



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

ADVICE NOTE

Allocation of offset sites

In relation to conditions 10, 11, 12 and 13 of the permit, the following actions will be attributed to the offset for this project:

- Revegetation and rehabilitation and conservation in perpetuity, as described within the 'CPS 9981/1 Flynn Drive Stage 2 and 3 - 2025 Revegetation and Rehabilitation Plan - Edgar Griffith Park (Crown Reserve 36601)' (City of Wanneroo, 2025), of:
 - 1.78 hectares of native vegetation within Edgar Griffith Park (R 36601), Wanneroo that comprises foraging habitat for Carnaby's cockatoo (*Zanda latirostris*).
- Revegetation and rehabilitation and conservation in perpetuity, as described within the approved CPS 9981/2 Flynn Drive Stage 2 and 3 Revegetation and Rehabilitation Plan – Montrose Park (Crown Reserve 33343) of condition 10 of this permit, of:
 - 4.70 hectares of native vegetation within Montrose Park (Crown Reserve 33343), Girrawheen that comprises the “*Banksia attenuata* woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. 1994)” threatened ecological community (TEC), the “Banksia Woodlands of the Swan Coastal Plain” (Banksia Woodlands) TEC and foraging habitat for Carnaby's cockatoo (*Zanda latirostris*);
- 38.46 hectares of the permit holder's banked offset site at Lot 901 on Deposited Plan 409610, Bindoon, is to be used to offset the impacts of the authorised clearing to Carnaby's cockatoo (*Zanda latirostris*) habitat. The nominated area contains suitable foraging habitat in excellent condition for the Carnaby's cockatoo, among other environmental values.

Purpose Permit number:	CPS 9981/2
Permit Holder:	City of Wanneroo
Duration of Permit:	From 19 June 2025 to 19 June 2037

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 road construction and installation of associated infrastructure.

2. Land on which clearing is to be done

Flynn Drive Road Reserve (PIN 11751051), Banksia Grove, Carramar and Neerabup
Greenwich Parade Road Reserve (PIN 11806345), Neerabup
Lot 5 on Diagram 91435, Neerabup

Lot 900 on Deposited Plan 50843, Neerabup
Lot 901 on Deposited Plan 50843, Neerabup
Lot 902 on Deposited Plan 50843, Neerabup
Lot 6001 on Deposited Plan 402319, Banksia Grove
Lot 8002 on Deposited Plan 411322 (Crown Reserve 53763), Neerabup
Lot 8054 on Deposited Plan 402319 (Crown Reserve 53764), Banksia Grove
Lot 9943 on Diagram 53573 (Crown Reserve 35951), Neerabup
Mather Drive Road Reserve (PIN 11751046), Neerabup
Road (PIN 1177686), Banksia Grove and Pinjar
Road (PIN 11782987, PIN 12280440), Neerabup
Tranquil Drive Road Reserve (PIN 11751057), Carramar
Ziatas Road Reserve (PIN 11751041), Banksia Grove, Neerabup and Pinjar

3. Clearing authorised

The permit holder must not clear more than 7.4 hectares of *native vegetation* within the area cross-hatched yellow in Figure 1 of Schedule 1.

4. Period during which clearing is authorised

The permit holder must not clear any *native vegetation* after 19 June 2032.

PART II – MANAGEMENT CONDITIONS

5. 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.

6. 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; and
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

7. Wind erosion management

The permit holder must commence road construction activities no later than three (3) months after undertaking the authorised clearing activities to reduce the potential for wind erosion.

8. Directional clearing

The permit holder must:

- (a) Conduct all clearing authorised under this permit in a slow, progressive manner, in one direction towards adjacent *native vegetation*; and
- (b) Allow a reasonable time for fauna present within the area being cleared to move into that adjacent *native vegetation* ahead of the clearing activity.

9. Fauna management – black cockatoo habitat

- (a) Prior to undertaking any clearing authorised under this permit within the combined areas cross-hatched yellow on Figure 1 of Schedule 1, the permit holder must engage a *fauna specialist* to inspect the *black cockatoo habitat tree* (ID 4) identified to contain the suitable black cockatoo breeding hollows, for evidence of current or past breeding use by *black cockatoo species*.

Table 1. Habitat tree containing the black cockatoo hollows

ID	Species	Easting	Northing
4	<i>Eucalyptus marginata</i>	386055.96	6493809.85

- (b) Where the *black cockatoo habitat tree* contains no *evidence* of current or past use by *black cockatoo species* is identified in accordance with condition 9(a), that tree must only be cleared immediately after the inspection.
- (c) Where the tree hollows show *evidence* of current or past breeding use by *black cockatoo species* under condition, 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.
- (d) If there is *evidence* of current breeding use by *black cockatoo species*, the tree must not be cleared whilst it is in use for that breeding season as determined by the *fauna specialist* under condition 9(c).
- (e) The permit holder must install five (5) artificial black cockatoo nesting hollows as calculated by the WA offset metric calculator to account for the loss of four (4) suitably sized hollows for black cockatoo nesting that cannot be avoided.
- (f) Each artificial black cockatoo nesting hollow required by condition 9(e) must be installed prior to commencement of the next black cockatoo breeding season following clearing of the related *black cockatoo breeding tree*.
- (g) The artificial black cockatoo nest hollows required by condition 9(e) of this permit must:
 - (i) be installed within the area cross-hatched blue on Figure 2 of Schedule 2;
 - (ii) be designed and placed in accordance with the specifications detailed in Schedule 4; and
 - (iii) be monitored and maintained in accordance with the specifications detailed in Schedule 4, for a period of at least ten years.
- (h) Within two months of clearing authorised under this permit within the combined areas cross-hatched yellow on Figure 1 of Schedule 1, the permit holder must provide the results of the hollow inspection in a report to the *CEO*.

10. Offset – Crown Reserve 33343

Within 12 months of undertaking clearing authorised under this permit, and no later than 16 June 2027, the permit holder must:

- (a) Provide to the *CEO* a copy of the executed change in purpose of Lot 9276 on Plan 10841 (Montrose Park R 33343), Girrawheen from ‘Public Recreation’ to ‘Conservation’;
- (b) Conduct a spring survey of Lot 9276 on Plan 10841 (Montrose Park R 33343), to inform the baseline species list for the site
- (c) Submit a Revegetation and Rehabilitation Plan prepared by an *environmental specialist*, to the *CEO* for approval. The Revegetation and Rehabilitation Plan is to include the results from the spring survey to inform the species list and is to be endorsed by the Department of Biodiversity Conservation and Attractions (DBCA), specifically for the species list, areas requiring infill planting and adequacy of the completion criteria.
- (d) If the *CEO* decides not to approve the Revegetation and Rehabilitation Plan, the permit holder must revise and resubmit the Revegetation and Rehabilitation Plan for the *CEO*’s approval within one (1) month of that decision.
- (e) Where the *CEO* decides not to approve a resubmitted Revegetation and Rehabilitation Plan, the permit holder is required to continue to revise and resubmit the Revegetation and Rehabilitation Plan at the *CEO*’s request, until such time that the *CEO* approves the Revegetation and Rehabilitation Plan.
- (f) The permit holder must obtain the approval of the *CEO* prior to implementing the Revegetation and Rehabilitation Plan.
- (g) The permit holder must commence implementation of the approved Revegetation and Rehabilitation Plan within 12 months of the date of approval by the *CEO* for the combined areas hatched red in Figure 3 of Schedule 2, including but not limited to the following actions:
 - (i) establish a 10 metre x 10 metre quadrat reference site within Lot 9276 on Plan 10841, Girrawheen (*reference site 1*);
 - (ii) deliberately *planting* and/or *direct seeding* within areas crosshatched in red in Figure 3 of Schedule 2 of native vegetation at an *optimal time*, using species representative of the *Banksia attenuata woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. 1994)* threatened ecological community and providing foraging habitat for Carnaby’s cockatoo (*Zanda latirostris*);
 - (iii) ensure only *local provenance* propagating material is used to *revegetate* and *rehabilitate*;
 - (iv) water planted vegetation at the *optimal time* for the first two years post planting as required;
 - (v) establish four 10 metre x 10 metre quadrat monitoring sites within areas of planted vegetation;
 - (vi) install signage to educate reserve users of the revegetation activities being undertaken;
 - (vii) implement hygiene protocols by cleaning earth-moving machinery of soil and vegetation prior to entering and leaving the site;
 - (viii) undertake *weed control* activities on an ‘as needs’ basis;
 - (ix) achieve the completion criteria specified in the Revegetation and Rehabilitation Plan after the three-year monitoring period for areas *revegetated* and *rehabilitated* under condition 10;
 - (x) the permit holder may seek approval from the *CEO* of alternative completion criteria based on *reference site 1* established under condition 10(h)(i) of this

- Permit;
- (xi) undertake remedial actions for areas revegetated and rehabilitated, where monitoring indicates that *revegetation/rehabilitation* has not met the completion criteria outlined in the Revegetation and Rehabilitation Plan or in accordance with condition 10(h)(x) of this permit, including:
 - (A) *revegetate/rehabilitate* the area by deliberately *planting* and/or *direct seeding native vegetation* that will result in the minimum completion criteria being met and ensuring only *local provenance* seeds and propagating material are used;
 - (B) additional *weed control* activities;
 - (C) undertake further watering activities; and
 - (D) annual monitoring of the revegetated and rehabilitated areas by an *environmental specialist*, until the completion criteria are met;
 - (i) Where an *environmental specialist* determines that the completion criteria outlined in the Revegetation and Rehabilitation Plan or approved under condition 10(g)(x) has been met, a report shall be submitted to the *CEO* within three months of the determination being made; and
 - (j) Where the *CEO* does not agree with the determination made under condition 10(i), the *CEO* may require the permit holder to undertake remedial actions in accordance with the requirements under condition 10(g)(xi) and repeat the actions under condition 10(i).

