GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 9479/1
Permit Holder:	European Space Agency and Stratham Engineering Consulting Services
Duration of Permit:	From 18 June 2022 to 18 June 2037

ADVICE NOTE:

The funds referred to in condition 10 of this permit are intended for contributing towards the purchase of 4.64 hectares of native vegetation with habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*) that occurs in an area that has been extensively cleared.

The permit holder is authorised to clear *native vegetation* subject to the following conditions of this permit.

PART I – CLEARING AUTHORISED

1. Clearing authorised (purpose)

The permit holder is authorised to clear *native vegetation* for the purpose of constructing a BIOMASS Calibration transponder and associated infrastructure

2. Land on which clearing is to be done

Lot 73 on Plan 420072, Yarawindah

Lot 11 on Plan 24201, Yarawindah

3. Clearing authorised

The permit holder must not clear more than 8.15 hectares of *native vegetation* within the area cross-hatched yellow in Figure 1 of Schedule 1.

4. Period during which clearing is authorised

The permit holder must not clear any *native vegetation* after 18 June 2027.

PART II – MANAGEMENT CONDITIONS

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

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

(a) avoid the *clearing* of *native vegetation*;

(b) minimise the amount of *native vegetation* to be cleared; and

(c) reduce the impact of *clearing* on any environmental value.

6. Weed and dieback management

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

(a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;

(b) ensure that no known *dieback* or *weed*-affected soil, *mulch*, *fill*, or other material is brought into the area to be cleared; and

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

7. Directional clearing

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

8. Fauna management – black cockatoo habitat

(a) Within 72 hours prior to undertaking any *clearing* authorised under this permit within the area cross-hatched yellow in Figure 1 of Schedule 1, the permit holder must engage a *fauna specialist* to inspect all *black cockatoo habitat tree*/s identified in the report 'Deep Space Facility Flora and Fauna Survey (Ecoscape, September 2020)' for *evidence* of current or past breeding use by *Calyptorhynchus lateriosis* (Carnaby's cockatoo):

(b) Where a *black cockatoo habitat* tree with no *evidence* of current or past use by *black cockatoo species* is identified in accordance with condition 8(a), that tree must only be cleared within 72 hours after the inspection.

(c) Where a *black cockatoo habitat tree* is identified within the combined area cross-hatched yellow in Figure 1 of Schedule 1 and that tree shows *evidence* of current or past breeding use by *black cockatoo species* under condition 8(a), and *clearing* of that tree cannot be avoided, that tree must be monitored by a *fauna specialist* to determine when it is no longer in use for that breeding season.

(d) Any *black cockatoo breeding tree* with *evidence* of current breeding use by *black cockatoo species* must not be cleared whilst it is in use for that breeding season as determined by the *fauna specialist* under condition 8(c).

(e) For each *black cockatoo breeding tree* with *evidence* of current or past breeding use by *black cockatoo species* identified that cannot be avoided, the permit holder must install an artificial black cockatoo nest hollow.

(f) Each artificial black cockatoo nesting hollow required by condition 8(e) must be installed prior to commencement of any *clearing* activities otherwise authorised under this permit.

(g) The artificial black cockatoo nest hollow(s) required by condition 8(e) of this permit must:

(a) be installed at a location identified by the Department of Biodiversity, Conservation and Attractions within 10 kilometres of the application area;
(b) be designed and placed in accordance with the specifications detailed in Schedule 2; and
(c) be monitored and maintained in accordance with the specifications detailed in Schedule 3, for a period of at least ten years.

(b) Within two months of completing the *clearing* authorised under this permit within the area cross-hatched yellow on Figure 1 of Schedule 1, the permit holder must provide the results of the *fauna specialist's* inspection findings in a report to the *CEO*.

9. Offsets – revegetation and rehabilitation requirements

Within 12 months of undertaking *clearing* authorised under this permit, and no later than 18 June 2029, for the area hatched red in Figures 2 to 5 of Schedule 1, the permit holder must implement and adhere to the 'Revegetation Management Plan, ESA Deep Space Facility' dated December 2021, including but not limited to the following actions:

(a) commence *revegetating* and *rehabilitating* the areas cross-hatched red on Figures 2 to Figure 5 of Schedule 1, by way of:

(i) deliberately *planting* tube stock and salvaged native vegetation that will result in similar species composition, structure and density of native vegetation to the pre-European vegetation types; and

(ii) ensuring only *local provenance* seeds and propagating material are used to *revegetate* and *rehabilitate* the area.

(b) establish a minimum of six 5 x 5 metre *quadrat* monitoring sites;

(c) water planted vegetation between December and April for the first two years post planting as required;

(d) undertake weed control activities prior to planting, and annually thereafter for three years until the *completion criteria* 5 as listed in Table 1 have been met;

(e) fence the perimeter of the *revegetation* and *rehabilitation* areas using agricultural fencing and undertake monitoring of the fence annually and repair the fence as required, for the entire duration of this permit;

(f) achieve the following *completion criteria* listed in Table 1 after the three-year monitoring period for areas *revegetated* and *rehabilitated* under condition 9 of this permit;

Table 1: completion criteria

Aspect	Completion criteria	Monitoring
1) Species richness	No less than 12 species within two years of initial planting	Six-monthly for a three-year period
2) Vegetation condition	Vegetation must be in a good (Keighery, 1994) or higher condition.	Six-monthly for a three-year period
3) Foraging	Revegetation area to be planted with	Six-monthly for a three-

Aspect	Completion criteria	Monitoring
value	50 per cent of tree and shrub species being primary foraging plant species for black cockatoos	year period
4) Survival rate	Minimum survival rate of 80 per cent two years after planting	Six-monthly for a three-year period
5) Weed cover	No new weed species are introduced and existing weeds are not spread. Total weed cover is no more than 10 per cent of baseline weed cover	Six-monthly for a three-year period
6) Species density	1 plant per 4 meters squared for overstory/midstory species	Six-monthly for a three-year period

(g) undertake remedial actions for areas *revegetated* and *rehabilitated* where monitoring indicates that revegetation has not met the *completion criteria*, outlined in condition 9 (f), including:

(i) revegetate the area by deliberately *planting* native vegetation that will result in the minimum target in condition 9(f) and ensuring only *local provenance* seeds and propagating material are used;

(ii) undertake further *weed* control activities;

(iii) undertake further watering activities; and

(iv) annual monitoring of each *revegetated* and *rehabilitated* site, until the *completion criteria*, outline in condition 9(f) are met.

10. Offsets – monetary contributions to the Offsets Fund

Prior to undertaking any *clearing* authorised under this permit, the permit holder must provide documentary evidence to the *CEO* that funding of $100,734.4 has been transferred to the Department of Water and Environmental Regulation for the purpose of establishing or maintaining native vegetation as an environmental offset for the *clearing* activities authorised under this permit.

PART III - RECORD KEEPING AND REPORTING

11. Records that must be kept

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 2.

Table 2: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	(a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994/2020 (GDA94/2020), expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared;

No.	Relevant matter	Specifications
		(d) the size of the area cleared (in hectares); (e) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 5; and (f) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 6; (g) actions undertaken in accordance with condition 7;
2.	In relation to black cockatoo fauna management pursuant to conditions 8	(a) the time(s) and date(s) of inspection(s) of the suitable *black cockatoo habitat tree* 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 suitable *black cockatoo habitat tree* is 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; and (e) the time and date that the suitable *black cockatoo habitat tree* was cleared.
3.	In relation to the revegetation and rehabilitation of areas pursuant to condition 9 of this permit	(a) a description of the revegetation and rehabilitation activities undertaken each year, once commenced, outlined in a report produced by an *environmental specialist*; (b) the location and size of the areas *revegetated* and *rehabilitated* (in hectares) recorded using a GPS unit set to GDA94/GDA 2020, expressing the geographical coordinates in Eastings and Northings or decimal degrees; (c) the date that *revegetation* and *rehabilitation* works began; (d) the baseline data recorded for the area to be *revegetated/rehabilitated*, including species richness, species density, vegetation structure and weed cover (e) the species composition, structure, density of the areas *revegetated/rehabilitated* recorded annually; (f) a description of the extent of weed cover and vegetation condition, foraging value and survival rate of the areas *revegetated/ rehabilitated*, recorded annually; (g) a species list identifying those species planted; (h) a copy of the *environmental specialist* report and activities undertaken during monitoring; and (i) other actions taken in accordance with condition 9 of this permit

12. Reporting

(a) The permit holder must provide to the *CEO*, on or before 31 December of each calendar year, a written report containing:

(a) the records required to be kept under condition 11; and

(b) records of activities done by the permit holder under this permit between 1 July of the preceding calendar year and 30 June of the current calendar year.

(b) If no clearing authorised under this permit has been undertaken, a written report confirming that no clearing under this permit has been undertaken, must be provided to the *CEO* on or before 31 December 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 11, where these records have not already been provided under condition 12(a).

DEFINITIONS

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

Table 3: 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 salmonophloia* or *Eucalyptus wandoo*) that contain hollows suitable for breeding by black cockatoo species.
black cockatoo species	means one or more of the following species: (a) *Calyptorhynchus lateriosis* (Carnaby's cockatoo); (b) *Calyptorhynchus 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.
completion criteria	means a measurable outcome based on suitable reference sites, used to determine revegetation/rehabilitation success
department	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.
dieback	means the effect of *Phytophthora* species on native vegetation.
environmental specialist	means a person who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit, or who is approved by the *CEO* as a suitable environmental specialist.
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

Term	Definition
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*.
fill	means material used to increase the ground level, or to fill a depression.
local provenance	means native vegetation seeds and propagating material from natural sources within 100 kilometres and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared
mulch	means the use of organic matter, wood chips or rocks to slow the movement of 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.
plant/ed/ing	plant/ed/ing means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species
quadrat	means a sample plot established for the purpose of data collection and monitoring vegetation characteristics, for example species composition, structure, density and condition
rehabilitate/ rehabilitated/ rehabilitation	means actively managing an area containing native vegetation in order to improve the ecological function of that area
revegetated/ revegetation	means the re-establishment of a cover of local provenance native vegetation in an area using methods such as natural regeneration, direct seeding and/or planting, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area
weeds	means any plant – (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.

