



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 9168/1
Permit Holder:	Commissioner of Main Roads Western Australia
Duration of Permit:	From 1 August 2021 to 1 August 2036

ADVICE NOTE:

In relation to condition 19 of this Permit, it is noted that 11.86 hectares of Lot 201 on Deposited Plan 409860, Manjimup, will be attributed to the offset for this project. The remaining balance of the property (approximately 6.14 hectares) may be used as a banked offset for other projects. The nominated 11.86 hectare area contains western ringtail possum(s) (*Pseudocheirus occidentalis*) habitat, in addition to other environmental values.

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

1. Clearing authorised (purpose)

The Permit Holder is authorised to clear *native vegetation* for the purpose of the construction of a second carriageway along Bussell Highway and associated infrastructure.

2. Land on which clearing is to be done

The Permit Holder is authorised to clear *native vegetation* within the properties described in Table 3 of Schedule 1 of this Permit.

3. Clearing authorised

The Permit Holder must not clear more than 27.3 hectares of *native vegetation* within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2.

4. Type of clearing authorised

This Permit authorises the Permit Holder to clear *native vegetation* for the activities described in condition 1 of this Permit to the extent that the Permit Holder has the power to carry out work involving clearing for those activities under the *Main Roads Act 1930* or any other written law.

5. Period during which clearing is authorised

The Permit Holder must not clear any *native vegetation* after 1 August 2026.

PART II – MANAGEMENT CONDITIONS

6. Avoid, minimise, and reduce impacts and extent of clearing

In determining the *native vegetation* authorised to be cleared under this Permit, the Permit Holder must apply the following principles, set out in descending order of preference:

- (a) avoid the clearing of *native vegetation*;
- (b) minimise the amount of *native vegetation* to be cleared; and
- (c) reduce the impact of clearing on any environmental value by implementing:

7. Weed and dieback management

When undertaking any clearing authorised under this Permit, the Permit Holder must take the following measures to minimise the risk of introduction and spread of *weeds* and *dieback*:

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (b) ensure that no known *dieback* or *weed*-affected soil, *mulch*, *fill*, or other material is brought into the area to be cleared;
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

8. Flora management

Prior to undertaking any clearing authorised under this Permit, the Permit Holder must:

- (a) Engage an *environmental specialist* to *demarcate* the *priority flora* individuals and the relevant *buffers* that are to be retained, located within the area hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2.
- (b) Ensure that clearing of *Verticordia attenuata* is limited to 1,233 individuals.

9. *Verticordia attenuata* management - Retain and reuse vegetative material and topsoil

- (a) The Permit Holder must retain the vegetative material and topsoil removed by clearing authorised under this Permit from the areas identified as containing *Verticordia attenuata* in the Targeted Flora *Verticordia attenuata* survey (Ecoedge, 2021a).
- (b) Prior to the relocation of the vegetative material and topsoil retained under condition 9(a), the Permit Holder must submit a written proposal to the Department of Biodiversity, Conservation and Attractions which outlines where the soil will be transferred from/to and proposed methods for the minimisation of *weed* and *dieback* introduction and spread.
- (c) The Permit Holder must use the vegetative material and topsoil retained under condition 9(a) within 18 months of its removal.

- (d) The Permit Holder must relocate the vegetative material and topsoil retained under condition 9(a) to a site within the same *Verticordia attenuata* population, as identified during the Targeted Flora *Verticordia attenuata* survey (Ecoedge, 2021a); and:
 - (i) monitor the site annually in spring for two years following the completion of activities to capture any subsequent germination; and
 - (ii) submit a Threatened and Priority Flora Report Form to the Species and Communities Program of the Department of Biodiversity, Conservation and Attractions upon completion of each monitoring event.

10. *Verticordia attenuata* management – seed collection

- (a) The Permit Holder must collect a minimum of 3,000 *Verticordia attenuata* seeds. The Permit Holder must apply the following principles, set out in descending order of preference:
 - (i) Collect seeds from the populations impacted by the clearing activities authorised under this Permit;
 - (ii) Collects seeds from the retained individuals of the populations impacted by the clearing activities authorised under this Permit;
 - (iii) Collects seeds from other plants identified by Ecoedge (2021a) during the targeted *V. attenuata* flora survey.
- (b) The number of seeds required under condition 10(a) must be collected:
 - (i) Prior to clearing, if collected in accordance with conditions 10(a)(i); or
 - (ii) Within 24 months from the commencement of the clearing and no later than 1 August 2023, if collected under condition 10(a)(ii) and 10(a)(iii).
- (c) Prior to the actions required under condition 10(a) of this Permit, the Permit Holder must contact *Threatened Flora Seed Collection* for advice on the collection and submission of seeds.
- (d) The Permit Holder must forward all seeds collected to the WA Seed Centre via *Threatened Flora Seed Collection* with labels detailing collection details for each sample.

11. Priority ecological community management

The Permit Holder must not clear more than two hectares of native vegetation within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2 which represent the ‘Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain’ State listed priority ecological community as identified within the Targeted Vegetation Survey of Threatened and Priority Ecological Communities (Ecoedge, 2021b).

12. Threatened ecological community management

The Permit Holder must not clear native vegetation within the area cross-hatched red in Figure 1e of Schedule 2 which represents the ‘*Corymbia calophylla* woodlands on heavy soils of the southern Swan Coastal Plain’ State listed threatened ecological community.

13. Fauna management – black cockatoo foraging habitat

The Permit Holder must not clear more than 20.8 hectares of native vegetation within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2 that provides foraging habitat for *Calyptorhynchus latirostris* (Carnaby’s cockatoo), *Calyptorhynchus banksia* subsp. *naso* (forest red-tailed black cockatoo), *Calyptorhynchus baudinii* and (Baudin’s cockatoo).

14. Fauna management – black cockatoo habitat

- (a) Prior to undertaking any clearing authorised under this Permit within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2, the Permit Holder must engage a *fauna specialist* to conduct a *fauna survey* of the Permit area to identify *black cockatoo habitat tree/s* being utilised by *black cockatoo species*.
- (b) Where *black cockatoo habitat tree/s* are identified under condition 14(a), the Permit Holder must engage a *fauna specialist* to map *black cockatoo habitat tree/s* within the permit area.
- (c) Each *black cockatoo habitat tree* identified must be inspected by a *fauna specialist* for *evidence* of current or past breeding use by *black cockatoo species*.
- (d) Where a *black cockatoo habitat tree* with no *evidence* of current or past use by *black cockatoo species* is identified in accordance with condition 14(a), that tree must only be cleared immediately after the inspection.
- (e) Where a *black cockatoo habitat tree* is identified within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2, and that tree shows *evidence* of current or past breeding use by *black cockatoo species* under condition 14(c), and clearing of that tree cannot be avoided, that tree must be monitored by a *fauna specialist* to determine when it is no longer in use for that breeding season.
- (f) Any *black cockatoo habitat tree* with *evidence* of current breeding use by *black cockatoo species* must not be cleared whilst it is in use for that breeding season as determined by the *fauna specialist* under condition 14(e).
- (g) For each suitably sized hollow for black cockatoo nesting that cannot be avoided, the Permit Holder must install one artificial black cockatoo nesting hollow.
- (h) Each artificial black cockatoo nesting hollow required by condition 14(g) must be installed prior to commencement of the next black cockatoo breeding season following clearing of the related *black cockatoo habitat tree(s)*.
- (i) The artificial black cockatoo nest hollow(s) required by condition 14(g) of this Permit must:
 - (i) be installed at the location identified by the Department of Biodiversity, Conservation and Attractions within Ludlow State Forest No. 2;

