GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

ADVICE NOTE

Allocation of offset site

The land transfer offset referred to in condition 5 of this permit is intended to contribute towards the conservation, in perpetuity, of 4.05 hectares of native vegetation within Lot 2658 on Deposited Plan 91418, Jarrahdale (Crown Reserve 6428), that comprises significant foraging habitat for *Zanda latirostris* (Carnaby's cockatoo), *Zanda baudinii* (Baudin's cockatoo) and *Calyptorhynchus banksia naso* (forest red-tailed black cockatoo), in addition to other environmental values.

PERMIT DETAILS

Area Permit Number:	CPS 10192/1
File Number:	DWERVT12642
Duration of Permit:	From 6 December 2024 to 6 December 2036

PERMIT HOLDER

Shire of Serpentine-Jarrahdale

LAND ON WHICH CLEARING IS TO BE DONE

Atkins Road reserve (PIN 11750629), Jarrahdale

Unnamed Road reserve (PIN 11750631), Jarrahdale

AUTHORISED ACTIVITY

The permit holder must not clear more than 0.35 hectares of native vegetation within the area cross-hatched yellow in Figure 1 of Schedule 1.

CONDITIONS

1. Period during which clearing is authorised

The permit holder must not clear any *native vegetation* after 6 December 2026.

2. 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.

3. 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 *weed* or *dieback* 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.

4. Directional clearing

The permit holder shall conduct clearing in a slow progressive manner towards adjacent native vegetation to allow fauna to move into adjacent native vegetation ahead of the clearing activity.

5. Fauna management – black cockatoo habitat

(a) Within 72 hours prior to undertaking any clearing authorised under this permit within the combined areas cross-hatched red in Figure 2 of Schedule 1, the permit holder must engage a *fauna specialist* to inspect all *black cockatoo habitat trees* identified in the report 'Basic fauna and targeted black cockatoo assessment (Emerge Associates, 2023)' for *evidence* of current or past breeding use by any *black cockatoo species* listed below:

(i) *Zanda baudinii* (Baudin's cockatoo);

(ii) *Zanda latirostris* (Carnaby's cockatoo); and

(iii) *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo)

(b) Where a *black cockatoo habitat tree* which contains a breeding hollow(s) with *evidence* of current or past breeding use by *black cockatoo species* is identified within the combined areas cross-hatched red in in Figure 2 of Schedule 1, then that tree must be retained from clearing, if possible.

(c) If *black cockatoo habitat tree* which contains a breeding hollow(s) with *evidence* of current or past breeding use by *black cockatoo species* cannot be retained, the *black cockatoo habitat tree/s* is not authorised to be cleared until a *fauna specialist* has determined that it is no longer in use for that breeding season.

(d) Each *black cockatoo habitat tree/s* with no *evidence* of current or past breeding use by *black cockatoo species* within the confined areas cross hatched red in Figure 2 and Schedule 1, must be retained from clearing, if possible.

(e) If *black cockatoo habitat tree/s* with no *evidence* of current or past breeding use by *black cockatoo species* cannot be retained, that tree/s must only be cleared immediately after inspection.

(f) For each *black cockatoo habitat tree* with *evidence* of current or past breeding use by *black cockatoo species* that cannot be retained, the permit holder must install one (1) artificial black cockatoo nest hollow, in accordance with condition 5(g).

(g) For artificial cockatoo nest hollow(s) required by condition 5(d) of this permit must:

(i) be installed at a location identified by the Department of Biodiversity, Conservation and Attractions and in accordance with the location specifications detailed in Schedule 2;

(ii) be designed and placed in accordance with the specifications detained in Schedule 2; and

(iii) be monitored and maintained in accordance with the specifications detailed in Schedule 2, for a period of at least ten years.

(h) The permit holder must provide details and locations of any artificial black cockatoo nest hollow(s) installed in accordance with condition 5(g) to the *CEO* within two months of installation.

(i) Within two months of clearing authorised under this permit within the areas crosshatched yellow on Figures 1 on Schedule 1, the permit holder must provide the results of the *fauna specialist's* inspection findings in a report to the *CEO*.

6. Offset – Crown Reserve

Within 12 months of the commencement of clearing authorised under this permit and no later than 6 December 2025, the permit holder must provide to the *CEO* a copy of the executed change in purpose of the area cross-hatched red in Figure 3 of Schedule 1 within Lot 2658 on Deposited Plan 91418, Jarrahdale (Crown Reserve 6428) from 'Public Use' to 'Conservation'.

7. Records that must be kept

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

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	(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 direction that clearing was undertaken; (e) the size of the area cleared (in hectares); (f) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 2; (g) actions taken to minimise the risk of the introduction and spread of weeds in

No.	Relevant matter	Specifications
		accordance with condition 3. (h) actions taken in accordance with condition 4 of this permit; and (i) actions taken in accordance with condition 6 of this permit.
2.	In relation to black cockatoo fauna management pursuant to condition 5	(a) the time(s) and dates(s) of inspection(s) of all *black cockatoo habitat trees* by the *fauna specialist*; (b) a description of the inspection methodology employed by the *fauna specialist;* (c) the species name of any fauna determined by the *fauna specialist* to be occupying the suitable *black cockatoo habitat tree*; (d) where the *black cockatoo habitat trees* are determined by the *fauna specialist* to be occupied by *black cockatoo species*; (i) 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) date, details and locations of any artificial cockatoo nest hollow installed, records using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 2020.

8. Reporting

(a) The permit holder mist 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 7; and

(ii) records of activities done by the permit holder under this permit between 1 January and 31 December of the preceding calendar yea

(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 7, where these records have not already been provided under condition 8(a).

DEFINITIONS

In this permit, the terms in Table 2 have the meanings defined.

Table 2: Definitions

Term	Definition
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 *Eucalyptus marginata* or *Corymbia calophylla)* that contain hollows suitable for breeding by black cockatoo species.
black cockatoo species	means one or more of the following species: (a) *Zanda latirostris* (Carnaby's cockatoo); (b) *Zanda baudinii* (Baudin's cockatoo); and/or (c) *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo).
CEO	Chief Executive Officer of the department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*.
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 Phytophthora species on native vegetation.
fill	means material used to increase the ground level, or to fill a depression.
department	means the department established under section 35 of the *Public Sector Management Act 1994* (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
EP Act	*Environmental Protection Act 1986* (WA)
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 Biodiversity Conservation Act 2016.
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.
weeds	means any plant – (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or

Term	Definition
	(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.

END OF CONDITIONS

Jessica Burton
A/MANAGER
NATIVE VEGETATION REGULATION
Officer delegated under Section 20
of the Environmental Protection Act 1986

14 November 2024

SCHEDULE 1

The boundary of the area authorised to be cleared is shown in the map below:

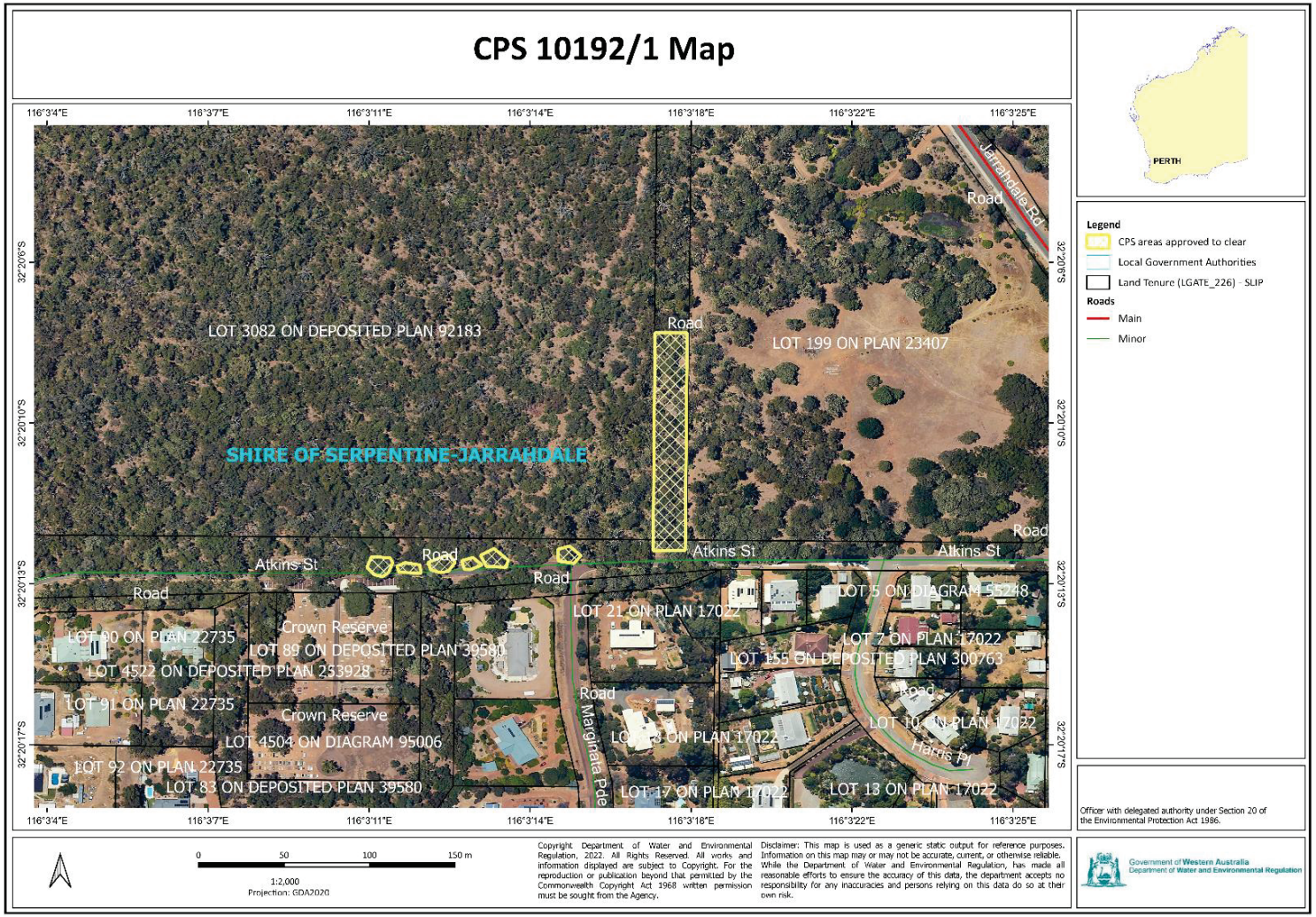


Figure 1: Map of the boundary of the area within which clearing may occur (area hatched yellow).

