energy, the Environment and Water. https://www.dcceew.gov.au/environment/land/nrs/science/ibra#ibra

DCCEEW. (2023b). *Calyptorhynchus banksii naso in Species Profile and Threats Database*. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=67034

DCCEEW. (2023c). *Calyptorhynchus (Zanda) latirostris in Species Profile and Threats Database*. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=87737

DCCEEW. (2025). *Protected Matters Search Tool*. Department of Climate Change, Energy, the Environment and Water. https://www.environment.gov.au/epbc/protected-matters-search-tool

DCCEEW. (undated). *How to use the Offsets Assessment Guide.* https://www.agriculture.gov.au/sites/default/files/documents/offsets-how-use.pdf

DEE. (2017). *Revised draft referral guideline for three threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo.* Department of the Environment and Energy, Commonwealth of Australia.

DEH. (2000). *List of marine species—Declaration under s248 of the EPBC Act*. Department of the Environment and Heritage. https://www.legislation.gov.au/Details/F2008B00465

DEH. (2006). *Protected marine species—Identification guide.* Department for Environment and Heritage. https://www.environment.gov.au/marine/publications/protected-marine-species-identification-guide

Dell, J., & Banyard, J. (Eds.). (2000). *Bush Forever*. Department of Environmental Protection.

Department of Environment and Conservation. (2012). *Carnaby's [Black-] Cockatoo Recovery Plan. Western Australian Wildlife Management Program No. 52.* Prepared by the Department of Environment and Conservation.

Desmond, A. and Chant, A. (2001). Geraldton Sandplain 3 (GS3 - Leseur Sandplain subregion). in May, J.E. and McKenzie, N.L. (2002) *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*. Prepared by the Department of Conservation and Land Management.

DPaW. (2013). *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan*. Department of Parks and Wildlife.

DPIRD. (2025a). *Native Vegetation Extent (DPIRD-005)*. Department of Primary Industries and Regional Development. https://catalogue.data.wa.gov.au/dataset/native-vegetation-extent

DPIRD. (2025b). *Pre-European Vegetation (DPIRD-006)*. Department of Primary Industries and Regional Development. https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006

DPIRD. (2025c). *Soil Landscape Mapping—Best Available (DPIRD-027)*. Department of Primary Industries and Regional Development. https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available

DSEWPaC. (2012). *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii, Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso*. Department of Sustainability, Environment, Water, Population and Communities.

DWER. (2025a). *Clearing Regulations—Environmentally Sensitive Areas (DWER-046)*. Department of Water and Environmental Regulation. https://catalogue.data.wa.gov.au/tr/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046

DWER. (2025b). *Environmentally Sensitive Areas*. Department of Water and Environmental Regulation. https://www.der.wa.gov.au/your-environment/environmentally-sensitive-areas

DWER. (2025c). *Index of Biodiversity Surveys for Assessments (IBSA)*. Department of Water and Environmental Regulation. https://biocollect.ala.org.au/ibsa#max%3D20%26sort%3DdateCreatedSort

Ecologia. (2016). *Supplementary Flora, Vegetation and Fauna Survey.* Unpublished report prepared for Waddi Wind Farm Pty Ltd.

EPA. (2002). *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3*. Environmental Protection Authority.

EPA. (2004). *Guidance for the assessment of environmental factors: Terrestrial fauna surveys for environmental impact assessment in Western Australia. No. 56*. Environmental Protection Authority.

EPA. (2020). *Technical Guidance—Terrestrial vertebrate fauna surveys for environmental impact assessment*. Environmental Protection Authority. https://www.epa.wa.gov.au/policies-guidance/technical-guidance-terrestrial-vertebrate-fauna-surveys-environmental-impact.

GHD (2015). *Level 1 terrestrial vertebrate fauna survey.* Unpublished report prepared on behalf of Main Roads WA.

Groom, C. (2011). *Plants Used by Carnaby's Black Cockatoo*. Department of Environment and Conservation.

Harvey, M. S. (2002). Short-range endemism among the Australian fauna: Some examples from non-marine environments. *Invertebrate Systematics*, *16*, 555–570.

How, R. A., & Shine, R. (1999). Ecological traits and conservation biology of five fossorial "sand-swimming" snake species (Simoselaps: Elapidae) in south-western Australia. *Journal of Zoology*, *249*, 269–282.

Huang, N. (2009). *REPTILE FAUNA OF THE GNANGARA SUSTAINABILITY STRATEGY STUDY AREA: A LITERATURE REVIEW*. Department of Environment and Conservation.

IUCN. (2017). *Ctenotus gemmula: Maryan, B., Shea, G., Gaikhorst, G., Lloyd, R., Ford, S., Sanderson, C., Craig, M. & Bamford, M.: The IUCN Red List of Threatened Species 2017: e.T178503A101748202* [dataset]. https://doi.org/10.2305/IUCN.UK.2017-3.RLTS.T178503A101748202.en

Institution: International Union for Conservation of NatureDOI: 10.2305/IUCN.UK.2017-3.RLTS.T178503A101748202.en

Johnston, T. R., Stock, W. D., & Mawson, P. R. (2016). Foraging by Carnaby's Black-Cockatoo in Banksia woodland on the Swan Coastal Plain, Western Australia. *Emu*, *116*(3), 284–293.

