



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 7870/1
Permit Holder:	Shire of Cuballing
Duration of Permit:	6 September 2018 – 6 September 2033

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

PART I – CLEARING AUTHORISED

1. Purpose for which clearing may be done

Clearing for the purpose of road upgrades and road safety.

2. Land on which clearing is to be done

Stratherne Road reserve (PIN 11542346), Cuballing

3. Area of Clearing

The Permit Holder must not clear more than 0.6 hectares of native vegetation within the area hatched yellow on attached Plan 7870/1a.

4. Period within which clearing is authorised

The Permit Holder shall not clear any native vegetation after 31 May 2023.

5. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

6. 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 works involving clearing for those activities under the *Local Government Act 1995* or any other written law.

PART II – MANAGEMENT CONDITIONS

7. Avoid, minimise and reduce the impacts and extent of clearing

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in 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.

8. Dieback and weed control

When undertaking any clearing authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the 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.

9. Fauna management – Carnaby’s cockatoo

(a) Prior to undertaking any clearing authorised under this Permit:

- (i) the area hatched yellow on attached Plan 7870/1a shall be inspected by a *fauna specialist* who shall identify *black cockatoo breeding trees*; and
 - (ii) each *black cockatoo breeding tree* identified shall be inspected by a *fauna specialist* for evidence of current or past breeding use by Carnaby’s cockatoo (*Calyptorhynchus latirostris*).
- (b) Where a *black cockatoo breeding tree(s)* with evidence of current breeding use by Carnaby’s cockatoo is identified and cannot be avoided in accordance with condition 7(a) of this Permit, that tree(s) shall be monitored by a *fauna specialist* to determine when it is no longer in use for that breeding season.
- (c) Any *black cockatoo breeding tree(s)* with evidence of current breeding use by Carnaby’s cockatoo shall not be cleared whilst it is in use for that breeding season as determined by the *fauna specialist* under condition 9(b) of this Permit.
- (d) Where a *black cockatoo breeding tree(s)* with evidence of past breeding use by Carnaby’s cockatoo is identified and cannot be avoided in accordance with condition 7(a) of this Permit, that tree(s) shall only be cleared:
- (i) outside the *Carnaby’s cockatoo breeding season*; or
 - (ii) later the same day of the inspection required by condition 9(a)(ii) of this Permit; or
 - (iii) later the same day of a repeat inspection undertaken by a *fauna specialist* if that inspection does not identify evidence of current breeding use.
- (e) For each *black cockatoo breeding tree* with evidence of current or past breeding use by Carnaby’s cockatoo identified, that cannot be avoided in accordance with condition 7(a) of this Permit, the Permit Holder shall install an artificial black cockatoo nest hollow.
- (f) Each artificial black cockatoo nest hollow required by condition 9(e) of this Permit must be installed prior to commencement of the next *Carnaby’s cockatoo breeding season* following clearing of the related *black cockatoo breeding tree*.
- (g) The artificial black cockatoo nest hollow(s) required by condition 9(e) of this Permit must:
- (i) be installed within the area hatched red on attached Plan 7870/1b being Crown Reserve 19021;
 - (ii) be designed and placed in accordance with the guidelines provided in Schedule 1 to this Permit; and
 - (iii) be monitored and maintained in accordance with the guidelines provided in Schedule 2 to this Permit, for a period of at least ten years.

10. Fauna management – red-tailed phascogale

(a) Prior to undertaking any clearing authorised under this Permit:

- (i) the area hatched yellow on attached Plan 7870/1a shall be inspected by a *fauna specialist* who shall identify *red-tailed phascogale habitat trees*; and
- (ii) each *red-tailed phascogale habitat tree* identified shall be inspected by a *fauna specialist* for evidence of use by red-tailed phascogale (*Phascogale calura*).

- (b) Where a *red-tailed phascogale habitat tree(s)* occupied by red-tailed phascogale is identified and cannot be avoided in accordance with condition 7(a) of this Permit, that tree(s) shall only be cleared:
 - (i) immediately after relocation of the red-tailed phascogale individual(s) by a *fauna specialist* in accordance with a fauna licence issued pursuant to Regulation 15 of the *Wildlife Conservation Regulations 1970*; or
 - (ii) immediately after a repeat inspection undertaken by a *fauna specialist* if that inspection confirms it is not occupied by red-tailed phascogale.
- (c) Where a *red-tailed phascogale habitat tree(s)* with evidence of use (but not occupied) by red-tailed phascogale is identified and cannot be avoided in accordance with condition 7(a) of this Permit, that tree(s) shall only be cleared:
 - (iii) immediately after the inspection; or
 - (iv) immediately after a repeat inspection undertaken by a *fauna specialist* if that inspection confirms it is not occupied by red-tailed phascogale.
- (d) For each *red-tailed phascogale habitat tree* with evidence of use by red-tailed phascogale identified, that cannot be avoided in accordance with condition 7(a) of this Permit, the Permit Holder shall install an artificial nest box.
- (e) Each artificial nest box required by condition 10(d) of this Permit must be installed prior to clearing the related *red-tailed phascogale habitat tree*.
- (f) The artificial nest box(es) required by condition 10(d) of this Permit must:
 - (i) be installed within the area hatched red on attached Plan 7870/1b being Crown Reserve 19021;
 - (ii) be designed and placed in accordance with the guidelines provided in Schedule 3 to this Permit; and
 - (iii) be monitored and maintained in accordance with the guidelines provided in Schedule 3 to this Permit, for a period of at least ten years.

11. Offset – Lot 434 on Deposited Plan 84296 (being Crown Reserve 2556)

- (a) By 16 June 2019, the Permit Holder shall provide to the *CEO* a copy of the executed change in purpose of the area hatched red on attached Plan 7870/1c within Lot 434 on Deposited Plan 84296 (being Crown Reserve 2556) from ‘Gravel’ to ‘Conservation’.
- (b) In the event that the change in purpose of Lot 434 on Deposited Plan 84296 (being Crown Reserve 2556) is not achieved in accordance with condition 11(a):
 - (i) the Permit Holder must submit a new offset proposal for the *CEO*’s approval by 16 September 2019; and
 - (ii) in preparing an offset proposal in accordance with condition 11(b)(i), the Permit Holder must comply with the principles in the Government of Western Australia’s *WA Environmental Offsets Policy* (September 2011) and have regard to the *WA Environmental Offsets Guidelines* (August 2014).

PART III – RECORD KEEPING AND REPORTING

12. Record keeping

The Permit Holder must maintain the following records for activities done pursuant to this Permit:

- (a) In relation to the clearing of native vegetation authorised under this Permit:
 - (i) 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 or decimal degrees;
 - (ii) the date(s) that the area was cleared;
 - (iii) the size of the area cleared (in hectares);
 - (iv) actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 7 of this Permit; and