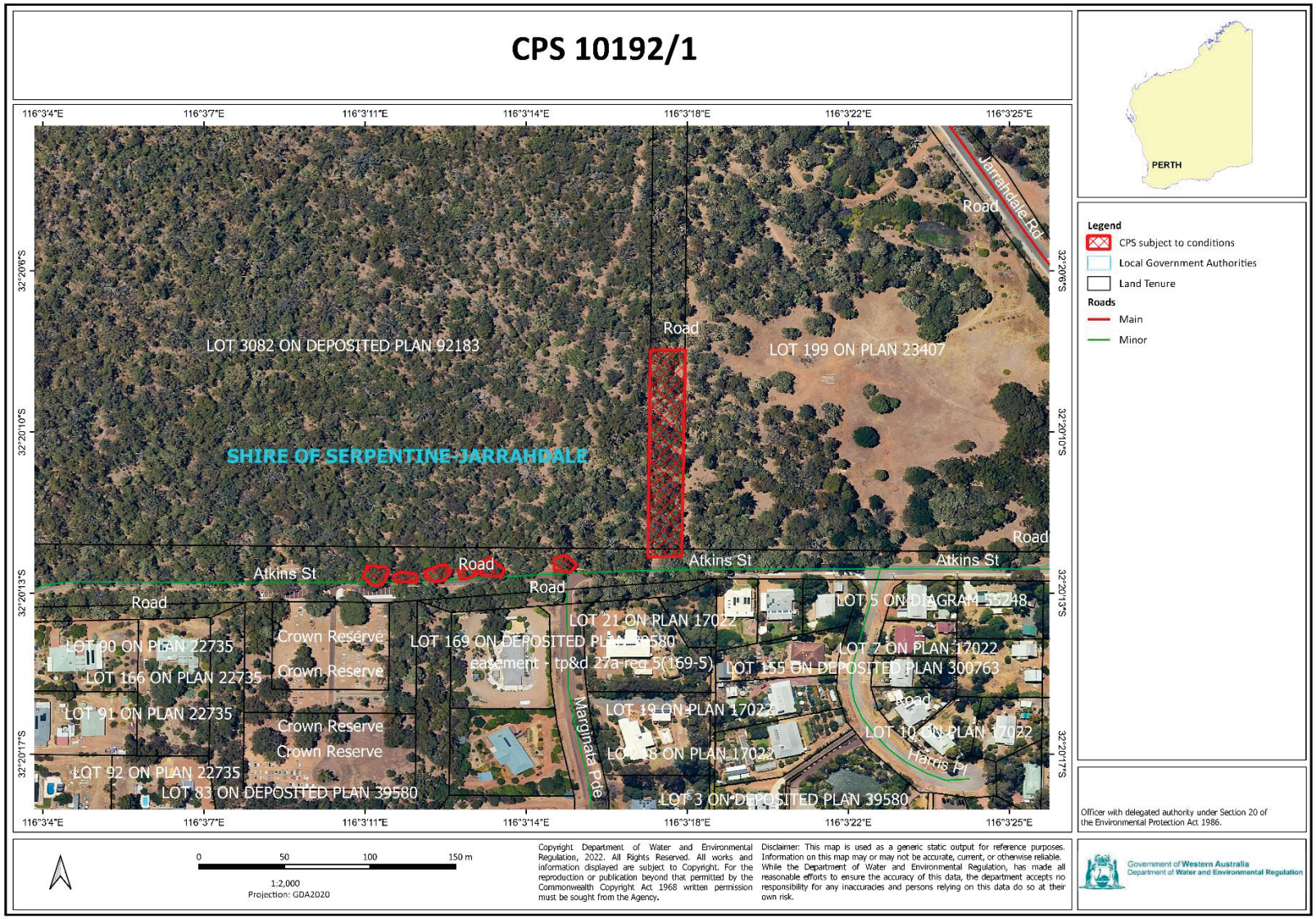


Figure 2: Map of the boundary of the area within which fauna management conditions apply (area hatched red).

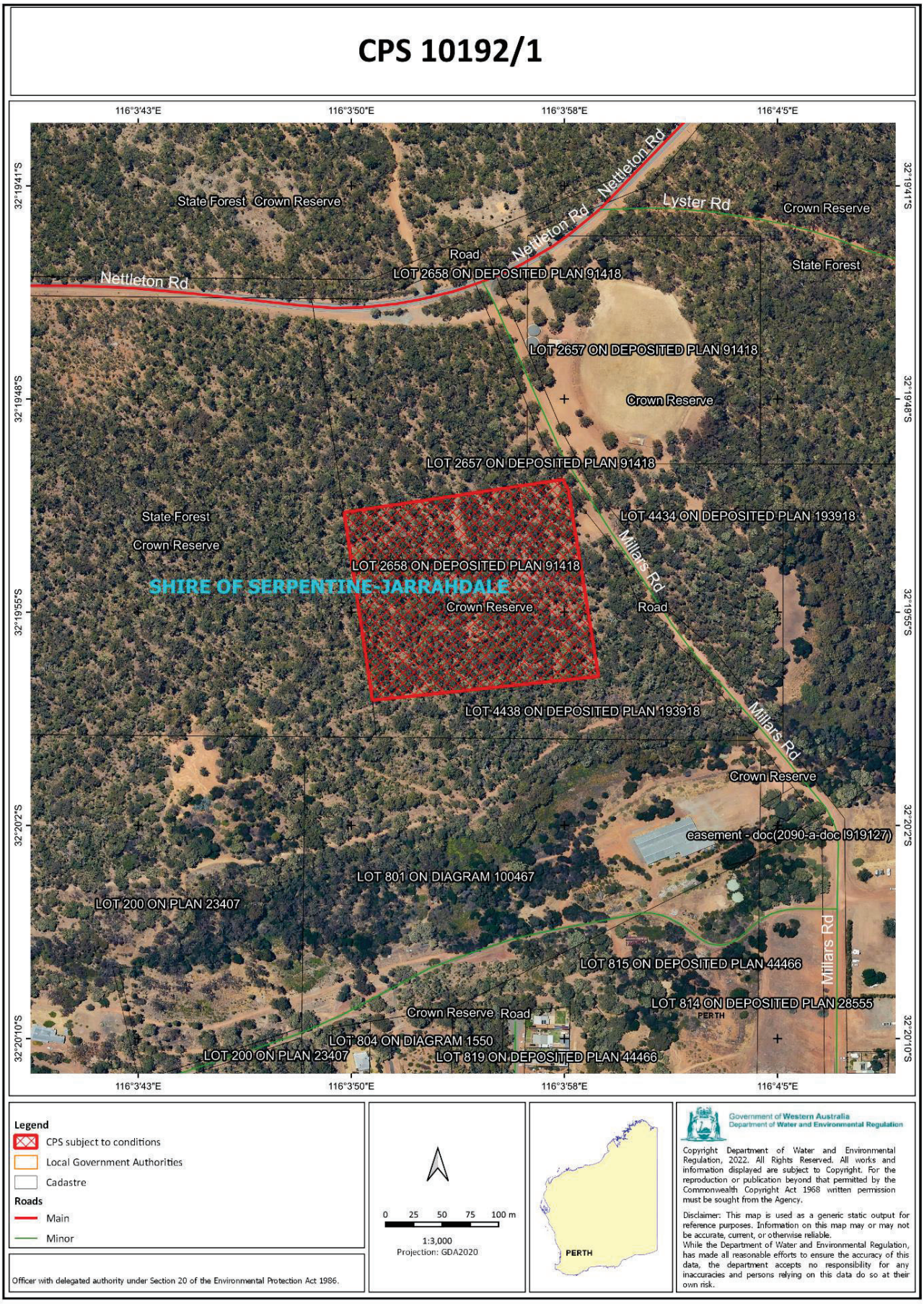


Figure 3: Map of the boundary of the area within which conditions apply (area hatched red).

Schedule 2

Artificial hollows for black cockatoos

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

FAUNA NOTES

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.

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

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.

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.

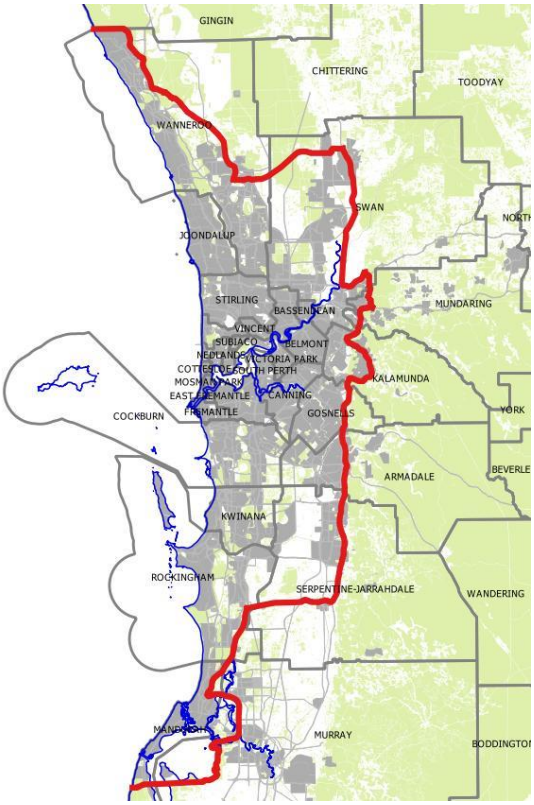
Is my site suitable for artificial hollows?

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.



Installing artificial hollows in built up areas to the west of the red line above, increases the risk of harm to birds. No artificial hollows should be installed west of this line. (green = remnant vegetation; grey = extent of existing and future urban and industrial development)

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**	
	Important consideration	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.
	Alternative conservation actions	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.**	

	Important consideration	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.
	Alternative conservation actions	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. 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. 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. 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.
3.	**The artificial hollows can be located in close proximity to adequate feeding areas – within a 12 km radius.**	
	Important consideration	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*.
	Alternative conservation actions	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.**	
	Important consideration	For advice on the monitoring and maintenance requirements, please refer to the section on how to monitor and maintain artificial hollows.
	Alternative conservation actions	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.**	
	Important consideration	For greatest chance of success, please refer to the sections below on how to design and place artificial hollows.
	Alternative conservation actions	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.

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)

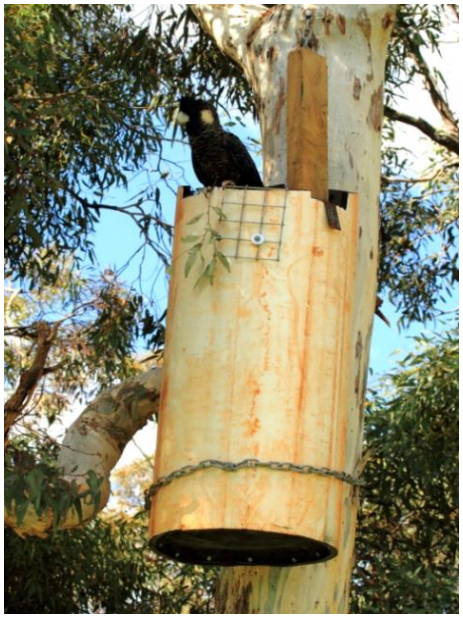




Photo: Christine Groom (left), Rick Dawson (centre and right)

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;

- 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. Zincalume®), 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.

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

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. 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

<table>
<tr><th>Technique</th><th>Description of Technique</th></tr>
<tr><td>Looking for signs of use</td><td>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.</td></tr>
<tr><td>Observing parent behaviour around a hollow</td><td>The behaviour of parent birds around a hollow can indicate an approximate age of young in the nest.
<table>
<tr><th>Parent Behaviour</th><th>Approximate Stage and Age of Young</th></tr>
<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>
</table></td></tr>
<tr><td>Observing feeding flocks</td><td>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).</td></tr>
<tr><td>Tapping to flush female</td><td>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.</td></tr>
<tr><td>Observing insect activity around a nest</td><td>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.</td></tr>
<tr><td>Listening for nestling</td><td>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.</td></tr>
<tr><td>Looking inside a nest</td><td>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.</td></tr>
</table>

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,

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.	• 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.	• 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 Observing breeding evidence from at least two of the techniques confirms use by black cockatoos.
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.	• Observing insect activity around a nest • Listening for nestlings • Looking inside a nest The presence of eggs or nestlings inside a nest will help to determine nesting success.
To determine use by any species	As often as possible.	As a minimum, inspection from the ground: • Looking for signs of use To confirm: • 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.

Artificial hollow base needing repair.
Photo by Christine Groom

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).