Johnstone, R. E., Kirkby, T., & Mannion, M. (2015). Trials on the use and effectiveness of artificial nest hollows for Carnaby's Cockatoo at Cataby, Western Australia. *The Western Australian Naturalist*, *29*(4), 250–262.

Johnstone, R. E., & Storr, G. M. (1998). *Handbook of Western Australian birds. Volume 1: Non-passerines (Emu to Dollarbird)* (Vol. 1). Western Australian Museum.

KBA. (2025). *Key Biodiversity Areas – map search*. https://www.keybiodiversityareas.org/sites/search

Key Biodiversity Areas Partnership. (2024). *Key Biodiversity Areas factsheet: Cataby. Extracted from the World Database of Key Biodiversity Areas. Developed by the Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Re:wild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society.* https://www.keybiodiversityareas.org/site/factsheet/26504

Menkhorst, P., & Knight, F. (2011). *A Field Guide to the Mammals of Australia*. Oxford University Press.

Mitchell, D. S., Williams, K., & Desmond, A. (2003). Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion). In CALM (Ed.), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (pp. 606–623). Department of Conservation and Land Management.

Murdoch University (2024). Warren, K. and Shephard, J. (Authors). Output 1 - Desktop analysis of clack cockatoo tracking data to show movement and site utilisation of Carnaby"s cockatoos in the Cataby Region with reference to the Waddi Wind Farm. A letter to Peta Brunel, 12th June 2024.

Outback Ecology (2014). Waddi Wind Farm spring Flora and Vegetation Survey and Black Cockatoo Habitat Survey. Unpublished report prepared for RPS.

Saunders, D. A. (1974). Breeding biology of the Short-billed form of the White-tailed Black Cockatoo Calyptorhynchus baudinii latirostris (Carnaby). *Emu*, *74*, 292–293.

Schoknecht, N. R., Tille, P. J., & Purdie, B. R. (2004). *Soil-landscape mapping in south-Western Australia: An overview of methodology and outputs, Resource management technical report 280*. Department of Agriculture and Food. https://library.dpird.wa.gov.au/cgi/viewcontent.cgi?article=1262&context=rmtr

Scott, J. K., & Black, R. (1981). Selective Predation by White-Tailed Black Cockatoos on Fruit of Banksia attenuata Containing the Seed-Eating Weevil Alphitopis nivea. *Australian Wildlife Research*, *8*(2), 421–430.

Shepherd, B. and Bamford, M.J. (2025). *Waddi Wind Farm Project Carnaby's Black-Cockatoo and Fork-tailed Swift Utilisation Survey Report.* Unpublished report prepared on behalf of Waddi Wind Farm Pty Ltd.

Stock, W. D., Finn, H. C., Parker, J., & Dods, K. (2013). Pine as Fast Food. Foraging Ecology of an Endangered Cockatoo in a Forestry Landscape. *PLoS ONE*, *8*.

Thackway, R., & Cresswell, I. D. (1995). *An Interim Biogeographic Regionalisation for Australia: A framework for establishing the national system of reserves, Version 4.0*. Australian Nature Conservation Agency.

Valentine, L., & Stock, W. (2008). *Food Resources of Carnaby's Black-Cockatoo (Calyptorhynchus latirostris) in the Gnangara Sustainability Strategy study area*. Unpublished report to Forest Products Commission by the Centre for Ecosystem Management, Edith Cowan University, and the Department of Environment and Conservation.

6 Appendices

Appendix 1. Explanation of fauna values.

Fauna values are the features of a site and its fauna that contribute to biodiversity, and it is these values that are potentially at threat from a development proposal. Fauna values can be examined under the five headings outlined below. It must be stressed that these values are interdependent and should not be considered equal, but contribute to an understanding of the biodiversity of a site. Understanding fauna values provides opportunities to predict and therefore mitigate impacts.

Assemblage characteristics

Uniqueness. This refers to the combination of species present at a site. For example, a site may support an unusual assemblage that has elements from adjacent biogeographic zones, it may have species present or absent that might be otherwise expected, or it may have an assemblage that is typical of a very large region. For the purposes of impact assessment, an unusual assemblage has greater value for biodiversity than a typical assemblage.

Completeness. An assemblage may be complete (i.e. has all the species that would have been present at the time of European settlement), or it may have lost species due to a variety of factors. Note that a complete assemblage, such as on an island, may have fewer species than an incomplete assemblage (such as in a species-rich but degraded site on the mainland).

Richness. This is a measure of the number of species at a site. At a simple level, a species rich site is more valuable than a species poor site, but value is also determined, for example, by the sorts of species present.