END OF CONDITIONS

Meenu Vitarana
A/MANAGER
NATIVE VEGETATION REGULATION

Officer delegated under Section 20
of the Environmental Protection Act 1986

25 May 2022

Schedule 1

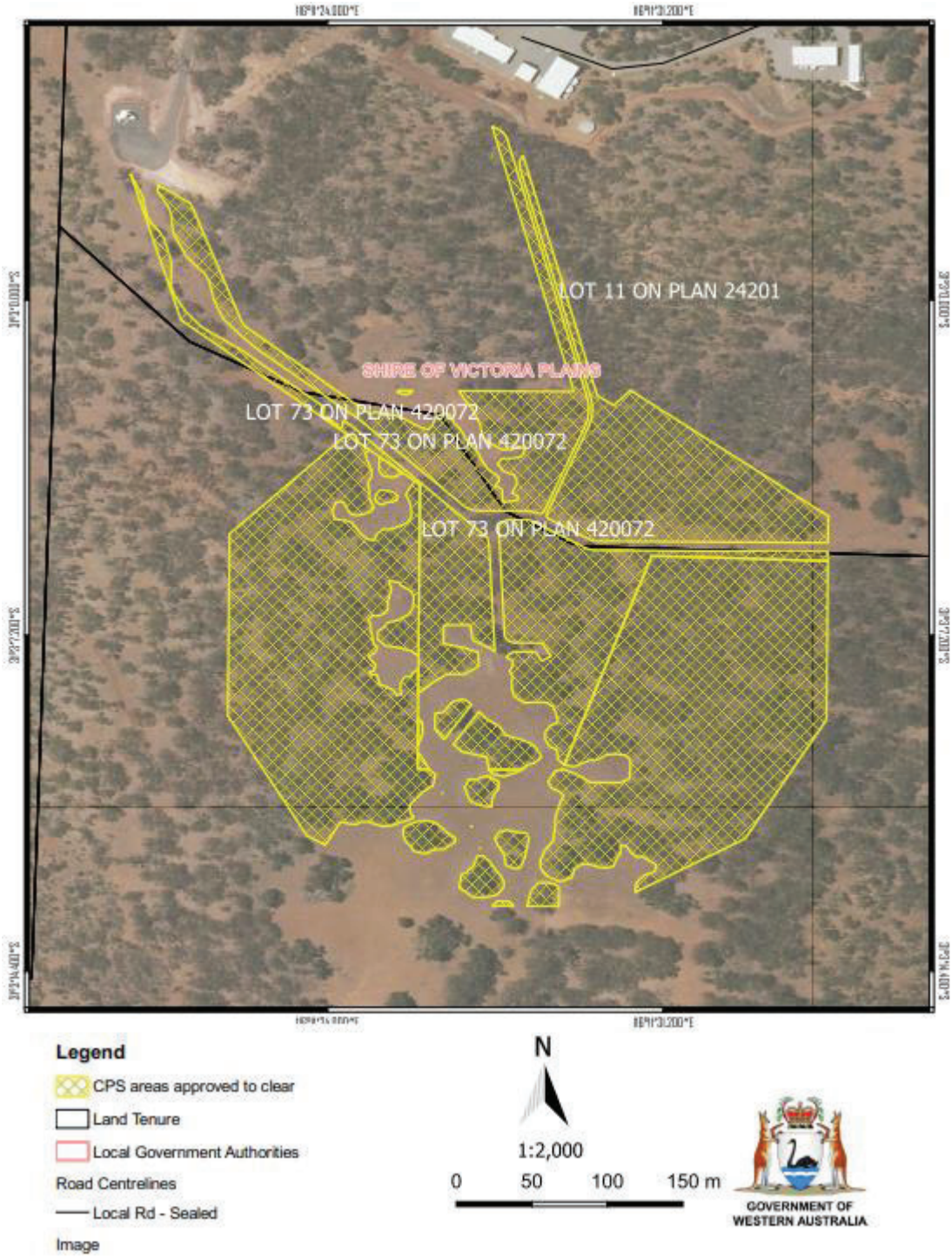


Figure 1: Map of the boundary of the area within which clearing may occur

Figure 2: The areas crosshatched red indicate the areas within which Condition 9 applies

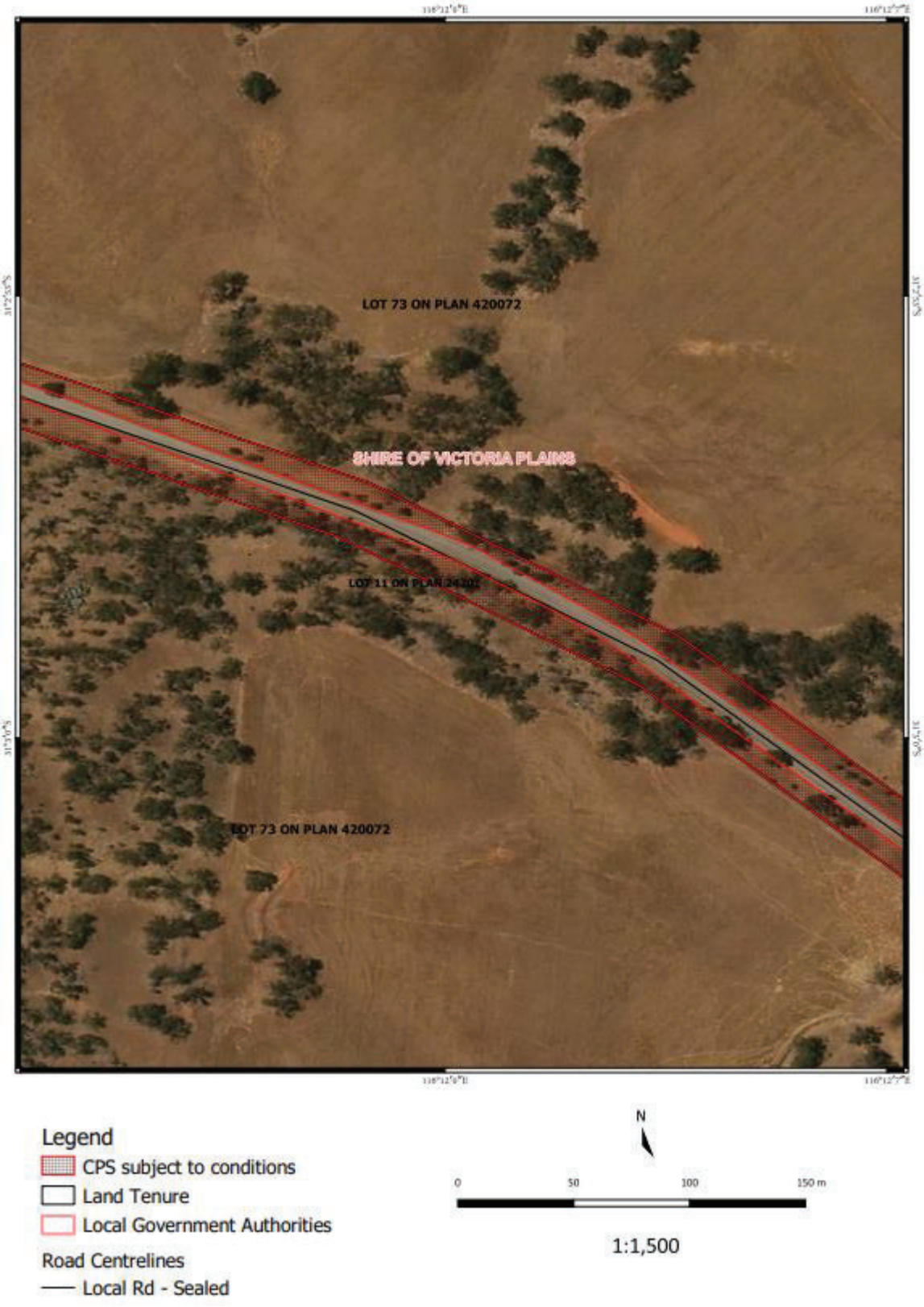


Figure 3: The areas crosshatched red indicate the areas within which Condition 9 applies

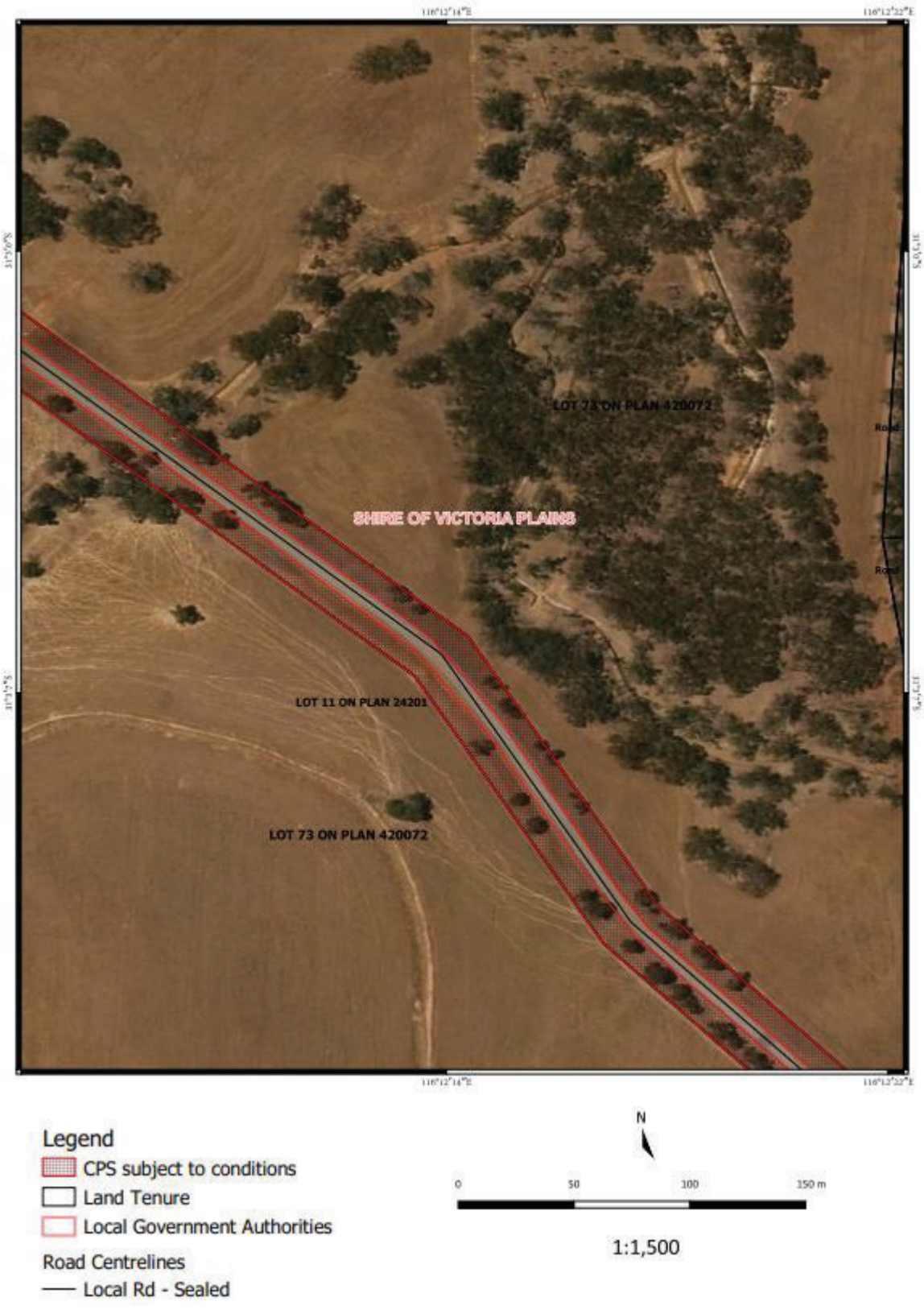


Figure 4: The areas crosshatched red indicate the areas within which Condition 9 applies

Figure 5: The areas crosshatched red indicate the areas within which Condition 9 applies

Schedule 2

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






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

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

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

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

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



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

Walls

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

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

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

Base

The base of the artificial hollow must be;

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

  ***Do not use*:**

  - Saw dust or fibre products that will retain moisture.