- (ii) be designed and placed in accordance with the specifications details in Schedule 3 of this Permit; and
- (iii) be monitored and maintained in accordance with the specifications detailed in Schedule 4 of this Permit, for a period of at least 10 years.
- (j) Within two months of clearing authorised under this Permit within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2, the Permit Holder must provide the results of the fauna survey in a report to the *CEO*.
- (k) The fauna survey report must include the following;
 - (i) The time(s) and date(s) of inspection(s) by the *fauna specialist*
 - (ii) A description of the *fauna specialist* inspection methods used
 - (iii) the location of the *black cockatoo habitat tree(s)* recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees
 - (iv) the location of any fauna species listed in condition 14(a), if identified, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees
 - (v) the name and amount of each fauna species identified
 - (vi) whether the *black cockatoo habitat tree/s* identified show current or past use by black cockatoo species
 - (vii) a photo of the *black cockatoo habitat tree(s)* identified; and
 - (viii) a description of the *black cockatoo habitat tree(s)* identified, including the:
 - (A) species of *black cockatoo habitat tree(s)*; and
 - (B) condition of the *black cockatoo habitat tree(s)*
 - (ix) the time and date each *black cockatoo habitat tree* with evidence of current or past breeding use was cleared
 - (x) the location of the artificial black cockatoo nesting hollow installed.

15. Fauna management – western ringtail possums

The Permit Holder must not clear more than 24 hectares of native vegetation within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2 that provides habitat for western ringtail possum(s) (*Pseudocheirus occidentalis*).

16. Fauna management – western ringtail possums

- (a) In relation to the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2, the Permit Holder must engage a *fauna specialist* to inspect that area immediately prior to, and for the duration of clearing activities, for the presence of western ringtail possum(s) (*Pseudocheirus occidentalis*).
- (b) Prior to the clearing authorised under this Permit, the Permit Holder must:
 - (i) define and mark the western ringtail possum assisted dispersal management areas identified within the *Western Ringtail Possum management plan*;
 - (ii) identify and mark western ringtail possum release points within the refuge sites identified within the *Western Ringtail Possum management plan*; and

- (iii) must engage *western ringtail possum specialist* to remove all vacant dreys within the area cross-hatched yellow in Figure 1a, Figure 1b, Figure 1c, Figure 1d, Figure 1e, Figure 1f, Figure 1g and Figure 1h of Schedule 2.
- (c) Clearing activities must cease in any area where fauna referred to in condition 16(a) are identified until either:
 - (i) the western ringtail possum(s) individual has moved on from that area to adjoining *suitable habitat*; or
 - (ii) the western ringtail possum(s) individual has been removed by a *western ringtail possum specialist*.
- (d) Any western ringtail possum(s) individual removed in accordance with condition 16(c)(ii) must be relocated by a *western ringtail possum specialist* to a *suitable habitat* at the western ringtail possum refuge sites identified within the *Western Ringtail Possum management plan*.
- (e) The Permit Holder must not exceed the release point limits identified in the *Western Ringtail Possum management plan*.
- (f) Where fauna is identified under condition 16(a), the Permit Holder must within two months provide the following records to the *CEO*:
 - (i) the number of individuals identified;
 - (ii) the date each individual was identified;
 - (iii) the location where each individual was identified recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (iv) the number of individuals removed and relocated;
 - (v) the relevant qualifications of the *western ringtail possum specialist* undertaking removal and relocation;
 - (vi) the date each individual was removed;
 - (vii) the method of removal;
 - (viii) the date each individual was relocated;
 - (ix) the location where each individual was relocated to, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees; and
 - (x) details pertaining to the circumstances of any death of, or injury sustained by, an individual.

17. Ecological linkage management – rope bridges

- (a) Within 24 months of commencing clearing, in consultation with the Department of Biodiversity, Conservation and Attractions, the Permit Holder must install western ringtail possum (*Pseudocheirus occidentalis*) rope bridges within the area cross-hatched green in Figure 1g and Figure 1h of Schedule 2 to allow the safe movement of western ringtail possum (*Pseudocheirus occidentalis*) rope bridges between remnants of native vegetation.
- (b) The Permit Holder must maintain the rope bridges installed under condition 17(a) for the remaining term of this Permit.

18. Wind erosion management

The Permit Holder must ensure that road widening and associated activities commence within three months of the authorised clearing being undertaken to reduce the risk of soil erosion by minimising the exposure time of soils prior to construction.

19. Offset – Land acquisition

Within 12 months of the commencement of clearing authorized under this Permit and no later than 1 August 2022, the Permit Holder must fund the purchase of native vegetation within the area cross-hatched red in Figure 2 of Schedule 2 (Lot 201 on Deposited Plan 409860, Manjimup) for inclusion of native vegetation into conservation estate managed by the Department of Biodiversity, Conservation and Attractions.

20. Offset – Rehabilitation

- (a) The Permit Holder must rehabilitate 60.26 hectares of native vegetation in a degraded (Keighery, 1994) condition in Ludlow State Forest No. 2 within the area cross-hatched orange in Figure 3 of Schedule 2 of this Permit, of which:
 - (i) 60.26 hectares must contain species which provide suitable foraging, breeding and roosting habitat for *Pseudocheirus occidentalis* (western ringtail possum) as identified in the *western ringtail possum recovery plan*
 - (ii) 47.51 hectares must contain species which provide suitable foraging, breeding and roosting habitat for *Calyptorhynchus latirostris* (Carnaby's cockatoo), *Calyptorhynchus banksia* subsp. *naso* (forest red-tailed black cockatoo) and *Calyptorhynchus baudinii* (Baudin's cockatoo) as identified in *black cockatoo recovery plan*
 - (iii) 8.95 hectares must contain species commonly found in 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain' ecological community as described in *Approved Conservation Advice*.
- (b) The *rehabilitation* required under condition 20(a) of this Permit, must be undertaken in accordance with the *Project Rehabilitation Plan* prepared under condition 21 of this Permit

21. Project Rehabilitation Plan

- (a) Within 12 months of the commencement of clearing authorized under this Permit, the Permit Holder must submit a *Project Rehabilitation Plan* to the CEO for approval for the areas cross-hatched orange in Figure 3 of Schedule 2, which shall be developed in accordance with *A Guide to Preparing Revegetation Plans for Clearing Permits* (Department, 2018).
- (b) The *Project Rehabilitation Plan* must be prepared by an *environmental specialist*.
- (c) The *Project Rehabilitation Plan* must include the following:
 - (i) *site preparation*
 - (ii) *weed control*
 - (iii) *a vegetation establishment period*
 - (iv) *revegetation success completion criteria* shall include but not be limited to target weed cover, target vegetation condition, target density, species richness, bare ground cover and target structure
 - (v) *revegetation success completion criteria* must be consistent with:
 - *reference site 1* for the *rehabilitation* area required under condition 20(a)(i) and 20(a)(ii) of this Permit; and
 - *reference site 2* for the *rehabilitation* area required under condition 20(a)(iii) of this Permit.

- (vi) *regeneration, direct seeding or planting, at an optimal time* in accordance with a defined species list. Species must include suitable foraging, breeding and roosting habitat for *Pseudocheirus occidentalis* (western ringtail possum), *Calyptorhynchus latirostris* (Carnaby's cockatoo), *Calyptorhynchus banksia* subsp. *naso* (forest red-tailed black cockatoo) and *Calyptorhynchus baudinii* (Baudin's cockatoo) and species which are commonly found in the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' ecological community as described in *Approved Conservation Advice*.
- (vii) contingency actions to be undertaken if *completion criteria* are not met
- (viii) ongoing maintenance and monitoring of the areas required to be *revegetated* and *rehabilitated*
- (ix) timeframes for completion of the activities
- (x) management commitments that will be achieved
- (xi) The Permit Holder shall implement the *Project Rehabilitation Plan* as approved by the *CEO* and the Director General of the Department of Biodiversity, Conservation and Attractions.