11. Offset – Crown Reserve 33343 – Bush Forever

- (a) Prior to 31 December 2028, the permit holder must provide evidence from the Department of Planning, Lands and Heritage that Lot 9276 on Plan 10841 (Montrose Park R 33343), Girrawheen is identified as ‘Bush Forever’ within the Perth Metropolitan Regional Scheme.

12. Offset – Crown Reserve 36601

Within 12 months of undertaking clearing authorised under this permit, and no later than 16 June 2027, the permit holder must:

- (a) provide to the *CEO* a copy of the executed change in purpose for the portion of Lot 10857 on Plan 15402 (Edgar Griffith Park R 36601), Wanneroo cross-hatched orange in Figure 4 of Schedule 2 from ‘Public Open Space’ to ‘Conservation’;
- (b) implement and adhere to the ‘CPS 9981/1 Flynn Drive Stage 2 and 3 2025 Revegetation and Rehabilitation Plan - Edgar Griffith Park (Crown Reserve 36601)’ (City of Wanneroo, 2025) for the combined areas hatched orange in Figure 4 of Schedule 2, including but not limited to the following actions:
 - (i) retain the vegetative material and topsoil removed by clearing authorised under this permit and stockpile the vegetative material and topsoil in an area that has already been cleared;
 - (ii) commence *revegetating* and *rehabilitating* the areas cross-hatched orange on Figure 4 of Schedule 2, by way of:
 - (A) laying the vegetative material and topsoil retained under condition 12(b)(i);
 - (B) deliberately *planting* tube stock and salvaged *native vegetation* at an *optimal time* that will result in similar species composition, structure and density of *native vegetation* to *reference site 2*; and
 - (C) ensuring only *local provenance* seeds and propagating material are used to *revegetate* and *rehabilitate* the area.
 - (iii) establish four 10 metre x 10 metre quadrat monitoring sites as specified in Table 4 of Schedule 3;

- (iv) water planted vegetation at the *optimal time* for the first two years post planting as required;
- (v) install signage to educate reserve users of the *revegetation* activities being undertaken;
- (vi) implement hygiene protocols by cleaning earth-moving machinery of soil and vegetation prior to entering and leaving the site;
- (vii) undertake *weed* control activities on an ‘as needs’ basis;
- (viii) achieve the completion criteria specified in Table 4 of Schedule 3 after the three-year monitoring period for areas *revegetated* and *rehabilitated* under condition 12;
- (ix) undertake remedial actions for area *revegetated* and *rehabilitated* where monitoring indicates that *revegetation* has not met the completion criteria, outlined in 12(b)(viii), including:
 - (A) *revegetate* the area by deliberately planting *native vegetation* that will result in the minimum completion criteria detailed in Table 4 of Schedule 3, ensuring only *local provenance* seeds and propagating material are used;
 - (B) undertake further *weed* control activities;
 - (C) undertake further watering activities; and
 - (D) monitoring of the *revegetated* and *rehabilitated* site by an *environmental specialist*, until the completion criteria are met.
- (c) Where an *environmental specialist* determines that the completion criteria outlined in Table 4 of Schedule 3 has been met, a report shall be submitted to the *CEO* within three months of the determination being made.
- (d) Where the *CEO* does not agree with the determination made by an environmental specialist, the *CEO* may require the permit holder to undertake remedial actions in accordance with the requirements under condition 12(b)(viii) and repeat the actions under condition 12(c).

13. Offset - Lot 901

- (a) Prior to commencement of clearing authorised under this permit, the permit holder must fund the purchase of the area cross hatched blue in Figure 2 of Schedule 2 to be ceded to the Department of Biodiversity Conservation and Attractions for the purpose of conservation.

PART III- RECORD KEEPING AND REPORTING

14. 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 2.

Table 2: 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 GDA2020, 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 5; and (f) actions taken to minimise the risk of the introduction and spread of <i>weeds</i> and <i>dieback</i> in accordance with condition 6; (g) actions taken in accordance with condition 7 (h) actions taken in accordance with condition 8,
2.	In relation to black cockatoo fauna management pursuant to condition 9	<ul style="list-style-type: none"> (a) the time(s) and date(s) of inspection(s) of the suitable <i>black cockatoo habitat tree</i> by the <i>fauna specialist</i>; (b) a description of the inspection methodology employed by the <i>fauna specialist</i>; (c) the species name of any fauna determined by the <i>fauna specialist</i> to be occupying the suitable <i>black cockatoo habitat tree</i>; (d) where the suitable <i>black cockatoo habitat tree</i> is determined by the <i>fauna specialist</i> to be occupied by <i>black cockatoo species</i>: <ul style="list-style-type: none"> the time and date that it was determined to be no longer occupied; and (ii) a description of the evidence by which it was determined to be no longer occupied; (e) the time and date that the suitable black cockatoo habitat tree was cleared. (f) a copy of the fauna specialist report; (g) the location where artificial black cockatoo hollows were installed, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 2020 (GDA2020), expressing the geographical coordinates in Eastings and Northings; (h) the date when each artificial nesting hollow was monitored and maintained; and

		(i) a description of the monitoring and maintenance activities undertaken.
3.	In relation to offset condition 10 and 11	<ul style="list-style-type: none"> (a) actions taken to change the purpose of Crown Reserve 33343 from ‘Public recreation’ to ‘Conservation’; (b) actions taken to include Crown Reserve 33343 as a Bush Forever under the Perth Metropolitan Regional Scheme; (c) a description of the revegetation and rehabilitation activities undertaken; (d) the size of the area revegetated and rehabilitated; (e) the date/s on which the revegetation and rehabilitation was undertaken; (f) the boundaries of the area revegetated and rehabilitated (recorded digitally as a shapefile using a Global Positioning System (GPS) unit set to GDA2020, expressing the geographical coordinates in Eastings and Northings); (g) determinations made by an environmental specialist; and (h) other actions taken in accordance with condition 10 and 11.
4.	In relation to offset condition 12 and 13	<ul style="list-style-type: none"> (a) actions taken to change the purpose of the identified portion of Crown Reserve 36601 from ‘Public Open Space’ to ‘Conservation’; (b) a description of the <i>revegetation</i> and <i>rehabilitation</i> activities undertaken; (c) the size of the area <i>revegetated</i> and <i>rehabilitated</i>; (d) the date/s on which the <i>revegetation</i> and <i>rehabilitation</i> was undertaken; (e) the boundaries of the area <i>revegetated</i> and <i>rehabilitated</i> (recorded digitally as a shapefile using a Global Positioning System (GPS) unit set to GDA2020, expressing the geographical coordinates in Eastings and Northings); (f) determinations made by an <i>environmental specialist</i>; and (g) other actions taken in accordance with condition 12 and 13.

15. Reporting

- (a) The permit holder must provide to the *CEO*, on or before 30 June of each calendar year, a written report containing:
- (i) the records required to be kept under condition 14; and
 - (ii) records of 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 has been undertaken, a written report confirming that no clearing under this permit has been undertaken, must be provided to the *CEO* on or before 30 June of each calendar year.
- (c) The permit holder must provide to the *CEO*, no later than 90 calendar days prior to the expiry date of the permit, a written report of records required under condition 14, where these records have not already been provided under condition 15(a).

DEFINITIONS

In this permit, the terms in Table 3 have the meanings defined.

Table 3: Definitions

Term	Definition
<i>Banksia attenuata</i> woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. 1994)	means the State listed threatened ecological community including the following dominant species - <i>Banksia attenuata</i> (occasionally with <i>Eucalyptus marginata</i>) with <i>Bossiaea eriocarpa</i> , <i>Conostephium pendulum</i> , <i>Hibbertia huegelii</i> , <i>H. hypericoides</i> , <i>Petrophile linearis</i> , <i>Scaevola repens</i> , <i>Stirlingia latifolia</i> , <i>Mesomelaena pseudostygia</i> and <i>Alexgeorgea nitens</i> .
black cockatoo habitat trees	means trees that have a diameter, measured 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 black cockatoo species.
black cockatoo species	means one or more of the following species: (a) <i>Zanda latirostris</i> (Carnaby's cockatoo); (b) <i>Zanda baudinii</i> (Baudin's cockatoo); and/or (c) <i>Calyptorhynchus banksii naso</i> (forest red-tailed black cockatoo).
CEO	Chief Executive Officer of the department 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.
condition	a condition to which this clearing permit is subject under section 51H of the EP Act.
dieback	means the effect of <i>Phytophthora</i> species on native vegetation.
direct seeding	means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species
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.