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

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

Entrance

The entrance of the artificial hollow must;

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

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

Ladder

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

The ladder must be;

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

  Do not use:

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

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

Sacrificial chewing posts

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

The sacrificial chewing posts must:

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

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

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

Photo by Rick Dawson

Mountings

The artificial hollows must be mounted such that:

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

Placement

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

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

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

Artificial hollows to be placed in trees require:

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

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

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

Safety

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

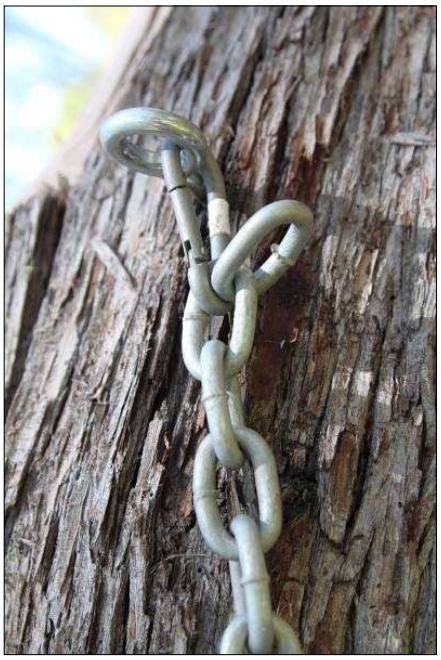
Maintenance and monitoring

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

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

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

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



Example fixing for artificial hollow
Photo by Christine Groom

Acknowledgements

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

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

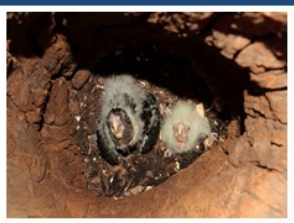
- *How to design and place artificial hollows for Carnaby's cockatoo*
- *How to monitor and maintain artificial hollows for Carnaby's cockatoo*

Information sheets available on the *Saving Carnaby's cockatoo* webpage:
http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/208-saving-carnaby-s-cockatoo

Schedule 3

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



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

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

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

Monitoring should be undertaken in order to detect:

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

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

How do I monitor artificial hollows?

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

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

Looking for signs of use

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

Observing parent behaviour around the hollow

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

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

Observing feeding flocks

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

Tapping

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

Observing insect activity around nest

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

Listening for nestlings

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

Looking inside the nest

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

How often should I monitor artificial hollows?

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

How do I maintain artificial hollows?

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

Maintenance checks should assess the following as a minimum:

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

Artificial hollow base needing repair.
Photo by Christine Groom

Repairing hollows

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

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

Monitoring of artificial hollows:

Monitoring aim	Frequency of visits	Monitoring techniques
To determine possible use by Carnaby's cockatoo	At least once during peak breeding season (i.e. between September and December)	• Observing behaviour of adults around hollow • Tapping to see if female will flush from hollow (best undertaken between 10am and 3pm when females most likely to be sitting) • Listening for nestlings • Looking for evidence of chewing • Looking inside nest
To confirm use by Carnaby's cockatoo	At least two visits during peak breeding season (i.e. between September and December)	To observe at least two of the following: • Breeding behaviour of adults around hollow or evidence of chewing • Female flushed from hollow • Noises from nestlings in hollow Or to observe: • Nestlings or eggs in nest
To determine nesting success by Carnaby's cockatoo	The more visits, the better. Preferably fortnightly visits between July and December. As a minimum, at least 3 visits spread throughout breeding season.	• Looking inside nest to observe eggs or nestlings.
To determine use by any species	As often as possible.	• Inspection from ground as a minimum. • Looking inside nest for detailed observations.
To determine maintenance requirements	At least every two years and preferably annually if hollow fitted with sacrificial chewing posts, can be longer if without.	• A basic maintenance check can be undertaken from the ground. A ladder or elevated work platform will be required for a comprehensive check and to replace sacrificial chewing posts

Acknowledgements

This information sheet is a joint initiative of Birdlife Australia, the Western Australian Museum and the Department of Parks and Wildlife. Many individuals have contributed to its preparation. The updated version was compiled by Rick Dawson (Department of Parks and Wildlife) with assistance from Denis Saunders.

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

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

Information sheets available on the *Saving Carnaby's cockatoo* webpage:
http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/208-saving-carnaby-s-cockatoo

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 9479/1
Permit type:	Purpose permit
Applicant name:	European Space Agency and Stratham Engineering Consulting Services
Application received:	4 November 2021
Application area:	8.15 hectares of native vegetation
Purpose of clearing:	Construction of Biomass Calibration Transponder
Method of clearing:	Mechanical
Property:	Lot 73 on Plan 420072 Lot 11 on Plan 24201
Location (LGA area/s):	Shire of Victoria Plains
Localities (suburb/s):	Yarawindah

1.2. Description of clearing activities

The vegetation proposed to be cleared is contained within several contiguous areas (see Figure 1, Section 1.4). The application is to clear trees and shrubs to allow for the construction of a biomass calibration transponder. The clearing includes the construction site itself and additional area around it to ensure that the vegetation does not interfere with radio frequency of the biomass calibration transponder.

1.3. Decision on application

Decision:	Granted
Decision date:	25 May 2022
Decision area:	8.15 hectares of native vegetation

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 two submissions were received. Consideration of matters raised in the public submission is summarised in Appendix B.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix C), relevant datasets (see Appendix H.1), the findings of a flora and fauna survey (see Appendix G), the clearing principles set out in Schedule 5 of the EP Act (see Appendix D), relevant planning instruments and any other matters considered relevant to the assessment (see Section 3). The Delegated Officer also took into consideration the significance of the project.

The Delegated Officer has determined that the proposed clearing will result in the following significant impacts:

- the loss of 8.15 hectares of native vegetation that is suitable habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*) and is significant as a remnant of native vegetation in an area that has been extensively cleared

The proposed clearing may also result in the potential introduction and spread of weeds 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 that the following requirements will be conditioned on the clearing permit to manage and address the impacts of clearing:

- avoid, minimise measures 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 directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity
- pre-clearing inspection of tree hollows for cockatoos; and
- offset measures to:
    - rehabilitate 2.85 hectares of native vegetation adjacent to the application area, along the access road from degraded to good condition with mostly foraging plant species for black cockatoos; and
    - a monetary contribution which will be used for the purchase of 4.64 hectares of native vegetation within the local area with habitat for Carnaby's cockatoo that occurs in an area that has been extensively cleared, to be protected in perpetuity and ceded to Department of Biodiversity, Conservation and Attractions.

Given the above and noting that the offset measures provided counterbalances the impacts to Carnaby's cockatoo foraging habitat and vegetation in an extensively cleared landscape, the Delegated Officer determined that the proposed clearing is unlikely to lead to an unacceptable risk to the environment.

1.5. Site map

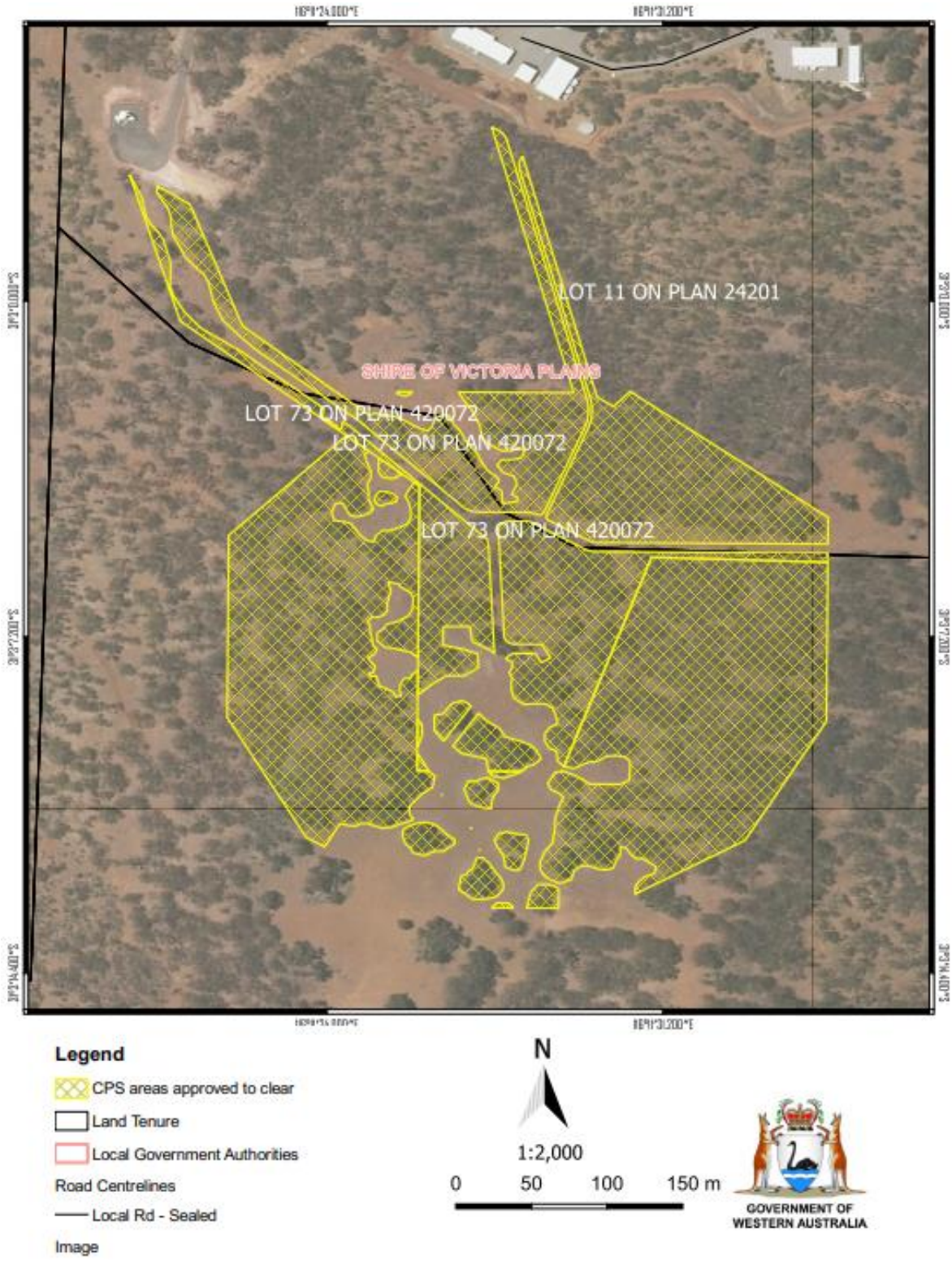


Figure 1 Map of the application area

The area crosshatched yellow indicates the area 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 polluter pays principle
- 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)