PART III - RECORD KEEPING AND REPORTING

22. Records that must be kept

The Permit Holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	<ul style="list-style-type: none"> (a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared; (d) the size of the area cleared (in hectares); (e) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 6 of this Permit; (f) actions taken to minimise the risk of the introduction and spread of <i>weeds</i> and <i>dieback</i> in accordance with condition 7 of this Permit; (g) actions taken in accordance with condition 9 of this Permit; (h) actions taken in accordance with condition 10 of this Permit; (i) the size of the Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain' State listed priority ecological community cleared (in hectares) in accordance with condition 11 of this Permit (j) evidence that no vegetation was cleared in the area cross-hatched red in Figure 1e of Schedule 1 in accordance with condition 12; (k) the size of foraging habitat for <i>Calyptorhynchus latirostris</i> (Carnaby's cockatoo), <i>Calyptorhynchus banksia</i> subsp. <i>naso</i> (forest red-tailed black cockatoo), <i>Calyptorhynchus baudinii</i> and (Baudin's cockatoo) cleared (in hectares) in accordance with condition 13 of this Permit; (l) the size of habitat for <i>Pseudocheirus occidentalis</i> (western ringtail

No.	Relevant matter	Specifications
		<p>possum) cleared (in hectares) in accordance with condition 15 of this Permit;</p> <p>(m) actions taken to minimise the impacts of the clearing authorised under this Permit on western ringtail possum in accordance with condition 16 of this Permit;</p> <p>(n) actions taken to minimise the risk of wind erosion in accordance with condition 18 of this Permit;</p> <p>(o) actions taken to acquire and conserve the area cross-hatched red in Figure 2 of Schedule 2 of this Permit in accordance with condition 19 of this Permit; and</p> <p>(p) actions taken to develop a <i>Project Rehabilitation Plan</i> in accordance with condition 21 of this Permit.</p>
2.	In relation to flora management pursuant to condition 8	<p>(a) the name and location of each <i>threatened flora</i> and/or <i>priority flora</i> species, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;</p> <p>(b) actions taken to demarcate each <i>priority flora</i> species recorded and their relevant buffers;</p> <p>(c) actions taken to avoid the clearing of <i>priority flora</i> species; and</p> <p>(d) the number of priority flora plants cleared in accordance with condition 8(c) of this Permit</p>
3.	In relation to rehabilitation pursuant to condition 20	<p>(a) a description of the <i>revegetation</i> and <i>rehabilitation</i> activities undertaken;</p> <p>(b) the size of the areas <i>revegetated</i> and <i>rehabilitated</i> (in hectares);</p> <p>(c) the date that <i>revegetation</i> and <i>rehabilitation</i> works began;</p> <p>(d) any remediation works undertaken; and</p> <p>(e) the date that <i>completion criteria</i> are considered to be met.</p>

23. Reporting

- (a) The Permit Holder must provide to the *CEO* on or before 30 June of each year, a written report:
 - (i) of records required under condition 22 of this Permit; and
 - (ii) concerning activities done by the Permit Holder under this Permit between 1 January and 31 December of the preceding calendar year.
- (b) If no clearing authorised under this Permit was undertaken between 1 January to 31 December of the preceding calendar year, a written report confirming that no clearing under this Permit has been carried out, must be provided to the *CEO* on or before 30 June of each year.
- (c) Prior to 1 May 2036, the Permit holder must provide to the *CEO* a written report of records required under condition 22 of this Permit, where these records have not already been provided under condition 23(a) of this Permit.

DEFINITIONS

In this Permit, the terms in Table have the meanings defined.

Table 2: Definitions

Term	Definition
Approved Conservation Advice	means Approved Conservation Advice for the Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain prepared by the Threatened Species Scientific Committee available at http://www.environment.gov.au/biodiversity/threatened/communities/pubs/153-conservation-advice.pdf
Black cockatoo habitat trees	means trees that have a diameter measured over bark at 130 centimetres from the base of the tree of 50 centimetres or greater (or 30 centimetres or greater for <i>Eucalyptus salmonophloia</i> or <i>Eucalyptus wandoo</i>) that contain hollows suitable for breeding by <i>black cockatoo species</i> .
black cockatoo recovery plan	means: a) A recovery plan prepared by Department of Environment and Conservation (2008) for Forest Black Cockatoo (Baudin's Cockatoo <i>Calyptorhynchus baudinii</i> and Forest Red tailed Black Cockatoo <i>Calyptorhynchus banksii naso</i>) b) A recovery plan prepared by Department of Parks and Wildlife (2013) for Carnaby's cockatoo (<i>Calyptorhynchus latirostris</i>)
Black cockatoo species	means one or more of the following species: a) <i>Calyptorhynchus latirostris</i> (Carnaby's cockatoo); b) <i>Calyptorhynchus baudinii</i> (Baudin's cockatoo); and/or c) <i>Calyptorhynchus banksii naso</i> (forest red-tailed black cockatoo).
Buffer	means 20 metres for <i>priority flora</i>
CEO	Chief Executive Officer of the department or his/her delegates responsible for the administration of the clearing provisions under the <i>Environmental Protection Act 1986</i> .
Clearing	has the meaning given under section 3(1) of the EP Act.
Completion criteria	means a measurable outcome based on suitable <i>reference sites</i> , used to determine revegetation/ <i>rehabilitation success</i>
Condition	a condition to which this clearing permit is subject under section 51H of the EP Act.
Demarcate	means the utilisation of flagging tape or using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
Dieback	means the effect of <i>Phytophthora</i> species on native vegetation.
Direct seeding	means a method of re-establishing vegetation through establishment of a seed bed and the introduction of seeds of the desired plant species.
Environmental specialist	means a person who holds a tertiary qualification in environmental science or equivalent and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit, or who is approved by the CEO as a suitable environmental specialist.
Environmental Management Plan	means the plan prepared by the Permit Holder for the purpose of managing native vegetation clearing impacts associated with the Bussell Highway Duplication Stage, Hutton to Sabina project (DWER Ref: A2023688).
EP act	<i>Environmental Protection Act 1986</i> (WA)
Fauna specialist	means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of 2 years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed, or who is approved by the CEO as a suitable fauna specialist for the bioregion, and who holds a valid fauna licence issued under the <i>Biodiversity Conservation Act 2016</i> .
Fill	means material used to increase the ground level, or to fill a depression.
Local provenance	means native vegetation seeds and propagating material from natural sources within 100 kilometres and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared.
Mulch	means the use of organic matter, wood chips or rocks to slow the movement of