Term	Definition
environmental specialist	means a person who holds a tertiary qualification in environmental science or equivalent, and has a minimum of two (2) years work 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.
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
evidence	means showing chew marks or scratchings on the habitat tree representative of the species being surveyed, the presence of the species entering or leaving the habitat tree, and/or the presence of chicks/young.
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 50 kilometres and the same IBRA subregion of the area cleared.
mulch	means the use of organic matter, wood chips or rocks to slow the movement of 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 period from April to June when referring to planting; October to April when referring to watering.
planting	means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species.
reference site 1	a quadrat established within Lot within Lot 9276 on Plan 10841, Girrawheen that is representative of the “ <i>Banksia attenuata</i> woodlands over species rich dense shrublands (Swan Coastal Plain Community type 20a – Gibson et al. 1994)” threatened ecological community in very good to excellent (Keighery, 1994) condition.
reference site 2	quadrat number EG04 from Edgar Griffiths Detailed Flora Survey (Natural Area Holdings, 2024) with the following coordinates: Latitude: -31.737723471 Longitude: 115.823360073

Term	Definition
Revegetation and Rehabilitation Plan	<p>In condition 10 the revegetation and rehabilitation plan refers to 'CPS 9981/2 Flynn Drive Stage 2 and 3 Revegetation and Rehabilitation Plan – Montrose Park (Crown Reserve 33343)'</p> <p>In condition 12 the Revegetation and Rehabilitation Plan refers to CPS 9981/1 Flynn Drive Stage 2 and 3 2025 Revegetation and Rehabilitation Plan - Edgar Griffith Park (Crown Reserve 36601)' (City of Wanneroo, 2025)</p>
rehabilitate/ed/ing/ion	means actively managing an area containing native vegetation in order to improve the ecological function of that area.
revegetate/ed/ing/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.
weeds	<p>means any plant –</p> <p>(a) that is a declared pest under section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i>; or</p> <p>(b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or</p> <p>not indigenous to the area concerned.</p>

END OF CONDITIONS



Meenu Vitarana
MANAGER
NATIVE VEGETATION REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

30 March 2026

Schedule 1

The boundary of the area authorised to be cleared is shown in the map below (Figure 1).

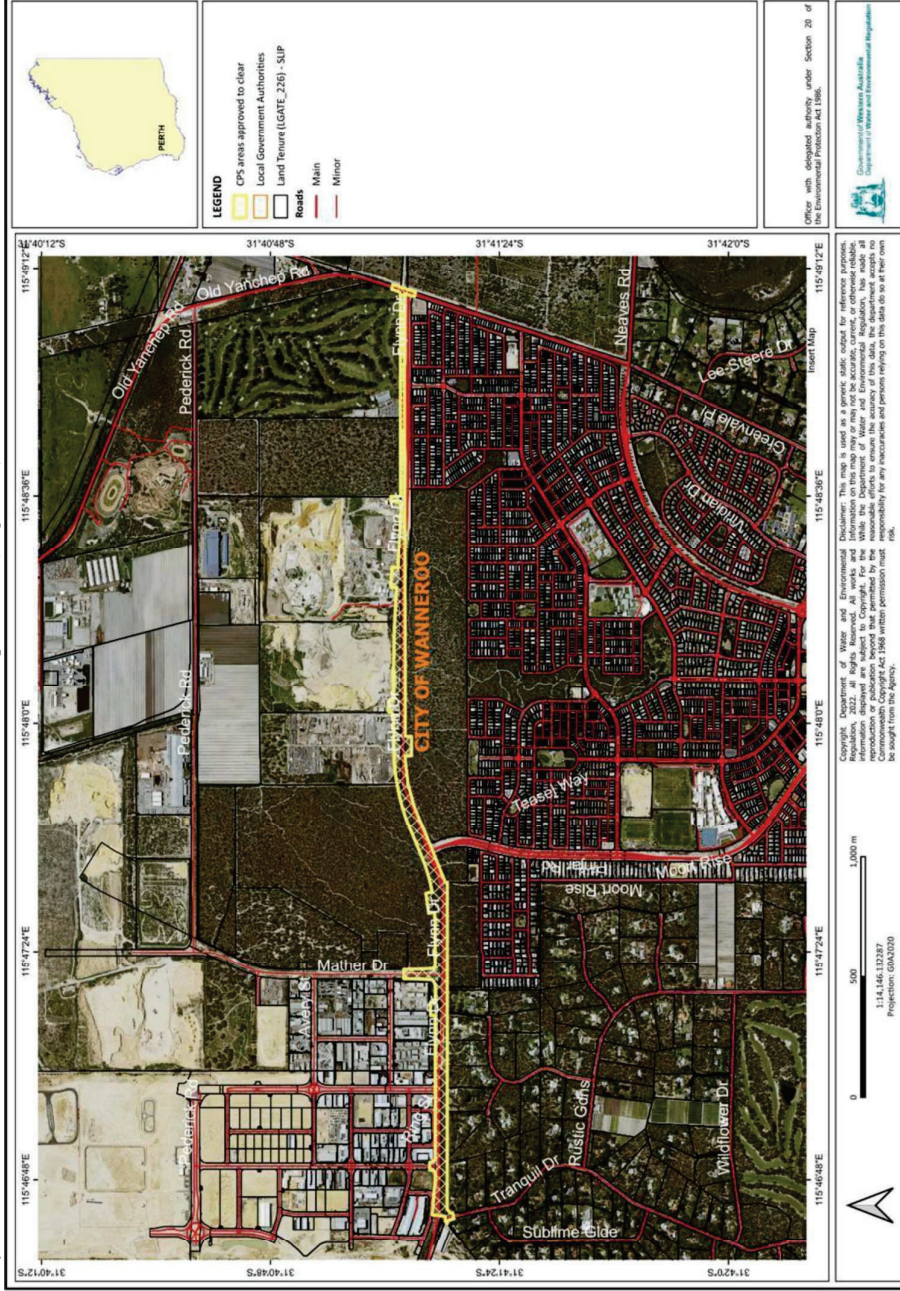


Figure 1: Map of the boundary of the area within which clearing may occur

Schedule 2

The boundary of the areas within which conditions apply are shown in the maps below (Figure 2, Figure 3 and Figure 4).

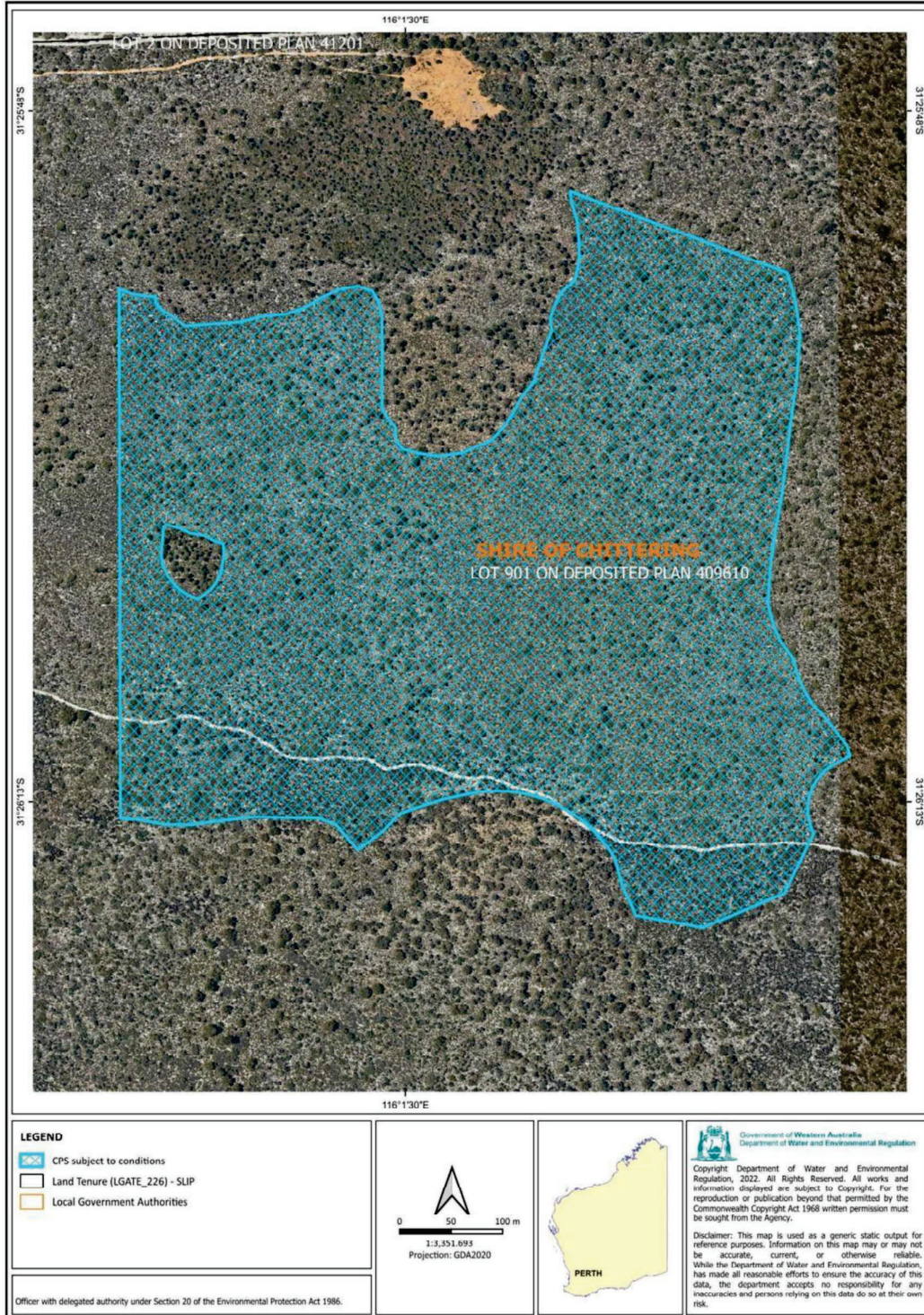


Figure 2: Map of the boundary of the area within which Condition 9 and Condition 13 applies.