- (v) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 8 of this Permit.
- (b) In relation to fauna management pursuant to condition 9 of this Permit:
- (i) the time(s) and date(s) of inspection(s) by the *fauna specialist*;
 - (ii) a description of the *fauna specialist* inspection methodology employed;
 - (iii) the location of each *black cockatoo breeding tree* identified, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (iv) a description of the evidence of current or past breeding use observed for each *black cockatoo breeding tree* identified;
 - (v) a photo of each *black cockatoo breeding tree* with evidence of current or past breeding use identified;
 - (vi) for each *black cockatoo breeding tree* with evidence of current breeding use:
 - (1) the time and date it was determined to no longer be in use for that breeding season; and
 - (2) the evidence by which it was determined to no longer be in use for that breeding season.
 - (vii) the time and date each *black cockatoo breeding tree* with evidence of current or past breeding use was cleared;
 - (viii) the date each artificial black cockatoo nest hollow was installed;
 - (ix) the location of each artificial black cockatoo nest hollow installed, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (x) a photo of each artificial black cockatoo nest hollow installed;
 - (xi) the dates each artificial black cockatoo nest hollow installed was monitored;
 - (xii) a description of the monitoring methodology employed for each artificial black cockatoo nest hollow installed;
 - (xiii) a description of the monitoring observations for each artificial black cockatoo nest hollow installed;
 - (xiv) the date(s) each artificial black cockatoo nest hollow installed was maintained; and
 - (xv) a description of the maintenance activities undertaken for each artificial black cockatoo nest hollow installed.
- (c) In relation to fauna management pursuant to condition 10 of this Permit:
- (i) the time(s) and date(s) of inspection(s) by the *fauna specialist*;
 - (ii) a description of the *fauna specialist* inspection methodology employed;
 - (iii) the location of each *red-tailed phascogale habitat tree* identified, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (iv) a description of the evidence of use by red-tailed phascogale observed for each *red-tailed phascogale habitat tree* identified;
 - (v) a photo of each *red-tailed phascogale habitat tree* with evidence of use identified;
 - (vi) the time and date each red-tailed phascogale individual was relocated by a *fauna specialist*;
 - (vii) the location where each red-tailed phascogale individual was relocated to, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (viii) the time and date each *red-tailed phascogale habitat tree* with evidence of use was cleared;
 - (ix) the date each artificial nest box was installed;
 - (x) the location of each artificial nest box installed, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (xi) a photo of each artificial nest box installed;
 - (xii) the dates each artificial nest box installed was monitored;
 - (xiii) a description of the monitoring methodology employed for each artificial nest box installed;
 - (xiv) a description of the monitoring observations for each artificial nest box installed;
 - (xv) the date(s) each artificial nest box installed was maintained; and
 - (xvi) a description of the maintenance activities undertaken for each artificial nest box installed.

13. Reporting

- (a) At least 48 hours prior to commencing clearing authorised under this Permit, the Permit Holder shall advise the *CEO* in writing of the date that clearing is scheduled to commence.
- (b) On or before 30 June of each year following the commencement of clearing authorised under this Permit, the Permit Holder must provide to the *CEO* a written report of records required under condition 12 of this Permit.
- (c) The Permit Holder must produce the records required under condition 12 of this Permit when required by the *CEO*.

DEFINITIONS

The following meanings are given to terms used in this Permit:

black cockatoo breeding tree/s: means trees that have a diameter, measured at 1.5 metres from the base of the tree, of 50 centimetres or greater (or 30 centimetres or greater for *Euclayptus salmonophloia* or *Eucalyptus wandoo*) that contain hollows suitable for breeding by Carnaby's cockatoo (*Calyptorhynchus latirostris*);

Carnaby's cockatoo breeding season means the period from 1 June to 29 February of any given year;

CEO means the Chief Executive Officer of the Department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*;

dieback means the effect of *Phytophthora* species on native vegetation;

fauna specialist: means a person who holds a tertiary qualification specializing 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 *Wildlife Conservation Act 1950*;


fill means material used to increase the ground level, or fill a hollow;

red-tailed phascogale habitat tree(s) means a tree of the *Eucalyptus* genus that contains a hollow(s) suitable to be used by red-tailed phascogale (*Phascogale calura*);

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;

weed/s means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*;
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.



Samara Rogers
MANAGER
NATIVE VEGETATION REGULATION

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

9 August 2018

CPS 7870/1, 09 August 2018

SCHEDULE 1

How to design and place 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>

SCHEDULE 2

How to monitor and maintain 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 (wildlifelicensing@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

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SCHEDULE 3

Nest Boxes for Red-tailed Phascogales



Nest Boxes for Red-tailed Phascogales

The red-tailed phascogale (*Phascogale calura*), also known as Kengoor, is Specially Protected under Western Australia's State legislation as Conservation Dependent. This means that the species requires ongoing conservation intervention to prevent them from becoming a threatened species again.

The species was once known from much of arid and semi-arid Australia but is now only found in remnant vegetation in the southern Wheatbelt. One of the current threats to the species is nest hollow shortages due to habitat loss and degradation from land clearing and fire, and competition with native and pest birds and feral European honey bees.

Nest boxes can be used to help conserve red-tailed phascogales by enabling them to breed in areas where natural hollows are limited. This information sheet provides advice on how to select an appropriate site, broad guidelines on how to design and place a nest box, and general advice on how to maintain and monitor nest boxes.

It is important to remember that the retention of both old and dead trees that have suitable hollows for red-tail phascogales is important for breeding and hence the long-term survival of the species. The installation of nest boxes should not be used to justify the removal of natural hollow-bearing trees.



Photo: Meredith Spencer/Bush Heritage Australia

When to Use Nest Boxes

Nest boxes may be useful at sites where natural hollows are limited, such as where existing hollows are degrading and not being replaced quickly enough due to lack of tree regeneration. However, red-tailed phascogales don't always use nest boxes when provided. There are ways to select sites for nest boxes that will increase the chance that they will be used by red-tailed phascogales.

Where and when do red-tailed phascogales nest?

Red-tailed phascogales are largely found in old-growth woodlands, predominantly dominated by Wandoo and York Gum and associated with Red Sheoak. Red-tailed phascogales have a preference for habitats that contain numerous tree hollows, have semi-continuous canopy and are long unburnt. Red-tailed phascogales are known to nest in hollow logs, tree hollows, and the skirts and stumps of Grass Trees.

Phascogales use nesting hollows all year round for sleeping during the day as they are a nocturnal species that is active during the night. They may use several hollows within their home range. Mating occurs during a three-week period in July, and young are born 28-30 days later. The young remain dependent on the mother from August to October.

Is my site suitable for nest boxes?

It is recommended that nest boxes be used in known nesting areas where there has been a decrease in the availability of natural nesting hollows. To decide if your site is suitable for nest boxes you need to consider the following criteria (Table 1). Protecting habitat, revegetating and controlling competitive pest species are alternative conservation actions that can also be used to complement the placement of artificial hollows.

Table 1: Criteria to determine if a site is suitable for the placement of nest boxes

1.	The site contains suitable habitat within the known breeding range of the species	
	<i>Important consideration</i>	Red-tailed phascogales generally nest in woodlands dominated by Wandoo and York Gum and associated with Red Sheoak. The species is currently only known to persist in the southern Wheatbelt.
2.	The site is in an area where it is suspected or known that there is a lack of available tree hollows preventing breeding that would otherwise occur, due to the loss of suitable hollow-bearing trees (either through clearing or natural die-off).	
	<i>Important consideration</i>	Indirect evidence that may indicate a lack of available tree hollows includes sightings of red-tailed phascogales within rural buildings.
3.	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 nest boxes.
4.	A suitable artificial hollow design is used.	
	<i>Important consideration</i>	For greatest chance of success, please refer to the section on how to design and place nest boxes

How to Design and Place Nest Boxes

There are various designs for nest boxes available but it best to tailor the design of the nest box to the specific nesting requirements of the red-tailed phascogale. This will encourage red-tailed phascogales to use the nest box while discouraging other species.

It is recommended that multiple nest boxes are placed at 50 m intervals around a site as red-tailed phascogales are known to regularly move between several nesting hollows.



Nest boxes being attached with nails (left), with a rear entrance hole (centre), and with a hinged lid and carpet (right).
 Photo: Angela Sanders/Bush Heritage Australia (left), DBCA (centre and right)

Nest box design

With any nest box design for red-tailed phascogales, it is important to ensure that it fits the following general specifications (Table 2). A diagram is also provided of a recommended design by Bush Heritage Australia, which they have successfully used to monitor red-tailed phascogales in Kojonup.