Term	Definition
	water across the soil surface and to reduce evaporation.
Native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act.
Optimal time	means the optimal time for undertaking direct seeding and planting for that region.
Priority flora	means those plant taxa described as priority flora classes 1, 2, 3 or 4 in the <i>Department of Parks and Wildlife's Threatened and Priority Flora List for Western Australia</i> (as amended);
Planting	means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species.
Project Rehabilitation Plan	Means plans developed by the Permit Holder for the <i>revegetation</i> and <i>rehabilitation</i> of a site in accordance with condition 22 of this Permit:
Reference site 1	means nearby sites used to provide baseline data for planning a revegetation project. Measurements from fixed reference points or plots where biodiversity components are measured are used to set measurable completion criteria for revegetation projects. The reference sites must contain native vegetation which provides the following values: <ul style="list-style-type: none"> provides suitable habitat for <i>Pseudocheirus occidentalis</i> (western ringtail possum) provides suitable foraging habitat for <i>Calyptorhynchus latirostris</i> (Carnaby's cockatoo), <i>Calyptorhynchus banksia</i> subsp. <i>naso</i> (forest red-tailed black cockatoo) and <i>Calyptorhynchus baudinii</i> (Baudin's cockatoo) accurately represents the surrounding vegetation in Ludlow State Forest No. 2 is in good (Keighery, 1994) or better condition
Reference site 2	means nearby sites used to provide baseline data for planning a revegetation project. Measurements from fixed reference points or plots where biodiversity components are measured are used to set measurable completion criteria for revegetation projects. The reference sites must contain the following values: <ul style="list-style-type: none"> Native vegetation which represents the Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain' State listed priority ecological community.
Regeneration	means revegetation that can be established from in situ seed banks contained either within the topsoil or seed-bearing mulch.
Rehabilitate, rehabilitated and rehabilitation	means actively managing an area containing native vegetation in order to improve the ecological function of that area using methods such as natural <i>regeneration</i> , <i>direct seeding</i> and/or <i>planting</i> , so that the species composition, structure and density is similar to pre-clearing vegetation types in that area.
Revegetate/ed/ion	means the re-establishment of a cover of local provenance native vegetation in an area using methods such as natural regeneration, direct seeding and/or planting, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area
Revegetation area	Means the areas cross-hatched red on Figure 2 of Schedule 1.
Site preparation	means management of existing site topsoil and preparation of the finished soil surface for revegetation, for example by ripping or tilling the soil surface and resspreading site topsoil and chipped native vegetation
Suitable habitat (western ringtail possum)	means habitat known to support western ringtail possums (<i>Pseudocheirus occidentalis</i>) within the known current distribution of the species, typically characterised by abundant foliage, presence of suitable nesting structures such as tree hollows, as well as high canopy cover and continuity. Known habitat includes peppermint (<i>Agonis flexuosa</i>) dominated woodlands, jarrah (<i>Eucalyptus marginata</i>) and marri (<i>Corymbia calophylla</i>) forests, riparian vegetation with a canopy of Bullich (<i>Eucalyptus megacarpa</i>) or flooded gum (<i>Eucalyptus rudis</i>), karri (<i>Eucalyptus diversicolor</i>) forests, sheoak (<i>Allocasuarina fraseriana</i>) dominated woodlands, and other stands of myrtaceous trees growing near swamps, watercourses or floodplains
Threatened Flora Seed Collection	means Threatened Flora Seed Collection at the Department of Biodiversity, Conservation and Attractions: Ph. 9219 9063 or email tfsc@dbca.wa.gov.au,

Term	Definition
Vegetation condition	means the rating given to native vegetation which refers to the impact of disturbance on each of the layers and the ability of the community to regenerate (Keighery 1994)
Vegetation establishment period	means a period of at least two summers after the revegetation during which time replacement and infill revegetation works may be required for areas in which revegetation has been unsuccessful, and involves regular inspections of revegetation sites to monitor the success of revegetation
Weeds	means any plant – (a) that is a declared pest under section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i> ; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.
Western ringtail possum recovery plan	means a plan prepared by Department of Parks and Wildlife (2017) to guide recovery actions for the western ringtail possum for the next 10 years.
Western ringtail possum specialist	means a fauna specialist who holds a tertiary qualification specialising in environmental science or equivalent, has a minimum of two years of work experience in western ringtail possum (<i>Pseudocheirus occidentalis</i>) identification, surveys of western ringtail possums and capture and handling of western ringtail possums, and holds a valid fauna licence issued under the Biodiversity Conservation Act 2016.
Western Ringtail Possum Management Plan	means a plan prepared by the Permit Holder and approved by the Department and the Department of Biodiversity, Conservation and Attraction to adequately managed impacts associated with the Bussell Highway Duplication Stage, Hutton to Sabina project on western ringtail possum (DWER Ref: A2021755).

REFERENCES

- Department of Environment and Conservation (2008). Forest Black Cockatoo (Baudin's Cockatoo *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*) Recovery Plan. Department of Environment and Conservation, Perth, Western Australia.
- Department of Parks and Wildlife (2013). Carnaby's cockatoo (*Calyptorhynchus latirostris*) Recovery Plan. Department of Parks and Wildlife, Perth, Western Australia
- Department of Parks and Wildlife (2017). Western Ringtail Possum (*Pseudocheirus occidentalis*) Recovery Plan. Wildlife Management Program No. 58. Department of Parks and Wildlife, Perth, WA.
- Ecoedge. (2021a). *Targeted Flora (Verticordia attenuata) Survey. Bussell Highway between Hutton Road and Sabina River*. Flora survey prepared for Main Roads Western Australia for clearing permit application CPS 9168/1. Received by the Department on 9 March 2021. DWER Ref: A1987003
- Ecoedge. (2021b). *Targeted Vegetation Survey of Threatened and Priority Ecological Communities. Hutton Road to Sabina River, Capel*. Biological survey prepared for Main Roads Western Australia for clearing permit application CPS 9168/1. Received by the Department on 23 December 2020. Updated in May 2021. DWER Ref: A2023798.
- Keighery, B.J. (1994) *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

END OF CONDITIONS

Michelle Andrews

Chief Executive Officer

DEPARTMENT OF WATER AND ENVIRONMENTAL REGULATION

9 July 2021

Schedule 1

Table 3: List of properties within which the clearing is authorised in accordance with conditions of this Permit.

Property	Property Identification Numbers (PINs)	Locality
Lot 53 on Plan 19312	11422129, 11422128	Yalyalup
Lot 3819 on Plan 410411	12267364	Yalyalup
Lot 500 on Plan 19312	11947243	Yalyalup
Lot 4354 on Plan 209044 (Crown Reserve R 27534)	534514	Yalyalup
Bussell Highway Road reserve	1247124	Yalyalup
Lot 5193 on Plan 21119, Sues Road reserve	11429547	Yalyalup
Lot 5193 on Plan 21119	11429548	Yalyalup
Un-named road	11507305	Ruabon
Sues Road reserve	11380878, 11380823, 11380822	Yalyalup
Lot 100 on Plan 65306	11849853	Yalyalup
Lot 501 on Plan 19312	11947244	Yalyalup
Lot 4411 on Plan 213198	534525	Yalyalup
Lot 52 On Plan 19311	11425078, 11425079	Yalyalup
Lot 4626 on Plan 47033 (Crown reserve R 33734)	534536	Yalyalup
Bussell Highway Road Reserve	11380879	Yalyalup
Layman Road reserve	11507303	Yalyalup/Ruabon
Wannerup South Road	11380879	Yalyalup/Ruabon
Lot 51 on Plan 19311	11425077	Ruabon
Lot 50 on Plan 19311	11425080	Ruabon
Ruabon Road reserve	11551801, 11507306, 11507327	Ruabon/Ludlow
Lot 114 on Plan 236759	11765105	Ruabon/Ludlow
Lot 51 on Plan 18910	11414648	Ruabon/Ludlow
Lot 21 on Plan 402137	12102506	Ludlow
Lot 52 on Plan 18910	11414649	Ludlow
Lot 51 on Plan 18909	11416794, 1416798	Ludlow
Lot 12 on Plan 22029	1200431	Ludlow
Lot 52 on Plan 18909	11416793	Ludlow
Lot 53 on Plan 18909	11416797	Ludlow
Ludlow-Hithergreen Road reserve	11551805	Ludlow
Lot 103 on Plan 49023	11520166	Ludlow
Lot 54 on Plan 18909	11416796	Ludlow
Lot 55 on Plan 18909	11416795	Ludlow
Lot 56 on Plan 18908	11567174	Ludlow
Lot 300 on Plan 18908	11947202	Ludlow
Lot 301 on Plan 18908	11947201	Ludlow
Lot 303 on Plan 18908	11947199	Ludlow
Lot 304 on Plan 18908	11947198	Ludlow
Lot 302 on Plan 18908	11947200	Ludlow

Schedule 2

The boundary of the area authorised to be cleared is shown in the maps below (Figure 1a – 1h).