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Figure 3: Map of the boundary of the area within which Condition 10 and 11 applies.

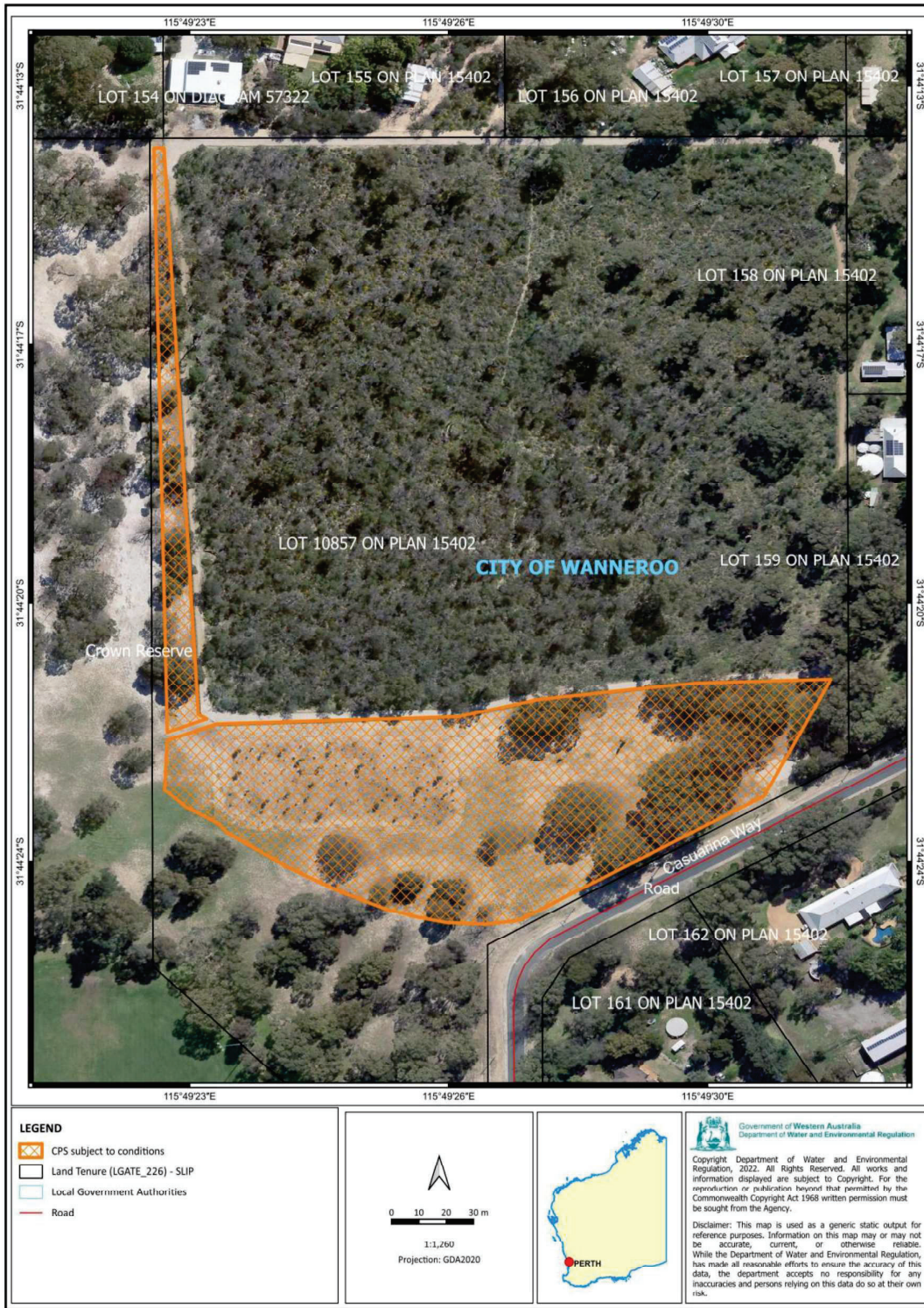


Figure 4: Map of the boundary of the area within which Condition 12 applies.

Schedule 3

Table 4. *Revegetation* and rehabilitation criteria for condition 12 (revegetation and rehabilitation of Edgar Griffith Park, Reserve 36601).

Criterion	Reference area data	Completion Targets	Completion Criteria	Monitoring
Site Species Richness	33 (native sp. only) based on results of Edgar Griffiths Detailed Flora Survey (Natural Area Holdings, 2024)	Minimum of 50% of native species returned in the revegetation areas.	Minimum of 17 native species to be present in the revegetation areas	Years 3, 4 & 5.
Quadrat species richness	Quadrat species richness is 31 (native sp. only) based on <i>reference site 2</i>	Minimum of 50% of the number of native species present in <i>reference site 2</i> , which must include a minimum of two tree species which provide suitable foraging habitat for black cockatoo species, in each monitoring quadrat	Minimum of 16 native species, which must include a minimum of two tree species which provide suitable foraging habitat for black cockatoo species, in each monitoring quadrat	Years 3, 4 & 5.
Weed Cover	Average weed cover of quadrats recorded in Edgar Griffiths Detailed Flora Survey (Natural Area Holdings, 2024) is 30%.	Weed cover in the revegetation areas to be no greater than reference data	Weed cover in the revegetation areas to be no greater than 30%	Years 3, 4 & 5.
Declared weeds	N/A	No Declared weeds to be present within the revegetation areas	0% declared weed cover	Years 3, 4 & 5.
Survival rate	N/A	A survival rate of at least 50%	A survival rate of at least 50%	Years 3, 4 & 5
Bare ground	N/A	No more than ::15% bare ground.	No more than ::15% bare ground.	Years 3, 4 & 5.

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

Artificial Hollows for Black Cockatoos

There are three species of threatened black cockatoos in the southwest of Western Australia (WA): Baudin's cockatoo *Zanda baudinii* (previously *Calyptorhynchus baudinii*), Carnaby's cockatoo *Zanda latirostris* (previously *Calyptorhynchus latirostris*) and forest red-tailed black cockatoo *Calyptorhynchus banksii naso*. Some of the main threats to the three species include nest hollow shortages due to ongoing and extensive habitat loss and degradation, lack of recruitment of new hollow bearing trees, and competition with galahs, corellas, and feral European honey bees.

Artificial hollows can be used to help conserve these threatened black cockatoos by enabling them to breed in areas where natural hollows are limited. This Fauna Note provides advice on how to select an appropriate site, guidelines on how to design and place artificial hollows, and advice on how to maintain and monitor

artificial hollows. The information presented here is based on experience with Carnaby's cockatoo which have many examples of successful use of artificial hollows and forest red-tailed black cockatoo which have a few known examples of use. However, to date there are no records of Baudin's cockatoo using artificial nest hollows.

Sometimes a site may not be suitable for artificial hollows. This Fauna Note includes options for alternative conservation actions that are important to the conservation of black cockatoos and can also be used to complement the placement of artificial hollows.

It is important to remember that the retention of both old and dead trees (stags) that have suitable hollows for black cockatoos is crucial for breeding, and natural replacement of hollow bearing trees for future breeding is vital for the long-term survival of the species. The installation of artificial hollows should not be used to justify the removal of natural hollow-bearing trees.

When to Use Artificial Hollows

Artificial hollows may be useful at sites where natural hollows are a limiting resource. However, cockatoos may not always use artificial hollows, for example if provided in non-traditional nesting areas. Artificial hollows that are installed within 2 km of current breeding sites are regularly taken up. There are ways to select sites for artificial hollows that will increase the chance that they will be used and that birds will be able to successfully raise chicks.

Where do black cockatoos nest?

Black cockatoos nest in the hollows of mature trees in uncleared or remnant Eucalypt woodland or forest, as well as in remnant paddock trees. Trees may take more than 120 years to develop hollows that are a suitable size, and cockatoos use hollows in both living and dead trees. Refer to the maps at the end of this document for the known breeding range of the three species of black cockatoo.

Carnaby's cockatoos generally breed in Wandoo and Salmon Gum in the Wheatbelt, Marri in forested areas, and Tuart along the Swan Coastal Plain. They are also known to nest in Jarrah, Flooded Gum, York Gum, Gimlet, Powderbark Wandoo, and Karri.

Baudin's cockatoos generally nest in Jarrah, Marri, and Karri in densely forested areas. They are also known to nest in hollows in Wandoo and Tuart.



Carnaby's cockatoo nestlings in an artificial hollow. Note this chewing post will require replacement following breeding.

Photo: Rick Dawson

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The breeding habitat for forest red-tailed black cockatoos is in uncleared forest or remnant patches of old Marri. They are also known to nest in Karri, Wandoo, Bullich, Blackbutt, Tuart, and Jarrah.

Is my site suitable for artificial hollows?

It is recommended that artificial hollows be used in known nesting areas where there has been a decrease in the availability of natural nesting hollows. Trials have shown that Carnaby's cockatoo and forest red-tailed black cockatoos will nest in artificial hollows if installed in suitable areas and are of a satisfactory design. However, putting up artificial hollows may not be the best way to help black cockatoos in your area.

Indeed, attracting birds to attempt to breed in unsuitable areas may result in increased risk of harm to adult birds or their chicks. The installation of artificial hollows in built up and urbanized areas of the metropolitan Perth and Peel regions, and other urban centres in the southwest is not recommended and should not be undertaken. This is due to the increased risk in this area, including car strike to young inexperienced birds, attack by predators such as Australian ravens and pets, and in highly urbanised and cleared areas there may not be sufficient food resource for the adults to successfully raise chicks).