Table 2: General specifications for red-tailed phascogale nest boxes

Component	Specification
Material	Rough-sawn untreated Jarrah or other native Australian hard woods with > 15mm thickness ensures that it is durable enough to last > 5 years and provides adequate thermal insulation. Softwoods, like marine ply, can be used as long as they are not treated with toxic preserving chemicals like copper or arsenic. DO NOT USE: treated timber, chipboard, pine, interior ply, any materials under 15 mm thickness, toxic/smelly paint.
Joinery	Long, galvanised screws or nails. Make sure that there are no projecting nails or screws. Non-toxic waterproof glue can also be used. DO NOT USE: Toxic/smelly glues
Entrance hole	Rear entrance hole with a diameter of 30 - 40 mm
Cavity	Cavity size approximately 20 - 30 mm x 20 - 30 mm x 20 - 30 mm. Weatherproof and dark. Toe holds on inside walls enabling animals to climb out (i.e. walls should be made from rough-sawn timber or notched with a circular saw)
Base	Recessed inside walls. Three small (<10 mm) drainage holes.
Lid	Hinged lid to allow for inspection but well-secured to prevent brush-tailed possums from gaining access. A piece of carpet or perspex glued to the inside of the lid to discourage bees. Sloped from the back and overhanging the front and side by 25 mm for weather protection.
Nesting material	Weathered wood chips, shredded Jarrah bark or Paperbark, and/or untreated sheep's wool. Filled to cover the base of the internal cavity.

Mounting and placement

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

Nest boxes should be mounted on rough-barked trees, preferably Wandoo, York Gum or Red Sheoak, with a diameter of ≥ 30 cm. **DO NOT** place nest boxes on trees that have existing hollows.

Nest boxes should be mounted so that that it is vertical and securely fastened to a tree at a height of 3 - 5 m above ground level. Red-tailed phascogales show no preference for aspect of nest boxes, but they should preferably be positioned to provide shelter from prevailing weather, particularly from sun and rain.

The best way to secure a nest box to a tree is by using two to four long galvanised screws or nails and securing it directly into the tree. One or two of the screws/nails should be through the pre-drilled holes at the back of the box.

Safety

Care needs to be taken when placing nest boxes to ensure human safety is considered at all times. Nest boxes are heavy and require lifting and manoeuvring into position.

How to Monitor and Maintain Nest Boxes

It is important to monitor and maintain nest boxes after they have been erected to:

- determine if the nest box is being used by red-tailed phascogales or other species (native or pest),
- determine the effectiveness of the design and placement of the nest box,
- identify any problems with pest species or maintenance requirements, and
- resolve any problems to ensure the nest box continues to be useful for nesting by red-tailed phascogale.

It is important to continue a regime of regular maintenance while the nest box is required.



Red-tailed phascogales inside a nest box.
Photo: Angela Sanders/Bush Heritage Australia

How do I monitor nest boxes?

Before undertaking monitoring of nest boxes for red-tailed phascogales, it is recommended that you seek advice from the Department of Biodiversity, Conservation and Attractions. It is also important to contact the Department's Wildlife Licensing Section to determine if a licence to disturb fauna is required (wildlifelicensing@dbca.wa.gov.au).

Monitoring nest boxes requires keen observation and naturalist skills. It is often not possible to observe direct evidence of use and therefore inferences must be made based on other observations. There are a variety of techniques available to monitor nest boxes, and a combination of several is likely to achieve the best results (Table 3).

Keep in mind that it is important to limit disturbance to any animals using the nest box, particularly during the breeding season. Animals should not be physically disturbed or handled.

When monitoring a nest box, always ensure that it is done as quickly and quietly as possible to avoid disturbing any animals that may be using it. Phascogales are nocturnal animals and therefore it is best to monitor them near sunrise or sunset. Therefore, if a phascogale is disturbed during the monitoring and leaves the nest box, the sun is not too bright, and it is not too hot.

Nest boxes can be left for long-periods of time without checking but ideally should be monitored once a year during the early mating season (July).

The information collected from the 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 frequently monitoring a larger number of nest boxes, you can put the details into a spreadsheet. Records should be submitted to the Department by emailing fauna@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 are always appreciated and can also be reported via the same email.

Important information to record includes: observer's name and contact details, date and time, location, fauna species, description of the animal or a photo, vegetation description, and observation description (i.e. details about nest box monitoring, signs of use, animal behaviour etc.).

Table 3: Techniques for monitoring nest boxes

Technique	Description of Technique
Observation from the ground – looking for signs of use outside the nest box	<p>Look for signs of recent use from the outside, particularly noting any chew or scratch marks, and any discolouration around the entrance hole(s).</p> <p>Cobwebs covering the entrances will indicate that the nest box has not been used recently.</p> <p>A light piece of string nailed over the entrance hole is a useful way to determine if an animal is inside the nest box because animals entering the box will push the end of the string in with them.</p>
Observation from the ground – observing insect activity outside the nest box	<p>Faecal matter produced by animals attracts insects, especially flies and ants.</p> <p>Blowflies around a nest usually indicates that a death has occurred.</p>
Observation from the ground – stag watching	<p>Stag watching is when you watch the nest box for a certain period of time to see if any animals exit the nest box. The following methodology is recommended:</p> <ul style="list-style-type: none"> • Choose a place to sit within 2 -5 m of the nest box and within sight of its entrance holes • Sit quietly from at least 10 minutes before dusk until at least 30 minutes after sunset. • When movement is observed, see if you can identify the animal in any natural light available by observing its shape and size. If this is not possible, use a torch to illuminate the animal to see its distinguishing features. • Take notes of the important information (see above).
Observation via a camera – telescopic camera	<p>To avoid disturbing any animals that may be using the next box, look inside the nest via the entrance holes with the aid of a telescopic pole and camera or mirror.</p>
Observation via a camera (long-term monitoring) – remote camera	<p>Cameras can be installed in or nearby a nest box to watch remotely to see if the nest box is used. This technique allows for monitoring/information to be gathered throughout the year, including throughout the breeding season.</p> <p>When installing a camera nearby a nest box, make sure it is in sight of the entrance holes at the rear of the nest box. If you are installing a camera inside the nest box, make sure it is prepared before the nest box is mounted to a tree so that the camera can easily be turned on and off without disturbing any animals inside the nest box.</p> <p>There are various types of nest-box camera kits with infra-red lights that can be used.</p>
Observation via a ladder – looking for signs of use inside the nest box	<p>If the nest box appears to be empty (confirmed by the use of a camera), quietly approach the nest box using a ladder and open the hinged lid slowly.</p> <p>If there is an animal in the nest box, quietly close the lid and leave the area as quietly as possible to reduce any further disturbance.</p> <p>If there are no animals in the nest box, the inside of the nest box can be checked for signs of use, particularly noting any feathers, fresh or old scats, scratch marks, discolouration, and new or disturbed nesting material.</p> <p>DO NOT approach the nest box if there are bees present. Research has found that bees will move out by themselves and so won't have a long-term impact on nest box use, particularly if you have several nest boxes at your site.</p> <p>Watch out for spiders, ants and other insects that may be using the nest box and can inflict stings or bites when disturbed.</p>

How do I maintain nest boxes?

Nest boxes can be left for long periods of time, but they may still require maintenance to ensure they continue to have the greatest chance of being used by red-tailed phascogale. Therefore, it is best to make periodic maintenance checks at least every two years. Maintenance checks can be undertaken while monitoring, but it is preferable that they are undertaken prior to the breeding season so that any problems identified can be addressed before breeding occurs. If breeding is occurring, maintenance should be delayed if it is likely to disturb the animals. 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.

At a minimum, maintenance checks should assess the following:

- Condition of attachment points,
- Stability of tree or pole used to mount the nest box,
- Presence of black rats,
- Presence of feral bees,
- Presence of dead animals,
- Condition of nest box, particularly the base, and
- Condition of nesting material.

Likely maintenance includes:

- Control of black rats using rat traps (weekly if black rats are present);
- Control of feral bees with the help of an apiarist (only if bees become an issue);
- Adjustment of nest box placement (only if rains entering or excessive heat in the summer is an issue);
- Replacement of nest box due to deterioration (rarely for hard woods, occasionally for soft woods); and

Replacement of wet and mouldy nesting material (rarely if using hard woods with holes drilled into the base).

Further Reading

Bush Heritage Australia's species webpage: [Red-tailed Phascogales](#)

Acknowledgements

This information sheet was developed with contributions on monitoring methods and nest box design from Bush Heritage Australia.