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

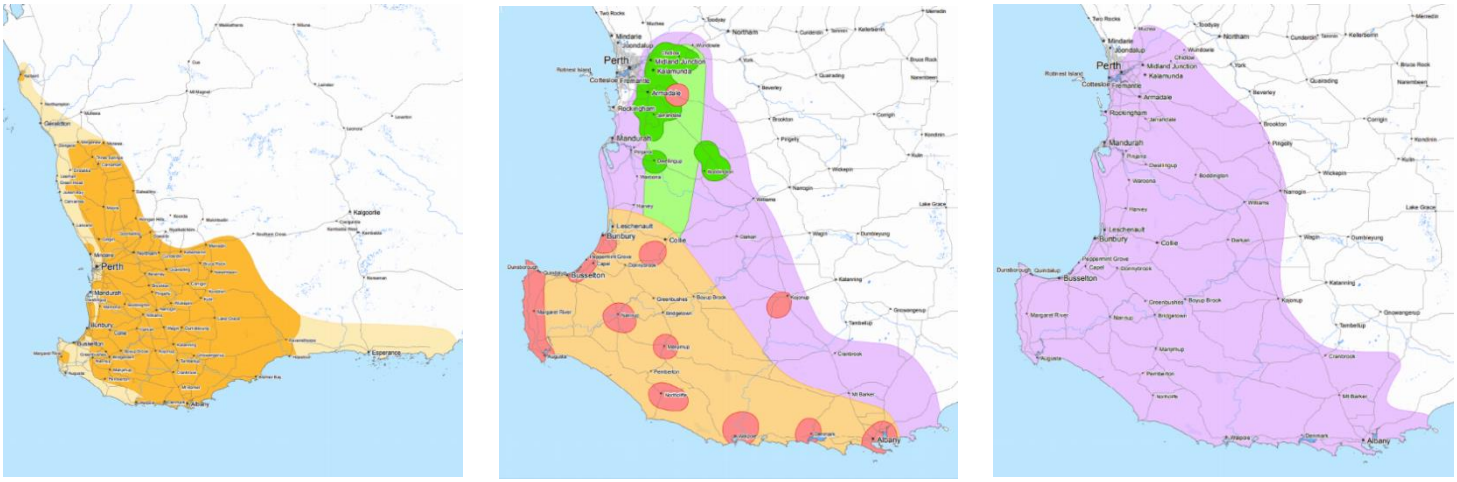


Image: [Commonwealth of Australia, 2011]

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.

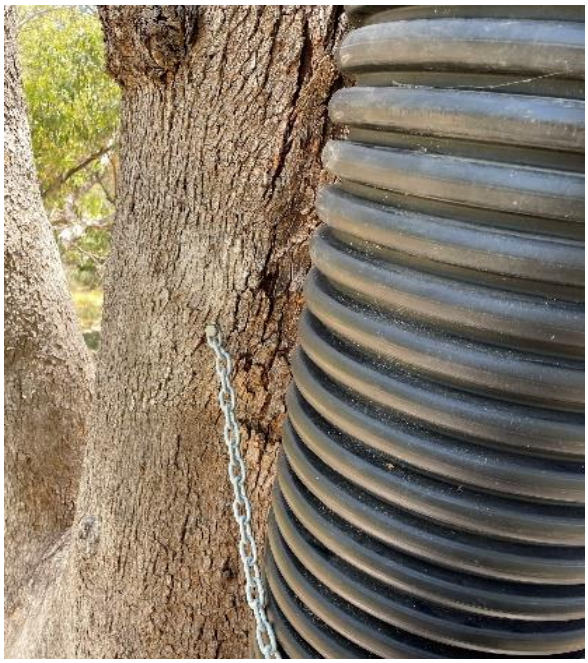
Artificial Hollows – best current design and installation specifications

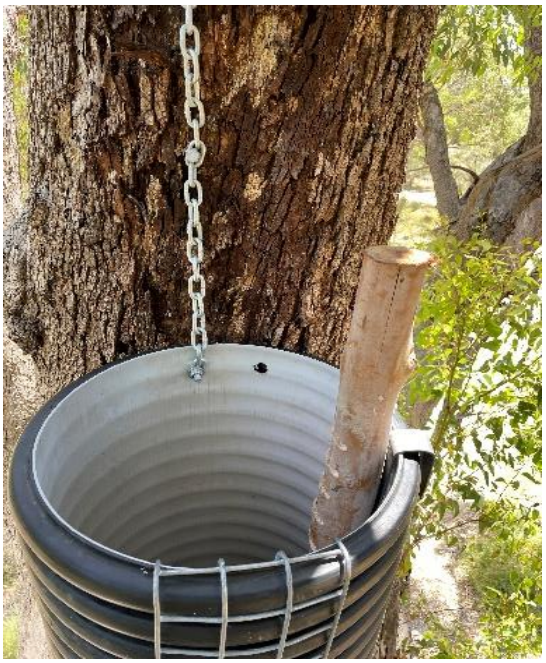
The specifications below outline the most recent detailed specifications for artificial hollow construction installation and maintenance. These would provide for a well-constructed and installed artificial hollow that is most likely to have an adequate lifespan (minimum 50-years). To ensure longevity, 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 M10 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.





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 course, 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

Acknowledgements

This Fauna Note is a joint initiative of the Department of Biodiversity, Conservation and Attractions, Birdlife Australia, and the Western Australian Museum. Many individuals have contributed to its preparation, including members of the department's Carnaby's cockatoo and forest black cockatoo recovery teams, with significant contributions from Rick Dawson (DBCA Research Associate), Ron Johnstone (WAM), Alan Elliot (Serpentine-Jarrahdale Landcare Centre), and Denis Saunders (CSIRO). This document was prepared by David Mitchell, Geoff Barrett, Kim Williams, Rebecca Bloomfield, Amie Raycraft, Brooke Richards, Teagan Johnston and Martin Dziminski.

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Disclaimer

Last updated: 08 Feb 2023

Government of Western Australia
Department of Water and Environmental Regulation

Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 10192/1
Permit type:	Area permit
Applicant name:	Shire of Serpentine-Jarrahdale
Application received:	15 May 2023
Application area:	0.35 hectares of native vegetation
Purpose of clearing:	Constructing parking bay and a carpark
Method of clearing:	Mechanical
Property:	Atkins Road reserve (PIN 11750629) Unnamed Road reserve (PIN 11750631)
Location (LGA area/s):	Shire of Serpentine-Jarrahdale
Localities (suburb/s):	Jarrahdale

1.2. Description of clearing activities

The Shire of Serpentine-Jarrahdale is proposing to clear 0.35 hectares of native vegetation distributed across multiple areas within Atkins Road reserve (PIN 11750629) and an unnamed Road reserve (PIN 11750631), Jarrahdale (see Figure 1, Section 1.5). The proposed clearing will aid in the construction of roadside parking bays and a carpark.

1.3. Decision on application

Decision:	Granted
Decision date:	14 November 2024
Decision area:	0.35 hectares of native vegetation as depicted in Section 1.5, below.

1.4. Reasons for decision

This clearing permit application was submitted, accepted, assessed and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act). The Department of Water and Environmental Regulation (DWER) advertised the application for 21 days and no submissions were received.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix A), relevant datasets (see Appendix F.1), the findings of a targeted fauna and black cockatoo assessment and a vegetation survey (see Appendix E), the clearing principles set out in Schedule 5 of the EP Act (see Appendix B), relevant planning instruments and any other matters considered relevant to the assessment (see Section 3). The Delegated Officer also took into consideration the proposed clearing is for the purpose of creating safe roadside parking and an additional car park to support the high number of weekend visitors to the adjacent Gooralong Conservation Park.

The assessment identified that the proposed clearing will result in:

- the loss of 0.35 hectares of native vegetation that is suitable habitat for *Zanda latirostris* (Carnaby's cockatoo), *Zanda baudinii* (Baudin's cockatoo) and *Calyptorhynchus banksia naso* (forest red-tailed black cockatoo) (collectively referred to as black cockatoos),
- the loss of three potential black cockatoo hollow that may providing breeding habitat for all three black cockatoo species trees, and
- the potential introduction and spread of weeds and dieback into adjacent vegetation, which could impact on the quality of the adjacent vegetation and its habitat values.

After consideration of the available information, as well as the applicant's minimisation and mitigation measures (see Section 3.1), the Delegated Officer determined the impacts of the proposed clearing is unlikely to have long -term adverse impacts and can be managed to unlikely lead to an unacceptable risk to environmental values.

The Delegated Officer decided to grant a clearing permit subject to the following conditions:

- avoid, minimise to reduce the impacts and extent of clearing;
- take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback;
- undertake slow, progressive one-direction clearing to allow terrestrial fauna to move into adjacent habitats ahead of the clearing activity;
- undertake black cockatoo hollow inspection prior to clearing and carry out actions to avoid impacts to black cockatoos should they be present during clearing activities.
- retention of trees containing potentially suitable or suitable hollows unless they cannot be avoided, in which case the permit holder must install one artificial hollow per suitable hollow, notifying the CEO within two months of the instillation; and
- implementation of an environmental offset to counterbalance the residual impacts of the proposed clearing to habitat for black cockatoo species (see Section 4).

1.5. Site maps

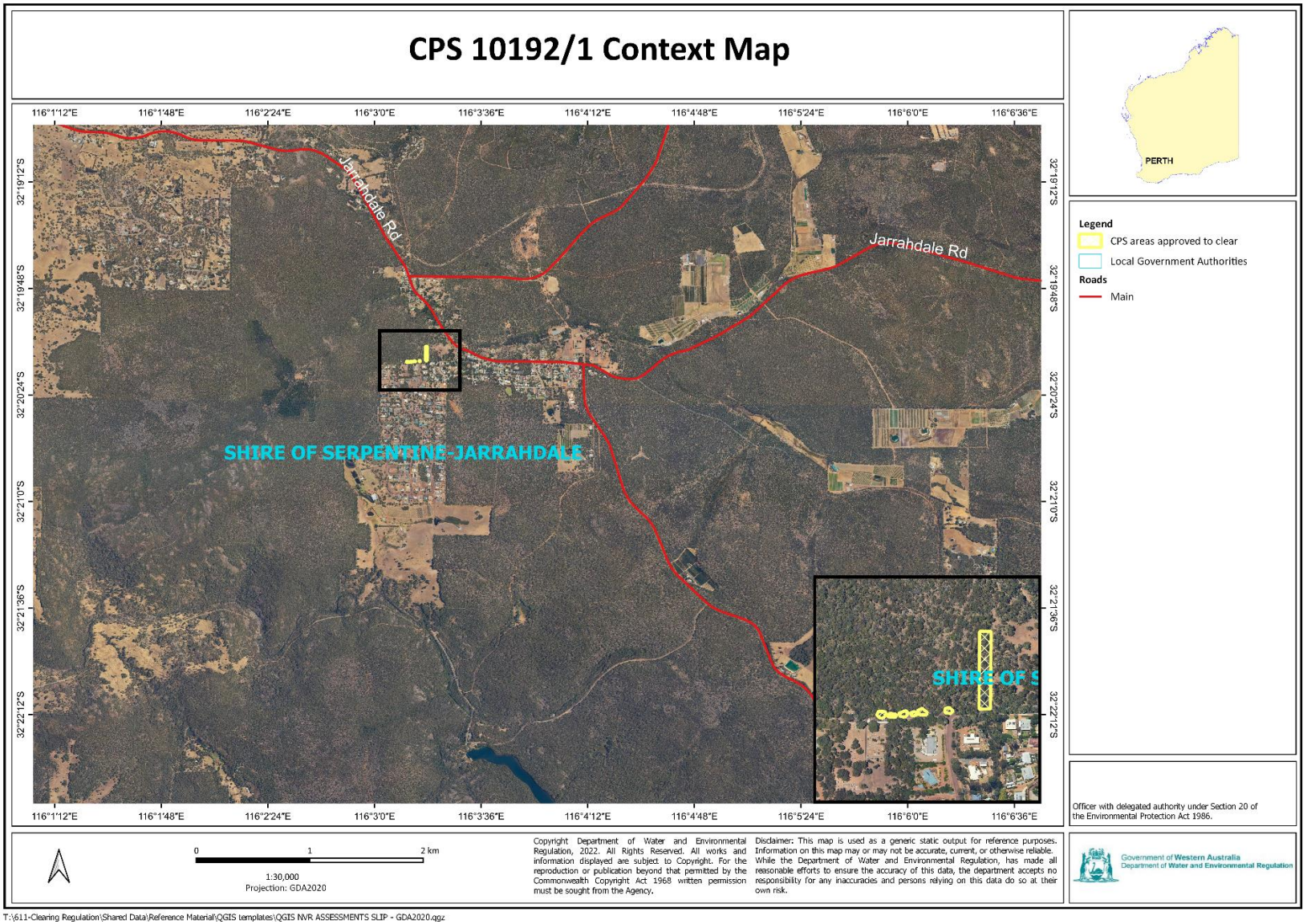

Figure 1: Context map of the application area CPS 10192/1. The areas cross-hatched yellow indicates the areas authorised to be cleared under the granted clearing permit.