To decide if your site is suitable for artificial hollows you need to consider five essential criteria (Table 1). If your site does not match all criteria, you may wish to consider alternative conservation actions including:

- protecting habitat by fencing and/or rabbit and stock control to encourage regeneration of native vegetation;
- controlling competitive species such as galahs, corellas and feral bees that may occupy hollows;
- repairing old and damaged natural nesting hollows;
- providing access to fresh water;
- revegetating with preferred food species and nesting trees; and/or
- creating linkages of vegetation between nesting and feeding areas.

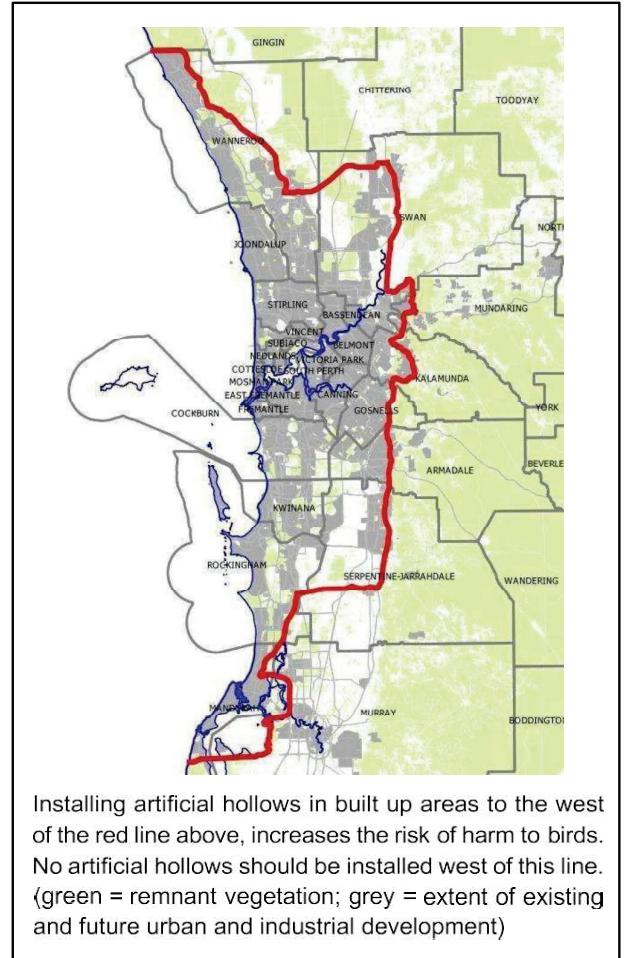


Table 1: Essential criteria for a site to be considered suitable for installation of artificial hollows, with alternative conservation actions suggested for each criterion that is not met.

1. The site is Eucalypt woodland or forest within the known breeding range of the species	
<i>Important consideration</i>	Carnaby's cockatoos tend to nest in Wandoo and Salmon Gum in the Wheatbelt, Marri in forested area and Tuart along the Swan Coastal Plain. Baudin's cockatoos generally nest in Jarrah, Marri, and Karri and forest red-tailed black cockatoos usually nest in Marri.
<i>Alternative conservation actions</i>	If the site is not within the known current breeding range of black cockatoos, then it is unlikely that the installation of artificial hollows will attract the birds to the site. However, black cockatoos are highly mobile species that also require habitat for feeding and roosting which means that it is important to protect and manage habitat visited by the cockatoos by fencing, and carrying out other management, such as rabbit and stock control, to retain existing habitat, and to encourage regeneration of native vegetation. It is also important to revegetate areas within the breeding and non-breeding areas with preferred food species, and to create linkages of vegetation to assist the movement of the birds through the landscape.
2.	Breeding by Black cockatoos is known or suspected at the site. There must also be evidence that a lack of suitable available tree hollows is preventing breeding that would otherwise occur in the area.

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	<i>Important consideration</i>	If the lack of available hollows is due to nest competitors such as galahs, western long-billed corellas or feral bees then any attempt to install artificial hollows must be accompanied by efforts to deter or control these competitors. Alternatively, successful control of competitors may mean that artificial hollows are not needed.
	<i>Alternative conservation actions</i>	<p>If sufficient suitable natural hollows are available in an area, then there is no need to install artificial hollows. This overcomes the need for ongoing maintenance of unnecessary artificial hollows.</p> <p>If breeding is already occurring at the site and there are plenty of available hollows, efforts can be redirected towards caring for existing or future nesting hollows. This may involve repairing old or damaged nesting hollows by covering cracks, removing debris blocking access to hollows or replacing rotted wood in the hollow so that the depth of the nest floor is manageable for the birds. Future hollows can be protected by preventing compaction of ground around trees, fencing and/or rabbit and stock control to encourage regeneration to produce future nesting trees, fire management, and the strategic pruning of limbs to prevent limbs breaking and tearing open hollows. Efforts can also be aimed at enhancing the success of existing breeding by revegetating with preferred food and nesting species, as well as creating linkages of suitable vegetation and fresh water between nesting and feeding areas.</p> <p>If breeding is not occurring at the site despite hollows being available, then there may be a range of factors making the site unsuitable for breeding. These factors must be identified and addressed before breeding can resume in the area (if at all possible). Lack of sufficient food could be the cause, and this can be addressed by revegetating with preferred food species and increasing connectivity in the landscape.</p> <p>To compile a list of plant species suitable for revegetation at your site, refer to the document Plants Used by Carnaby's Black Cockatoo available on the Department of Biodiversity, Conservation and Attractions (DBCA) black cockatoo webpage.</p>
3.	The artificial hollows can be located in close proximity to adequate feeding areas -within a 12 km radius.	
	<i>Important consideration</i>	Feeding areas commonly contain proteaceous species such as banksias (including dryandras) and hakeas. A list of food plants can be obtained by use of the document Plants Used by Carnaby's Black Cockatoo .
	<i>Alternative conservation actions</i>	If the site is not close to adequate food, then the black cockatoos will not be able to successfully raise young. Cockatoos require sufficient food close to nesting areas in order to be able to forage during the day and return to feed nestlings. Existing feeding habitat close (within 12km) to breeding areas can be protected by fencing and/or undertaking rabbit and stock control to encourage regeneration of native vegetation. The amount of feeding habitat in an area can be increased by planting or revegetating with preferred food species.
4.	The hollows are placed in secure locations and the owner/manager of these areas is supportive and willing to provide the necessary long-term security and annual maintenance for the entire time that the artificial hollow will be in place.	
	<i>Important consideration</i>	For advice on the monitoring and maintenance requirements, please refer to the section on how to monitor and maintain artificial hollows.
	<i>Alternative conservation actions</i>	Artificial hollows can be subject to nest robbing and vandalism. It is highly recommended that artificial hollows are not put in exposed or easily accessible areas such as road verges unless they are above 8m and placed on the side of trees away from roads. If the site is considered at high risk of nest robbing or vandalism then alternative actions to assist the conservation of the species are recommended including: revegetation, fencing, repairing old or damaged natural nesting hollows and planting vegetation linkages to connect nesting and feeding areas.
5.	A suitable artificial hollow design is used.	
	<i>Important consideration</i>	For greatest chance of success, please refer to the sections below on how to design and place artificial hollows.
	<i>Alternative conservation actions</i>	If an alternative design is proposed, it is recommended that Department of Biodiversity, Conservation and Attractions, Birdlife Australia, or WA Museum are contacted to discuss and approve design.

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How to Design and Place Artificial Hollows

A wide variety of artificial hollow designs have been previously used with mixed success. Evidence suggests that, while artificial hollows 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.

Successful artificial hollows have been constructed from sections of salvaged natural hollows, or black and white industrial pipe. Research results show that the most effective artificial hollows are made of plastic culvert pipe which is readily available, durable, light, cheap, and easy to install and maintain (see right picture below). When using non-natural materials care must be taken to ensure there are no toxic residues, and that the materials are safe to ingest.

Below are three examples of successful artificial hollows that have been used by black cockatoos for nesting:

- natural log with cut side entrance (left);
- white industrial pipe with top entrance (centre); and
- DBCA recommended polypropylene pipe design (right)



Photo: Christine Groom (left), Rick Dawson (centre and right)

The notes below provides general guidance on design and construction of artificial hollows for black cockatoos. Additional specifications are provided at the end of this Fauna Note which outline current best practice and may be considered recommendations for minimum requirements.

Walls, size, base, and entrance design

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

- durable enough to withstand exposure to elements for at least 20 years; and
- able to simulate the thermal properties of a natural tree hollow.

Artificial hollows should be:

- not less than 375 mm in internal diameter; and
- preferably 1200 mm deep overall with 200 mm of substrate/nesting material covering the base.

The base of the artificial hollow must be:

- securely fixed to the walls and able to support the weight of an adult and nestling(s);
- durable enough to last the life of the nest, and survive chewing by cockatoos;
- free draining;

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- at least 375 mm in diameter; and
- covered with 200 mm of sterile, dry, free draining substrate/nesting 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 hard plastic, thick hardwood timber slab or marine ply (not chipboard or MDF). The base material must be cut to fit internally with sharp or rough edges ground away or curled inwards, be fixed securely to the walls and have small drainage holes.

The entrance of the artificial hollow:

- must have a diameter of at least 375 mm; and
- preferably be top entry which will minimise use by non-target species.