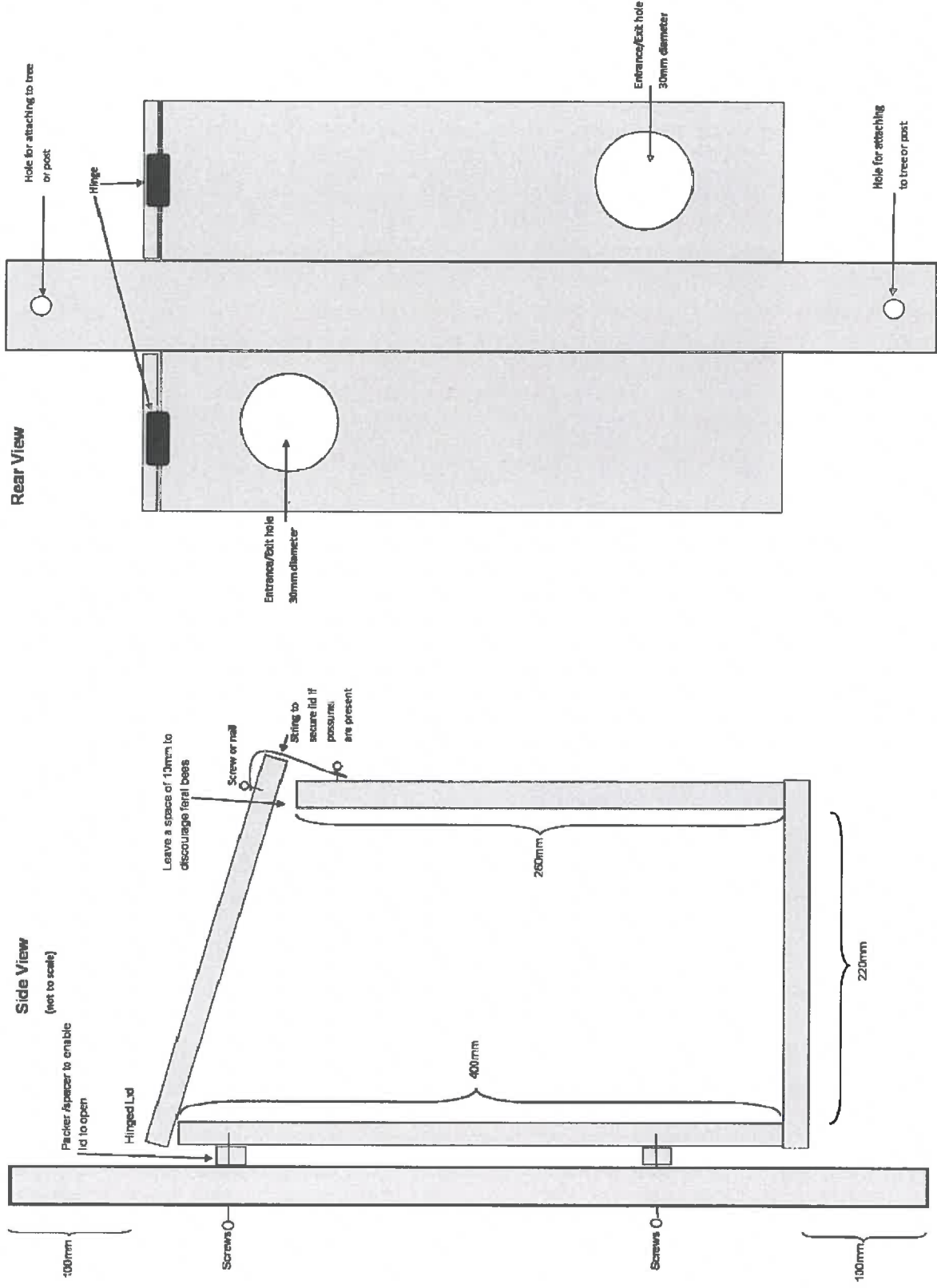
Citation

Department of Biodiversity, Conservation and Attractions. (2018). *Fauna Notes – Nest Boxes for Red-tailed Phascogales* Retrieved from <http://www.dbca.wa.gov.au/>

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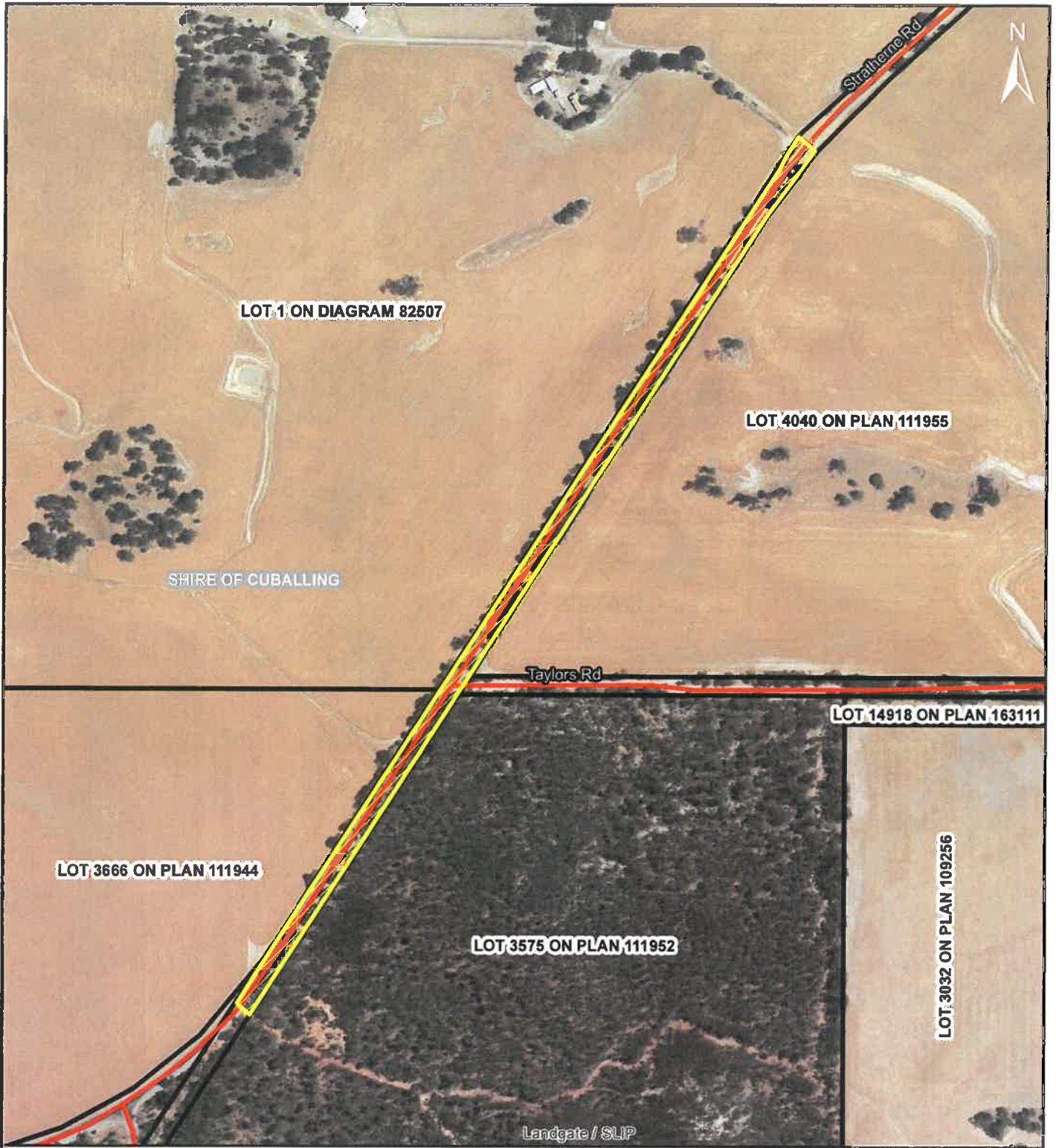
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FAUNA NOTES – Nest Boxes for Red-tailed Phascogales