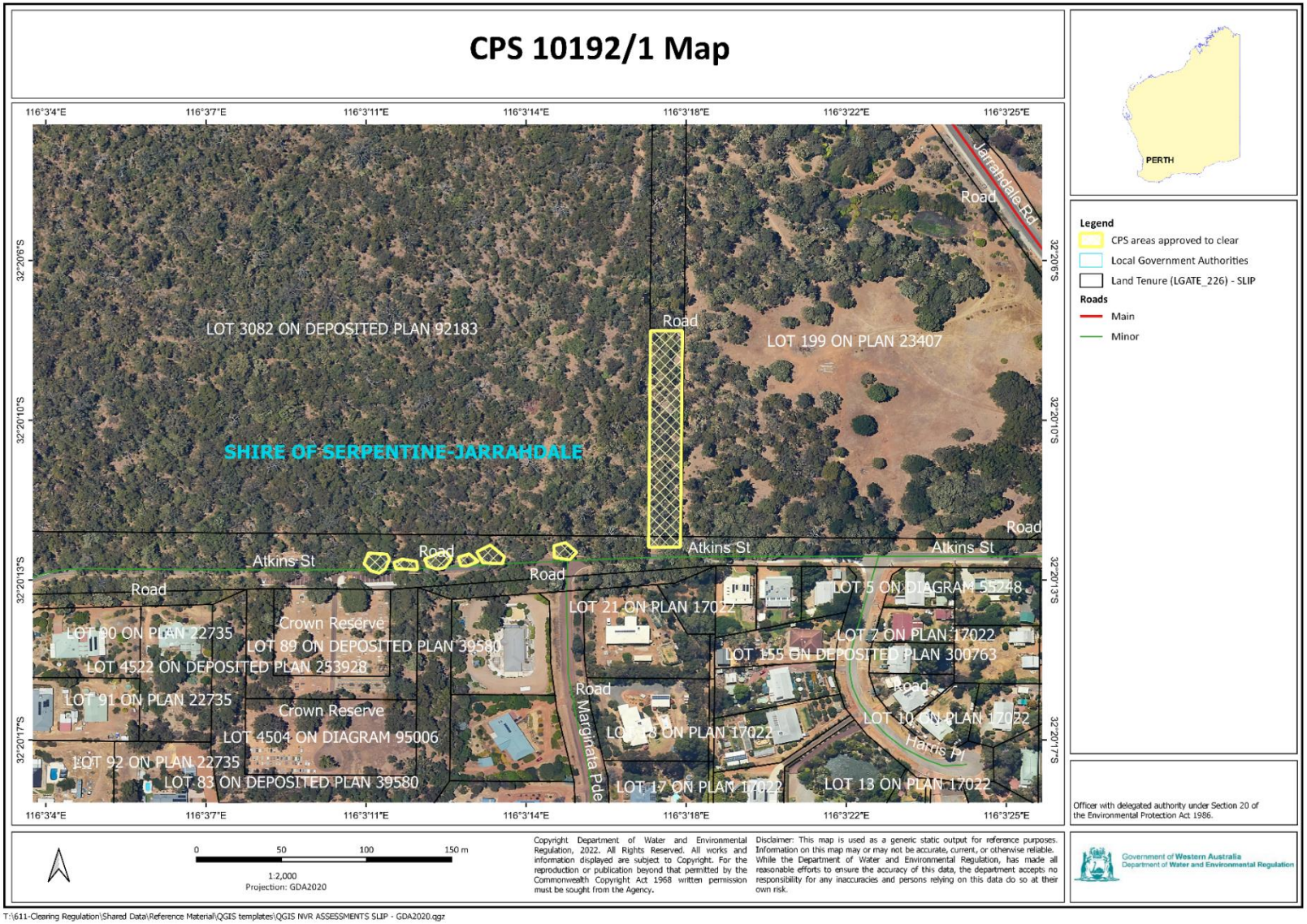

Figure 2: Map of the application area CPS 10192/1. The areas cross-hatched yellow indicates the areas authorised to be cleared under the granted clearing permit.

2 Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)
- *Soil and Land Conservation Act 1945* (WA)

Relevant policies considered during the assessment include:

- *Environmental Offsets Policy* (2011)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2013)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)
- *Environmental Offsets Guidelines* (August 2014)
- Technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016)
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

The Shire of Serpentine-Jarrahdale (the Shire) amended the design plans of the proposed parking bays after the Atkins Road basic and targeted black cockatoo assessment report found several trees as having hollows that may be potential nesting trees for black cockatoo species. As such the Shire redesigned and modified the parking bay designs to retained, where possible, the potential nesting habitat trees.

The Shire has committed to translocating any grass trees from within the clearing footprint, to be preserved elsewhere in the Shire's boundaries.

After consideration of avoidance and mitigation measures, it was determined that an offset to counterbalance the significant residual impacts to habitat for black cockatoo species is necessary. In accordance with the Government of Western Australia's Environmental Offsets Policy and Environmental Offsets Guidelines, these significant residual impacts have been addressed through the conditioning of environmental offset requirements on the permit. The nature and suitability of the offset is provided are summarised in Section 4

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix A) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, and land and water resource values.

The assessment against the clearing principles (see Appendix B) identified that the impacts of the proposed clearing present a risk to biological values (fauna) and conservation areas. The consideration of these impacts and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act is set out below.

3.2.1. Biological values (fauna) - Clearing Principles (b)

Assessment

The application area is located within the Shire of Serpentine-Jarrahdale within the Perth hills. A flora and vegetation assessment undertaken in November 2022 (Emerge Associates 2022) identified that the vegetation within the

application area consists of Marri and Jarrah woodland in a completely degraded to very good (Keighery, 1994) condition with the majority of the vegetation being in good to very good condition (Emerge Associates, 2022)

According to the available database, 21 conservation-significant fauna species have been recorded within the local area, comprising five Priority 3, five Priority 4, three Endangered, four Vulnerable, one critically endangered, one specially protected species (OS), and two conservations dependent. Noting the habitat requirements, the distribution of the recorded species, the mapped vegetation types, and the condition of the vegetation within the application area, the application area is likely to provide suitable habitat for *Zanda baudinii* (Baudin's cockatoo) (EN), *Zanda latirostris* (Carnaby's cockatoo) (EN), *Dasyurus geoffroii* (Chuditch) (VU), *Calyptorhynchus banksii naso* (Forest red-tailed black cockatoo) (VU), *Cacatua pastinator pastinator* (Muir's corella) (CD), *Myrmecobius fasciatus* (Numbat) (EN), *Isoodon fusciventer* (Quenda) (P4), *Acanthophis antarcticus* (Southern death adder) (P3), *Phascogale tapoatafa wambenger* (South-western brush-tailed phascogale) (CD), *Notamacropus Irma* (Western brush wallaby) (P4), and *Pseudocheirus occidentalis* (Western ringtail possum) (CR).

Black cockatoos

The habitat for Black Cockatoos can be categorized into three groups: foraging, breeding, and roosting. Black Cockatoos typically forage within a 12-kilometre radius of their active breeding site (Commonwealth of Australia, 2022). Following breeding, they will flock in search of food sources within six kilometres of their night roost (Commonwealth of Australia, 2022). However, they can travel up to 20 kilometres or more in search of food (Commonwealth of Australia, 2022). To maintain their population, it is crucial to have an abundance of food resources within the range of breeding and roosting sites. Consequently, foraging resources are evaluated based on known breeding and night roosting sites, primarily within 12 kilometres of a breeding or roosting site (Commonwealth of Australia, 2022). The application area is located within the modelled potential breeding range of Carnaby's cockatoo and the core distributed range of the Forest Red-tailed Black-cockatoo. The range of black cockatoo species has contracted west and south from its historical range.

Breeding Habitat

Black cockatoo species are known to nest in hollows of live or dead trees, including *Corymbia calophylla* (Marri), *Eucalyptus marginata* (Jarrah), *Eucalyptus diversicolor* (Karri), *Eucalyptus wandoo* (Wandoo), *Eucalyptus gomphocephala* (Tuart), *Eucalyptus rudis* (Flooded gum), and other *Eucalyptus spp*. (Commonwealth of Australia, 2022). 'Breeding habitat' for black cockatoos includes trees of these species that either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow, where suitable DBH for nest hollows is ≥ 50 centimetres for most tree species (Commonwealth of Australia, 2022).

According to spatial data, five white-tailed black cockatoos' (Baudin's and Carnaby's) breeding sites have been recorded within 1.35 kilometres of the application area, and three Forest red-tailed black cockatoo breeding sites within 12 kilometres of the application area, with the closest being 7.19 kilometres from the application area.

During the basic fauna and targeted black cockatoo assessment, a total of 13 Marri trees and 11 Jarrah trees with a diameter at breast height greater than 50cm were identified and considered potential breeding habitat for black cockatoos, within the application area (see Table 1 and figure 6) (Emerge Associates 2022). Three of the 24 trees were classified as suitable nesting trees as they contained hollows that may be suitable for black cockatoo breeding, as observed from ground level. The remaining 21 trees were classified as potential nesting trees as they did not contain suitable hollows but had the potential to form suitable hollows in the future. The three trees with suitable hollows did not have any internal hollow inspection to confirm suitability or current/past use by black cockatoos (Emerge Associates, 2023).

The applicant has advised that some of the mature trees within the application area will be retained. A condition will be placed on the permit to require the permit holder to inspect all habitat trees prior to clearing and if evidence of use by black cockatoos is observed, to avoid clearing those trees, if possible. If avoidance is not possible, the permit holder is required to install an artificial hollow at a location determined in consultation with DBCA.

Foraging habitat

Baudin's, Carnaby's and Forest Red-tailed Black-cockatoo forage on a variety of seeds, nuts, flowers, and plants, including *Proteaceous* species (*Banksia* spp., *Hakea* spp., and *Grevillea* spp.), as well as *Allocasuarina* and *Eucalyptus* species, marri, and a range of introduced species (Valentine & Stock, 2008). The application area consists of Jarrah and Marri woodland and contains 0.35 hectares of primary native foraging habitat for all three species of black cockatoo. The understory of the application area also contains suitable foraging species, including primary foraging species *Banksia grandis*, *Banksia sessilis,* and secondary foraging species in *Xanthorrhoea* sp.(Emerge Associates, 2022). There was foraging evidence of the Forest Red-tailed Black-cockatoo recorded during the survey (Emerge Associates, 2022).

Roosts
Following breeding, Black cockatoos will assemble into flock and move through the landscape searching for suitable food recourses, usually foraging within 6 kilometres of a night roost (Commonwealth of Australia 2012). Black cockatoo species will utilise a wide range of native and non-native trees situated within a variety of land-use types to roost. Black cockatoos will usually roost in tall (average of >25 metres) trees species that have a relatively thick trunk (DBH of 1 metre) and medium foliage density (average of 50%) (Le Roux, 2017). According to available databases, there are 20 roosts within a 12-kilometre radius of the application area. The closest known roost site for black cockatoo species is approximately 0.24 kilometres from the application area. Roosting typically occurs within suitable trees that are in close proximity to an important water source and within an area of quality foraging habitat (Commonwealth of Australia, 2022).