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

Adding ladders and sacrificial chewing posts

For artificial hollows made of non-natural materials, or of processed boards, it is necessary to provide a ladder to enable the birds access to the hollow, and sacrificial chewing posts so that birds can chew material, and so that non-target species can exit the hollow. The post can also assist in providing further material to the substrate, however research has shown that not all posts are heavily chewed.

The ladder must be:

- securely mounted to the inside of the hollow;
- made from an open heavy wire mesh with a mesh size of 30 - 50 mm (such as WeldMesh™); or heavy chain; and
- reach to, or below the level of substrate/nesting material.

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.

Do not use material for ladders that the birds can chew, including galvanised metal because the birds may grip or chew the ladder, and ingest harmful compounds.

The sacrificial chewing posts must be:

- made of untreated hardwood such as Jarrah, Marri or Wandoo;
- thick enough to satisfy the birds' needs between maintenance visits;
- extended beyond the top of the hollow as an aid to see whether the nest is being used and reach to the floor of the hollow;
- placed on the inside of the hollow; and
- attached in such a way that they are easy to replace (e.g. a 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 one chewing post is provided. Posts 70 x 50 mm have been used but require monitoring at least every second breeding season when the nest is active and replacing when found to be no longer reaching the nesting material or otherwise significantly chewed. Birds do vary in their chewing habits, and therefore the frequency at which the chewing posts require replacement will also vary.

Mounting and placement

It is important that artificial hollows are placed where they will be accessible for future monitoring and maintenance, but preferably not conspicuous to the general public.

The height at which artificial hollows should be placed is variable, between 4 - 8m for Carnaby's cockatoo, and the average height of natural hollows in dominant tree species in the area is a good guide. If located in an area that the general public cannot access, such as a private property, the hollows can be placed as low as 4 m from the ground so that they are easily accessible by ladder. If located in an area where the general public are allowed access, hollows should be placed at least 8 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.

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Black cockatoos 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; and
- fitted on the side where the most shade can be obtained.

Artificial hollows must be mounted such that:

- the fixings used will last the duration of the nest e.g. galvanized bracket or chain and fixed with galvanized coach screws;
- it is secured by more than one anchor for security and stability;
- it is positioned vertically or near vertically; and
- where possible living trees are to be used to provide shade.

Artificial hollows should not be placed in the open on poles, as this may result in excessive exposure to sun during very hot weather.

Safety

Care needs to be taken when placing artificial hollows to ensure human safety is paramount.

Monitoring and Maintaining Artificial Hollows

It is important to monitor and maintain artificial hollows after they have been erected to ensure their effectiveness and so that problems with pest species or maintenance requirements can be identified and resolved. This will ensure the artificial hollow continues to provide opportunities to be used and that birds will be able to successfully raise chicks

Without regular maintenance, artificial hollows are likely to fail to achieve their objective to provide safe nesting opportunities for threatened black cockatoos. Therefore, it is important to continue a regime of regular maintenance for however long the artificial hollow is required. It may be several (to many) decades until a natural replacement hollow is available. Artificial hollows erected as a condition of development to offset the loss of natural hollows may be required to be available and maintained for the life of the development approval.

How do I monitor artificial hollows?

Before undertaking monitoring of artificial hollows for black cockatoos, it is recommended that you seek advice from the Department of Biodiversity, Conservation and Attractions, Birdlife Australia, or the WA Museum. It is also important to contact the Department's Wildlife Licensing Section, to determine if a lawful authority required (<https://www.dbca.wa.gov.au/licences-permits>).

Monitoring artificial hollows requires keen observation, and naturalist skills. It is often not possible to observe direct evidence of breeding (i.e. nestlings or eggs) and therefore inferences must be made based on other observations. It is also important to limit disturbance to breeding birds. There are many techniques available to monitor artificial hollows, and a combination of several is likely to achieve the best results (**Table 2**).

Monitoring of artificial hollows should consider and record:

- the condition of the tree, hollow fixings and general hollow condition;
- condition and connection of sacrificial chewing posts, ladder and substrate/nesting material inside hollow;
- any use by black cockatoos and nature of activity (adult birds, chewing, eggs, chicks etc.)
- details of use by non-target species (native or pest);
- identify any problems with pest species or maintenance requirements; and
- maintenance actions undertaken to resolve any problems.

The information collected from monitoring should be written down and reported. There are standard fauna report forms available on the Department's website (<https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals>) that can be used to record the details of your sighting. Alternatively, if you are

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frequently monitoring a larger number of artificial hollows, you can put the details into a spreadsheet or use the black cockatoo monitoring forms available on the [DBCA website](http://www.dbca.wa.gov.au). Records should be submitted to the Department by emailing fauna.data@dbca.wa.gov.au. The Department will put the records into the Threatened and Priority Fauna Database, and it will be used to inform conservation and management decisions. Any other opportunistic sightings of Threatened and Priority species can also be reported via the same email.

Table 2: Techniques for monitoring artificial hollows

Technique	Description of Technique								
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 a hollow	The behaviour of parent birds around a hollow can indicate an approximate age of young in the nest.								
	<table border="1"> <thead> <tr> <th>Parent Behaviour</th> <th>Approximate Stage and Age of Young</th> </tr> </thead> <tbody> <tr> <td>Prospecting for hollow</td> <td>Unborn</td> </tr> <tr> <td>Male only seen out of hollow</td> <td>Egg or very young nestling (< 3 - 4 weeks)</td> </tr> <tr> <td>Both parents seen entering/exiting the hollow</td> <td>Nestling(s) has hatched (> 3 - 4 weeks)</td> </tr> </tbody> </table>	Parent Behaviour	Approximate Stage and Age 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) has hatched (> 3 - 4 weeks)
	Parent Behaviour	Approximate Stage and Age 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) has hatched (> 3 - 4 weeks)								
Observing feeding flocks	Flocks of all male birds can indicate that 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 to flush female	When females are sitting on eggs they will usually respond to tapping or scraping at the base of their tree by appearing at the entrance or flying from the hollow opening. This is not a guarantee of breeding activity, but an indication that breeding is possibly occurring in the hollow. Tapping or scraping is best undertaken between 10 am - 3 pm when females will most likely to be sitting.								
Observing insect activity around a nest	Faecal matter produced by nestlings attracts insects, especially flies and ants. The type and number of these insects will help to 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 the entrance of a nest usually indicate that a death has occurred.								
Listening for nestling	With experience it is possible to determine if nestlings are present, and a broad estimate of age based on the type and volume of noises they make.								
Looking inside a 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 organize. Also keep in mind that it is important to limit disturbance to breeding birds. 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 to reach nests to undertake observations.								

When do 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, frequency, and timing of monitoring (Table 3).

Breeding by the three southwest black cockatoos varies, and the timing of monitoring of artificial hollows should accommodate the breeding of the likely target species. The Commonwealth Department of Climate Change, Energy,

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the Environment and Water {DCCEEW} Species Profile and Threats Database {SPRAT} database records the breeding periods of each of the species as:

- Carnaby's cockatoo - July to November {with peak between August to September}
- Baudin's cockatoo - October to January
- Forest red-tailed black cockatoo - every month, with peaks in April to June and August to October

The age of Carnaby's cockatoo nestlings can be determined by using the following publication:

Saunders, D. A., Dawson, R. and Nicholls, A. O. {2015}. Aging nestling Carnaby's cockatoo, *Calyptorhynchus latirostris*, and estimating the timing and length of the breeding season. *Nature Conservation* 12: 27-42
<http://dx.doi.org/10.3897/natureconservation.12.4863>

This document provides a series of photographs to illustrate changes in size and plumage of nestlings over the 10-11 weeks of the nestling period which can be used to estimate the approximate age of Carnaby's cockatoo nestlings, up to about nine weeks, by comparing appearance with the nestlings illustrated in the photographs.

Any monitoring that involving disturbance or handling of black cockatoos, requires lawful authority {<https://www.dbca.wa.gov.au/licences-permits>}. Such activity requires specialist skills and authorisation under the *Biodiversity Conservation Act 2016*.

Table 3: Recommended frequency for monitoring artificial hollows, as determined by the aim of the monitoring

Monitoring Aim	Frequency of Visits	Monitoring Techniques
To determine possible use by black cockatoos	At least once during peak breeding season.	<ul style="list-style-type: none"> • Looking for signs of use (evidence of chewing) • Observing behaviour of adults around a hollow • Tapping or scraping to flush female • Listening for nestlings • Looking inside nest
To confirm use by black cockatoos	At least two visits during peak breeding season.	<ul style="list-style-type: none"> • Looking for signs of use (evidence of chewing) • Observing behaviour of adults around a hollow • Tapping or scraping to flush female • Listening for nestlings • Looking inside a nest <p>Observing breeding evidence from at least two of the techniques confirms use by black cockatoos.</p>
To determine nesting success by black cockatoos	Preferably fortnightly visits between July and December. As a minimum, at least 3 visits spread throughout breeding season.	<ul style="list-style-type: none"> • Observing insect activity around a nest • Listening for nestlings • Looking inside a nest <p>The presence of eggs or nestlings inside a nest will help to determine nesting success.</p>
To determine use by any species	As often as possible.	<p>As a minimum, inspection from the ground:</p> <ul style="list-style-type: none"> • Looking for signs of use <p>To confirm:</p> <ul style="list-style-type: none"> • Looking inside a nest
To determine maintenance requirements	At least every two years and preferably annually.	A basic maintenance check can be undertaken from the ground. Looking inside the nest using a telescopic pole with camera or mirror enables inspection of the sacrificial chewing posts and level of substrate/nesting material. A ladder or elevated work platform will be required for a comprehensive check, and to replace sacrificial chewing posts and carry out other maintenance.