Side view (left) and rear view (right) of a red-tailed phascogale nest box design. Image: Bush Heritage Australia

Plan 7870/1a




Legend

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-  Roads
-  Cadastre
-  Local Government Authorities

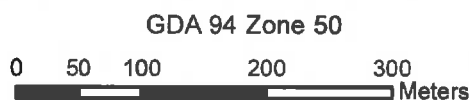
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 Date 10/8/2018

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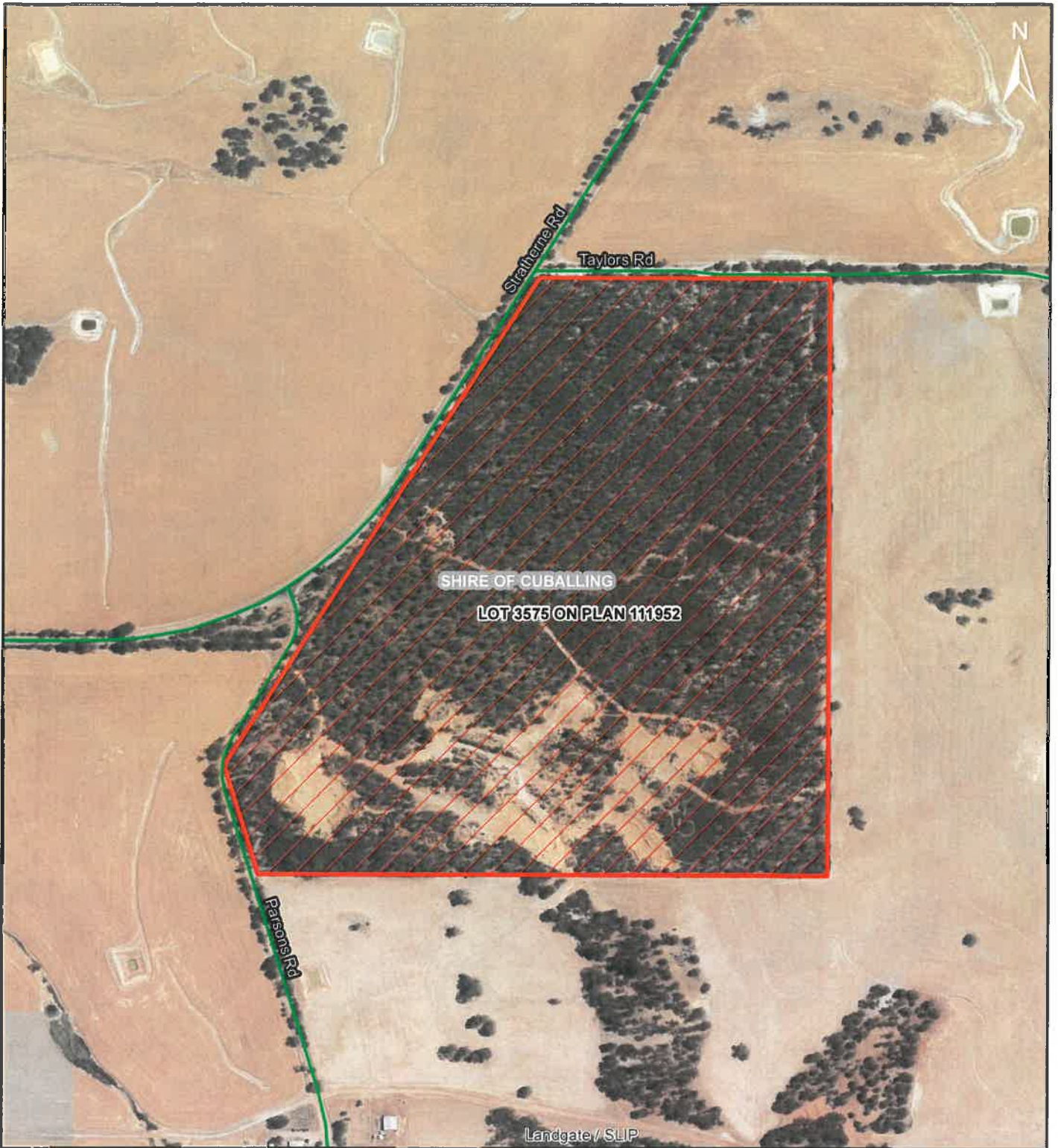


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


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Plan 7870/1b



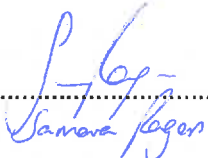
Legend

-  Roads
-  Areas subject to conditions
-  Local Government Authorities

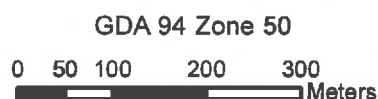
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Date 10/8/2018

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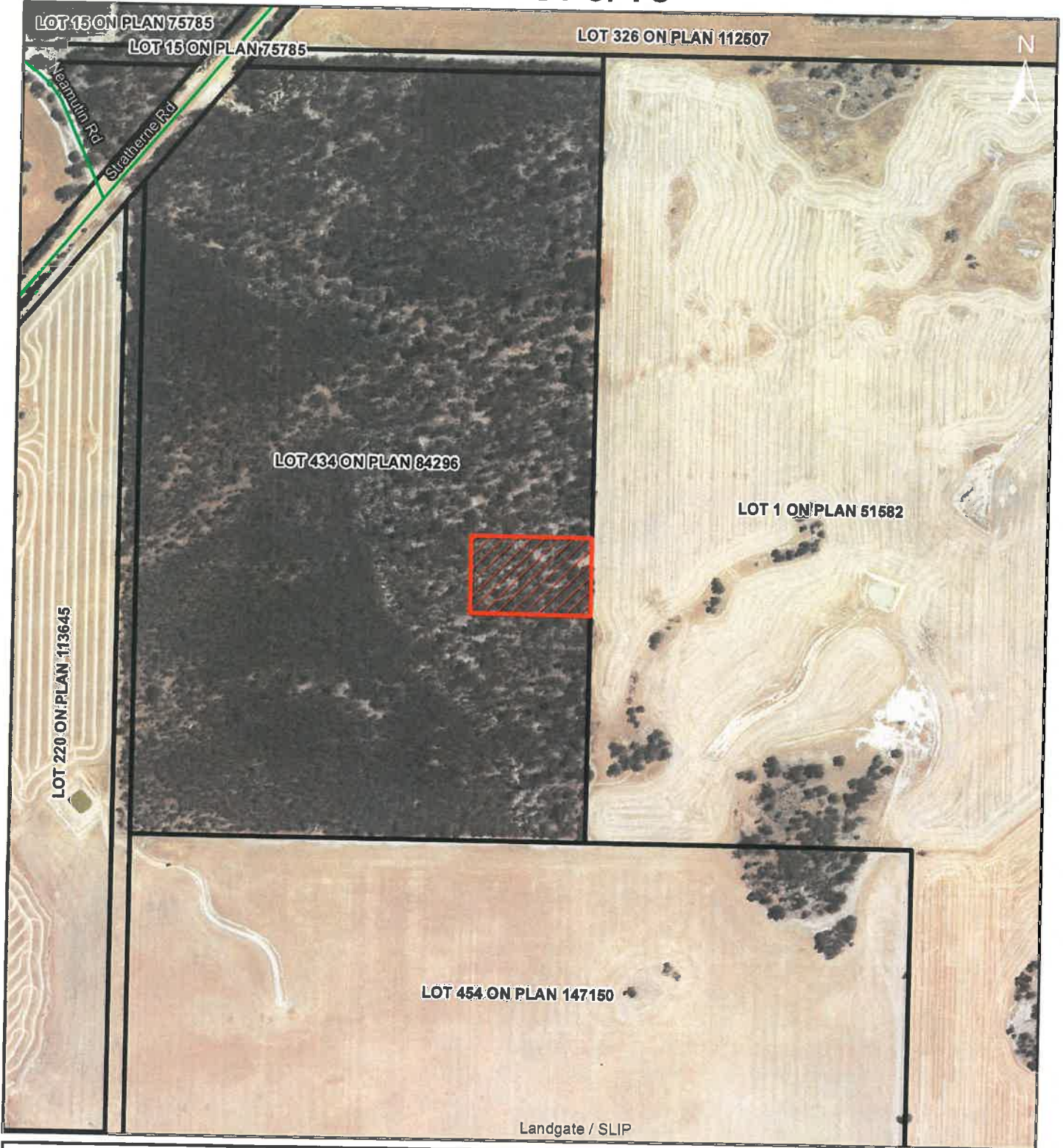