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

Within the application form and additional information provided, the applicants noted the following consideration of avoidance and mitigation measures:

- Information from the flora and fauna surveys conducted on-site has influenced the design of the proposed action as far as practicable.
- Of the two areas chosen as potential sites for the construction of the Biomass Calibration Transponder, the chosen site was selected due to the benefit of its elevation which gives the site the benefit of having low radio frequency interference. The mesa on which it will be constructed is the highest point in the landscape closest to the existing ESA infrastructure and this elevation will reduce the probability of any existing radio interference from existing infrastructure and enable satellite information to be readily received assuming surrounding vegetation is kept low (European Space Agency and Stratham Engineering Consultancy Service,2021 and EndPlan Environmental 2022).
- Removal of remnant native vegetation is required due to project constraints such as the need to remove vegetation around the Biomass Calibration Transponder so that radio frequency interference does not occur. The vegetation around the Biomass Calibration Transponder must remain below 600 millimetres in height.
- The preparation of a Construction Environmental Management Plan (CEMP) to reduce impacts. The CEMP will include but not be restricted to the following:
    - Vegetation protection: prior to clearing commencing, the areas of vegetation to be retained will be clearly demarcated with star pickets, coloured tape, or bunting, or fencing, and all clearing personnel will be inducted and made aware of the requirement to protect native vegetation in these areas.
    - Dieback (*Phytophthora cinnamomi*): the movement of soils and plant material will be strictly managed at the site to ensure dieback is not introduced into the surrounding vegetated areas. All clearing machinery will be washed down prior to entering and leaving the site. No dieback or weed-affected soil, mulch or fill will be brought into the disturbance area.
    - Environmental induction: all vegetation clearing, and construction personnel will be required to participate in an environmental induction toolbox session to ensure they are made aware that native fauna/flora are protected under the *Biodiversity Conservation Act 2016* and of the measures to be implemented to prevent undue environmental harm.
    - Native fauna protection: any fauna injured during construction will be taken to a designated veterinary clinic or a DBCA nominated wildlife carer.

- Hydrocarbon storage: if hydrocarbons are to be temporarily stored, they will be contained within portable bunds. Precautions will be required to be taken when refuelling and a spill-response kit will be near any refuelling locations.

- The applicant also noted an area of 2.8 hectares within Lot 11 on Plan 24201 that is in completely degraded condition and will be revegetated to be in good condition. The applicant has provided a revegetation plan and the revegetation has been considered within Section 4.

The Delegated Officer was satisfied that the applicant has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values.

After consideration of avoidance and mitigation measures, it was determined that offsets (revegetation and a monetary contribution) to counterbalance the significant residual impacts to Carnaby's cockatoo and the loss of vegetation which is considered a significant as a remnant in an extensively cleared area were 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 offsets 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 C) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, or land and water resource values.

The assessment against the clearing principles (see Appendix D) identified that the impacts of the proposed clearing present a risk to habitat for black cockatoo species (Carnaby's cockatoo), risk of weeds/dieback into adjacent remnant vegetation and the loss of vegetation which is a significant remnant in an extensively cleared area. 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 (biodiversity, flora, fauna, and ecological communities) - Clearing Principles (a, b, c, and d)

Assessment

Fauna

Within the local area (10-kilometre radius of the application area), three conservation significant fauna species have been recorded:

- *Idiosoma mcclementsorum* (Julimar shield-backed trapdoor spider) (P2)
- *Throscodectes xederoides* (Mogumber bush cricket) (P3)
- *Calyptorhynchus latirostris* (Carnaby's cockatoo) (Endangered)

The Julimar shield-back spider is endemic to Western Australia. The species is known from 30 records within the state of which 16 were recorded in 2018 as part of a survey conducted on the Great northern Highway located approximately 1.2 kilometres east of the application area. The survey conducted noted that the soil types observed within the application are lateritic, but the substrate is clay loam and not sandy making it unsuitable for the species. The survey report further commented that the grazing activity on the site (and likely trampling of burrows if ever present) would mean there is a low likelihood of the species occurring within the application area (Ecoscape, 2020)

The Mogumber bush cricket is known from four records within the available databases. The records are across a range of approximately 27 kilometres. Two records are within 1.7 kilometres of the application area at the Sevenmile nature reserve. The habitat preference of the species is not well documented. The survey report provided noted that a desktop study indicated a low likelihood of the species occurring and did not record the species within the survey.

The application area is within the known breeding range for Carnaby's cockatoo and the vagrant distribution for forest red tailed black cockatoo. Within the local area, there are two mapped occurrences of breeding by white-tailed black cockatoos, the closest of which is located approximately three kilometres from the application area. The desktop assessment noted a high likelihood of occurrence of *Calyptorhynchus latirostris* (Carnaby's black cockatoo) but the field survey did not find any individuals of this species within the application area.

Eighteen fauna species were recorded during the survey which are a mix of native and introduced species, none of which are conservation significant species and are listed below:

- *Macropus fuliginosus* (western grey kangaroo)

- *Tachyglossus aculeatus* (short-beaked echidna)
- *Bos taurus* (European cattle)
- *Oryctolagus cuniculus* (rabbit)
- *Ovis aries* (sheep)
- *Vulpes vulpes (*red fox)
- *Acanthiza chrysorrhoa (*yellow-rumped thornbill)
- *Cacatua roseicapilla (*galah)
- *Corvus coronoides* (Australian raven)
- *Cracticus tibicen* (Australian magpie)
- *Dacelo novaeguineae (*laughing kookaburra)
- *Petroica goodenovii* (red-capped robin)
- *Platycercus zonarius (*Australian ringneck)
- *Rhipidura albiscapa* (grey fantail)
- *Rhipidura leucophrys* (willie wagtail)
- *Smicrornis brevirostris* (weebill)
- *Zosterops lateralis* (grey-breasted white-eye)
- *Hesperoedura reticulata* (reticulated velvet gecko)

The survey investigated trees within the application area for suitability as breeding habitat for black cockatoo species (particularly Carnaby's cockatoo). A total of 254 trees were surveyed across the application area with the following classifications:

Table 1: Classification of trees for breeding by black cockatoo species

Classification for breeding habitat	**Number of trees**
Trees without suitable hollows (class 5)	190
Trees with large hollows or broken branches but not having the features preferred by black cockatoos for breeding (Class 4)	42
Trees with potentially suitable hollows but with no evidence of use by black cockatoos (Class 3)	22
Trees with suitable hollows and evidence of use but not currently occupied (Class 2)	0
Trees with and active nest (Class 1) *	0
Total	254

Table 2: Classification of trees by species

Tree species	**Number of trees**
marri	27
other	2
wandoo	224
York gum	1
Total	254

The results in the Tables above show the proposed clearing will result in the loss of 254 trees, none of which contain hollows showing evidence of use or active nests being used by black cockatoos. However, all the trees surveyed are considered 'breeding habitat' in accordance with the relevant guidelines as they are trees of species known to support breeding (within the range of the species which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow (Commonwealth of Australia, 2012)

The vegetation types occurring within the application area described as '*Eucalyptus loxophleba* subsp*. loxophleba* woodland over *Avena barbata* low isolated grasses' and *'Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over *Avena barbata* low isolated grasses' (Ecoscape, 2020). Both vegetation types are considered likely to provide some foraging habitat for species of black cockatoo.

Foraging habitat (for Carnaby's cockatoo) within the application area was analysed in the survey report (Ecoscape, 2020). The survey report noted the vegetation within the application area provides 'quality' to 'low quality' foraging habitat for black cockatoo species. The analysis was completed using the Commonwealth Black Cockatoo Foraging Quality Scoring Tool (Commonwealth of Australia, 2017) resulting in the following:

Table 3: Foraging assessment (Ecoscape, 2020)

Scoring	**Working**	**Rationale**
Starting score	5	'quality': it does not meet the descriptive criteria for high quality due to the lack of foraging species

Additions	+3	has trees with suitable nest hollows
	+2	has trees that can potentially be used for breeding
Subtractions	-2	no evidence of foraging
	-1	>12 km from known breeding location
	-1	>12 km from known roosting site
	-1	no watering points within 2 km
Total	5	'quality' to 'low quality' foraging habitat;

Night roosting habitat for black cockatoos is unlikely within the application area due to the absence of riparian environments or permanent water sources. This was also noted in the survey report (Ecoscape, 2020).

Flora

The survey by Ecoscape (2020) was completed in May 2020, which is not within the optimal period for a primary survey within the bioregion according to the Flora and Vegetation Technical Guidance (EPA 2016). The survey recorded 25 vascular flora species within the application area and noted that additional species were likely to be recorded if the survey was conducted later in the year. No conservation significant flora species were recorded during the survey.

An additional survey was undertaken in September 2021 (PVG Environmental, 2021) to target three threatened flora species that DWER considered could be present within the application area but had the potential to be missed due to the initial survey timing. The species targeted during the additional survey were:

- *Spirogardnera rubescens* (endangered under the EPBC Act, threatened under the BC Act)
- *Banksia serratuloides* subsp. serratuloides (vulnerable under the EPBC Act, threatened under the BC Act)
- *Melaleuca sciotostyla* (endangered under the EPBC Act, threatened under the BC Act)

The targeted flora survey did not identify any of the above species within the application area and within the broader survey area (PGV Environmental, 2021). Excerpts from the targeted survey can be found in Appendix G.