How do I maintain artificial hollows?

Natural hollows used by black cockatoos are typically present for many decades and if artificial hollows are expected to provide a similar role, then they will require maintenance to ensure they continue to function as potential nesting locations for black cockatoos for the long term.

In many cases artificial hollows are required as a condition of development to offset loss of natural hollows, in which case State and Commonwealth offset policy expects that the artificial hollows continue to provide that function for the duration of the impact (or alternatively the expected period of time the natural hollow would have persisted, or the life of the environmental approval). As part of establishing artificial hollows the responsibility and regime for long term monitoring and maintenance should also be established.

Periodic maintenance checks should be undertaken at least every two years, preferably annually, for as long as the artificial hollow is required. Maintenance actions should be completed prior to the breeding season.

Any problems identified during monitoring or maintenance checks should be addressed as soon as possible and will require similar specialist skills and equipment as used in installation. If breeding is currently occurring, maintenance may need to be delayed if it is likely to disturb the parents or nestling. 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. Likely maintenance includes:

- replacement of sacrificial chewing posts (frequently);
- top-up or replacement of nesting substrate to ensure it reaches the ladder and chewing posts (occasionally);
- replacement of nest bases (occasionally);
- repair or replacement of attachment points (infrequently); and/or
- repair of any cracks to wooden hollows (infrequently).

For artificial hollows known to be used, spare chewing posts should be taken into the field when undertaking maintenance checks as these are likely to need replacement.

Artificial hollows are likely to need to be completely replaced after many years, and other circumstances may require the relocation of artificial hollows (e.g. if the tree they are in becomes damaged).



Artificial hollow base needing repair.
Photo by Christine Groom

Applying this guidance to forest red-tailed black cockatoo and Baudin's cockatoo

The information presented here is based on experience with Carnaby's cockatoo, for which many examples of successful use of artificial hollows exist, and forest red-tailed black cockatoo for which a few known examples of use exist. However, to date there are no records of Baudin's cockatoo using artificial nest hollows.

A definite reason for this lack of use is not yet known but may relate to the location of artificial hollows installed to date (few or none placed in Baudin's cockatoo breeding sites where breeding is occurring and natural hollows are limiting) or design or installation issues, such as hollows not being installed high enough in tall forest canopy.

Before deciding to install artificial hollows for forest red-tailed black cockatoo or Baudin's cockatoo, it is recommended that you discuss your proposal with, and/or seek advice from, the Department of Biodiversity, Conservation and Attractions, Birdlife Australia, or the WA Museum.

Maps of Black Cockatoo Breeding Range

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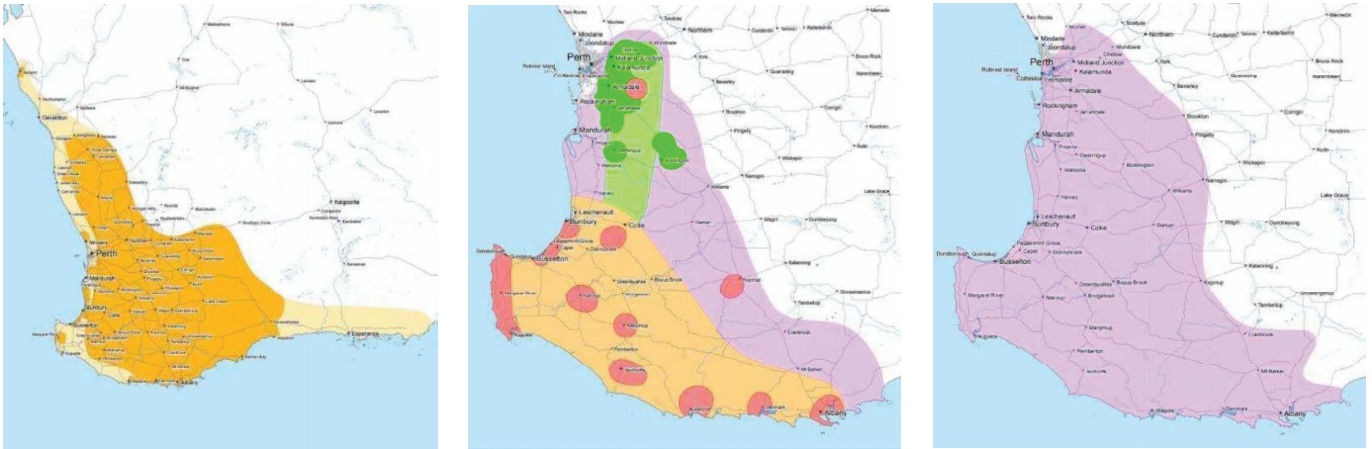


Image: [Commonwealth of Australia, 2011](#)

The maps show the modelled distributions of Carnaby's cockatoo (left), Baudin's cockatoo (centre) and forest red-tailed black cockatoo (right). For Baudin's cockatoo, the breeding range is indicated by the red (known breeding areas) and yellow (predicted breeding range), and for Carnaby's cockatoo, the breeding range is indicated by the orange.

Artificial Hollows - best current design and installation specifications

The specifications below outline the most recent detailed specifications for artificial hollow construction installation and maintenance. These would provide for a well-constructed and installed artificial hollow that is most likely to have an adequate lifespan (minimum 50-years). To ensure longevity, regular maintenance will be required on the nesting material, sacrificial post, and removal of debris from the hollow.

It is highly recommended that any artificial hollows installed as a condition of environmental approval (for example where the artificial hollow is expected to provide benefit for a long period), or installed on DBCA managed lands would meet these specifications as a minimum.

Artificial Hollow Construction Specifications

- Dimensions: internal diameter 375mm (430 mm external), 1200 mm in height, and installed a minimum of 4 m above ground on private property and 8 m on public land.
- Pipe material: Fifty-year UV rated culvert pipe (polypropylene material used with corrugated outer wall and thin inner sleeve. Recommended brand or similar: The 'Vinidex StormPRO' pipes are twin wall, corrugated, polypropylene pipes for non-pressure stormwater and drainage applications, which meet all the requirements for artificial hollows.
- Chain: 6 mm galvanised (not zinc plated). The hollows will be attached to the tree by chain and fixed by 4 points.
- Fixings: Galvanised MIO coach screws four x 75 mm. Two on the weight bearing chain at the top and one each side of the hollow.
- Ladder: 50 x 50 mm square galvanised weldmesh 4mm thick.
- Chewing posts: Untreated Jarrah, Marri or Wandoo that meet requirements in "Adding ladders and sacrificial chewing posts" above.

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Artificial hollow design, the fixing method, and the sacrificial chewing post extending above the hollow rim. Left image shows the side chains that are to be at a 30-degree upwards angle to allow the hollow to move up the tree as the tree grows. Right image shows the top weight bearing fixing which is to be 100 mm above the hollow to allow upwards movement.



Left image shows the internal view, including substrate material placed on the floor to line the hollow, and the internal weld mesh ladder. Substrate material must be coarse, hard, wood chips at least 200 mm deep.
Centre image shows one hard wood sacrificial post which is to fit and connect to the rim of the hollow by a hook screwed to the post to ensure it does not come loose, block the hollow or injure the occupants.
Right image shows the hard plastic floor which is to be securely fixed with a minimum of 12 small drainage holes. Larger holes may result in the occupants chewing the base.

Monitoring and Maintaining Artificial Hollows

It is important to continue a regime of regular maintenance for however long the artificial hollow is required. Artificial hollows erected as a condition of development to offset the loss of natural hollows may be required to be available and maintained for the life of the development approval. As part of establishing artificial hollows the responsibility and regime for long term monitoring and maintenance should also be established.

Periodic maintenance checks should be undertaken at least every two years, preferably annually, for as long as the artificial hollow is required. Maintenance actions should be completed prior to the breeding season.

Further Reading

DBCA webpage and fauna profiles: [Black cockatoos](#)

Department information sheets: [Fauna Note - Corellas and other flocking cockatoos](#)

Birdlife Australia webpage and brochure: [Identify your Black cockatoo](#)

Western Australian Museum webpage and fact sheets: [Cockatoo Care](#)

Saunders DA et al. (2022) Artificial nesting hollows for the conservation of Carnaby's cockatoo *Calyptorhynchus latirostris*: definitely not a case of erect and forget. Pacific Conservation Biology [doi:10.1071/PC21061](https://doi.org/10.1071/PC21061)

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Department of Biodiversity,
Conservation and Attractions



Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9981/2
Permit type:	Purpose permit
Applicant name:	City of Wanneroo
Application received:	11 November 2025
Application area:	7.4 hectares of native vegetation
Purpose of clearing:	Road construction
Method of clearing:	Mechanical
Property:	<p>Flynn Drive Road Reserve (PIN 11751051)</p> <p>Greenwich Parade Road Reserve (PIN 1180634)</p> <p>Lot 5 on Diagram 91435</p> <p>Lot 900 on Deposited Plan 50843</p> <p>Lot 901 on Deposited Plan 50843</p> <p>Lot 902 on Deposited Plan 50843</p> <p>Lot 6001 on Deposited Plan 402319</p> <p>Lot 8002 on Deposited Plan 411322 (Crown Reserve 53763)</p> <p>Lot 8054 on Deposited Plan 402319 (Crown Reserve 53764)</p> <p>Lot 9943 on Diagram 53573 (Crown Reserve 35951)</p> <p>Mather Drive Road Reserve (PIN 11751046)</p> <p>Road (PIN 1177686)</p> <p>Road (PIN 11782987, PIN 12280440)</p> <p>Tranquil Drive Road Reserve (PIN 11751057)</p> <p>Ziatas Road Reserve (PIN 11751041)</p>
Location (LGA area/s):	City of Wanneroo
Localities (suburb/s):	Banksia Grove, Carramar, Neerabup, Pinjar

1.2. Description of clearing activities

The City of Wanneroo proposes to upgrade Flynn Drive in three (3) stages. The project comprises of the construction of double carriage ways and associated infrastructures which include adjoining intersections, shared use pathways and connections, drainage and kerbing, street lighting, asset protection, signage and integrated landscaping. Funded by the State and Federal Governments, the road upgrades have been planned for several years for the public benefits in response to the increased traffic volumes and growing needs of residential and commercial road uses.

