



## CLEARING PERMIT

*Granted under section 51E of the Environmental Protection Act 1986*

<b>Purpose Permit number:</b>	CPS 7431/1
<b>Permit Holder:</b>	Commissioner of Main Roads
<b>Duration of Permit:</b>	27 September 2018 – 27 September 2028

### ADVICE NOTE

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

### PART I – CLEARING AUTHORISED

#### 1. Purpose for which clearing may be done

Clearing for the purpose of road widening and road safety upgrades.

#### 2. Land on which clearing is to be done

Road Reserve (PIN: 1367743), Bailup  
Road Reserve (PIN: 1367746), Bailup  
Road Reserve (PIN: 1367748), Morangup  
Road Reserve (PIN: 1367747), Morangup  
Road Reserve (PIN: 1367749), Morangup  
Road Reserve (PIN: 1367750), Morangup  
Road Reserve (PIN: 1367753), Morangup  
Road Reserve (PIN: 1190599), Morangup  
Road Reserve (PIN: 1367684), Morangup  
Road Reserve (PIN: 1367821), Morangup  
Road Reserve (PIN: 1367685), Morangup  
Road Reserve (PIN: 1367686), Morangup  
Road Reserve (PIN: 1367687), Morangup  
Road Reserve (PIN: 1367688), Morangup  
Road Reserve (PIN: 1367690), Morangup  
Road Reserve (PIN: 1367689), Morangup  
Road Reserve (PIN: 1367706), Morangup  
Road Reserve (PIN: 1367691), Morangup  
Road Reserve (PIN: 1367825), Morangup  
Road Reserve (PIN: 1367827), Morangup  
Road Reserve (PIN: 1367826), Morangup  
Road Reserve (PIN: 11263833), Morangup  
Road Reserve (PIN: 1367692), Morangup  
Road Reserve (PIN: 1367803), Morangup  
Road Reserve (PIN: 1367693), Morangup  
Road Reserve (PIN: 1367694), Morangup  
Road Reserve (PIN: 1367696), Morangup  
Road Reserve (PIN: 1367719), Morangup  
Road Reserve (PIN: 1367697), Morangup  
Road Reserve (PIN: 1367698), Morangup  
Road Reserve (PIN: 1367699), Morangup  
Road Reserve (PIN: 1367700), Morangup

Road Reserve (PIN: 1367824), Morangup  
Road Reserve (PIN: 1367823), Hoddys Well  
Road Reserve (PIN: 1367701), Morangup  
Road Reserve (PIN: 1367822), Morangup  
Road Reserve (PIN: 1367758), Hoddys Well  
Road Reserve (PIN: 1367756), Toodyay  
Road Reserve (PIN: 1367757), Toodyay  
Road Reserve (PIN: 1367755), Toodyay  
Road Reserve (PIN: 1367759), Hoddys Well  
Road Reserve (PIN: 1367763), Toodyay  
Road Reserve (PIN: 1367830), Toodyay  
Road Reserve (PIN: 1367867), Toodyay  
Road Reserve (PIN: 1367831), Toodyay  
Road Reserve (PIN: 1367702), Hoddys Well  
Road Reserve (PIN: 1278629), Toodyay  
Road Reserve (PIN: 1367833), Toodyay  
Road Reserve (PIN: 1367780), Toodyay  
Road Reserve (PIN: 1151312), Toodyay  
Road Reserve (PIN: 1367798), Toodyay  
Road Reserve (PIN: 1367854), Hoddys Well  
Road Reserve (PIN: 1367856), Toodyay  
Road Reserve (PIN: 11153401), Hoddys Well  
Road Reserve (PIN: 1367857), Hoddys Well  
Road Reserve (PIN: 1278627), Toodyay  
Road Reserve (PIN: 1367797), Toodyay  
Road Reserve (PIN: 1367799), Hoddys Well  
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Road Reserve (PIN: 11438518), Toodyay  
Road Reserve (PIN: 1367837), Hoddys Well  
Road Reserve (PIN: 1367791), Hoddys Well  
Road Reserve (PIN: 1367859), Hoddys Well  
Road Reserve (PIN: 1367792), Hoddys Well  
Road Reserve (PIN: 1367858), Hoddys Well  
Road Reserve (PIN: 1367793), Hoddys Well  
Road Reserve (PIN: 1367794), Hoddys Well  
Road Reserve (PIN: 1367860), Hoddys Well  
Road Reserve (PIN: 1367838), Toodyay  
Road Reserve (PIN: 1367842), Hoddys Well  
Road Reserve (PIN: 1367839), Hoddys Well  
Road Reserve (PIN: 11536026), Toodyay  
Road Reserve (PIN: 1367846), Toodyay  
Road Reserve (PIN: 1367845), Toodyay  
Road Reserve (PIN: 1239217), Toodyay  
Road Reserve (PIN: 11744644), Toodyay  
Road Reserve (PIN: 1367852), Hoddys Well  
Road Reserve (PIN: 1239218), Toodyay  
Road Reserve (PIN: 1367862), Hoddys Well  
Road Reserve (PIN: 1367847), Hoddys Well  
Road Reserve (PIN: 1367864), Hoddys Well  
Road Reserve (PIN: 11536021), Dumbarton  
Road Reserve (PIN: 1367850), Toodyay  
Road Reserve (PIN: 1367851), Hoddys Well  
Road Reserve (PIN: 1367863), Hoddys Well  
Road Reserve (PIN: 1367849), Hoddys Well  
Road Reserve (PIN: 11536024), Dumbarton  
Road Reserve (PIN: 11536025), Toodyay  
Road Reserve (PIN: 1367861), Hoddys Well  
Road Reserve (PIN: 11744643), Toodyay