Ecological Communities

The closest ecological community to the application area is Eucalypt woodlands of the Western Australian Wheatbelt with an occurrence located approximately five kilometres from the application area. The application area contains some of the features of this community but lacks the key diagnostic species to be representative of this community. In addition, the application area is approximately five kilometres from the Avon Wheatbelt bioregion which is outside of the IBRA region for this community, so the vegetation does not meet the criteria for this community.

Conclusion

Based on the above assessment, the application area contains 254 trees which are considered future breeding habitat and comprise foraging habitat for Carnaby's cockatoo.

The survey noted the presence of native fauna at the time of the survey which mostly comprised bird species as listed above. Three terrestrial species recorded included the western grey kangaroo, reticulated velvet gecko and the short-beaked echidna. If present during the time of clearing, individuals of these species are likely to be impacted. It is considered that the loss of individuals would not compromise the conservation status of these species as none are currently listed.

The vegetation proposed to be cleared is in good to degraded condition and is not representative of an ecological community and does not provide habitat for Priority or Threatened flora species

Conditions

A permit to clear is conditioned with requirements to undertake directional clearing to minimise impacts to ground dwelling fauna that may be present during the clearing and a fauna management condition in relation to Carnaby's cockatoo. The fauna management condition requires the inspection of hollow prior to any clearing and additional measures to be implemented should an active or used breeding hollow be located.

It is considered that the proposed impacts to significant foraging and potential habitat for Carnaby's cockatoo are of a scale that can be offset through the offset proposed by the applicant. Further details on the offset are provided in Section 5.

3.2.2. Biological values - significant remnant vegetation and conservation areas - Clearing Principles (e)

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

In assessing the risk of further loss and subsequent cumulative effects, consideration has been given to the extent of native vegetation remaining and what is currently managed as conservation estate as indicated in Appendix C.2. It is noted that the current vegetation extents for the bioregion, and mapped vegetation type are above the recommended 30 per cent thresholds. However, the local area contains less than 30 per cent remnant vegetation. The application area presents approximately one per cent of the remnant vegetation within the local area.

Conclusion
As discussed within Section 3.2.1, the application area includes significant habitat for threatened black cockatoo species and noting the above, the vegetation within the application area is significant as a remnant in an extensively cleared landscape. The application area also forms a local linkage across the patchwork of remnant vegetation within the local area.

The proposed clearing and subsequent construction have the potential to introduce weeds and dieback into the surrounding vegetation which may lead to further loss in quality of vegetation.

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

- Environmental offsets (revegetation and monetary contribution as detailed in Section 4 below)
- Avoidance and minimisation
- Weed and dieback management

3.2.3. Biological values - land and water resources - Clearing Principles (f and j)

Assessment

The application area intersects a minor non-perennial watercourse for 20 meters. The survey provided (Ecoscape, 2020) did not report any vegetation representative of types that would be growing in association with a watercourse. In addition to this, the mapped watercourse is impacted by other infrastructure nearby, it is considered the proposed clearing is not likely to significantly impact water quality or the integrity of the watercourse, however minor changes to water quality could occur if the clearing occurs within times of water flow. It is considered that as vegetation remains upstream and downstream of the area of intersection, impacts to water quality is likely to be limited.

Conclusion
Noting that the area of intersection is minor, and the watercourse would only flow during winter, any impacts would be minor and temporary.

Conditions
None

3.3. Relevant planning instruments and other matters

Other relevant authorisations required for the proposed land use include:

- Development approval under the *Planning and Development Act 2005* (issued by the Shire of Victoria Plains 28 April 2022).
- Amendment to Local Planning Scheme No. 5 – The Minister for Planning approved an amendment in accordance with section 87(2)(a) of the *Planning and Development Act 2005* for the rezoning of portion of Lot M1991 on Diagram 14747 (being No. 10353 Great Northern Highway, Yarawindah from 'Rural' to 'Special Use: Satellite Communication Facility' and amending the Special Use Zone No.1 in Schedule 4 of the Scheme text to include Lot 11 on Plan 24201 and portion of Lot M1991 on Diagram 14747 being No. 10353 Great Northern Highway, Yarawindah as special use (Satellite Communications Facility (European Space Agency) on 14 February 2022.

The application area was part of a previous application (CPS 9270/1). The application CPS 9270/1 was originally for the proposed clearing of 8.79 hectares and included the proposed clearing for the construction of biomass calibration transponder and a powerline corridor. The two activities were decoupled in 2021 to allow the two projects to occur separately as the application area for the powerline corridor was mostly void of native vegetation and was 0.64 hectares in total which presented no significant environmental values and did not require further planning approvals. On November 12, 2021, the Delegated Officer granted a clearing permit for the clearing of 0.64 hectares of vegetation for the construction of a powerline corridor (DWER, 2021).

The proposed clearing was referred to the Department of Agriculture, Water, and the Environment (DAWE). The decision of the referral was that the proposed clearing is not a controlled action (DAWE, 2021)

The application area is within 100 meters of an Aboriginal site of significance, the Gingin Brook Waggl Site (ID 20008). It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972* (WA) and 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, the Delegated Officer has determined that the following significant residual impacts remain after the application of the avoidance and mitigation measures summarised in Section 3.1:

- Clearing of 8.15 hectares of foraging and potential breeding habitat for Carnaby's cockatoo which is also considered a significant remnant of native vegetation within an extensively cleared area.

The applicant proposed an environmental offset to counterbalance the significant residual impacts listed above, consisting of:

- the rehabilitation of 2.85 hectares of native vegetation within the subject properties (along the access road), from degraded to good condition with mostly foraging plant species for black cockatoos; and
- a monetary contribution which will be used for the purchase of 4.64 hectares of native vegetation to be protected in perpetuity and ceded to Department of Biodiversity, Conservation and Attractions.

The applicant had initially provided an area of 2.88 hectares for revegetation, but this was adjusted to 2.85 hectares as the proposed area intersected a current permit that runs along Great Northern Highway.

To determine that the offset would be adequately proportionate to the significance of the environmental values being impacted, DWER undertook a calculation using the WA environmental offsets calculator. The justification for the values used in the offset calculation is provided in Appendix F.

Given the above, the Delegated Officer considered that an appropriate environmental offset should take into account the existing threats to foraging habitat on the Swan Coastal Plain. Noting this, the Delegated Officer determined that an offset with a combination of revegetation in closer proximity to the clearing area and a monetary offset would better meet the requirements of the WA Environmental Offsets Guidelines (2014).

As such, the Delegated Officer considers that the proposed offset is consistent with the *WA Environmental Offsets Policy (2011)* and the *WA Environmental Offsets Guidelines (2014),* and adequately counterbalances the significant residual impacts listed above.

The applicant's monetary contribution was determined based on current land values of 4.64 hectare parcels of vegetation within the Shire of Victoira Plains ($21,710 per hectare) to a total of $100,734.4. The receipt of funds will be used to acquire vegetated land within the region that contain the same environmental values being impacted by the proposed clearing.

End

Appendix A. Additional information provided by applicant

During the assessment, DWER wrote to the applicant seeking clarification of the vegetation condition as reported within the survey (Ecoscape, 2020). It was observed that the condition within the body of the report was given as 'degraded' while the quadrat data suggested it may be in better condition.

The applicant engaged with the consultant who conducted the survey, and the data was reviewed by the consultant. A response from the applicant contained a correspondence and detail with maps of the revised condition rating of the vegetation proposed to be cleared (prepared by the consultant). The survey data was updated and lodged within the Index of Biodiversity Surveys for Assessments (IBSA). DWER's FTP site has been updated with the revised information and excerpts are included in Appendix G.

Appendix B. Details of public submissions

Summary of comments	Consideration of comment
Alternative site – The commissioned survey shows two sites (a and b). Option b includes almost no native vegetation but there is no information as to why this site was not selected	Refer to avoidance and minimisation (section 3.1)
Vegetation condition - the survey provided states the vegetation within the application area is in poor condition. Quadrats within the area under Option A were classified as being in 'good' to 'very good' condition but the whole area has been mapped as being degraded within the body of the report.	Refer to Further information provided by applicant (Appendix A and G)
Offset funding and revegetation – ESA has offered to provide offset funds for land acquisition and rehabilitate 2.8 hectares of land along the access road. If Option A is selected, then even with offsets, a net loss of vegetation will result.	Offsets were calculated in accordance with *Environmental Offsets Policy* (2011). It was considered an offset with a combination of revegetation in closer proximity to the clearing area and a monetary offset will ensure a better environmental outcome than a standalone monetary offset. Noting the time constrains associated with the project and its significance, DWER did an analysis of available land parcels in the local area for purchase (in consultation with DBCA) prior to accepting a part monetary offset to ensure the offset monies can be appropriately used for a local land acquisition. While it is acknowledged that land acquisition will result in some net loss of native vegetation, noting the limitations associated with revegetating of a larger area (such as availability of land for revegetation and ongoing maintenance), the combined offset was considered more viable, and would better meet the requirements of the WA Environmental Offsets Guidelines (2014). Refer section 4 and Appendix F of the decision report for further details on the suitability of the proposed offset.