The application is to clear up to 7.4 ha of native vegetation within a clearing footprint of 20.22 ha for the Flynn Street Stages 2 and 3 Road Upgrade Project, which includes the construction of the double carriage ways and associated infrastructures from Tranquil Drive to Pinjar Road. The vegetation to be cleared is distributed on both sides of an approximately 3.9 km stretch of road on Flynn Drive and approximately 150 m stretch into Mather Drive.

1.3. Decision on application

Decision:	Granted
Decision date:	30 March 2026
Decision area:	7.4 hectares of native vegetation

1.4. Reasons for decision

On 26 May 2025, the Department of Water and Environmental Regulation (the department) determined to grant Clearing Permit CPS 9981/1 to authorise the City of Wanneroo to clear 7.4 hectares of native vegetation to facilitate road construction and upgrades to Flynn Drive (DWER, 2025).

One appeal was lodged against the grant of CPS 9981/1, including three grounds of appeal.

This clearing permit amendment gives effect to the Minister for Environment's (Minister) determination to allow the appeal in part (Appeal number: 023 of 2025). The Minister determined that condition 10 on Clearing Permit CPS 9981/1, which relates to the offset of Crown Reserve 33343, should be strengthened to include a spring survey of the site to inform the species list of a Revegetation and Rehabilitation Plan. This Revegetation and Rehabilitation Plan is also to be endorsed by the Department of Biodiversity Conservation and Attractions (DBCA), particularly with regard to the infill species list, areas requiring infill and adequacy of the completion criteria.

The Delegated Officer has taken the above into consideration and decided to grant an amended clearing permit in accordance with the Minister's determination.

As part of the revised permit, the permit holder is responsible for producing two Revegetation and Rehabilitation Plans; one specific to Edgar Griffith Park (Crown Reserve 36601) and the other relating to Montrose Park (Crown Reserve 33343). It is to be noted this change to the permit to include two revegetation plans and the strengthening of Condition 10 to include the completion of a spring survey and a DBCA endorsed revegetation plan relating to Montrose Park, is not an appealable decision noting this is at the request of the Minister.

During the assessment of the amendment, the department enabled the City of Wanneroo to provide comment on the revised amended permit. This consultation resulted in additional definitions of optimal time relating to watering times to be added to the permit as well as defining the two Revegetation and Rehabilitation Plans. During this consultation time the City of Wanneroo also requested the timeframe for Condition 12 is to be updated from 16 June 2026 to 16 June 2027, noting the commencement of clearing has been delayed due to Commonwealth approvals (City of Wanneroo, 2026). The City also requested the shape of the offset area for Edgar Griffiths Park; relating to Condition 12 of the permit, is amended to align with the Environmental Protection and Biodiversity Conservation Act (EPBC Act) offset area, the size of the offset location remains the same (refer to figure 1). Whilst these requests are out of scope of the Ministerial Amendment, the Delegated Officer considered these as reasonable requests and agreed to the additional amendment. It is however to be noted these additional amendment requests are considered appealable changes to the permit noting they are requests by the City not the Minister.

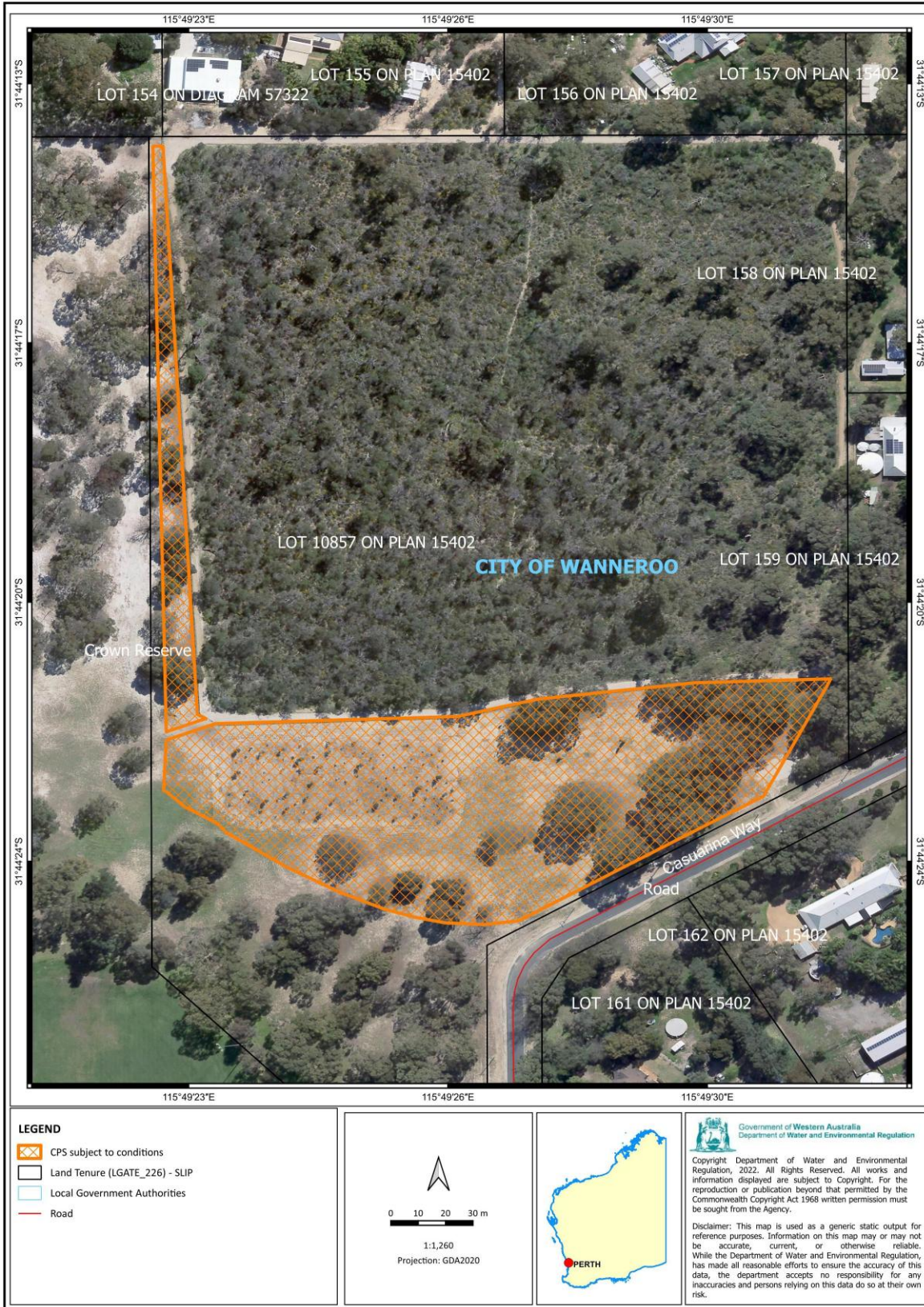


Figure 1: Amended offset shape relating to Condition 12 (the size of the offset remains unchanged).

2 Detailed assessment of application

2.1. Assessment of impacts on environmental values

The amendment is the result of an appeal determination made by the Minister regarding the amendment of Clearing Permit CPS 9981/1. The Minister determined that a revision to Condition 10 on Clearing Permit CPS 9981/1 was required, as discussed above under Section 1.4.

As a result of the appeal determination, the assessment against the clearing principles, and planning and other matters has not changed from the initial Clearing Permit Decision Report CPS 9981/1 (DWER, 2025). It is also to be noted the additional amendments to the permit as requested by the City, does not impact the clearing assessment and the decision report relating to these items also remains unchanged.

Appendix A. Sources of information

A.1. References

City of Wanneroo (2026). CPS 9981/2 Draft Permit Comment. Received 28 January 2026 (DWER Ref: DWERDT1266942)

City of Wanneroo (2026). CPS 9981/2 Additional Draft Comments. Received 27 February 2026 (DWER Ref: DWERDT1284126)

Department of Water and Environmental Regulation (DWER) (2025). Purpose Permit and Decision Report: CPS 9981/1, Available from: [Index of /permit/9981/Permit](#)

Office of the Appeals Convenor (2025) Appeal Convenor's Report to the Minister for Environment – Appeal against grant of Clearing Permit CPS 9981/1, multiple properties along Flynn Drive Road Reserve in Banksia Grove, Carramar, Neerabup and Pinjar

Minister for Environment (2025) Minister's Appeal Determination - Appeal against grant of a Clearing Permit CPS 9981/1, Multiple Properties along Flynn Drive Road Reserve in Banksia Grove, Carramar, Neerabup and Pinjar.