Figure 1a: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur.

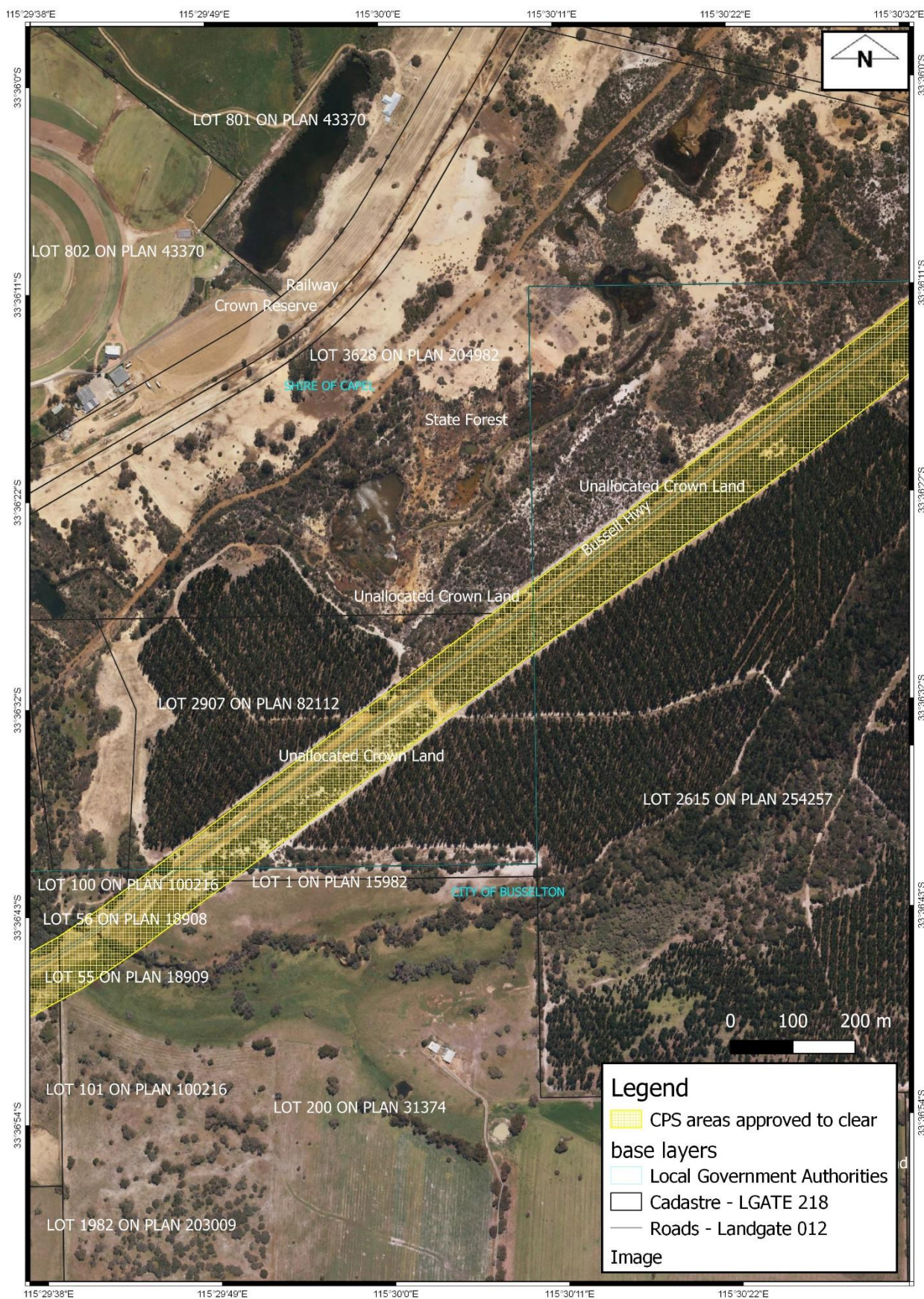


Figure 1b: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur

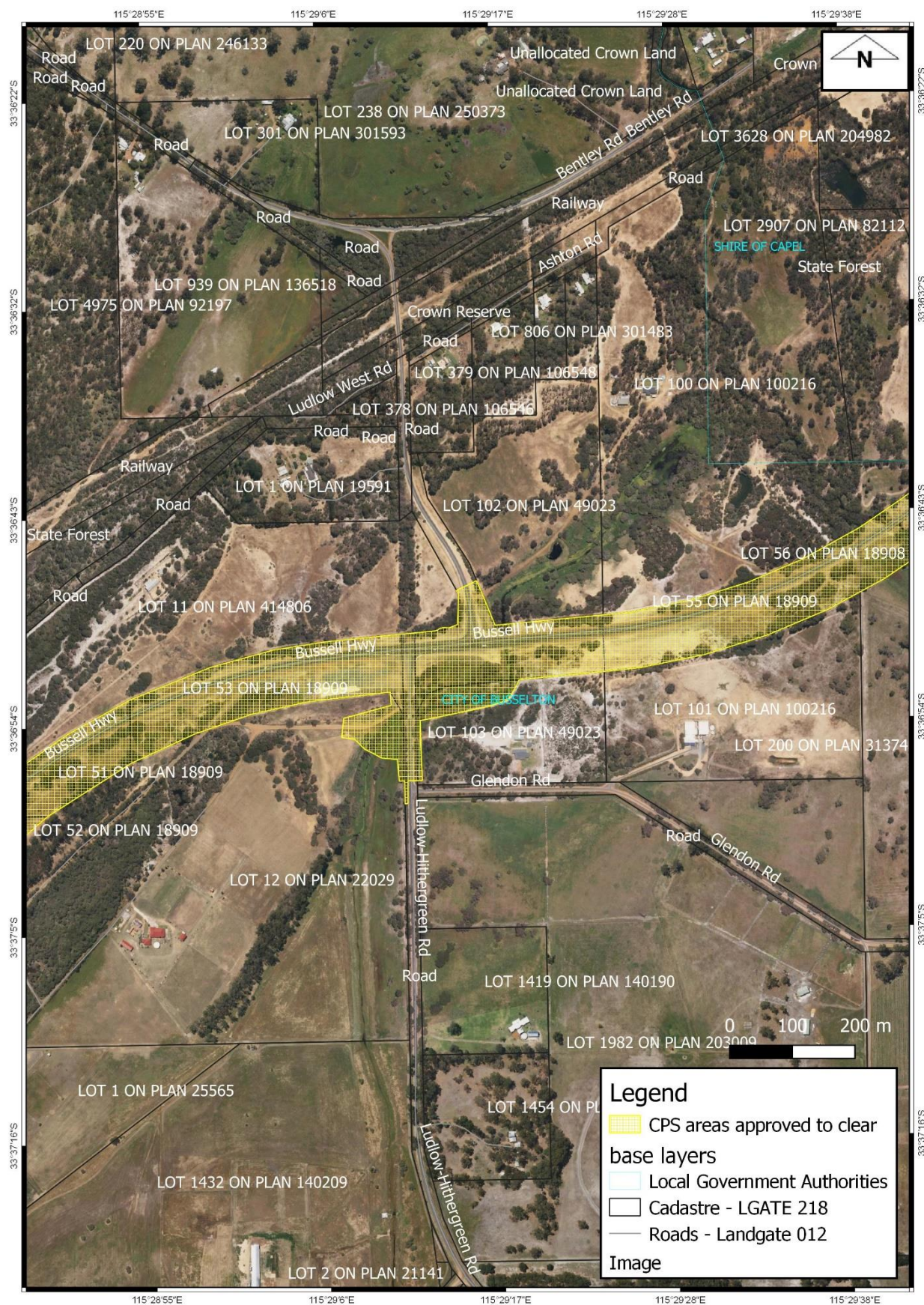


Figure 1c: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur

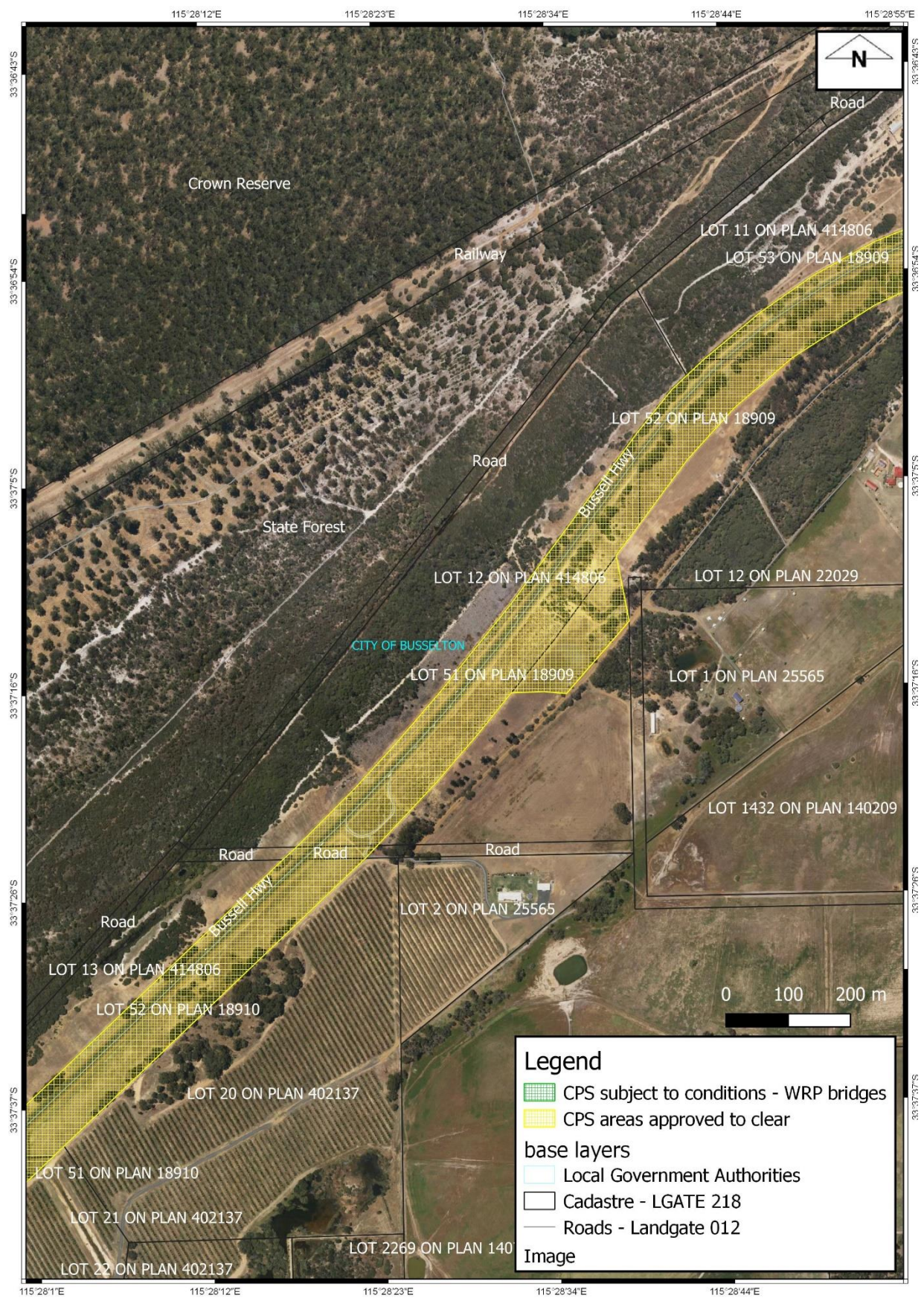


Figure 1d: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur



Figure 1e: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur. The area cross-hatched red indicates the area within which clearing of native vegetation is not authorised in accordance with Condition 12 of this Permit.