Appendix C. Site characteristics

C.1. Site characteristics

Characteristic	Details
Local context	The area proposed to be cleared is within a patch of native vegetation in the intensive land use zone of Western Australia. It is surrounded by a mostly cleared agricultural landscape with other small remnants of native vegetation which are somewhat linked to the application area. Spatial data indicates the local area (10-kilometre radius from

Characteristic	Details
	the centre of the area proposed to be cleared) retains approximately 22 per cent of the original native vegetation cover.
Ecological linkage	There are no formal mapped ecological linkages mapped within the application area, however the application area is likely to be part of local linkages across the patchwork of remnant vegetation within the local area.
Conservation areas	The application area is within 1300 meters of Sevenmile Well Nature Reserve, an A class reserve purposed for the conservation of flora and fauna.
Vegetation description	Vegetation survey (Ecoscape, 2020) indicate the vegetation within the proposed clearing area consists of the vegetation types as described below. The full survey descriptions and maps are available in Appendix G. • EIW: *Eucalyptus loxophleba* subsp. loxophleba woodland over **Avena barbata* low isolated grasses, on the lower slopes • EwW: *Eucalyptus wandoo* subsp. wandoo woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. hypericoides mid shrubland over *Avena barbata low isolated grasses, on the lateritic upland. This is somewhat consistent with the mapped vegetation type: • Yalanbee, Y6, which is described as Woodland of *Eucalyptus wandoo-Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* subsp. thalassica-*Corymbia calophylla* on lateritic uplands and breakaway landscapes in arid and perarid zones. The mapped vegetation types retain approximately 46 per cent (respectively) of the original extent (Government of Western Australia, 2019).
Vegetation condition	The vegetation survey's revised condition rating (Ecoscape, 2022; Appendix G) indicate the vegetation within the proposed clearing area is in good to degraded (Keighery, 1994) condition, described as: • Good - Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it (5.4 per cent of the application area) • Degraded - Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management (94.6 per cent of the application area) The full Keighery (1994) condition rating scale is provided in Appendix E. The full survey descriptions and mapping are available in Appendix G.
Climate and landform	The annual average rainfall for New Norcia is 386 millimetres. The application area varies between approximately 245 – 290 meters AHD.
Soil description	There are three soil types mapped within the application area. • Julimar Michibin cb Phase which is described as: gently inclined to steep breakaway slope; red to brown loamy earths and duplexes, some loamy gravel, acid duplexes and stony • Yarawindah 3 Subsystem which is described as: stripped very gently to gently inclined hillslopes and hillcrests, commonly includes small rises of rock such as quartzite; loamy earths, loamy stony soils, loamy gravel • Udamong 1 plateau remnant Phase which is described as: residual plateau, very gently inclined, small portions of Ug1a; loamy gravel, some shallow gravel, and sandy gravels. Heath and mallee.
Land degradation risk	The three mapped soil types within the application area have varying risks of land degradation. The wind erosion of the Yarawindah 3 Subsystem is reported to be medium to high. The remainder of the mapped soil types have a low risk of land degradation.

Characteristic	Details
Waterbodies	The desktop assessment and aerial imagery indicated that the application area intersects a minor non-perennial watercourse.
Hydrogeography	The application area is not within any proclaimed areas under the RIWI or CAWS Acts. The mapped groundwater salinity is 3000-7000 milligrams per litre which is described as saline.
Flora	According to available databases, there are 39 flora records in the local area, the nearest record is a Priority 4 species '*Calothamnus pachystachyus'*. There are three records of priority flora within one kilometre of the application area.
Ecological communities	The application area is within 5.2 kilometres of mapped occurrences of the Threatened Ecological Community 'Eucalypt woodlands of the Western Australian Wheatbelt'
Fauna	Available databases show records of four conservation significant fauna species within the local area. The closest record is of a Julimar shield-backed trapdoor spider (*Idiosoma mcclementsorum*). The most frequent occurring is *Calyptorhynchus latirostris* (Carnaby's cockatoo).

C.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 Forest	4,506,660.25	2,399,838.15	53.25	1,673,614.25	37.14
Vegetation complex					
Yalanbee, Y6 *	197,849.01	92,080.88	46.54	41,703.16	21.08
Local area					
10km radius			22.96	-	-

* Government of Western Australia (2019a)

C.3. Flora analysis table

Species name	Conservation status	Suitable habitat features ? [Y/N] FAUNA ONLY	Suitable vegetation type? [Y/N]	Suitable soil 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]
Acacia alata var. platyptera	4	N/A	N	N	6.5	33	Y
Acacia anarthros	3	N/A	N	N	7.4	31	Y
Acacia cummingiana	3	N/A	N	N			Y
Acacia drummondii subsp. affinis	3	N/A	N	Y	7.7	37	Y
Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)	3	N/A	Y	N	2.6	18	Y

Species name	Conservation status	Suitable habitat features? [Y/N] FAUNA ONLY	Suitable vegetation type? [Y/N]	Suitable soil 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]
Acacia ridleyana	3	N/A	N	N	6.6	27	Y
Acacia sp. New Norcia (E.A. Griffin 5917)	1	N/A	N	Y	7.012	3	Y
Allocasuarina ramosissima	3	N/A	Y	N	6.9	40	Y
Anigozanthos humilis subsp. chrysanthus	4	N/A	N	N			Y
Asterolasia grandiflora	4	N/A	Y	N	8.6	68	Y
Baeckea sp. Youndegin Hill (A.S. George 15772)	1	N/A	N	Y	2.642	17	Y
Banksia serratuloides subsp. serratuloides	T	N/A	Y	N	0.6	27	Y
Beaufortia eriocephala	3	N/A	N	N		28	Y
Calothamnus pachystachyus	4	N/A	Y	Y	0.4	36	Y
Conospermum densiflorum subsp. unicephalatum	T	N/A	Y	N	2.6	16	Y
Darwinia acerosa	T	N/A	N	N	2.9	18	Y
Darwinia carnea	T	N/A	Y	Y	4		Y
Dielsiodoxa leucantha subsp. leucantha	3	N/A	Y	Y	5.6	31	Y
Grevillea bracteosa subsp. bracteosa	T	N/A	N	N	9	23	Y
Grevillea drummondii	4	N/A	Y	N	1.6	26	Y
Grevillea florida	3	N/A	Y	Y	6.2	19	Y
Guichenotia tuberculata	3	N/A	N	N	9	23	Y
Hibbertia miniata	4	N/A	Y	N	1.2	53	Y
Hibbertia subglabra	3	N/A	N	N	7.4	9	Y
Lasiopetalum cenobium	1	N/A	N	N	9	2	Y
Lasiopetalum rotundifolium	T	N/A	Y	Y	1.5	40	Y
Melaleuca sciotostyla	T	N/A	N	N	5.6	36	Y
Melaleuca sclerophylla	3	N/A	N	N	1.2	46	Y
Persoonia sulcata	4	N/A	Y	N	2.9	39	Y
Petrophile biternata	3	N/A	Y	N	1.6	23	Y
Petrophile plumosa	3	N/A	Y	N	0.4	20	Y
Spirogardnera rubescens	T	N/A	N	N	8.4	35	Y
Stylidium sacculatum	3	N/A	Y	N	0.4	19	Y
Stylidium scabridum	4	N/A	N	N	7.1	53	Y
Synaphea grandis	4	N/A	Y	N	2.9	36	Y
Synaphea rangiferops	2	N/A	Y	N	4.1	19	Y
Tetratheca plumosa	1	N/A	Y	N	3.6	3	Y
Thomasia sp. Green Hill (S. Paust 1322)	T	N/A	N	Y	5.8	6	Y
Verticordia insignis subsp. eomagis	3	N/A	N	N	9	36	Y

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

C.4. 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]
Calyptorhynchus latirostris (Carnaby's cockatoo)	EN	Y	Y	1.7	20924	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]
Idiosoma mcclementsorum (Julimar shield-backed trapdoor spider)	P2	Y	Y	1.2	30	Y
Throscodectes xederoides (Mogumber bush cricket)	P2	Y	Y	1.3	4	Y

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

C.5. Land degradation risk table

Risk categories	Udamong 1 plateau remnant Phase
Wind erosion	10-30% of map unit has a high to extreme wind erosion risk
Water erosion	<3% of map unit has a high to extreme water erosion risk
Salinity	3-10% of map unit has a moderate to high salinity risk or is presently saline
Subsurface Acidification	>70% of map unit has a high subsurface acidification risk or is presently acid
Flood risk	<3% of the map unit has a moderate to high flood risk
Water logging	3-10% of map unit has a moderate to very high waterlogging risk
Phosphorus export risk	3-10% of map unit has a high to extreme phosphorus export risk

Risk categories	Julimar Michibin cb Phase
Wind erosion	10-30% of map unit has a high to extreme wind erosion risk
Water erosion	<3% of map unit has a high to extreme water erosion risk
Salinity	<3% of map unit has a moderate to high salinity risk or is presently saline
Subsurface Acidification	>70% of map unit has a high subsurface acidification risk or is presently acid
Flood risk	<3% of the map unit has a moderate to high flood risk
Water logging	<3% of map unit has a moderate to very high waterlogging risk
Phosphorus export risk	30-50% of map unit has a high to extreme phosphorus export risk

Risk categories	***Yarawindah 3 Subsystem***
Wind erosion	50-70% of map unit has a high to extreme wind erosion risk
Water erosion	3-10% of map unit has a high to extreme water erosion risk
Salinity	<3% of map unit has a moderate to high salinity risk or is presently saline
Subsurface Acidification	>70% of map unit has a high subsurface acidification risk or is presently acid
Flood risk	<3% of the map unit has a moderate to high flood risk
Water logging	<3% of map unit has a moderate to very high waterlogging risk
Phosphorus export risk	10-30% of map unit has a high to extreme phosphorus export risk

Appendix D. 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: A survey completed noted the area proposed to be cleared does not contain local or regionally significant flora or assemblages of plant communities but may contain fauna habitat.	May be at variance	Yes Refer to Section 3.2.1, above
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 breeding habitat for Carnaby's black cockatoo. A survey completed within the application area located 18 vertebrate fauna species, none of which are conservation significant.	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 targeted survey (PVG Environmental, 2021) recorded no conservation significant flora within the application area. Therefore, the area proposed to be cleared is unlikely to contain habitat for flora species listed under the BC Act.	Not likely to be at variance	Yes *Refer to Section 3.2.1, above.*
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: The area proposed to be cleared contains species that can indicate a threatened ecological community 'Eucalypt Woodlands of the Western Australian Wheatbelt'. This community is listed as 'Critically Endangered' under the EPBC Act and as Priority 3(iii) by DBCA.	May be at variance	Yes *Refer to Section 3.2.1, above.*
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 within the application area is consistent with the national objectives and targets for biodiversity conservation in Australia however the extent of the local vegetation is not. The vegetation proposed to be cleared is not considered to be part of a local linkages across the patchwork of remnant vegetation within the local area.	At variance	Yes *Refer to Section 3.2.2, above.*

Assessment against the clearing principles	Variance level	Is further consideration required?
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 is not likely to have an impact on the environmental values of nearby conservation areas.	Not likely to be at variance	No
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: Given a minor non-perennial water courses is recorded as intersecting the application area, the proposed clearing may have a minor impact on-site water quality however this is likely to be temporary.	May be at variance	Yes *Refer to Section 3.2.3, above.*
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: Two of the mapped soils are moderately to highly susceptible to wind erosion and all the mapped soil types have a high risk of subsurface acidification. Noting vegetation will remain surrounding the application area, the proposed clearing is not likely to have an appreciable impact on land degradation.	May be at variance	Yes *Refer to Section 3.2.3, above.*
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 the application area intersects minor non-perennial watercourses, the proposed clearing may impact surface water if clearing occurs during winter. It is considered that the area of intersection is minor, and any impacts would be minor and temporary.	May be at variance	Yes *Refer to Section 3.2.3, above.*
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. While the application area intersects a minor non-perennial watercourse, noting it is only a very small area, the proposed clearing is unlikely to contribute to waterlogging.	Not likely to be at variance	No