Vegetation and substrate associations (VSAs)

VSAs combine broad vegetation types, the soils or other substrate with which they are associated, and the landform. In the context of fauna assessment, VSAs are the environments that provide habitats for fauna. The term habitat is widely used in this context, but by definition an animal's habitat is the environment that it utilises (Calver et al., 2009), not the environment as a whole. Habitat is a function of the animal and its ecology, rather than being a function of the environment. For example, a species may occur in eucalypt canopy or in leaf-litter on sand, and that habitat may be found in only one or in several VSAs. VSAs are not the same as vegetation types since these may not incorporate soil and landform, and recognise floristics to a degree that VSAs do not. Vegetation types may also not recognise minor but often significant (for fauna) structural differences in the environment. VSAs also do not necessarily correspond with soil types, but may reflect some of these elements.

Because VSAs provide the habitat for fauna, they are important in determining assemblage characteristics. For the purposes of impact assessment, VSAs can also provide a surrogate for detailed information on the fauna assemblage. For example, rare, relictual or restricted VSAs should automatically be considered a significant fauna value. Impacts may be significant if the VSA is rare, a large proportion of the VSA is affected and/or the VSA supports significant fauna. The disturbance of even small amounts of habitat in a localised area can have significant impacts to fauna if rare or unusual habitats are disturbed.

VSA assessment was made with reference to the key attributes provided by (EPA, 2020):

- soil type and characteristics
- extent and type of ground surfaces and landforms
- height, cover and dominant flora within each vegetation stratum
- presence of specific flora or vegetation of known importance to fauna
- evidence of fire history including, where possible, estimates of time since fire
- evidence and degree of other disturbance or threats, e.g. feral species
- presence of microhabitats and significant habitat features, such as coarse woody debris, rocky
- outcrops, tree hollows, water sources and caves
- evidence of potential to support significant fauna
- function of the habitat as a fauna refuge or part of an ecological linkage.

Patterns of biodiversity across the landscape

This fauna value relates to how the assemblage is organised across the landscape. Generally, the fauna assemblage is not distributed evenly across the landscape or even within one VSA. There may be zones of high biodiversity such as particular environments or ecotones (transitions between VSAs). There may also be zones of low biodiversity. Impacts may be significant if a wide range of species is affected even if most of those species are not significant per se.

Species of conservation significance

Species of conservation significance are of special importance in impact assessment. The conservation status of fauna species in Australia is assessed under Commonwealth and State Acts such as the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Western Australian *Biodiversity Conservation Act 2016* (BC Act). In addition, the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) recognises priority levels, while local populations of some species may be significant even if the species as a whole has no formal recognition. Therefore, three broad levels of conservation significance can be recognised and are used for the purposes of this report, and are outlined below. A full description of the conservation significance categories, schedules and priority levels mentioned below is provided in

.

Conservation Significance (CS) 1: Species listed under State or Commonwealth Acts.

Species listed under the EPBC Act are assigned to categories recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN, 2012), or are listed as migratory. Migratory species are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA), the Republic of South Korea Australia Migratory Bird Agreement (ROKAMBA), and/or the Convention on the Conservation of Migratory Species of Wild Animals (CMS; also referred to as the Bonn Convention). The *Biodiversity Conservation Act 2016* uses a series of divisions within three Schedules to classify conservation status that largely reflect the IUCN categories (IUCN, 2012).

Conservation Significance (CS) 2: Species listed as Priority by DBCA but not listed under State or Commonwealth Acts.

In Western Australia, DBCA has produced a supplementary list of Priority Fauna, being species that are not considered threatened under the *Biodiversity Conservation Act 2016* but for which DBCA feels there is cause for concern.

Conservation Significance (CS) 3: Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution.

This level of significance has no legislative or published recognition and is based on interpretation of distribution information, but is used here as it may have links to preserving biodiversity at the genetic level (EPA, 2002). If a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Conservation significance is applied to allow for the preservation of genetic richness at a population level, and not just at a species level. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as CS3, as may colonies of waterbirds. The Western Australian Department of Environmental Protection, now DBCA, used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of the Perth Bushplan (Dell & Banyard, 2000).

Marine-listed species

Some conservation significant species may also be listed as 'Marine' under the EPBC Act. This listing protects these species in 'Commonwealth areas' which include "marine areas beyond the coastal waters of each State and the Northern Territory, and includes all of Australia's Exclusive Economic Zone (EEZ)" (DEH, 2000). The EEZ extends to 200 nautical miles (approximately 350 kilometres) from the coast (DEH, 2006). This may mean that the 'Marine' listing does not apply to the project/survey area (depending on its location). Therefore, when a species is otherwise protected (under the EPBC Act or BC Act) or priority-listed (by the DBCA) then the Marine listing is also noted but it does not have site-specific relevance. In cases where a species is solely Marine-listed (for a list see DEH, 2000) and a project/survey area is not within a Commonwealth area then it is treated like all other fauna.