Figure 1f: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur



Figure 1g: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur. The area cross-hatched green indicates the area within which the Permit Holder must install XXX

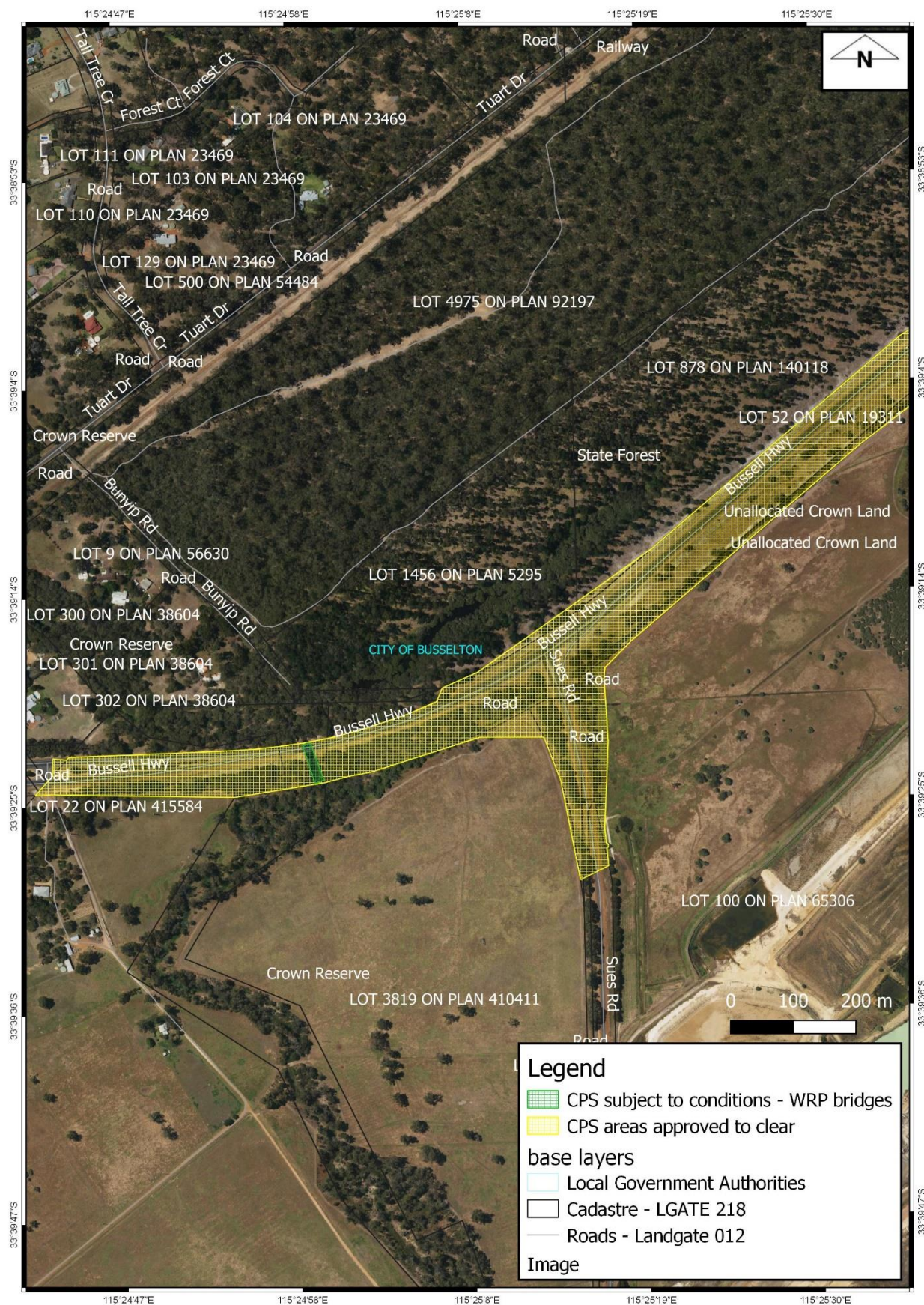


Figure 1h: Map of the boundary of the area (cross-hatched yellow) within which clearing may occur



Figure 2: Land acquisition area



Figure 3: Map of the boundary of the areas cross-hatched orange within which the rehabilitation in accordance with condition 20 of this Permit must occur. Within this area the Permit Holder must install one artificial black cockatoo nesting hollow.