No evidence of roosting was observed within the application area, during the targeted black cockatoo assessment (Emerge Associates, 2023). However, given the proximity of the application area to known roost sites and the presence of high-quality foraging habitat within the application area, it is considered for the vegetation under application to provide suitable foraging habitat to support nearby roosting individuals.

Western brush wallaby
The western brush wallaby (Notamacropus Irma – Priority 4) was common in WA in the past, but its population reduced significantly due to agricultural development. Their preferred habitat is associated with open, seasonally wet flats with low grasses and open scrubby thickets (DEC, 2012a). There are three records of this species in the local area, with the closest record being approximately 0.95 kilometres from the application area. However, given the limited number of records and the extent of remnant adjacent native vegetation, the proposed clearing is unlikely to significantly impact habitat for this species.

Western ringtail possum
The western ringtail possum (WRP) is a medium sized, nocturnal species that roams through the trees at night, feeding on leaves of eucalypt, marri and peppermint trees and other fruits and flowers. It has a long, thin tail with a white tip that helps it to move through the trees and carry nesting material (DCCEEW, 2023). The current distribution of the western ringtail possum is patchy and largely restricted to the moister south-western corner of Western Australia (de Tores, 2008), especially near coastal areas of peppermint woodland and peppermint/tuart associations from the Australind/Eaton area to the Waychinicup National Park (DEC, 2012b). There is only one record of the WRP within 10 kilometre radius of the application area being approximately 0.48 kilometres recorded in 1991. Given the low quality of WRP habitat within the clearing area, the extent of the proposed clearing and the most recent date of the WRP recorded within the local area, the proposed clearing is unlikely to significantly impact habitat for this species.

Other fauna
Other fauna (Quenda, Chuditch, the Western Corella, Numbat, Southern death adder, and South-western brush-tailed phascogale) may be transient visitors to the application area are listed in Appendix A.3. Given the size of the application area and the extend of remnant adjacent native vegetation adjacent to the application area, the application area is not considered to provide significant habitat for these species.

Conclusion
Based on the above assessment, the proposed clearing will result in the loss of 0.35 hectares of significant foraging and potential breeding habitat for black cockatoo species.

Conditions
To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- undertake slow, progressive one-directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity;
- avoidance and minimisation to reduce the impacts and extent of clearing;
- inspection of habitat trees prior to clearing and to avoid if evidence of use. If can't avoid, replace with an artificial hollow in consultation with DBCA; and
- provide an offset to counterbalance the residual impact to black cockatoo habitat.

3.2.2. Significant remnant vegetation and conservation areas (conservation area) - Clearing Principles (h)

Assessment
The application area occurs adjacent to the environmental conservation reserve, Gooralong Conservation Park.

The proposed clearing may impact the environmental values of the adjacent conservation area by facilitating the spread of weeds and dieback into the conservation area.

Conditions

To address the above impacts, the following management measure will be required as a condition on the clearing permit:

- Weeds and dieback management measures.

3.3. Relevant planning instruments and other matters

The applicant advised that the proposed clearing is to support the construction of formalise car parking bays due to the number of cars parked on the weekends from the users of the Kitty's Gorge Walk.

The application area has been mapped within a Surface Water area - Serpentine River System, managed under the *Rights in Water and Irrigation Act* 1914 (RIWI Act). The proposed clearing is not likely to impact any watercourse or wetlands within the surrounding area (See Appendix B) and therefore approvals under RIWI Act under section 11,17, or 21A is not required.

No Aboriginal sites of significance have been mapped within the application area. It is the permit holder's responsibility to ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

4 Suitability of offsets

Through the detailed assessment outlined in Section 3.2 above, it has been determined that the following significant residual impacts remain after the application of the avoidance and mitigation measures summarised in Section 3.1:

- The loss of 0.35 hectares of black cockatoo (Zanda latirostris, Zanda baudinii, Calyptorhynchus banksii naso) foraging habitat and potential breeding habitat.

The applicant has proposed an environmental offset consisting of the conservation, in perpetuity, of 4.05 hectares of very good condition (Keighery,1994) Jarrah and Marri woodland that provides high quality foraging, and potential breeding and roosting habitat for all three black cockatoo species (*Zanda baudinii*, *Zanda latirostris*, and *Calyptorhynchus banksii naso*). The offset is located within Lot 2658 on Deposited Plan 91418 and currently vested as a Reserve (Type 3 R) for the purpose of public use. To conserve the vegetation in perpetuity, the purpose of the Reserve will be changed to conservation.

The proposed offset area is mapped as open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* on lateritic uplands in subhumid and semiarid zones and consists of the following species: *Banksia grandis, Banksia nivea, Banksia sessilis, Corymbia calophylla, Eucalyptus Marginata, Eucalyptus patens, Grevillea wilsonii, Hakea lissocarpha* and *Xanthorrhoea preissii.* The offset proposed is to change the reserve vesting form public open space to conservation, with a realignment of the reserve boundaries to exclude Nettleton Road subject to council approvals (Shire of Serpentine-Jarrahdale, 2024). The proposed offset area is located approximately 1.10 kilometres northeast of the application area (see figure 3).

In assessing whether the proposed offset is adequate and proportionate to the significance of the environmental values being impacted, a calculation using the WA state Offset Matric was undertaken for the proposed clearing. The calculation indicates that the proposed offset will counterbalance 100 percent of the significant residual impacts of the clearing and is therefore consistent with the WA Offset Policy (2011). The justification for the values used in the offset calculation is provided in Appendix F. The Delegated Officer considers that the proposed offset adequately counterbalances the significant residual impacts listed above.

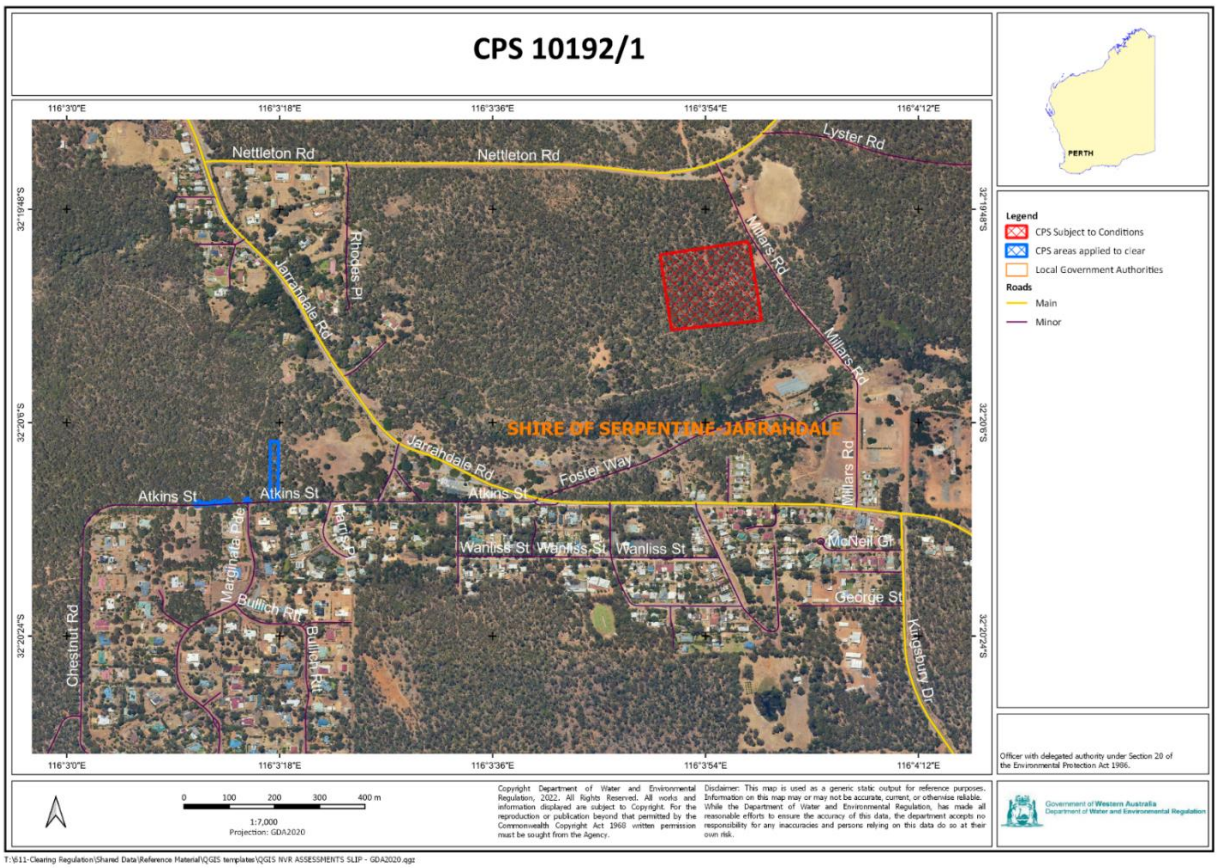

Figure 3: Map of the Offset area (cross hatched red) for CPS 10192/1. The areas cross-hatched blue indicates the areas under assessment.

End

Appendix A. Site characteristics

A.1. Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to the department at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix B.

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td>Local context</td><td>The area proposed to be cleared is 0.35 hectares of native vegetation split into multiple areas within proximity of one another in the intensive land use zone of Western Australia. The vegetation is a part of a larger area of remnant vegetation. The application area is surrounded by remnant vegetation and borders on Gooralong Conservation Park reserve.

The application area is located within the western border of the Jarrah Forest IBRA bioregion. Spatial data indicates the local area (10-kilometre radius from the centre of the area proposed to be cleared) retains approximately 62.23 per cent of the original native vegetation cover.</td></tr>
<tr><td>Ecological linkage</td><td>The application area is not a part of any larger vegetation linkages. With the closest to the application area being approximately 516 metres from the Perth ecological linkage (146) and approximately 1.45 kilometres from the Perth ecological linkage (34). The application area is associated with a roadside conservation linkage (Serpentine Jarrahdale - 1028), the road linkage that has a medium to low conservation value with patchy coverage of native vegetation with Eragrostis curvula throughout the area.

The proposed clearing will unlikely sever or impact any formal linkage functions of the Serpentine Jarrahdale (1028).</td></tr>
<tr><td>Conservation areas</td><td>The application area does not occur within a conservation area. However the application area is surrounded by multiple conservation areas as outlined in the below table.
<table>
<tr><th>Name/ID</th><th>Conservation area type</th><th>Approximate Distance from application area</th><th>Direction from application area</th><th>Number of reserves</th></tr>
<tr><td>Gooralong Conservation Park</td><td>Conservation Park</td><td>2.6 m</td><td>North-west</td><td>2</td></tr>
<tr><td>Korribinjal Brook</td><td>Public recreation</td><td>2.48 km</td><td>North-west</td><td>2</td></tr>
<tr><td>Serpentine National Park</td><td>National Park</td><td>250 m</td><td>North, South and west</td><td>2</td></tr>
<tr><td>Un named reserves</td><td>Multiple uses</td><td>11 m</td><td>North, East and West</td><td>31</td></tr>
</table></td></tr>
<tr><td>Vegetation description</td><td>Photographs supplied by the applicant, the detailed flora and vegetation assessment, and the basic fauna and targeted black cockatoo assessment (Emerge Associates 2022 and 2023), indicate the vegetation within the proposed clearing area consists of, open forest of Eucalyptus marginata and Corymbia calophylla over shrubland of Xanthorrhoea preissii, Macrozamia riedlei and Pteridium esculentum, over open vineland of Clematis pubescens and Hardenbergia comptoniana over forbland of Lagenophora huegelii, Trachymene pilosa and Briza maxima.