Invertebrates

Invertebrate species considered to be short range endemics (SREs) also fall within the CS3 category, as they have no legislative or published recognition and their significance is based on interpretation of distribution information. Harvey (2002) notes that the majority of species that have been classified as short-range endemics have common life history characteristics such as poor powers of dispersal or

confinement to discontinuous habitats. Several groups, therefore, have particularly high instances of short-range endemic species: Gastropoda (snails and slugs), Oligochaeta (earthworms), Onychophora (velvet worms), Araneae (mygalomorph spiders), Pseudoscorpionida (pseudoscorpions), Schizomida (schizomids), Diplopoda (millipedes), Phreatoicidea (phreatoicidean crustaceans), and Decapoda (freshwater crayfish). The poor understanding of the taxonomy of many of the short-range endemic species hinders their conservation (Harvey, 2002).

Introduced species

In addition to these conservation levels, species that have been introduced (INT) are indicated throughout the report. Introduced species may be important to the native fauna assemblage through effects by predation and/or competition.

Ecological processes upon which the fauna depend

These are the processes and conditions that apply to the existing environment and that affect and maintain fauna populations in an area. As such they are very complex; for example, populations are maintained through the dynamic of mortality, survival and recruitment being more or less in balance, and these are affected by a myriad of factors. The dynamics of fauna populations in a survey area may be affected and effectively determined by processes such as:

- fire regime.
- landscape patterns (such as extent of existing habitat, fragmentation and/or linkage).
- the presence of feral species.
- hydrology.

Appendix 2. Categories used in the assessment of conservation status.

Species of conservation significance are of special importance in impact assessment. The conservation status of fauna species in Australia is assessed under Commonwealth and State Acts such as the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Western Australian *Biodiversity Conservation Act 2016* (BC Act). In addition, the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) recognises priority levels, while local populations of some species may be significant even if the species as a whole has no formal recognition. Therefore, three broad levels of conservation significance can be recognised and are used for the purposes of this report, and are outlined below. A full description of the conservation significance categories, schedules and priority levels mentioned below is provided at the end of this appendix.

Conservation Significance (CS) 1: Species listed under State or Commonwealth Acts.

Species listed under the EPBC Act are assigned to categories recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN, 2012), or are listed as migratory. Migratory species are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA), the Republic of South Korea Australia Migratory Bird Agreement (ROKAMBA), and/or the Convention on the Conservation of Migratory Species of Wild Animals (CMS; also referred to as the Bonn Convention). The *Wildlife Conservation Act 1950* uses a series of seven Schedules to classify conservation status that largely reflect the IUCN categories (IUCN, 2012).

Conservation Significance (CS) 2: Species listed as Priority by DBCA but not listed under State or Commonwealth Acts.

In Western Australia, DBCA has produced a supplementary list of Priority Fauna, being species that are not considered threatened under the *Wildlife Conservation Act 1950* but for which DBCA feels there is cause for concern.

Conservation Significance (CS) 3: Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution.

This level of significance has no legislative or published recognition and is based on interpretation of distribution information, but is used here as it may have links to preserving biodiversity at the genetic level (EPA, 2002). If a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Conservation significance is applied to allow for the preservation of genetic richness at a population level, and not just at a species level. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as CS3, as may colonies of waterbirds. The Western Australian Department of Environmental Protection, now DBCA, used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of the Perth Bushplan (Dell & Banyard, 2000).

Conservation significance categories under legislation and the DBCA Priority system

IUCN (International Union for the Conservation of Nature) categories, as outlined by IUCN (2012), and as used for the *Environment Protection and Biodiversity Conservation Act 1999* and the Western Australian *Biodiversity Conservation Act 2016*.

Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild (Ex)	Taxa known to survive only in captivity.
Critically Endangered (CR)	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (E)	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable (V)	Taxa facing a high risk of extinction in the wild in the medium-term future.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern.	Taxa that are not Threatened.

Schedules used in the WA *Biodiversity Conservation Act 2016, updated 2023*

Schedule 1	Specially protected fauna
	Division 1 – Species of special conservation interest (S1D1)
	Division 2 – Migratory species (S1D2)
	Division 3 – Species otherwise in need of special protection (S1D3)
Schedule 2	Threatened species
	Division 1 – Critically endangered species (S2D1)
	Division 2 – Endangered species (S2D2)
	Division 3 – Vulnerable species (S2D3)
Schedule 3	Extinct species (S3)

WA DBCA Priority species (species not listed under the *WA Biodiversity Conservation Act 2016*, but for which there is some concern).

Priority 1 (P1)	Taxa with few, poorly known populations on threatened lands.
Priority 2 (P2)	Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
Priority 3 (P3)	Taxa with several, poorly known populations, some on conservation lands. Taxa in need of monitoring.
Priority 4. (P4)	Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.
Priority 5 (P5)	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependent).

Appendix 3. Scoring system for the assessment of foraging value of vegetation for Black-Cockatoos.

Bamford Consulting Ecologists. Revised 4th April 2021

Introduction

Application of the Offset Assessment Guide (offsets guide) developed by the federal environment department for assessing Black-Cockatoo foraging habitat requires the calculation of a score out of 10. The following system has been developed by Bamford Consulting Ecologists (BCE) with assistance from Quessentia Consulting to provide an objective scoring system that is practical and can be used by trained field zoologists with experience in the environments frequented by the species.