Appendix E. 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.
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 F. Offset calculator value justification

WA Environmental Offsets Calculator

Step 1: Determining conservation significance

Clear Data

Key:
- Data to be entered
- Drop-down selection
- Automatically-generated scores (Or, if appropriate, manual data entry permitted)

Area / Feature (Impact Site)

CONSERVATION SIGNIFICANCE DETERMINATION for the Environmental Value impacted		
Conservation significance	Description	8.15 hectares of vegetation representative of habitat for Carnabys cockatoo species
	Type of environmental value	Species (Flora/Fauna)
	Conservation significance of environmental value	Rare/Threatened Species - Endangered
	Conservation significance score	1.2%

Please select 'Area' or 'Feature for the calculations	Area

PART A: SIGNIFICANT IMPACT CALCULATION *Area*

Significant impact	Description	Quantum of impact	
	8.15 hectares of vegetation in degraded condition that includes habitat for Carnabys cockatoo	Significant impact (hectares)	8.15
		Quality (scale)	2.00
		Total quantum of impact	1.63

PART B: REHABILITIATION CREDIT CALCULATION *Area* (On-site)

Rehabilitation Credit	Description				
	Revegetation of 2.85 hectares within the property from degraded to good condition	Proposed rehabilitation (area in hectares)	2.85	Time until ecological benefit (years)	20.00
		Current quality of rehabilitation site (scale)	1.00	Confidence in rehabilitation result (%)	80.0%
		Future quality WITHOUT rehabilitation (scale)	1.00	Rehabilitation credit	0.54
		Future quality WITH rehabilitation (scale)	4.00		

PART C: SIGNIFICANT RESIDUAL IMPACT CALCULATION *Area*

Significant RESIDUAL impact		
	Total quantum of impact	1.63
	Rehabilitation credit	0.54
	Significant residual impact	1.09

Environmental value (Step 1)	8.15 hectares of vegetation representative of habitat for Carnabys cockatoo species	Significant impact (Step 2 Part A)	8.15
		Rehabilitation credit (Step 2 Part B)	0.54
		Significant residual impact (Step 2 Part C)	1.09

***Area* (Offset Site)**

OFFSETS CALCULATION
Area

Offsets calculation	**Description**	**Proposed offset (area in hectares)**	4.64	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value** (applied to Step 2 Part C)	**1.09**
	Monetry contribution	**Current quality of offset site (scale)**	7.00	**Time until offset site secured (years)**	1.00	What-if Analysis	**100.0%**
		Future quality WITHOUT offset (scale)	6.00	**Risk of future loss WITHOUT offset (%)**	30.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	5.0%	What-if Analysis Reinstate Formula	
		Time until ecological benefit (years)	1.00				
		Confidence in offset result (%)	90.0%			**OFFSET ADEQUATE?**	**NO**

Environmental value to be offset		
Calculation/Element	***Score (Area)***	***Rationale***
Conservation significance		
Description	8.15 hectares of vegetation representative of habitat for Carnabys cockatoo species	Information provided within the report 'Deep space facility flora and fauna survey' prepared for Stratham Engineering Consultancy Services by Ecoscape Australia 2020. This is also a significant remanant in an extensively cleared landscape
Type of environmental value	Species (Flora/Fauna)	Fauna species (Carnabys Cockatoo)
Conservation significance of environmental value	Rare/Threatened Species - Endangered	Carnabys cockatoo is listed as endangered under the BC Act 2016 and the EPBC Act 1999.
Landscape-level value impacted	yes/no	Yes
Significant impact		
Description	8.15 hectares of vegetation in degraded condition that includes habitat for Carnabys cockatoo	Information from clearing permit applciaiton form, report 'Deep space facility flora and fauna survey' prepared for Stratham Engineering Consultancy Services by Ecoscape Australia 2020 and available databases (DWER, 2021)
Significant impact (hectares) / Type of feature	8.15	The application area is 8.15 hectares in total.
Quality (scale) / Number	2.00	Quality score obtained from report 'Deep space facility flora and fauna survey' prepared for Stratham Engineering Consultancy Services by Ecoscape Australia 2020, condition is described as 'degraded'

Rehabilitation credit		
Description	Revegetation of 2.85 hectares within the property from degraded to good condition	Reponse received from applicant noted they propose the revegeation of an area of 2.85 hectares
Proposed rehabilitation (area in hectares)	2.85	Reponse received from applicant noted they propose the revegeation of an area of 2.85 hectares
Current quality of rehabilitation site / Start number (of type of feature)	1.00	Quality score start is assumed to be degraded condition
Future quality WITHOUT rehabilitation (scale) / Future number WITHOUT rehabilitation	1.00	It is assumed that without rehabilitation, the quality score would not change
Future quality WITH rehabilitation (scale) / Future number WITH rehabilitation	4.00	4- Estimated that at best, the linear strip proposed for revegetation could achieve 'good' condition
Time until ecological benefit (years)	20.00	20 - It is considered that it will take no more than 20 years to achieve the condition change from degraded to good condition and provide foraging or breeding habitat for Carnabys cockatoo
Confidence in rehabilitation result (%)	0.8	80% - there is reasonable level of confidence that the offset is likely to change in quality.
Offset		
Description	Monetry contribution	The applicant has proposed monetary contribution for land acquisition ito mitigate the reminder of the signficant residual impacts.
Proposed offset (area in hectares)	4.64	Back calculated using the 'What if' function
Current quality of offset site / Start number (of type of feature)	7.00	As per the land parcels identified by DBCA, the native vegetation to be acquired is considered to be in 'very good to excellent' condition.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	6.00	It is considered that the quality of the habitat may decrease slightly over the next 20 years without the security of the offset due to clearing for exempt purposes or other land degradation factors.
Future quality WITH offset (scale) / Future number WITH offset	7.00	No on-ground management is proposed as part of the offset, and thus the site's quality is considered unlikely to improve beyond its current quality over the next 20 years. However, transfer to conservation estate will avoid the likely decline in quality as a result of clearing for exempt purposes and allow broader-scale threat management.
Time until ecological benefit (years)	1.00	Arrangements for the purchase of the land have begun, and it is expected that the transfer will be complete within 12 months.
Confidence in offset result (%)	0.9	There is a high level of confidence that the land will be purchased and that the habitat quality will not deteriorate with the implementation of the offset.
Duration of offset implementation (maximum 20 years)	20.00	The offset site will be protected in perpetuity – the mechanism for this is yet to be determined, however transfer to conservation tenure is preferred.
Time until offset site secured (years)	1.00	Noting the DBCA is progressing a land parcel fo acquisition, it is considered the offset site can be secured within an year.
Risk of future loss WITHOUT offset (%)	30.0%	The offset site is located in a rural zoned area with a structure plan but does not have any environmental approvals. There is a moderate risk of loss.
Risk of future loss WITH offset (%)	5.0%	Acquisition and transfer to conservation estate (pending) will reduce the risk of loss of the site.
Offset ratio (Conservation Area only)	N/A	
Landscape level values of offset?	N/A	

Appendix G. Biological survey information excerpts

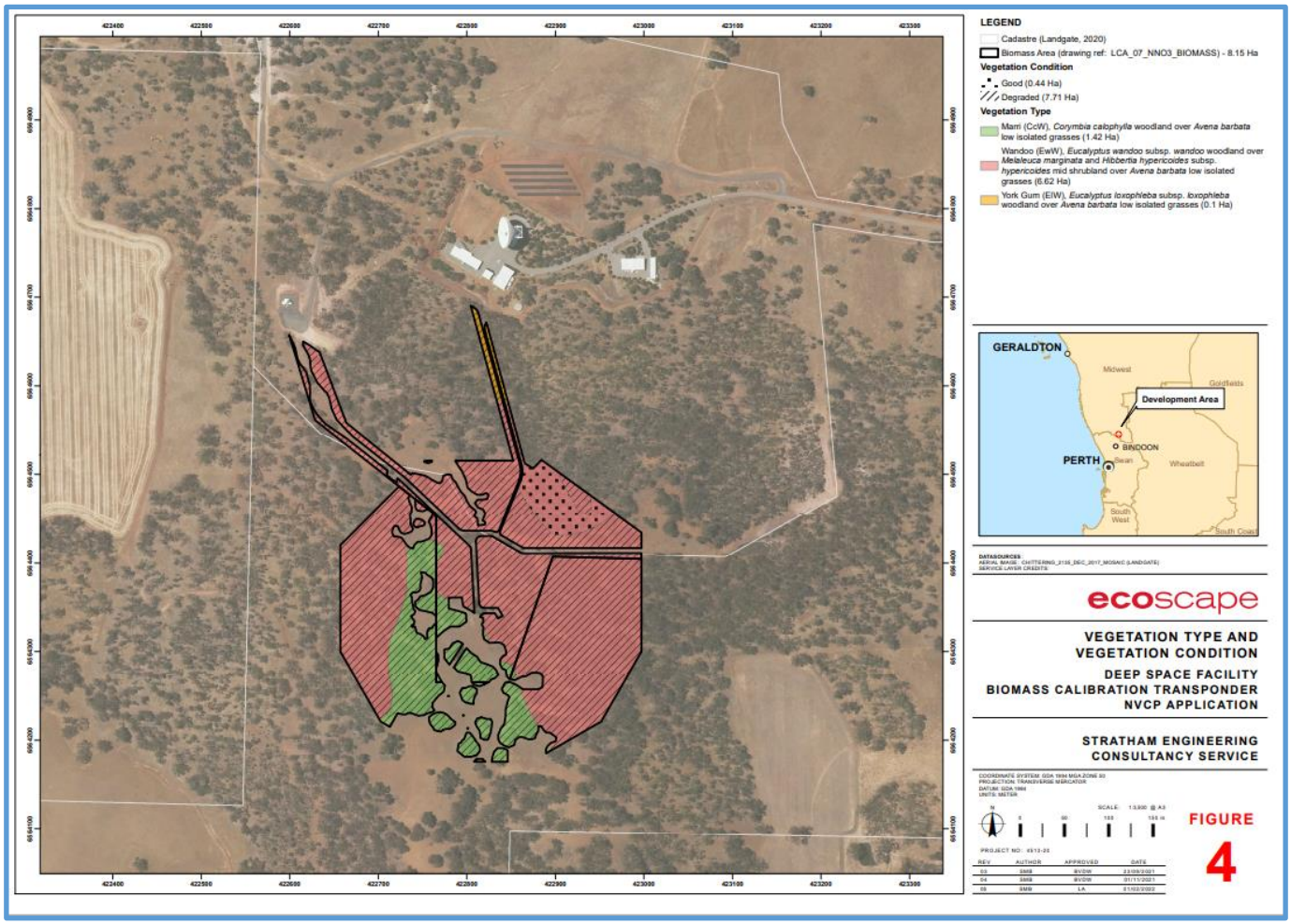


Figure 2: The condition and vegetation type of the revised application area was provided the applicant (Ecoscape, 2022)