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Plan 7870/1c



Legend

- Roads
- Areas subject to conditions
- Cadastre

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RGB

- Red: Band_1
- Green: Band_2
- Blue: Band_3

S. Rogers Date 9/8/18
Simone Rogers

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GDA 94 Zone 50



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1. Application details

1.1. Permit application details

Permit application No.: 7870/1
Permit type: Purpose Permit

1.2. Applicant details

Applicant's name: Shire of Cuballing
Application received date: 14 November 2017

1.3. Property details

Property: ROAD RESERVE (PIN 11542346), CUBALLING
Colloquial name: Stratherne Road
Local Government Authority: SHIRE OF CUBALLING
Localities: CUBALLING

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	Purpose category:
0.6		Mechanical Removal	Road construction or upgrades

1.5. Decision on application

Decision on Permit Application: Granted
Decision Date: 9 August 2018
Reasons for Decision:

The clearing permit application has been assessed against the clearing principles, planning instruments and other matters in accordance with section 51O of the *Environmental Protection Act 1986*. It has been concluded that the proposed clearing is at variance to Principles (d) and (e), may be at variance to Principle (b), and is not likely to be at variance to the remaining Principles.

It has been determined that the proposed clearing will result in the following significant residual impacts:

- loss of approximately 0.15 hectares of a patch of the 'Eucalypt Woodlands of the Western Australian Wheatbelt' (Wheatbelt Woodlands) threatened ecological community (TEC); and
- loss of 0.6 hectares of significant remnant native vegetation in an area that has been extensively cleared.

Noting that upgrades to the road will provide a public benefit including improved road safety it is considered that the significant residual impacts can be counterbalanced through the conservation of 1.1 hectares of Crown Reserve 2556 as an offset.

It has also been determined that the proposed clearing may result in the following:

- impacts to Carnaby's cockatoo and red-tailed phascogale individuals if they are found to be utilising the application area for habitat; and
- indirect impacts to remaining adjacent portions of the Wheatbelt Woodlands TEC through weed and dieback introduction/spread.

It is considered that inspecting potential habitat trees, delaying clearing until no longer in use (where identified as being occupied), and installing artificial hollows or nesting boxes to replace confirmed habitat trees will adequately mitigate any impacts to Carnaby's cockatoo and red-tailed phascogale. It is considered that implementing appropriate hygiene management actions will adequately mitigate the risk of impacts to remaining adjacent portions of the Wheatbelt Woodlands TEC.

Given the above, the Delegated Officer decided to grant a clearing permit subject to avoid/minimise, offset, fauna management and dieback and weed management conditions.

2. Site information

Clearing Description The application is for the clearing of 0.6 hectares of native vegetation within a 1.1 kilometre stretch of the Stratherne Road reserve (PIN 11542346), Cuballing, for the purpose of road upgrades and road safety.

The road reserve is approximately 20 metres wide and the application area encompasses the full width of the road reserve on both sides of the existing road (Figure 1).

The applicant proposes to widen the road seal to a 7.2 metre bitumen seal. This includes relocating the existing drain approximately one metre further into the road reserve and widening the maintenance zone.

Vegetation Description

The application area is mapped as Beard vegetation association 1023, described as Medium woodland; York gum (*Eucalyptus loxophleba*), wandoo (*Eucalyptus wandoo*) and salmon gum (*Eucalyptus salmonophloia*) (Shepherd et al., 2001).

Officers of the Department of Water and Environmental Regulation (DWER) conducted a site inspection on 16 May 2018 (DWER site inspection). The DWER site inspection identified that the vegetation within the application area predominantly comprised wandoo and *Allocasuarina* spp. over introduced grasses/bare soil (DWER, 2018).

Vegetation Condition

The vegetation within the application area is in the following condition:

- Good: Vegetation structure significantly altered by very obvious signs of multiple disturbance; retains basic structure or ability to regenerate (Keighery, 1994).
- Degraded: Basic vegetation structure severely impacted by disturbance; scope for regeneration but not to a state approaching Good condition without intensive management (Keighery, 1994).
- Completely Degraded: The structure of the vegetation is no longer intact and the area is completely or almost completely without native species (Keighery, 1994).

The condition of the vegetation within the application area was determined from the DWER site inspection (DWER, 2018). The majority of the application area is in Degraded to Completely Degraded condition. The exception is the south-eastern portion of the road reserve which is located adjacent to a larger remnant of intact native vegetation and is considered to be in Good condition. Although weeds were largely absent from this portion, the understorey was also largely devoid of native vegetation.

Soil type

The soils within the application area are mapped as the Noombling Subsystem (Dryandra) 257DyNB, described as long gentle and undulating hillslopes and divides. Colluvium / weathered granite, gneiss and some dolerite; yellow/brown and grey deep sandy duplexes, brown deep loamy duplexes, sandy gravels and shallow duplexes (DPIRD, 2018).

Comment

The local area considered in the assessment of this application is defined as a 10 kilometre radius measured from the perimeter of the application area. The local area retains approximately 20 per cent (approximately 7,000 hectares) native vegetation cover.

Figure 1: Application area



3. Assessment of application against clearing principles

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Proposed clearing is not likely to be at variance to this Principle

The DWER site inspection determined that the vegetation within the application area ranged from Good (Keighery, 1994) to Completely Degraded (Keighery, 1994) condition, with the majority in a Degraded to Completely Degraded (Keighery, 1994) condition (DWER, 2018).

According to available databases, two rare and five priority (P) flora species have been recorded within the local area. The priority flora species are discussed below; rare flora are discussed further under Principle (c).

- *Banksia subpinnatifida* var. *subpinnatifida* (P2) has been recorded approximately 7.7 kilometres from the application area. This species is known from 20 records in the Shires of Cuballing, Narrogin, Pingelly and Wandering, and is typically associated with gravelly loams (Western Australian Herbarium, 1998-).
- *Leucopogon darlingensis* subsp. *rectus* (P2) has been recorded approximately 10 kilometres from the application area. This species is known from 22 records from the Shires of Cuballing, Narrogin and Williams, and is typically associated with yellow or brown sandy or gravelly loams over laterite (Western Australian Herbarium, 1998-).
- *Acacia deflexa* (P3) has been recorded approximately 7.1 kilometres from the application area. This species is known from 42 records from the Jarrah Forest, Avon Wheatbelt and Mallee bioregions, and is typically associated with yellow and gravelly lateritic sand and gravelly sandy loam on plains (Western Australian Herbarium, 1998-).
- *Eucalyptus loxophleba* x *wandoo* (P4) has been recorded approximately 9.8 kilometres from the application area. This species is known from 14 records from the Avon Wheatbelt, Geraldton Sandplains and Jarrah Forest bioregions, and is typically associated with sandy clay or loam (Western Australian Herbarium, 1998-).
- *Hibbertia montana* (P4) has been recorded approximately 8.9 kilometres from the application area. This species is known from 93 records from the central Avon Wheatbelt, northern Jarrah Forest and eastern Swan Coastal Plain, and is typically associated with loam over granite, lateritic soils and gravel on granite rocks, lateritic ridges, boulders and hills (Western Australian Herbarium, 1998-).

The vegetation within the application area predominantly consists of wandoo and *Allocasuarina* spp. over introduced grasses/bare soil and therefore no priority or rare flora species are expected to be present.