The foraging value score provides a numerical value that reflects the significance of vegetation as foraging habitat for Black-Cockatoos, and this numerical value is designed to provide the information needed by the Federal Department of Agriculture, Water and the Environment (DAWE) to assess impact significance and offset requirements. The foraging value of the vegetation depends upon the type, density and condition of trees and shrubs in an area and can be influenced by the context such as the availability of foraging habitat nearby. The BCE scoring system for value of foraging habitat has three components as detailed above. These three components are drawn from the DAWE offsets guide but the scoring approach was developed by BCE and includes a fourth (moderation) component.

Note that the scoring system can only be applied within the range of the species or at least where the species could reasonably be expected to occur based upon existing information.

Calculating the total score (out of 10) requires the following steps:

A. Site condition. Determining a score out of six for the vegetation composition, condition and structure; plus
B. Site context. Determining a score out of three for the context of the site; plus
C. Species stocking rate. Determining a score out of one for species density.
D. Determining the total score out of 10, which may require moderation for context and species density with respect to the site condition (vegetation) score. Moderation also includes consideration of pine plantations as a special case for foraging value.

The BCE scoring system places the greatest weight on site condition (scale of 0 to 6) because this has the highest influence on the foraging values of a site, which in turn is the fundamental driver in meeting ecological requirements for continued survival.

Site context has a lower weight (scale of 0 to 3) in recognition of the mobility of the species, which means they can access good foraging habitat even in fragmented landscapes, but allowing for recognition of the extent of available habitat in a region and context in relation to activity (such as breeding and roosting). The application of scoring site context is further discussed below.

Species stocking rate is given a low weight (0 to 1) as it is a means only of recognising that a species may or may not be abundant at a site, but that abundance is dependent upon site condition and context and is thus not an independent variable. The abundance of a species is also sensitive to sampling effort, and to seasonal and annual variation, and is therefore an unreliable indicator of actual importance of a site to a species.

Calculation of scores and the moderation process are described in detail below.

A. Site condition. Vegetation composition, condition and structure scoring

Site Score	Description of Vegetation Values		
	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
0	No foraging value. No Proteaceae, eucalypts or other potential sources of food. Examples: • Water bodies (e.g. salt lakes, dams, rivers); • Bare ground; • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits) or with vegetation of no food value, such as some suburban landscapes. • Mown grass	No foraging value. No eucalypts or other potential sources of food. Examples: • Water bodies (e.g. dams, rivers); • Bare ground; • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).	No foraging value. No eucalypts or other potential sources of food. Examples: • Water bodies (e.g. dams, rivers); • Bare ground; • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).
1	Negligible to low foraging value. Examples: • Scattered specimens of known food plants but projected foliage cover of these is < 2%. This could include urban areas with scattered foraging trees; • Paddocks that are lightly vegetated with melons or other known food-source weeds (e.g. *Erodium* spp.) that represent a short-term and/or seasonal food source; • Blue Gum plantations (foraging by Carnaby's Black-Cockatoos has been reported but appears to be unusual).	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. This could include urban areas with scattered foraging trees.	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. Could include urban areas with scattered foraging trees.

Site Score	Description of Vegetation Values		
	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
2	Low foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have < 10% projected foliage cover; • Woodland with tree banksias 2-5% projected foliage cover; • Woodland with tree banksias (of key species *B. attenuata* and *B. menziesii*) with <10% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Open eucalypt woodland/mallee of small-fruited species; • Paddocks that are densely vegetated with melons or other known food-source weeds (e.g. *Erodium* spp.) that represent a short-term and/or seasonal food source.	Low foraging value. Examples: • Woodland with scattered specimens of known food plants (e.g. Marri and Jarrah) 1-5% projected foliage cover; • Marri-Jarrah Woodland with <10% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Parkland-cleared Eucalypt Woodland/Forest with known food plants <10% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants <10% projected foliage cover (establishing food sources with good long-term viability); • Urban areas with scattered foraging trees.	Low foraging value. Examples: • Woodland with scattered specimens of known food plants (e.g. Marri, Jarrah) 1-5% projected foliage cover; • Marri-Jarrah Woodland with <10% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Sheoak Woodland with <10% projected foliage cover; • Parkland-cleared Eucalypt Woodland/Forest with known food plants <10% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants <10% projected foliage cover (establishing food sources with good long-term viability); • Urban areas with scattered food plants such as Cape Lilac, *Eucalyptus caesia* and *E. erythrocorys*.

Site Score	Description of Vegetation Values		
	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
3	Low to Moderate foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have 10-20% projected foliage cover; • Woodland with tree banksias 5-20% projected foliage cover; • Woodland with tree banksias (of key species *B. attenuata* and *B. menziesii*) with 10-40% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Eucalypt Woodland/Mallee of small-fruited species; • Eucalypt Woodland with Marri < 10% projected foliage cover.	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri) 5-20% projected foliage cover; • Marri-Jarrah Woodland with 10-40% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10-40% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants 10-40% projected foliage cover (establishing food sources with good long-term viability).	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri and Jarrah; also Pricklybark (Coastal Blackbutt) where it occurs in Banksia Woodlands) 5-20% projected foliage cover; • Marri-Jarrah Woodland with 10-40% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Sheoak Forest with 10-40% projected foliage cover; • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10-40% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants 10-40% projected foliage cover (establishing food sources with good long-term viability).