This is broadly consistent with the mapped vegetation types over the application area:</td></tr>
</table>

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td></td><td>

Dwellingup, D2 described as an open forest of Eucalyptus marginata subsp. marginata, Corymbia calophylla on lateritic uplands in subhumid and semiarid zones.
Murray 1, My1 described as an open forest of Eucalyptus marginata subsp. marginata, Corymbia calophylla, Eucalyptus patens on valley slopes to woodland of Eucalyptus rudis and Melaleuca rhaphiophylla on the valley floors in humid and subhumid zones.

The mapped vegetation types retain approximately 82.50 per cent and 76.13 per cent of the original extent (Government of Western Australia, 2019). A full record of all flora species found within the application area can be found (Appendix G)
</td></tr>
<tr><td>Vegetation condition</td><td>
Photographs supplied by the applicant and the detailed flora and vegetation assessment (Emerge Associates 2022), indicate that the vegetation within the proposed clearing area is in a completely degraded to very good (Keighery, 1994) condition, with 90 per cent of the vegetation in good or better condition. The exact hectare condition rating found below.
<table>
<tr><th>Condition category</th><th>Size (ha)</th></tr>
<tr><td>Very good</td><td>0.13</td></tr>
<tr><td>Good</td><td>0.3</td></tr>
<tr><td>Good - degraded</td><td>0.03</td></tr>
<tr><td>Completely degraded</td><td>0.04</td></tr>
</table>
The full Keighery (1994) condition rating scale is provided in Appendix C. Representative photos are available in Appendix E.
</td></tr>
<tr><td>Climate and landform</td><td>
Mediterranean, characterized by hot and dry summers and cool and wet winters. According to the Bureau of Meteorology (2021), An average of 1169.7 millimetres of rainfall is recorded annually from the Jarrahdale weather station (no. 9023), which is the closest weather station, located approximately 2 kilometres from the site. The majority of this rainfall is received between the months of May and September (BoM 2022).
The elevation of the application area on the eastern side of the application area is 250 meters Isohyet and gently slopes down as towards the east to 240 meters Isohyet.
</td></tr>
<tr><td>Soil description</td><td>
The soil type mapped within the application area is:
<table>
<tr><td>Name</td><td>Dwellingup 2 Phase</td></tr>
<tr><td>Soils</td><td>255DpDW2</td></tr>
<tr><td>Description</td><td>Very gently to gently undulating terrain (<10%) with well drained, shallow to moderately deep gravelly brownish sands, pale brown sands and earthy sands overlying lateritic duricrust.</td></tr>
</table>
</td></tr>
<tr><td>Land degradation risk</td><td>
The degradation risk factors mapped over the application area are detailed below:
<table>
<tr><th></th><th>Dwellingup 2 Phase</th></tr>
<tr><td>Wind erosion</td><td>H2 >70% of the map has a high to extreme risk</td></tr>
<tr><td>Water erosion</td><td>L1 <3% of the map has a high to extreme risk</td></tr>
<tr><td>Salinity risk</td><td>L1 <3% of the map has a high to extreme risk</td></tr>
<tr><td>Phosphorous export</td><td>L1 <3% of the map has a high to extreme risk</td></tr>
<tr><td>Waterlogging</td><td>L1 <3% of the map has a high to extreme risk</td></tr>
</table>
<table>
<tr><td>Subsurface acidification</td><td>H2>70% of the map has a high to extreme risk</td></tr>
<tr><td>Acid sulphate soils</td><td>No known risk</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td></td><td>
<table>
<tr><td>Flooding</td><td>L1 <3% of the map has a high to extreme risk</td></tr>
<tr><td>Floodplains</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Waterbodies</td><td>The desktop assessment and aerial imagery indicated that there are no wetlands or natural watercourses within the application area. The closest wetland is Gooralong Brook, a nonperennial natural watercourse approximately 130 metres north of the application area and an unnamed palusplain wetland located approximately 1.13 kilometres southeast of the application area.</td></tr>
<tr><td>Hydrogeography</td><td>
<table>
<tr><td>Hydrological Zone</td><td>Western Darling Range</td></tr>
<tr><td>Basin</td><td>Murray River (614)</td></tr>
<tr><td>Hydrographic Catchment</td><td>Peel Estuary Serpentine River</td></tr>
</table>
<table>
<tr><td>RIWI Act Surface Water and Irrigation District</td><td>Yes</td><td>Serpentine River System</td></tr>
<tr><td>RIWI Act Rivers</td><td>No</td><td></td></tr>
<tr><td>RIWI Act Groundwater Areas</td><td>No</td><td></td></tr>
<tr><td>CAWS Act Clearing Control Catchment</td><td>No</td><td></td></tr>
<tr><td>Public Drinking Water Source Areas</td><td>No</td><td></td></tr>
<tr><td>Wellhead Protection Zone</td><td>No</td><td></td></tr>
<tr><td>Reservoir Protection Zone</td><td>No</td><td></td></tr>
</table>
The salinity of the application area is mapped at 500-1000 total dissolved solids milligrams per litre.
</td></tr>
<tr><td>Flora</td><td>According to available database, 35 conservation significant flora species have been recorded within the local area (10-kilometre buffer). Comprising four Priority 1, four Priority 2, 13 Priority 3, five Priority 4, and nine threatened, flora taxa.

A detailed flora and vegetation assessment found no threatened or priority flora species within the application area (Emerge associates 2022).</td></tr>
<tr><td>Ecological communities</td><td>According to available databases, 193 conservation significant ecological communities have been mapped within the local area (10-kilometres buffer). None of these records occur over the application area. The closest ecological community is a Priority Ecological community (PEC) located approximately 3.97 kilometres from the application area.

According to flora and vegetation survey, no TECs or PECs occur within the application area (Emerge Associates 2022).</td></tr>
<tr><td>Fauna</td><td>According to available database, 21 conservation significant fauna species have been recorded within the local area comprising of five Priority 3, five Priority 4, three Endangered, four Vulnerable, one critically endangered, one specially protected species (OS), and two conservations dependent. fauna taxa. One fauna species is associated only with marine, estuarine, or freshwater habitats and as there is no water within the application area, the species is unlikely to occur.

Of the 20 terrestrial fauna species, 14 are non-avian. The closest recorded fauna that have suitable habitat and vegetation requirements to that of the application area are the Chuditch (Dasyurus geoffroii), being 1.13 kilometres, the quenda (Isoodon fusciventer) being 0.59 kilometres, the South-western brush-tailed phascogale (Phascogale tapoatafa wambenger) being 0.53 kilometres, the western ringtail possum</td></tr>
</table>

Characteristic	Details
	(*Pseudocheirus occidentalis*) being 0.48 kilometres and the southern death adder (*Acanthophis antarcticus)* being 1.13 kilometres from the application area, respectively. All three species of black cockatoo species, the Carnaby's cockatoo (*Zanda latirostris*), Baudin's cockatoo (*Zanda baudinii*), and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) have been recorded within a 12-kilometre radius of the application area.

A.2. Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed land (ha)	Current proportion (%) of pre-European extent in all DBCA managed land
IBRA bioregion*					
Jarrah Forrest	4,506,660.25	2,399.838.15	53.25	1,673,614.25	37.14
Vegetation complex (Pre-European)					
West Darling 3	485,532.26	416,850.04	85.85	377,182.76	77.68
Vegetation complex					
Dwellingup, D2 (79)	86,128.33	71,055.96	82.50	58,975.34	68.47
Murray 1, My1 (206)	68,695.18	52,296.01	76.13	44,444.95	64.70
Local area					
10km radius	32,024.45	19,928.72	62.23	-	-

*Government of Western Australia (2019a)

A.3. Fauna analysis table

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Birds						
Cacatua pastinator pastinator (Muir's corella)	CD	Y	Y	2.68	2	Y
Calyptorhynchus banksii naso (Forest red-tailed black cockatoo)	VU	Y	Y	1.13	171	Y
Zanda baudinii (Baudin's cockatoo)	EN	Y	Y	0.23	134	Y
Zanda latirostris (Carnaby's cockatoo)	EN	Y	Y	0.11	351	Y
Falco peregrinus (Peregrine falcon)	OS	N	N	3.88	6	Y
Tyto novaehollandiae novaehollandiae (masked owl (southwest))	P3	N	N	4.48	1	Y
Mammals						
Dasyurus geoffroii (Chuditch, western quoll)	VU	Y	Y	1.13	29	Y
Falsistrellus mackenziei (Western false pipistrelle, western falsistrelle)	P4	Y	Y	5.59	6	Y

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Hydromys chrysogaster (water-rat, rakali)	P4	N	N	7.52	3	Y
Isoodon fusciventer (quenda, southwestern brown bandicoot)	P4	Y	Y	0.59	75	Y
Myrmecobius fasciatus (numbat, walpurti)	EN	Y	Y	3.17	12	Y
Notamacropus Irma (Western brush wallaby)	P4	Y	Y	0.95	3	Y
Phascogale tapoatafa wambenger (South-western brush-tailed phascogale, wambenger)	CD	Y	Y	0.53	7	Y
Pseudocheirus occidentalis (western ringtail possum, ngwayir)	CR	Y	Y	0.48	1	Y
Setonix brachyurus (Quokka)	VU	N	Y	2.36	23	Y
Reptiles						
Acanthophis antarcticus (southern death adder)	P3	Y	Y	1.13	10	Y
Ctenotus delli (Dell's skink, Darling Range Southwest Ctenotus)	P4	Y	Unknown	5.78	4	Y
Invertebrates						
Euoplos inornatus (inornate trapdoor spider (northern Jarrah Forest))	P3	Y	N	8.18	1	Y
Glacidorbis occidentalis (Jarrah Forest freshwater snail)	P3	N	N	8.91	2	Y
Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)	P3	N	N	7.73	1	Y

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

A.4. Ecological community analysis table

Community name	Conservation status	Suitable habitat features?	Suitable vegetation type?	Suitable soil type?	Distance of closest record to application area (km)	Number of known records (total)
Banksia attenuata and/or Eucalyptus marginata woodlands of the eastern side of the Swan Coastal Plain.	CR	N	N	N	5.61	13
Banksia Woodlands of the Swan Coastal Plain ecological community	Priority 3	N	N	N	3.97	158
Corymbia calophylla — Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain.	EN	N	Y	N	4.94	8
Corymbia calophylla – Kingia australis woodlands on heavy soils.	CR	N	N	N	5.85	4
Corymbia calophylla — *Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain.	EN	N	Y	N	7.09	2
Granite communities of the northern Jarrah Forest	Priority 3	Y	N	N	5.55	1
Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson et al. 1994)	EN	N	N	N	7.88	1
Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson et al. 1994)	EN	N	N	N	7.79	2
Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. 1994)	EN	N	N	N	7.68	3
Southern wet shrublands, Swan Coastal Plain (floristic community type 2 as originally described in Gibson et al. 1994)	CR	N	N	N	6.51	1

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

Appendix B. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biological values		
Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."* Assessment: The area proposed to be cleared is not likely to contain local or regionally significant flora or assemblages of plants, However the application area contains suitable habitat and potential occurrences of conservation significant fauna.	May be at variance	No
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."* Assessment: The area proposed to be cleared contains foraging and potential breeding habitat for *Zanda latirostris, Zanda baudinii, Calyptorhynchus banksii naso.* The application area may also provide suitable habitat for *Dasyurus geoffroii, Cacatua pastinator pastinator, Myrmecobius fasciatus, Isoodon fusciventer, Setonix brachyurus, Acanthophis antarcticus, Phascogale tapoatafa wambenger, Notamacropus Irma, Falsistrellus mackenziei, Pseudocheirus occidentalis*.	At variance	Yes *Refer to Section 3.2.1, above.*
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: A flora and vegetation assessment (Emerge associates 2022) found no threatened or priority flora species within the application area. The area proposed to be cleared is unlikely to contain flora species listed under the BC Act.	Not likely to be at variance	No
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."* Assessment: A flora and vegetation assessment (Emerge associates 2022) did not identify any Threatened Ecological Community (TEC) within the application area.	Not likely to be at variance	No
Environmental value: significant remnant vegetation and conservation areas		
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."* Assessment: The extent of the mapped vegetation type in the local is consistent with the national objectives and targets for biodiversity conservation in Australia. The local area has 62.23% of pre-European vegetation extent remaining. The vegetation proposed to be cleared is not considered to be part of a significant ecological linkage in the local area. Given this, the application area is not considered a significant remnant in an extensively cleared landscape.	Not likely to be at variance	No
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."* Assessment: Given the distance to the nearest conservation area, the proposed clearing may have an impact on the environmental values of the adjacent conservation area, Gooralong Conservation Park through the spread and introduction of weeds and dieback.	May be at variance	Yes *Refer to Section 3.2.2, above.*

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: land and water resources		
Principle (f): *"Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."* Assessment: The application area is located approximately 130 meters south of Gooralong Brook, a nonperennial watercourse. Given the distance to this watercourse, the proposed clearing is unlikely to impact on riparian vegetation.	Not at variance	No
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: The mapped soils are highly susceptible to wind erosion and subsurface acidification. Noting the small extent of the proposed clearing and that the application area is surrounded by native vegetation, the proposed clearing is unlikely cause appreciable land degradation.	Not at variance	No
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."* Assessment: Given no water courses or Public Drinking Water Sources Areas are recorded within the application area, the extent of the proposed clearing and the purpose being the construction of parking bays, the proposed clearing is unlikely to impact surface or ground water quality.	Not at variance	No
Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."* Assessment: The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding or waterlogging.	Not at variance	No

Appendix C. Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Considering its location, the scale below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from Keighery, B.J. (1994) *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Measuring vegetation condition for the South West and Interzone Botanical Province (Keighery, 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, with disturbance affecting individual species; weeds are non-aggressive species.
Very good	Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or grazing.