Quadrat	Quadrat vegetation description	Vegetation type (as originally mapped)	Condition		Upper stratum	Mid stratum	Ground stratum (native shrubs)	Ground stratum (native forbs/grasses)	Ground stratum (introduced)	Weed cover	No. species (native; introduced)
			Original	Revised	species; % cover						
DS2005	U+ ^*Eucalyptus wandoo* subsp. *wandoo*\^tree\7\c;G ^*Avena barbata*,^*Acacia shuttleworthii*\^other grass,shrub\1\r	*Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over **Avena barbata* low isolated grasses	Good	Degraded	1; 35%	0; 0	2; 1%	1; <1%	1; 5%	5%	5 (4; 1)
DS2006	U+ ^*Corymbia calophylla*\^tree\7\i	*Corymbia calophylla* woodland over **Avena barbata* low isolated grasses	Good	Degraded	1; 24%	0; 0	2; <1%	1; <1%	3; <1%	<1%	7 (4; 3)
DS2007	U+ ^*Corymbia calophylla*\^tree\7\i;G ^*Avena barbata*\^other grass\1\bi	*Corymbia calophylla* woodland over **Avena barbata* low isolated grasses	Good	Degraded	1; 23%	0; 0	0; 0	0; 0	3; 1%	2%	4 (1; 3)
DS2008	U+ ^*Eucalyptus wandoo* subsp. *wandoo*\^tree\7\c	*Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over **Avena barbata* low isolated grasses	Good	Degraded	1; 30%	0; 0	2; <1%	1; <1%	1; <1%	1%	5 (4; 1)
DS2012	U+ ^*Corymbia calophylla*\^tree\7\i;G ^*Avena barbata*\^other grass\1\bi	*Corymbia calophylla* woodland over **Avena barbata* low isolated grasses	Degraded	Degraded	1; 20%	0; 0	1; <1%	0; 0%	2; 1%	1%	5* (3; 2)

* *Amyema miquelii* (Mistletoe) is included in the total species number in DS2012 but not within the structure counts

Table 2: Quadrat details for areas revised as being in Good condition

Quadrat	Quadrat vegetation description	Vegetation type (as originally mapped)	Condition		Upper stratum	Mid stratum	Ground stratum (native shrubs)	Ground stratum (native forbs/grasses)	Ground stratum (introduced)	Weed cover	No. species (native; introduced)
			Original	Revised	species; % cover						
DS2009	U+ ^*Eucalyptus wandoo* subsp. *wandoo*\^tree\7\i;M ^*Melaleuca marginata*,^*Hibbertia hypericoides* subsp. *hypericoides*\^shrub\3\c;	*Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over **Avena barbata* low isolated grasses	Very Good	Good	1; 23%	2; 33%	0; 0	1; <1%	1; <1%	<1%	5 (4; 1)
DS2010	U+ ^*Eucalyptus wandoo* subsp. *wandoo*,^*Eucalyptus loxophleba* subsp. *loxophleba*\^tree\7\i;M ^^*Melaleuca marginata*,*Hibbertia hypericoides* subsp. *hypericoides*,*Melaleuca concreta*\^shrub\3\c;	*Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over **Avena barbata* low isolated grasses	Very Good	Good	2; 24%	3; 28%	0; 0	1; <1%	1; <1%	<1%	7 (6; 1)
DS2011	U+ ^*Eucalyptus wandoo* subsp. *wandoo*\^tree\7\i;M ^*Melaleuca marginata*,^*Hibbertia hypericoides* subsp. *hypericoides*\^shrub\3\c;G ^*Avena barbata*\^other grass\1\bi	*Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over **Avena barbata* low isolated grasses	Very Good	Good	1; 16%	2; 43%	0; 0	1; <1%	1; 1%	<1%	5 (4; 1)

Figure 3: The condition of the vegetation was revised during the assessment (Ecoscape, 2022)

Landform	Mapping Unit	Vegetation Type	Floristic Quadrats	Representative Photograph	Characteristic Species (all areas)	Area (ha) and Extent (%) of Survey Area
Upper Slope	**CcW**	*Corymbia calophylla* woodland over **Avena barbata* low isolated grasses	DS2006 DS2007 **DS2012**		Diagnostic: *Corymbia calophylla* Constant: *Corymbia calophylla*, **Avena barbata*, *Hibbertia commutata*, **Trifolium subterraneum*	2.74 ha 20.93%

Figure 3: The description and photograph of vegetation type within the application area (EcoScape, 2020)

EwW	*Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over **Avena barbata* low isolated grasses Note: the above vegetation description is from the entire survey area and the mid stratum is not relevant for the Infrastructure site.	**DS2004** (DS2005 DS2008 DS2009 DS2010 DS2011)		Diagnostic: *Eucalyptus wandoo* subsp. *wandoo, Melaleuca marginata* Constant: *Eucalyptus wandoo* subsp. *wandoo, *Avena barbata, Hibbertia hypericoides* subsp. *hypericoides, Melaleuca marginata*

Figure 4: The description and photograph of vegetation type within the application area (EcoScape, 2020)

Landform	Mapping Unit	Vegetation Type	Floristic Quadrats	Representative Photograph	Characteristic Species (all areas)	Area (ha) and Extent (%) of Survey Area
Crest/Slope	**EwW**	*Eucalyptus wandoo* subsp. *wandoo* woodland over *Melaleuca marginata* and *Hibbertia hypericoides* subsp. *hypericoides* mid shrubland over **Avena barbata* low isolated grasses	(DS2004) **DS2005** DS2008 **DS2009** DS2010 DS2011		Diagnostic: *Eucalyptus wandoo* subsp. *wandoo, Melaleuca marginata* Constant: *Eucalyptus wandoo* subsp. *wandoo, *Avena barbata, Hibbertia hypericoides* subsp. *hypericoides, Melaleuca marginata*	10.17 ha 77.65%

Figure 5: The description and photograph of vegetation type within the application area (EcoScape, 2020)

Extract from additional targeted flora survey (PGV, 2021)

Plate 1: Targeted Flora Survey Area (green)

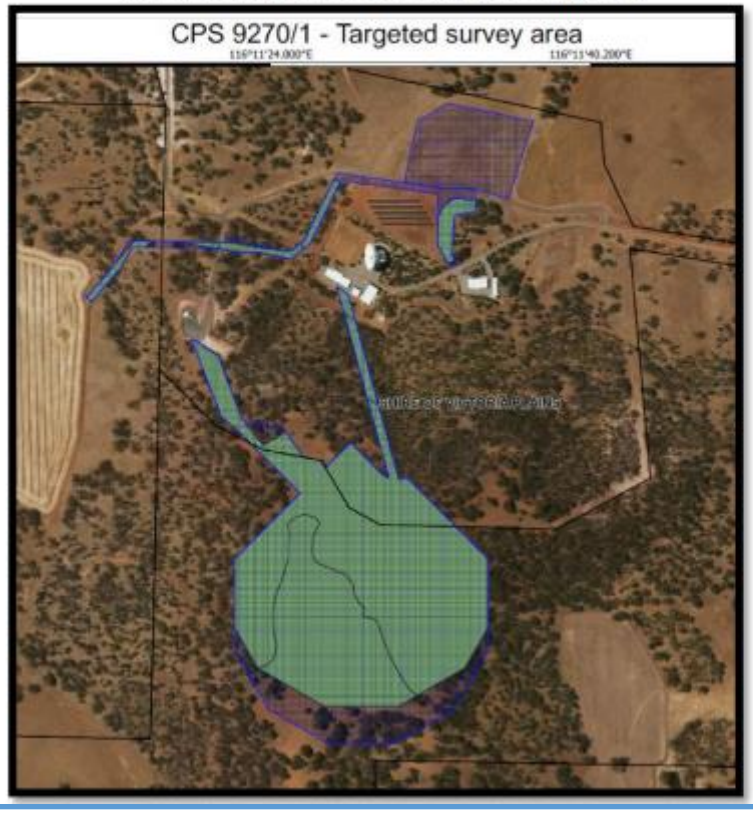


Figure 6: The additional targeted search for flora species

The targeted survey was undertaken on 3 September 2021 b y Dr Paul van der Moezel, a botanist with more than 30 years' experience in Western Australia. The survey was undertaken at a time when all species are within their flowering period, although at the end of the *Melaleuca sciotostyla* flowering time. *Melaleuca sciotostyla* is readily identifiable by its corky branches and fruit and does not need flowers for identification.

The targeted survey included walking parallel traverses through the main survey area on the hill and along the linear tracks that are proposed to be upgraded to access tracks and roads. As all three plants are medium sized shrubs and the understorey is very open, a spacing of 20m was considered appropriate between traverses. The track log for the survey area is shown in Attachment 2. A total of 8.4km was walked.

Figure 7: The findings of additional targeted search for flora species

4 Results

4.1 Targeted Flora Search

The survey of the proposed roads and access tracks was mostly through Wandoo (*Eucalyptus wandoo*) and York Gum (*Eucalyptus loxophleba*) over an understorey of pasture and introduced species, particularly Capeweed (*Arctotheca calendula*) and Oats (*Avena fatua*), with very few to no native species (Plate 3).

Plate 3: Wandoo and York Gum over weeds.

The vegetation in the main survey area on the hill was a mixture of Wandoo on the upper slopes and hilltop and Marri (*Corymbia calophylla*) on the hill top, particularly at the southern end. Some native understorey shrubs occurred on the north-east breakaway, including *Trymalium odoratissimum* and *Melaleuca marginata* (Plate 4). Other breakaways were very sparsely vegetated (Plate 5).

Figure 8: The findings of additional targeted search for flora species

Plate 4: Wandoo over *Trymalium odoratissimum* and *Melaleuca marginata* on north-east breakaway

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Plate 5: Wandoo over bare understorey on western breakaway

Figure 9: The findings of additional targeted search for flora species

Very few native shrubs were observed on the hilltop (Plate 6 and 7).

Plate 6: Wandoo over bare understorey on hill top

Figure 10: The findings of additional targeted search for flora species

Plate 7: Marri over bare understorey on hill top

No plants of either of the three Threatened species were observed during the survey.

Figure 11: The findings of additional targeted search for flora species

Appendix H. Sources of information

H.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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