Site Score	Description of Vegetation Values		
	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
4	Moderate foraging value. Examples: • Woodland/low forest with tree banksias (of key species *B. attenuata* and *B. menziesii*) 20-40% projected foliage cover; • Woodland/low forest with tree banksias (of key species *B. attenuata* and *B. menziesii*) with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Kwongan/ Shrubland in which species of foraging value, such as shrubby banksias, have 20-40% projected foliage cover; • Eucalypt Woodland/Forest with Marri 20-40% projected foliage cover.	Moderate foraging value. Examples: • Marri-Jarrah Woodland/Forest with 20-40% projected foliage cover; • Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Parkland-cleared Eucalypt Woodland/Forest with known food plants 40-60% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants 40-60% projected foliage cover (establishing food sources with good long-term viability); • Orchards with highly desirable food sources (e.g. apples, pears, some stone fruits).	Moderate foraging value. Examples: • Marri-Jarrah Woodland/Forest with 20-40% projected foliage cover; • Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Sheoak Forest with 40-60% projected foliage cover; • Parkland-cleared Eucalypt Woodland/Forest with known food plants 40-60% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants 40-60% projected foliage cover (establishing food sources with good long-term viability).

Site Score	Description of Vegetation Values		
	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
5	Moderate to High foraging value. Examples: • Banksia Low Forest (of key species *B. attenuata* and *B. menziesii*) with 40-60% projected foliage cover; • Banksia Low Forest (of key species *B. attenuata* and *B. menziesii*) with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Kwongan/ Shrubland in which species of foraging value, such as shrubby banksias, have 40-60% projected foliage cover; • Marri-Jarrah Forest with 40-60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term). • Pine plantations with trees more than 10 years old (but see pine note below in moderation section).	Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover; • Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Parkland-cleared Eucalypt Woodland/Forest with known food plants >60% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants >60% projected foliage cover (establishing food sources with good long-term viability).	Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover; • Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths; • Sheoak Forest with > 60% projected foliage cover; • Parkland-cleared Eucalypt Woodland/Forest with known food plants >60% projected foliage cover (poor long-term viability without management); • Younger areas of (managed) revegetation with known food plants >60% projected foliage cover (establishing food sources with good long-term viability).

Site Score	Description of Vegetation Values		
	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
6	High foraging value. Example: • Banksia Low Forest (of key species *B. attenuata* and *B. menziesii*) with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term). • Kwongan/ Shrubland in which species of foraging value, such as shrubby banksias, have >60% projected foliage cover; • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term).	High foraging value. Example: • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term).	High foraging value. Example: • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term).

Vegetation structural class terminology follows Keighery (1994).

A. Site context.

Site Context is a function of site size, availability of nearby habitat and the availability of nearby breeding areas. Site context includes consideration of connectivity, although Black-Cockatoos are very mobile and will fly across paddocks to access foraging sites. Based on BCE observations, Black-Cockatoos are unlikely to regularly go over open ground for a distance of more than a few kilometres and prefer to follow tree-lines.

The maximum score for site context is 3, and because it is effectively a function of presence/absence of nearby breeding and the distribution of foraging habitat across the landscape, the following table, developed by Bamford Consulting in conjunction with the Department of the Environment and Energy (DEE), provides a *guide* to the assignation of site context scores. Note that 'local area' is defined as within a 15 km radius of the centre point of the study site. This is greater than the maximum distance of 12 km known to be flown by Carnaby's Black-Cockatoo when feeding chicks in the nest.

Site Context Score	Percentage of the existing native vegetation within the 'local' area that the study site represents.	
	'Local' breeding known/likely	'Local' breeding unlikely
3	> 5%	> 10%
2	1 - 5%	5 - 10%
1	0.1 - 1%	1 - 5%
0	< 0.1%	< 1%

The table above provides weighting for where nearby breeding is known (or suspected) and for the proportion of foraging habitat within 15 km represented by the site being assessed. Some adjustments may be needed based on the judgement of the assessor and in relation to the likely function of the site. For example, a small area of foraging habitat (e.g. 0.5% of such habitat within 15 km) could be upgraded to a context of 2 if it formed part of a critical movement corridor. In contrast, the same sized area of habitat, of the same local proportion, could be downgraded if it were so isolated that birds could never access it.

B. Species density (stocking rate).

Species stocking rate is described as "the usage and/or density of a species at a particular site" in the offsets guide. The description also implies that a site supports a discrete population, which is unlikely in the case of very mobile black-cockatoos. Assignation of the species density score (0 or 1) is based upon the black-cockatoo species being either abundant or not abundant. A score of 1 is used where the species is seen or reported regularly and/or there is abundant foraging evidence. Regularly is when the species is seen at intervals of every few days or weeks for at least several months of the year. A score of 0 is used when the species is recorded or reported very infrequently and there is little or no foraging evidence. Where information on actual presence of birds is lacking, a species density score can be assigned by interpreting the landscape and the site context. For example, a site with a moderate condition score that is part of a network of such habitat where a black-cockatoo species is known would

get a species density score of 1 even without clear presence data, while a species density score of 0 can be assigned to a site where the level of usage can confidently be predicted to be low.