Condition	Description
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and/or grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix D. Offset calculator value justification

Calculation	Score (Area)	Rationale
Conservation significance black cockatoo habitat		
Description	Habitat for Zanda latirostris, Zanda baudinii, and Calyptorhynchus banksii	The proposed clearing will impact 0.35 hectares of native vegetation that is significant as primary Black cockatoo foraging, roosting and nesting habitat.
Type of environmental value	Species (flora/fauna)	Significant black cockatoo habitat that includes, Eucalyptus marginate (Jarrah) (11 trees) and Corymbia calophylla (marri) (13 trees).
Conservation significance of environmental value	Rare/threatened species - endangered	Foraging, Roosting and Nesting habitat for Zanda latirostris, Zanda baudinii, and Calyptorhynchus banksii. There are 20 roosts within 12 kilometres of the application area.
Landscape level value impacted	Yes/No	The impact is to 0.35 hectares of significant black cockatoo habitat vegetation in hectares.
Significant impact		
Description	Clearing of significant habitat for black cockatoo species	The proposed clearing will impact 0.35 hectares of native vegetation that provides high value foraging and potential breeding habitat for Black cockatoo species.
Significant impact (hectares)	0.35	Given that the application is clearing not only the trees but the ground cover, that can also provide foraging habitat for black cockatoo species. The entire extent of the application area is considered to significantly contribute to the ecological function of providing habitat for black cockatoo species.
Quality (scale)	8.00	Based on the available information from the basic fauna and targeted clack cockatoo assessment 2022 and the detailed flora and vegetation assessment 2022, the application area consists of high-quality foraging and potential breeding habitat within close proximity to known black cockatoo roosts and breeding sites.
Offset		
Description	Lot 2658 on Plan 91418 will have its vesting changed from public use to conservation.	A single offset involving the acquisition of land and change of vesting to conservation within the surrounding area of the application site that contains native vegetation that provides black cockatoo foraging, roosting and potential nesting habitat (e.g. *Eucalyptus marginate* and *Corymbia calophylla*).
proposed offset (area in hectares)	4.05	4.05 hectares of native vegetation that is significant as black cockatoo habitat.
Current quality of offset site	7.00	The canopy vegetation within the offset site will be in a very good condition (Keighery,1994) based on the site photos and a flora survey from 2017.
Future quality WITHOUT offset	7.00	It is assumed that the offset site will be in a similar condition to the proposed clearing site. The surrounding area retains 62.23 per cent of the native vegetation, and it is assumed that clearing will be minimal with the extent of reserves within the surrounding area. It is not expected that the quality of black cockatoo habitat within an offset site will significantly change

		over two years in the absence of the offset. The 2017 flora survey mentioned that the recreational impacts of the surrounding area is low, except for the few events held at the oval.
Future quality WITH offset	7.00	It is assumed that the offset site will be secured in perpetuity as a reserve and that the native vegetation within the area will continue to provide black cockatoo foraging, roosting and potential nesting habitat.
Time until ecological benefit (years)	1.00	Lot 2658 on Plan 91418 will have its vesting changed from recreational to conservation. It will take approximately a year for these changes to occur.
Confidence in offset result (%)	95	There is a high level of confidence that the offset will achieve the predicted results given Lot 2658 on Plan 91418 has the same vegetation complex (Dwellingup 2), and the vegetation is in a very good condition.
Duration of offset implementation (maximum 20 years)	20.00	The offset site will be secured in perpetuity
Time until offset site secured (years)	1.00	The time it will take for the change of vesting purpose from recreation to conservation.
Risk of future loss WITHOUT offset (%)	15.0%	As the area is an intensive land use zone and the offset location is zoned as recreational and public use, there is the potential for clearing, weed migration and dieback within the proposed offset sites.
Risk of future loss WITH offset (%)	5.0%	The area is assumed to become a reserve for the purpose of conservation for perpetuity.
Offset ratio (Conservation area only)	NA	100% counterbalances impacts

Appendix E. Biological survey information excerpts / photographs of the vegetation

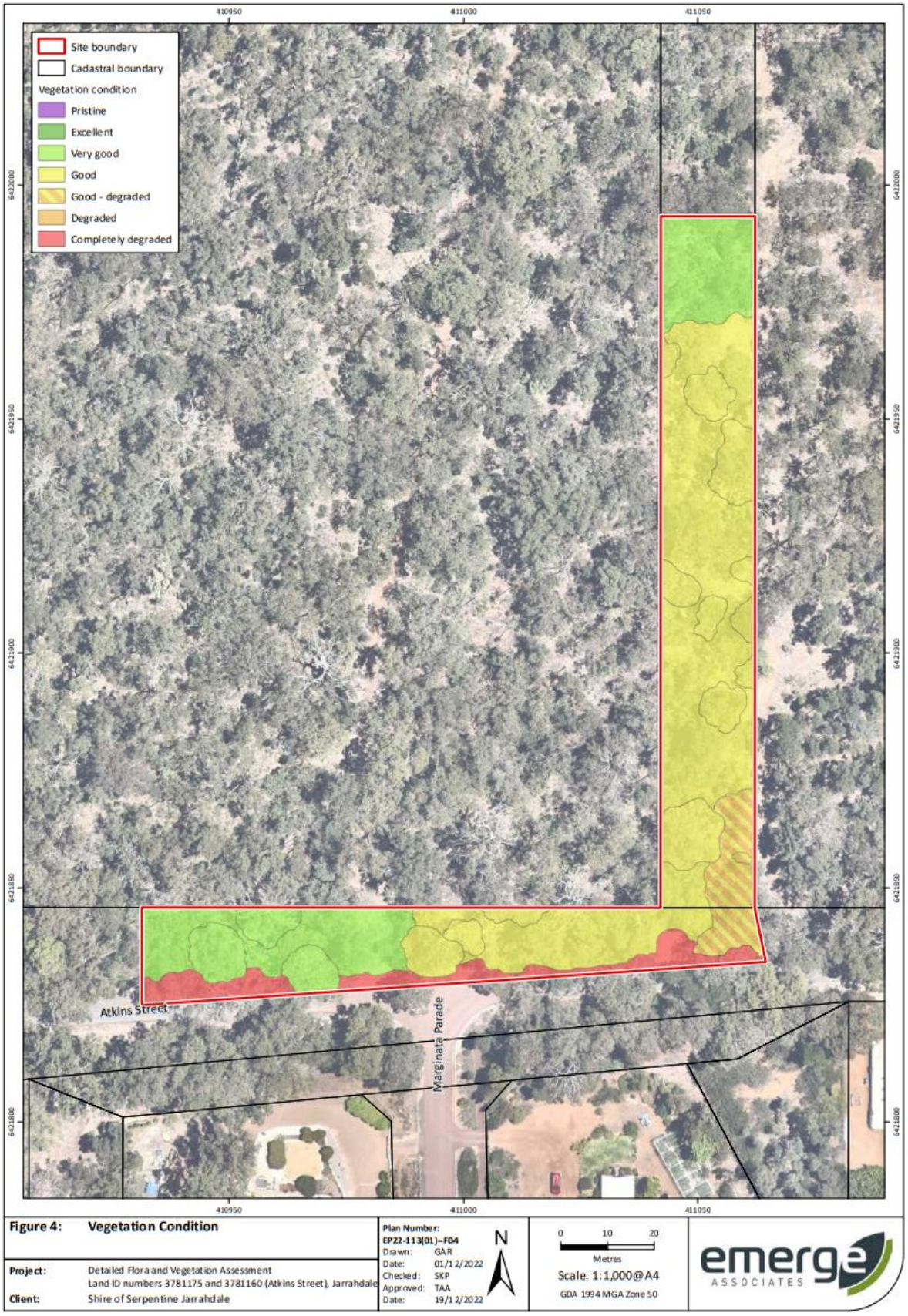

Figure 5: Map of application area CPS 10192/1 with vegetation condition rating (Emerge Associates, 2023).

Figure 6: Location of potential and suitable black cockatoo hollows within the application area

Figure 7: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla, Xanthorrhoea preissii,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 8: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla, Xanthorrhoea preissii, Macrozamia riedlei, Austrostipa compressa,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 9: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 10: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla, Xanthorrhoea preissii,* and *Macrozamia riedlei* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 11: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla Xanthorrhoea preissii,* and *Persoonia elliptica* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 12: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla, Xanthorrhoea preissii,* and *Persoonia elliptica, Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 13: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla, Xanthorrhoea preissii, Macrozamia riedlei,* and *Persoonia elliptica* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 14: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla, Xanthorrhoea preissii,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 15: Photograph of vegetation within the application area containing; *Eucalyptus marginata* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 16: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 17: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 18: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 19: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Figure 20: Photograph of vegetation within the application area containing; *Eucalyptus marginata, Corymbia calophylla,* and *Pteridium esculentum* (Shire of Serpentine-Jarrahdale, 2023b).

Table 1: GPS location, Diameter at Breast Height (DBH), and Black cockatoo hollow assessment recording for all black cockatoo habitat trees within the application area CPS 10192/1 (Emerge Associates, 2023).