As discussed under Principle (b), four fauna species listed under the *Wildlife Conservation (Specially Protected Fauna) Notice 2017* have been recorded within the local area (DPaW, 2007-). The application area may contain habitat for indigenous fauna of conservation significance.

According to available databases, two mapped occurrences of the Wheatbelt Woodlands TEC intersect the application area (Figure 2). The south-eastern portion of the road reserve forms part of a patch of the TEC that extends across the adjacent gravel reserve (Crown Reserve 19021). It is estimated that the proposed clearing will result in the loss of approximately 0.15 hectares of this TEC patch. The other occurrence mapped as intersecting the application area is not considered to meet the condition thresholds for the TEC based on observations from the DWER site inspection. No other TECs or priority ecological communities are expected to occur within the application area. TECs are discussed further under Principle (d).

Figure 2: Wheatbelt Woodlands TEC (green outline) intersected by the application area (blue outline)



The application area contains a portion of a patch of the Wheatbelt Woodlands TEC and may contain habitat for conservation significant fauna species. However, the application area contains minimal floristic diversity predominantly comprising wandoo and *Allocasuarina* spp. Therefore the application area is not likely to comprise a high level of biological diversity. The proposed clearing is not likely to be at variance to this Principle.

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Proposed clearing may be at variance to this Principle

According to available databases, four fauna species listed under the *Wildlife Conservation (Specially Protected Fauna) Notice 2017* have been recorded within the local area (DPaW, 2007-). These are Carnaby's cockatoo (*Calyptorhynchus latirostris*), bilby (*Macrotis lagotis*), numbat (*Myrmecobius fasciatus*) and red-tailed phascogale (*Phascogale calura*).

Carnaby's cockatoo nests in hollows in live or dead trees of wandoo, York gum, salmon gum, powderbark wandoo (*Eucalyptus accedens*), marri (*Corymbia calophylla*), jarrah (*Eucalyptus marginata*), flooded gum (*Eucalyptus rudis*), tuart (*Eucalyptus gomphocephala*) and karri (*Eucalyptus diversicolor*) (Commonwealth of Australia, 2012). Two wandoo trees containing hollows were observed within the application area and may provide suitable nesting habitat for the species (DWER, 2018).

Common foraging items for Carnaby's cockatoo includes seeds, flowers and nectar of Proteaceous plant species, *Eucalyptus* spp. and *Callistemon* spp. (Commonwealth of Australia, 2012). The DWER site inspection noted the dominance of wandoo within the application area (DWER, 2018). The application area may contain suitable foraging habitat for Carnaby's cockatoo.

Historically the bilby occupied a vast area of Australia with records from all states except Victoria and Tasmania. In WA, the distribution of the bilby extended from the Dampier Peninsula in the north to the Wheatbelt in the southwest. The species is now restricted to the Pilbara and Kimberley in WA, the Tanami, Great Sandy and Gibson deserts in NT, and an isolated population in southwest Queensland (Pavey, 2006). The application area does not occur within the current distribution of the bilby and therefore no impacts to the species are expected.

The preferred habitat of the numbat includes hollow horizontal logs, heavy leaf litter, and rocky crevices. None of these habitat features were observed within the application area (DWER, 2018). Noting this, the application area is not likely to contain suitable habitat for the numbat.

The preferred habitat of the red-tailed phascogale is *Allocasuarina* spp. woodlands with hollow-bearing *Eucalyptus* spp.. The application area includes *Allocasuarina* species and two eucalypt trees containing hollows were observed (DWER, 2018). Noting this, the application area may contain suitable habitat for the red-tailed phascogale.

Given the above, the application area may contain habitat for Carnaby's cockatoo and red-tailed phascogale. The proposed clearing may be at variance to this Principle.

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Proposed clearing is not likely to be at variance to this Principle

According to available databases, two rare flora species have been recorded within the local area:

- *Acacia insolita* subsp. *recurva* has been recorded approximately 7.1 kilometres from the application area. This species is known from nine records from the Shires of Cuballing and Wickpin, and is typically associated with lateritic ridges (Western Australian Herbarium, 1998-). Based on desktop information this species was considered unlikely to occur within the application area given its habitat preference (DBCA, 2018a). The DWER site inspection confirmed that the vegetation within the application area predominantly comprised wandoo and *Allocasuarina* spp. over introduced grasses/bare soil and therefore no impacts to this species are expected (DWER, 2018).
- *Banksia cuneata* has been recorded approximately 9.6 kilometres from the application area. This species is known from 50 records from the Shires of Brookton, Bruce Rock, Cuballing and Quairading, and is typically associated with grey, yellow or yellow-brown sands (Western Australian Herbarium, 1998-). Based on desktop information this species was considered unlikely to occur within the application area due to the soil type and landscape position being unsuitable (DBCA, 2018a). The DWER site inspection confirmed that the vegetation within the application area predominantly comprised wandoo and *Allocasuarina* spp. over introduced grasses/bare soil and therefore no impacts to this species are expected (DWER, 2018).

Given the above, the application area is not likely to include, or be necessary for the continued existence of, rare flora. The proposed clearing is not likely to be at variance to this Principle.

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Proposed clearing is at variance to this Principle

As discussed under Principle (a), according to available databases, two mapped occurrences of the Wheatbelt Woodlands TEC intersect the application area (Figure 2). The total number of occurrences of the TEC as mapped by the Commonwealth Department of the Environment and Energy is 87,224, with a total area of about 633,914 hectares. The TEC extends from Pindar to Takalarup, a distance of about 700 kilometres. All mapped occurrences require ground-truthing (DBCA, 2018b).

The south-eastern portion of the road reserve forms part of a patch of the TEC that extends across the adjacent gravel reserve (Crown Reserve 19021). It is estimated that the proposed clearing will result in the loss of approximately 0.15 hectares of this TEC patch. The remaining vegetation within the application area on the opposite side of the road and to the north occurs in patches of up to four metres in width.

The condition thresholds for the TEC outlined in the 'Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt' for this TEC states that roadside patches must be 5 metres or more in width to qualify as the TEC (Threatened Species Scientific Committee, 2015). Therefore the TEC is not likely to be present within the remainder of the application area.

The proposed clearing will result in the loss of approximately 0.15 hectares of a patch of the Wheatbelt Woodlands TEC. The proposed clearing is at variance to this Principle.

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Proposed clearing is at variance to this Principle

The National Objectives and Targets for Biodiversity Conservation 2001-2005 include a target to have clearing controls in place that prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750 (i.e. pre-European settlement) (Commonwealth of Australia, 2001). This is the threshold level, below which species loss appears to accelerate exponentially.

In assessing the risk of further loss and subsequent cumulative effects, consideration has been given to the extent of native vegetation remaining and what is currently managed as conservation estate:

- as indicated in Table 1, the current vegetation extents for the bioregion, and mapped Beard vegetation association are all below the 30 per cent recommended threshold;
- as indicated in Table 1, less than two per cent of the pre-European extent of the mapped Beard vegetation association is contained in conservation estate; and
- the local area retains approximately 20 per cent (approximately 7,000 hectares) pre-European native vegetation cover.

As discussed under Principle (b), the application area may contain habitat for indigenous fauna of conservation significance. As discussed under Principle (d) the application area contains a 0.15 hectare portion of a patch of the Wheatbelt Woodlands TEC.

Given the above, the application area is considered to be a significant remnant within an area that has been extensively cleared. The proposed clearing is at variance to this Principle.

Table 1: Vegetation extent remaining statistics

	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed lands (ha)	Extent remaining in all DBCA managed lands (proportion of Pre-European extent) (%)
IBRA Bioregion					
Avon Wheatbelt	9,517,110	1,761,227	18.5	174,961	1.8
Beard vegetation association					
1023	1,601,606	172,944	10.8	18,907	1.2
Beard vegetation association in IBRA Bioregion					
1023 (Avon Wheatbelt)	1,522,680	165,193	10.8	17,258	1.1

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Proposed clearing is not likely to be at variance to this Principle

According to available databases, no watercourses or wetlands occur within the application area. The DWER site inspection did not record the presence of watercourses or wetlands, or vegetation growing in association with watercourses or wetlands, within the application area (DWER, 2018).