C. Moderation of scores for the calculation of a value out of 10.

The calculation out of 10 requires the vegetation characteristics (out of 6) to be combined with the scores given for context and species density. It is considered that the context and density scores are not independent of vegetation characteristics; otherwise habitat of absolutely no value for black-cockatoo foraging (such as concrete or a wetland) could get a foraging score out of 10 as high as 4 if it occurred in an area where the species breed (context score of 3) and are abundant (species density score of 1). Similarly, vegetation of negligible or low characteristics which could not support black-cockatoos could be assigned a score as high as 6 out of 10. In that case, the score of 6 would be more a reflection of nearby vegetation of high characteristics than of the foraging value of the negligible to low scoring vegetation. The Black-Cockatoos would only be present because of vegetation of high characteristics, so applying the context and species density scores to vegetation of low characteristics would not give a true reflection of their foraging value.

For this reason, the context and species density scores need to be moderated for the vegetation characteristic score to prevent vegetation of little or no foraging value receiving an excessive score out of 10. A simple approach is to assign a context and species density score of zero to sites with a Condition score of low (2), negligible (1) or none (0), on the basis that birds will not use such areas unless they are adjacent to at least low-moderate quality foraging habitat ($\geq$3). The approach to calculating a score out of 10 can be summarised as follows:

Vegetation composition, condition and structure score	Context score	Species density score
3-6 (low/moderate to high value)	Assessed as per B above	Assessed as per C above
0-2 (no to low value)	0	0

Note that this moderation approach may require interpretation depending on the context. For example, vegetation with a condition score of 2 could be given a context score of 1 under special circumstances. Such as when very close to a major breeding area or if strategically located along a movement corridor.

Pine plantations

Pine plantations are an important foraging resource for Carnaby's Black-Cockatoo (only) but are not directly comparable with native vegetation. In comparing native vegetation with pine plantations for the purpose of calculating offsets, the following should be noted:

- Pine plantations are a commercial crop established with the intention of being harvested and thus have short-term availability (30-50 years), whereas native vegetation is available indefinitely if protected. Due to the temporary nature of pines as a food source, site condition and context differs between pines and native vegetation.
- Although pines provide a high abundance of food in the form of seeds, they are a limited food resource compared with native vegetation which provides seeds, insect larvae, flowers and nectar. The value of insect larvae in the diet of Carnaby's Black-Cockatoo has not been quantified, but in the vicinity of Perth, the birds forage very heavily on insect larvae in young cones of *Banksia attenuata* in winter, ignoring the seeds in these cones and seeds in older cones on the same trees (Scott & Black, 1981; M. Bamford pers obs.). This suggests that insect larvae are of high nutritional importance immediately prior to the breeding season.
- Pine plantations have very little biodiversity value other than their importance as a food source for Carnaby's Black-Cockatoos. They inhibit growth of other flora. While this is not a factor for direct consideration with respect to Carnaby's Black-Cockatoo, it is a factor in regional conservation planning of which offsets for the cockatoos are a part.

Taking the above points into consideration, it is possible to assign pine plantations a foraging value as follows:

- Site condition. The actual foraging value of pines is high. Stock *et al.*(2013) report that it takes nearly twice as many seeds of *Pinus pinaster* to meet the daily energy requirements for Carnaby's Black-Cockatoo compared with Marri, and three times as many *P. pinaster* seeds compared with Slender Banksia. However, pines are planted at a high density so the food supply per hectare can be high. Taking account of the lack of variety of food from pines, this suggests a site condition score of 4 or 5 out of 6 (5 is used in Section A above). As a source of food, pines are thus comparable to the best banksia woodland. This site condition score then needs to be adjusted to take account of the short-term nature of the food supply (for pine plantations to be harvested. Where pines are 'ornamental, such as in some urban contexts, they can be treated as with other trees in urban landscapes). The foraging value of a site after pines are harvested will effectively be 0, or possibly 1 if there is some retention. It is proposed that this should approximately halve the site condition score; young pine plantations could be redacted slightly less than old plantations on the basis that a young plantation provides a slightly longer term food supply. If a maximum site condition score of 5 is given, then a young plantation (>10 but <30 years old) could be assigned a score of 3, and an old plantation (>30 years old) could be assigned a score of 2. Plantations <10 years old and thus not producing large quantities of cones could also get a score of 2, but recognising they may increase in value.
- Site context. Although a temporary food source, pines can be very important for Carnaby's Black-Cockatoo in some contexts; they could be said to carry populations in areas where there is little native vegetation. The system for assigning a context score as outlined above (Section B) also applies to pines. Thus, a context score of 3 can be given where pines are a significant

proportion of foraging habitat (>5% if breeding occurs; >10% if no breeding), but where pines are a small part of the foraging landscape they will receive a context score of less than this.