Tag No.	Easting	Northing	DBH (cm)	Species	BC Hollow Category	Recorder
428	411059.33	6421856.60	52	*Corymbia calophylla*	Potential nesting tree	SKP
429	411052.00	6421865.74	102	Corymbia calophylla	Potential nesting tree	SKP
430	411051.43	6421856.09	82	*Corymbia calophylla*	Potential nesting tree	SKP
431	411057.35	6421835.08	60	*Corymbia calophylla*	Potential nesting tree	SKP
432	411054.98	6421890.93	63	*Eucalyptus marginata*	Potential nesting tree	SKP
433	411061.81	6421894.98	73	*Corymbia calophylla*	Suitable nesting tree	SKP
434	411050.80	6421906.19	54	*Eucalyptus marginata*	Potential nesting tree	SKP
435	411062.34	6421910.18	58	*Corymbia calophylla*	Potential nesting tree	SKP
436	411047.15	6421914.25	74	*Corymbia calophylla*	Potential nesting tree	SKP
437	411062.01	6421915.38	54	*Eucalyptus marginata*	Potential nesting tree	SKP
438	411046.77	6421914.92	92	*Corymbia calophylla*	Potential nesting tree	SKP
439	411053.26	6421935.82	110	*Eucalyptus marginata*	Potential nesting tree	SKP
440	411058.87	6421940.74	163	*Eucalyptus marginata*	Suitable nesting tree	SKP
441	411051.01	6421956.08	57	*Corymbia calophylla*	Potential nesting tree	SKP
442	411045.58	6421964.35	51	*Eucalyptus marginata*	Potential nesting tree	SKP
443	411036.73	6421836.00	54	Eucalyptus marginata	Potential nesting tree	SKP
444	411014.73	6421844.46	51	*Corymbia calophylla*	Potential nesting tree	SKP
445	411006.45	6421844.16	58	*Corymbia calophylla*	Potential nesting tree	SKP
446	411005.03	6421845.15	78	*Corymbia calophylla*	Suitable nesting tree	SKP
447	410998.09	6421841.76	92	*Eucalyptus marginata*	Potential nesting tree	SKP
448	410992.60	6421834.39	54	*Corymbia calophylla*	Potential nesting tree	SKP
449	410964.62	6421837.70	83	*Eucalyptus marginata*	Potential nesting tree	SKP
450	410948.07	6421835.78	133	*Eucalyptus marginata*	Potential nesting tree	SKP
451	410953.50	6421839.04	113	*Eucalyptus marginata*	Potential nesting tree	SKP

Table 2: Family and species names of all vegetation found within the application area CPS 10192/1, * = non-native species (Emerge Associates, 2023).

Family	Status	Species
Apiaceae		
		Daucus glochidiatus
		Pentapeltis peltigera
		Xanthosia candida
Araliaceae		
		Trachymene pilosa
Asparagaceae		
		Lomandra nigricans
		Lomandra sonderi
		Lomandra sp.
		Thysanotus manglesianus
		Thysanotus sparteus
Asteraceae		
	*	*Hypochaeris radicata*
		Lagenophora huegelii
Caryophyllaceae		
	*	*Petrorhagia dubia*
Colchicaceae		
		Burchardia congesta
Dennstaedtiaceae		
		Pteridium esculentum
Dilleniaceae		
		Hibbertia amplexicaulis
Droseraceae		
		Drosera ?macrantha
Elaeocarpaceae		
		Tetratheca hirsuta subsp. *viminea*
		Tremandra diffusa
Ericaceae		
		Styphelia propinqua
Fabaceae		
		Acacia pulchella var. *glaberrima*
		Acacia urophylla
		Chorizema cordatum
	*	*Dipogon lignosus*
		Hardenbergia comptoniana
		Hovea trisperma
		Mirbelia dilatata
		Sphaerolobium linophyllum
Goodeniaceae		
		Scaevola calliptera
Haemodoraceae		
		Conostylis setigera
Hemerocallidaceae		
		Caesia micrantha
Iridaceae		
	*	*Freesia alba x leichtlinii*
	*	*Ixia polystachya*

Table 3: Family and species names of all vegetation found within the application area CPS 10192/1, * = non-native species (Emerge Associates, 2023).

Family	Status	Species
Lamiaceae		
	*	*Lavenula stoechas*
Malvaceae		
	*	*Brachychiton* sp.
Myrtaceae		
		Corymbia calophylla
		Eucalyptus marginata
Orchidaceae		
		Diuris sp.
		Thelymitra crinita
Oxalidaceae		
	*	*Oxalis corniculata*
	*	*Oxalis pes-caprae*
Phyllanthaceae		
		Phyllanthus calycinus
Poaceae		
		Austrostipa compressa
	*	*Briza maxima*
		Microlaena stipoides
	*	*Pentameris airoides*
		Tetrarrhena laevis
Primuleceae		
	*	*Lysimachia arvensis*
Proteaceae		
		Banksia grandis
		Banksia sessilis
		Hakea prostrata
		Persoonia elliptica
Ranunculaceae		
		Clematis pubescens
Rhamnaceae		
		Trymalium odoratissimum subsp. *odoratissimum*
Rubiaceae		
		Opercularia hispidula
Stylidiaceae		
		Stylidium ciliatum
		Stylidium dichotomum
Xanthorrhoeaceae		
		Xanthorrhoea gracilis
		Xanthorrhoea preissii
Zamiaceae		
		Macrozamia riedlei

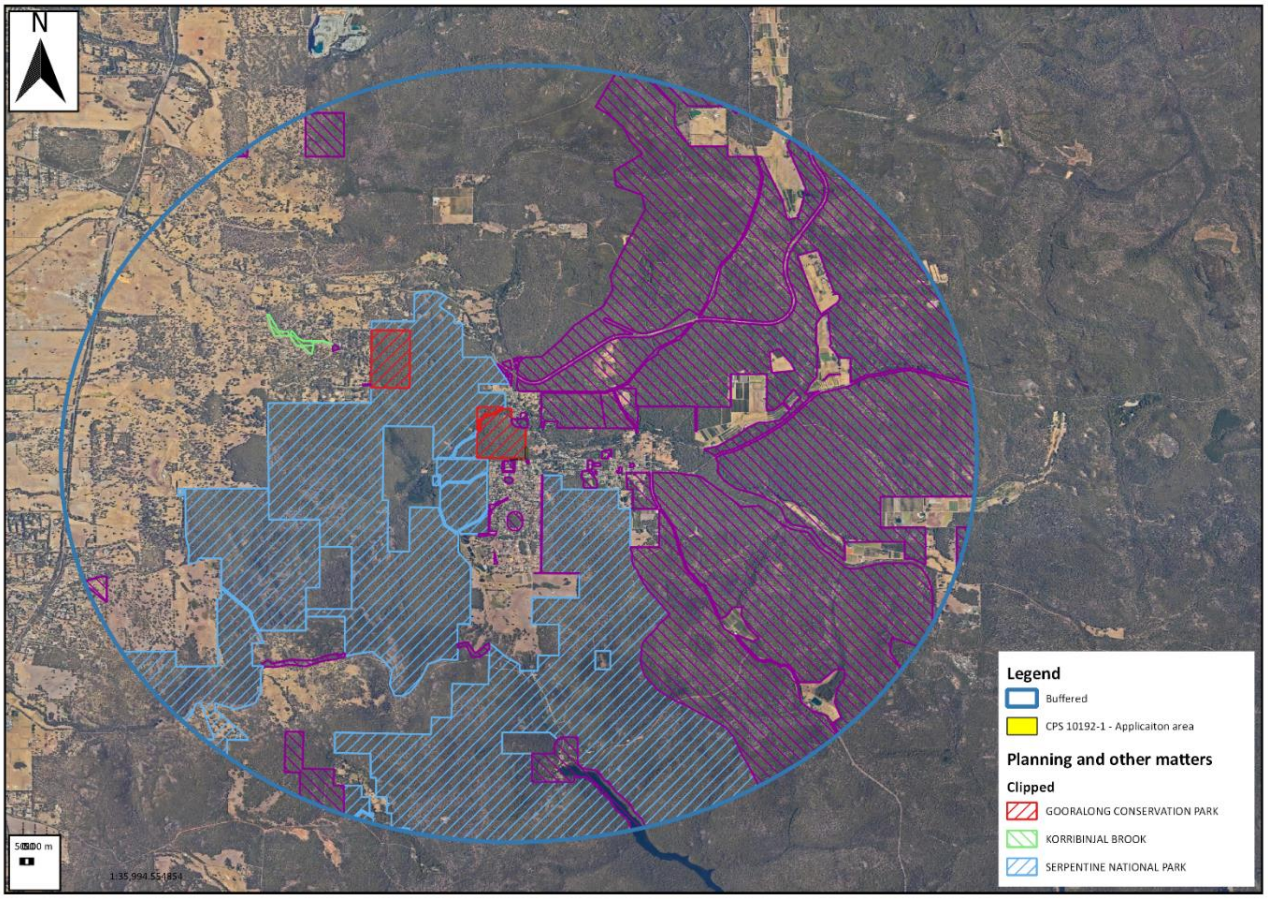

Figure 21: 10-kilometre buffer from the application area with mapped conservation areas.

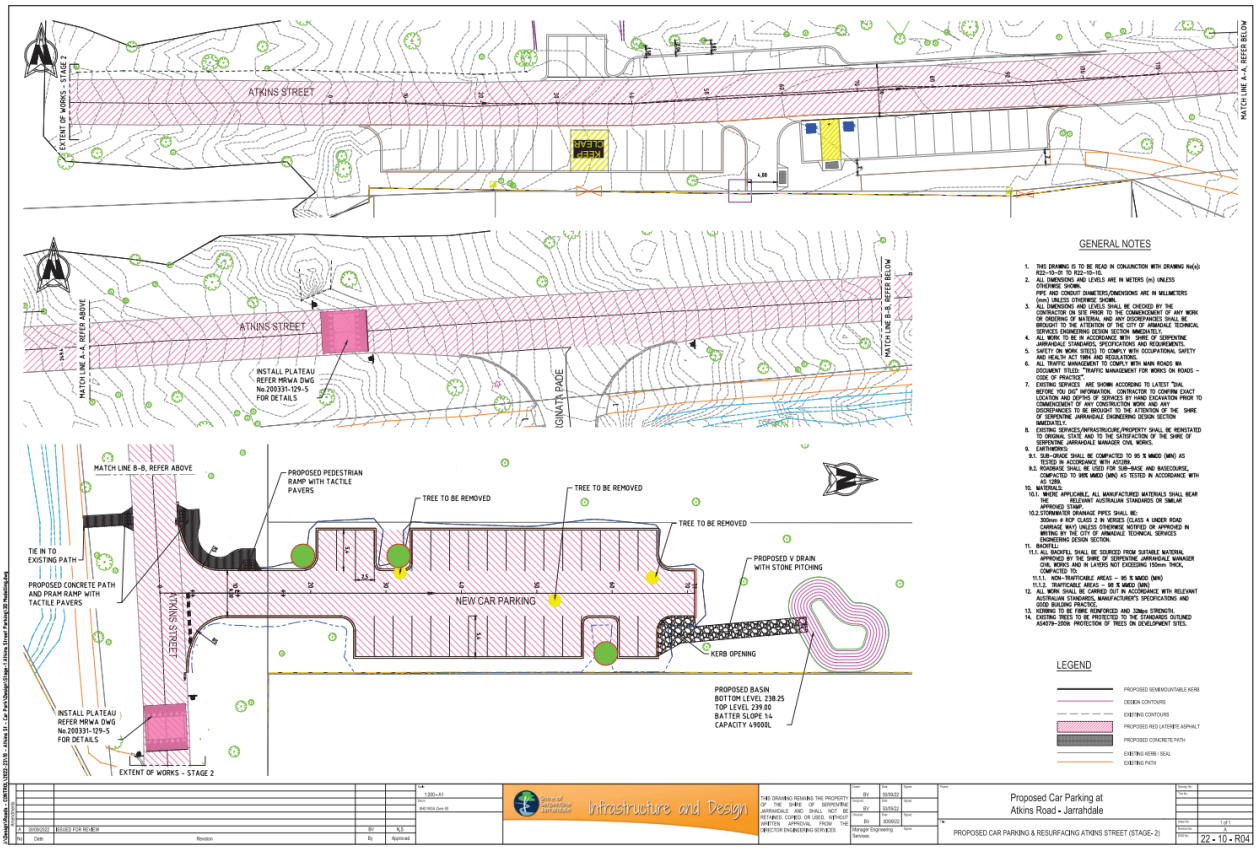

Figure 22: Redesign of carpark area with green dots representing trees to be retained.

Appendix F. Sources of information

F.1. GIS databases

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Contours (DPIRD-073)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Offsets Register – Offsets (DWER-078)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Regional Parks (DBCA-026)
- Remnant Vegetation, All Areas
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Wheatbelt Wetlands Stage 1 (DBCA-021)

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

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