Schedule 3 – How to design and place artificial hollows for Carnaby's cockatoo

Artificial hollows for Carnaby's cockatoo



How to design and place artificial hollows for Carnaby's cockatoo

Artificial hollows can be used to help conserve the threatened Carnaby's cockatoo by enabling the cockatoos to breed in areas where natural hollows are limited.

A wide variety of artificial hollow designs have been used with mixed success. Evidence suggests that, while the hollow must meet some basic requirements, other factors such as proximity to existing breeding areas may be more important in determining the success of artificial hollows. Before using this information sheet to construct or install an artificial hollow, you should refer to the criteria listed in the separate information sheet; *When to use artificial hollows for Carnaby's cockatoo*.

This information sheet contains broad guidelines for the design and placement of artificial hollows for Carnaby's cockatoo.

Below are three examples of successful artificial hollows used by Carnaby's cockatoo for nesting. Artificial hollows made from a natural log with cut side entrance (left), white industrial pipe with top entrance (centre) and natural log with natural side entrance (right).



Photos by Christine Groom (left and right) and Rick Dawson (centre)

Walls

The walls of the artificial hollow need to be constructed from a material that is;

- Durable enough to withstand exposure to elements for an extended period of time (i.e. 20+ years).
- Able to simulate the thermal properties of a natural tree hollow.
- Not less than 380 mm in internal diameter.
- Preferably 1.2 m deep overall and 1m deep to top of substrate/nesting material.

Successful artificial hollows have been constructed from sections of salvaged natural hollow, black and white industrial pipe. When using non-natural materials care must be taken to ensure there are no toxic residues and that the materials are safe to ingest.

Base

The base of the artificial hollow must be;

- Able to support the adult and nestling(s).
- Durable enough to last the life of the nest.
- Free draining.
- At least 380 mm in diameter.
- Covered with 200 mm of sterile, dry, free draining material such as charcoal, hardwood woodchips or wood debris.

Do not use:

- Saw dust or fibre products that will retain moisture.

Example materials that could be used for artificial hollow bases include heavy duty stainless steel, galvanised or treated metal (e.g. Zinalume ®), thick hardwood timber slab or marine ply (not chipboard or MDF). The base material must be cut to size to fit internally with sharp or rough edges ground away or curled inwards and fixed securely to the walls.



Carnaby's cockatoo eggs in an artificial hollow.
Photo by Rick Dawson

Entrance

The entrance of the artificial hollow must;

- Have a diameter of at least 270 mm).
- Preferably be top entry which will minimise use by non-target species.

Top entry hollows are unattractive to nest competitors such as feral bees, galahs and corellas. Side entry hollows have been successful in areas where feral bees are not a problem and where galahs and corellas are deterred.

Ladder

For artificial hollows made of non-natural materials, or of processed boards, it is necessary to provide a ladder to enable the birds to climb in and out of the hollow easily.

The ladder must be;

- Securely mounted to the inside of the hollow.
- Made from an open heavy wire mesh such as WeldMesh™ with mesh size of 30 - 50 mm, or heavy chain.

Do not use:

- A material that the birds can chew.
- Galvanized because the birds may grip or chew the ladder and ingest harmful compounds.

If using mesh for the ladder, the width will depend on the curvature of the nest walls. A minimum width of about 60 - 100 mm is recommended.

Sacrificial chewing posts

For artificial hollows made of non-natural materials, or of processed boards, it is necessary to provide sacrificial chewing posts. The birds chew material to prepare a dry base on which to lay their egg(s).

The sacrificial chewing posts must:

- Be made of untreated hardwood such as jarrah, marri or wandoo
- Be thick enough to satisfy the birds' needs between maintenance visits.
- Extend beyond the top of the hollow as an aid to see whether the nest is being used.
- Be placed on the inside of the hollow.
- Be attached in such a way that they are easy to replace e.g. hook over the top of hollow or can slide in/out of a pair of U bolts fitted to the side of the hollow.

It is recommended that at least two posts are provided. Posts 70 x 50 mm have been used, but require replacing at least every second breeding season when the nest is active. Birds do vary in their chewing habits and therefore the frequency at which the chewing posts require replacement will also vary.



Bottom of an artificial hollow showing ladder that is fixed to the wall and a chewed sacrificial post which is 200 mm from the floor.

Photo by Rick Dawson

Mountings

The artificial hollows must be mounted such that:

- The fixings used will last the duration of the nest e.g. galvanized bracket or chain fixed with galvanized coach screws.
- It is secured by more than one anchor for security and stability.
- It is positioned vertically or near vertically.

Placement

Sites should be chosen within current breeding areas and where they can be monitored, but preferably not conspicuous to the general public. It is important that artificial hollows are placed where they will be accessible for future monitoring and maintenance. For more detail refer to the separate information sheet; *When to use artificial hollows for Carnaby's cockatoo*.

The height at which artificial hollows should be placed is variable. The average height of natural hollows in dominant tree species in the area is a good guide. Natural hollows used by Carnaby's cockatoos have been recorded as low as 2 m above the ground. If located on private property the hollows can be placed lower to the ground so they are accessible by ladder or a rope and pulley system can be used. Where public access is possible artificial hollows should be placed at least 7 m high (i.e. higher than most ladders) and on the side of the tree away from public view to reduce the chance of interference or poaching.

Carnaby's cockatoo show no preference for aspect of natural hollows, however, it may still be beneficial to place artificial hollows facing away from prevailing weather and where they receive the most shade and protection.

Artificial hollows to be placed in trees require:

- Accessibility of the tree for a vehicle, elevated work platform or cherry picker.
- A section of trunk 2-3 m long suitable for attaching the hollow

If necessary, artificial hollows may be placed on poles, but this may result in excessive exposure to sun during very hot weather. When erected on poles there should be"

- A hinge at the bottom of the pole that can be secured when the pole is in the upright position.
- Access for a vehicle to assist raising the pole.

Safety

Care needs to be taken when placing artificial hollows to ensure safety is considered at all times. Artificial hollows are heavy and require lifting and manoeuvring into position up to 7 m above the ground.

Maintenance and monitoring

Once artificial hollows have been placed they require monitoring and maintenance to ensure they continue to be useful for nesting by Carnaby's cockatoo. It is important to monitor artificial hollows to determine use by Carnaby's cockatoo, other native species as well as pest species. By undertaking monitoring the success of the design and placement of artificial hollows can be determined and areas for improvement identified for future placement of artificial hollows.

Monitoring can also assess whether any maintenance is required. Without regular maintenance artificial hollows are unlikely to achieve their objective (that is, they will fail to provide nesting opportunities for threatened cockatoos). Therefore it is important to continue a regime of regular maintenance while the artificial hollow is required. It may be several (to many) decades until a natural replacement hollow is available.

For further advice on monitoring and maintenance of artificial hollows please refer to the separate information sheet; *How to monitor and maintain artificial hollows for Carnaby's cockatoo*.