- Species density. As outlined above (Section C), pines will receive a species density score of 1 where Carnaby's Black-Cockatoo are regular visitors. This is irrespective of an old plantation having a moderated condition score of 2.

Based on the above, pine plantations that represent a substantial part of the foraging landscape, such as in the region immediately north of Perth, would receive a total score (out of 10) of 6; young plantations in this area would receive a score of 7. In contrast, isolated and small plantations in rural landscapes could receive a score of just 2 if they are only a small proportion of foraging habitat and Carnaby's Black-Cockatoos are not regularly present.

Appendix 4. Conservation significant fauna species expected in the project area.

Latin Name	Common Name	Status	Expected Occurrence
INVERTEBRATES			
Austrosaga spinifer	Spiny Katydid (Swan Coastal Plain)	CS2 (P2)	
Hemisaga vepreculae	Thorny Bush Katydid (Moora)	CS2 (P2)	
Hylaeus globuliferus	Woolybush Bee	CS2 (P3)	
Synemon gratiosa	Graceful Sunmoth	CS2 (P4)	
Bothriembryon perobesus		CS2 (P1)	
REPTILES			
Ctenotus gemmula (Swan Coastal Plain subpopulation)	Jewelled Ctenotus	CS2 (P3)	Resident
Neelaps calonotos	Black-striped Snake	CS2 (P3)	Resident
BIRDS			
Apus pacificus	Fork-tailed Swift	CS1 (MI, S1D2)	Irregular visitor
Falco peregrinus	Peregrine Falcon	CS1 (S1D3)	Irregular visitor
Zanda latirostris	Carnaby's Black-Cockatoo	CS1 (EN, S2D2)	Regular visitor
MAMMALS			
Notamacropus irma	Brush Wallaby	CS2 (P4)	Resident

Appendix 5. Vertebrate fauna species observed (sightings unless otherwise indicated) during field investigations.

Latin Name	Common Name	Status	Notes
[redacted] **POTENTIAL OFFSET SITE**			
REPTILES			
Varanus sp	Goanna		Burrow
Tiliqua rugosa	Bobtail		Tracks
BIRDS			
Dromaius novaehollandiae	Emu		droppings
Phaps chalcoptera	Common Bronzewing		
Cacatua pastinator	Western Corella		
Eolophus roseicapilla	Galah		
Zanda latirostris	Carnaby's Black-Cockatoo	CS1 (EN, S2D2)	Foraging signs
Malurus assimilis	Purple-backed Fairy-wren		
Anthochaera carunculata	Red Wattlebird		
Gavicalis virescens	Singing Honeyeater		
Manorina flavigula	Yellow-throated Miner		
Phylidonyris niger	White-cheeked Honeyeater		
Acanthiza inornata	Western Thornbill		
Pachycephala rufiventris	Rufous Whistler		
Cracticus torquatus	Grey Butcherbird		
Rhipidura leucophrys	Willie Wagtail		
Grallina cyanoleuca	Magpie-lark		
Corvus coronoides	Australian Raven		
MAMMALS			
Macropus fuliginosus	Western Grey Kangaroo		Tracks and scats
Vulpes vulpes	Red Fox	Int	Tracks
Felis catus	Feral Cat	Int	Tracks
[redacted] **POTENTIAL OFFSET SITE**			
BIRDS			
Ocyphaps laphotes	Crested Pigeon		
Cacatua pastinator	Western Corella		
Eolophus roseicapilla	Galah		
Zanda latirostris	Carnaby's Black-Cockatoo	CS1 (EN, S2D2)	Foraging signs
Anthochaera carunculata	Red Wattlebird		
Manorina flavigula	Yellow-throated Miner		
Phylidonyris niger	White-cheeked Honeyeater		
Rhipidura leucophrys	Willie Wagtail		
Grallina cyanoleuca	Magpie-lark		
Corvus coronoides	Australian Raven		
MAMMALS			
Macropus fuliginosus	Western Grey Kangaroo		Tracks and scats
Vulpes vulpes	Red Fox	Int	Tracks

Appendix 6. Locally extinct conservation significant fauna species.

Latin Name	Common Name	Status
Dasyurus geoffroii	Chuditch	CS1 (VU, S2D3)
Parantechinus apicalis	Dibbler	CS1 (EN, S2D2)
Isoodon fusciventer	Quenda	CS2 (P4)
Macrotis lagotis	Greater Bilby	CS1 (VU, S2D3)
Bettongia penicillata ogilbyi	Woylie	CS1 (EN, S2D1)
Notamacropus eugenii derbianus	Tammar Wallaby	CS2 (P4)
Lagostrophus fasciatus	Banded Hare-Wallaby	CS1 (VU, S2D3)
Pseudomys fieldi	Djoongari/Shark Bay Mouse	CS1 (VU, S2D3)
Macroderma gigas	Ghost Bat	CS1 (VU, S2D3)

This page is intentionally left blank.