Given the above, the proposed clearing is not likely to be at variance to this Principle.

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Proposed clearing is not likely to be at variance to this Principle

As outlined in Section 2, the soils within the application area are mapped as yellow/brown and grey deep sandy duplexes, brown deep loamy duplexes, sandy gravels and shallow duplexes.

Groundwater salinity within the application area has been mapped as saline at between 7,000-14,000 milligrams per litre total dissolved solids (TDS), being saline.

Noting the extent of the proposed clearing, the linear shape of the application area and its location along an existing road, any land degradation impacts are not likely to be appreciable.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Proposed clearing is not likely to be at variance to this Principle

According to available databases, a number of privately managed and Department of Biodiversity, Conservation and Attractions (DBCA) managed conservation areas occur within the local area. The nearest privately-managed conservation area is located approximately three kilometres from the application area. The Montague State Forest, Rosedale Nature Reserve, Yormaning Nature Reserve, and an un-named Nature Reserve are located approximately 3.6 kilometres west, approximately 4.5 kilometres south-west, approximately 4.9 kilometres north-west and approximately 5.5 kilometres west of the application area, respectively.

Available aerial imagery indicates that the application area does not function as an ecological linkage between these conservation areas. Noting their distances from the application area, the proposed clearing is not likely to have an impact on the environmental values of these conservation areas.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Proposed clearing is not likely to be at variance to this Principle

As discussed under Principle (f), no watercourses or wetlands occur within the application area.

As discussed under Principle (g), groundwater salinity mapped within the application area is between 7,000-14,000 milligrams per litre TDS.

Noting the absence of watercourses and wetlands, the extent of the proposed clearing, the linear shape of the application area and the nature of the soils present, the proposed clearing is not likely to cause deterioration in the quality of surface or underground water.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Proposed clearing is not likely to be at variance to this Principle

As discussed under Principle (f), no watercourses or wetlands occur within the application area.

Noting the extent of the proposed clearing, the linear shape of the application area and the nature of the soils present, the proposed clearing is not likely to cause or exacerbate the incidence or intensity of flooding.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

Planning instruments and other relevant matters.

The clearing permit application was advertised on the DWER website on 22 December 2017 with a 21 day submission period. No public submissions have been received in relation to this application.

There are no Aboriginal Sites of Significance mapped within the application area.

4. Applicant's submissions

On 6 June 2018, DWER wrote to the applicant outlining that impacts to the Wheatbelt Woodlands TEC and significant remnant vegetation were identified during the assessment as well as potential impacts to fauna. The applicant was invited to provide additional advice regarding proposed measures to avoid and minimise impacts and offset unavoidable impacts. Advice was also sought whether the applicant could avoid the two trees with hollows identified during the DWER site inspection. In response the applicant advised:

- the two trees with hollows are located in the maintenance zone and present a danger to road users which will be increased with the planned widening of the road;
- the two trees with hollows have root systems which are undermining the road surface and effective maintenance of the roadside drains cannot currently be completed beside these trees;
- removal of the two trees with hollows will ensure the ongoing integrity of the road and any widening;
- one of the two trees with hollows is leaning over the road in a pronounced fashion and presents an ongoing risk to road users should termite activity result in the whole or a part of the tree collapsing over the road;
- the applicant is prepared to provide the installation and ongoing maintenance of two artificial hollows in the adjacent Crown Reserve 19021; and
- the applicant is prepared to relinquish a portion of Crown Reserve 2556 as an offset for the clearing by amending the reserve purpose from "Gravel" to "Conservation".

5. Consideration of variances following applicant's submissions / further information

Given no changes to the application area were proposed by the applicant, the variances against the clearing principles were not updated.

It is noted that upgrades to the road will provide a public benefit including improved road safety.

It is considered that the proposed impacts to the Wheatbelt Woodlands TEC and significant remnant vegetation are of a scale that can be offset through the conservation of a portion of Crown Reserve 2556 as proposed by the applicant. Further details on the offset are provided in Section 6.

In relation to potential impacts to Carnaby's cockatoo and red-tailed phascogale, it is considered that inspecting potential habitat trees, delaying clearing until no longer in use (where identified as being occupied), and installing artificial hollows or nesting boxes to replace confirmed habitat trees will adequately mitigate any impacts. Crown Reserve 19021 is considered a suitable location for the installation of artificial hollows and nest boxes being directly adjacent to the application area meaning any impacted fauna would not have to travel far to find the intended replacement habitat.

6. Suitability of proposed offset

The offset site is located approximately 20 kilometres northeast of the application area. The offset site is mapped as the same Beard vegetation association as the application area and the DWER site inspection identified that it is also dominated by wandoo and *Allocaeusuarina* spp. (DWER, 2018). It is considered that the offset site contains environmental values that relate to those being lost.

To determine what offset size would be adequately proportionate to the significance of the environmental values being impacted, DWER undertook a calculation using the Commonwealth Offsets Assessment Guide. The calculation indicated that the conservation of 1.1 hectares is required. The applicant has agreed to relinquish a 1.1 hectare portion of Crown Reserve 2556.

Given the above, the conservation of 1.1 hectares of Crown Reserve 2556 is considered adequate to counterbalance the significant residual impacts of the proposed clearing consistent with the *WA Environmental Offsets Policy September 2011*.

7. References

- Commonwealth of Australia (2001) National Objectives and Targets for Biodiversity Conservation 2001-2005, Canberra.
- Commonwealth of Australia (2012) EPBC Act referral guidelines for three threatened black cockatoo species, Canberra.
- Department of Biodiversity, Conservation and Attractions (DBCA) (2018a) Flora advice received in relation to clearing permit application CPS 7870/1, received 21 March 2018. Department of Biodiversity, Conservation and Attractions, Western Australia (DWER Ref: A1673057).
- Department of Biodiversity, Conservation and Attractions (DBCA) (2018b) TEC advice received in relation to clearing permit application CPS 7870/1, received 21 March 2018. Department of Biodiversity, Conservation and Attractions, Western Australia (DWER Ref: A1673052).
- Department of Parks and Wildlife (DPaW) (2007-) NatureMap: Mapping Western Australia's Biodiversity. Department of Parks and Wildlife. URL: <http://naturemap.dpaw.wa.gov.au/> (accessed 28 February 2018).
- Department of Primary Industries and Regional Development (DPIRD) (2018). NRInfo Digital Mapping. Department of Primary Industries and Regional Development. Government of Western Australia. URL: <https://maps.agric.wa.gov.au/nrm-info/> (accessed 18 May 2018).
- Department of Water and Environmental Regulation (DWER) (2018) Site Inspection Report for CPS 7870/1. Department of Water and Environmental Regulation. Western Australia (DWER ref. A1677070).
- Government of Western Australia. (2018). 2017 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of December 2017. WA Department of Biodiversity, Conservation and Attractions.
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- Pavey, C. (2006) National Recovery Plan for the Greater Bilby *Macrotis lagotis*. Northern Territory Department of Natural Resources, Environment and the Arts.
- Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2001) Native Vegetation in Western Australia, Extent, Type and Status. Resource Management Technical Report 249. Department of Agriculture, Western Australia.
- Threatened Species Scientific Committee (2015). Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt. Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/128-conservation-advice.pdf>.
- Western Australian Herbarium (1998-) FloraBase - The Western Australian Flora. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/> (accessed 22 February 2018).

GIS Datasets:

- Aboriginal Sites of Significance
- Department of Biodiversity Conservation and Attractions, Tenure
- Groundwater salinity
- Hydrography, linear
- Hydrography, hierarchy
- Land Degradation datasets
- NLWRA, Current Extent of Native Vegetation
- SAC Bio Datasets (Accessed 14 May 2018)
- Soils, Statewide
- Topographic contours