Carnaby's cockatoo female prospecting an artificial hollow.
Photo by Rick Dawson



Example fixing for artificial hollow
Photo by Christine Groom

Acknowledgements

This information sheet is a joint initiative of Birdlife Australia, the Western Australian Museum and the Department of Parks and Wildlife. Many individuals have contributed to its preparation. Special acknowledgement is made for the contributions of Ron Johnstone from the WA Museum, Alan Elliott from the Serpentine-Jarrahdale Land care Centre and Denis Saunders. This updated version was compiled by Rick Dawson Department of Parks and Wildlife).

Other information sheets in the series: Artificial hollows for Carnaby's cockatoo

- *How to design and place artificial hollows for Carnaby's cockatoo*
- *How to monitor and maintain artificial hollows for Carnaby's cockatoo*

Information sheets available on the *Saving Carnaby's cockatoo* webpage:

<http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/208-saving-carnaby-s-cockatoo>

Further information

Last updated 28/04/2015

Contact fauna@dpaw.wa.gov.au or your local office of the Department of Parks and Wildlife

See the department's website for the latest information: www.dpaw.wa.gov.au

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Schedule 4 - How to monitor and maintain artificial hollows for Carnaby's cockatoo

Artificial hollows for Carnaby's cockatoo



How to monitor and maintain artificial hollows for Carnaby's cockatoo

It is important to monitor and maintain artificial hollows after they have been erected. Monitoring ensures that the effectiveness of the artificial hollow can be determined. It also means that problems with pest species or any maintenance requirements can be identified and resolved.

Without regular maintenance, artificial hollows are likely to fail to achieve their objective (that is, they will fail to provide nesting opportunities for threatened cockatoos). Therefore it is important to continue a regime of regular maintenance while the artificial hollow is required. It may be several (to many) decades until a natural replacement hollow is available.

Monitoring should be undertaken in order to detect:

- Use by Carnaby's cockatoo
- Maintenance requirements
- Use by other native species
- Use by pest species (e.g. feral bees, galahs, corellas etc.)



Carnaby's cockatoo female prospecting an artificial hollow.
Photo by Rick Dawson

How do I monitor artificial hollows?

Before undertaking monitoring of artificial hollows for Carnaby's cockatoo it is recommended that you seek advice from BirdLife Australia, the WA Museum or the Department of Parks and Wildlife. It is also important to contact Parks and Wildlife, Wildlife Licensing Section, to determine if a scientific licence is required (wildlifelicencing@dpaw.wa.gov.au).

Monitoring artificial hollows requires keen observation and naturalist skills. It is often not possible to observe evidence of breeding directly (i.e. nestlings or eggs) and inferences must be made based on observation. There are many techniques available to monitor artificial hollows. A combination of several is likely to achieve the best results.

Looking for signs of use

Cobwebs covering the entrance to the hollow will indicate that the hollow has not been used recently. This would also apply to other light debris that may have fallen to cover the opening partially. Signs of recent use or interest in the hollow include evidence of chewing.

Observing parent behaviour around the hollow

The behaviour of parent birds around a hollow will indicate an approximate age of young in the nest.

Parent behaviour	Approximate age/stage of young
Prospecting for hollow	Unborn
Male only seen out of hollow	Egg or very young nestling (< 3 - 4 weeks)
Both parents seen entering/exiting the hollow	Nestling(s) have hatched (> 3 - 4 weeks)

Observing feeding flocks

Flocks of all male birds indicate that the females are incubating eggs. When flocks are mixed it suggests the birds have either not laid yet or that the nestlings have hatched and no longer require brooding (approximately 3 - 4 weeks old).

Tapping

When females are sitting on eggs they will usually respond to tapping at the base of their tree (or pole) by appearing at the entrance or flying from the hollow opening. This is not a guarantee of breeding activity, but an indication that it is possibly occurring in the hollow.

Observing insect activity around nest

The faecal matter produced by nestlings in a nest attracts insects, especially flies and ants. The type and number of these insects will help indicate how old any nestlings present may be. Factors such as temperature and humidity will also affect insect activity and so observations of insect activity should only be used as supporting evidence for other indications of age/use. Blowflies around a nest usually indicate that a death has occurred.

Listening for nestlings

With experience it is possible to determine if one or two nestlings are present and a broad estimate of age based on the type and loudness of noises they make.

Looking inside the nest

This can be achieved either with the aid of a telescopic pole and camera or mirror, or with the use of a ladder or other climbing equipment. This method can obtain the most detailed monitoring information for artificial hollows. However it is also the most time consuming and difficult to organise. Special equipment is likely to be needed depending on the height and positioning of artificial hollows. There are also safety issues associated with ladder or rope climbing options to reach nests to undertake observations.

How often should I monitor artificial hollows?

The minimum frequency of monitoring and the techniques used will be determined by the aims of the monitoring and the resources available. It is important to limit disturbance to breeding birds and this should be considered when determining the techniques used and frequency.

How do I maintain artificial hollows?

Artificial hollows require maintenance to ensure they continue to have the greatest chance of them being used by Carnaby's cockatoos. Periodic maintenance checks should be undertaken at least every two years, preferably annually. These checks should be undertaken prior to the breeding season which is between July and January with breeding occurring later in this period in southern areas. It is important to maintain a regime of regular maintenance as long as the artificial hollow is required. It may take several (to many) decades until a natural replacement hollow is available.

Maintenance checks should assess the following as a minimum:

- Condition of chewing posts (if present)
- Condition of attachment points
- Condition of hollow bases
- Stability of tree or pole used to mount the artificial hollow



Artificial hollow base needing repair.
Photo by Christine Groom

Repairing hollows

Any problems identified during maintenance checks should be addressed, and any repairs required done, as soon as possible. If breeding is currently occurring, maintenance may need to be delayed if it is likely to disturb the parents or nestling. Likely maintenance needs include replacement of chewing posts (frequently) or nest bases (occasionally) and repairing of any cracks (infrequently). Maintenance concerns regarding the security of attachment points or the stability of the tree or pole should be addressed as a priority for safety reasons.

For artificial hollows known to be used, spare chewing posts should be taken into the field when undertaking maintenance checks.

Monitoring of artificial hollows:

Monitoring aim	Frequency of visits	Monitoring techniques
To determine possible use by Carnaby's cockatoo	At least once during peak breeding season (i.e. between September and December)	<ul style="list-style-type: none"> • Observing behaviour of adults around hollow • Tapping to see if female will flush from hollow (best undertaken between 10am and 3pm when females most likely to be sitting) • Listening for nestlings • Looking for evidence of chewing • Looking inside nest
To confirm use by Carnaby's cockatoo	At least two visits during peak breeding season (i.e. between September and December)	<p>To observe at least two of the following:</p> <ul style="list-style-type: none"> • Breeding behaviour of adults around hollow or evidence of chewing • Female flushed from hollow • Noises from nestlings in hollow <p>Or to observe:</p> <ul style="list-style-type: none"> • Nestlings or eggs in nest
To determine nesting success by Carnaby's cockatoo	The more visits, the better. Preferably fortnightly visits between July and December. As a minimum, at least 3 visits spread throughout breeding season.	<ul style="list-style-type: none"> • Looking inside nest to observe eggs or nestlings.
To determine use by any species	As often as possible.	<ul style="list-style-type: none"> • Inspection from ground as a minimum. • Looking inside nest for detailed observations.
To determine maintenance requirements	At least every two years and preferably annually if hollow fitted with sacrificial chewing posts, can be longer if without.	<ul style="list-style-type: none"> • A basic maintenance check can be undertaken from the ground. A ladder or elevated work platform will be required for a comprehensive check and to replace sacrificial chewing posts

Acknowledgements

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