Road Reserve (PIN: 11882088), Dumbarton  
Avon Location 28703, Hoddys Well  
Avon Location 28914, Toodyay  
Avon Location 28998, Hoddys Well  
Avon Location 28999, Hoddys Well  
Lot 101 on Plan 40504, Morangup  
Lot 10 on Diagram 98737, Hoddys Well  
Lot 1101 on Plan 224298, Morangup  
Lot 11 on Diagram 63896, Hoddys Well  
Lot 11 on Diagram 98737, Hoddys Well  
Lot 123 on Plan 13033, Morangup  
Lot 124 on Plan 1837, Toodyay  
Lot 12 on Diagram 98737, Hoddys Well  
Lot 15 on Plan 44358, Hoddys Well  
Lot 185 on Plan 224214, Toodyay  
Lot 1981 on Plan 224299, Hoddys Well  
Lot 1985 on Plan 249419, Hoddys Well  
Lot 1 on Diagram 13583, Toodyay  
Lot 1 on Diagram 2549, Morangup  
Lot 1 on Diagram 49900, Hoddys Well  
Lot 1 on Diagram 63264, Toodyay  
Lot 1 on Plan 18024, Dumbarton  
Lot 1 on Plan 7064, Bailup  
Lot 208 on Plan 224215, Toodyay  
Lot 20 on Diagram 82545, Toodyay  
Lot 212 on Plan 224214, Hoddys Well  
Lot 28675 on Plan 13030, Morangup  
Lot 28805 on Plan 216137, Morangup  
Lot 28937 on Plan 188322, Morangup  
Lot 29109 on Plan 191601, Hoddys Well  
Lot 29375 on Plan 24478, Toodyay  
Lot 29375 on Plan 24478, Dumbarton  
Lot 29376 on Plan 24478, Dumbarton  
Lot 29378 on Plan 24478, Dumbarton  
Lot 2 on Plan 37590, Dumbarton  
Lot 302 on Plan 32615, Toodyay  
Lot 333 on Plan 21006, Toodyay  
Lot 334 on Plan 21006, Toodyay  
Lot 335 on Plan 21006, Toodyay  
Lot 340 on Plan 21006, Toodyay  
Lot 345 on Plan 224200, Hoddys Well  
Lot 346 on Diagram 96806, Toodyay  
Lot 358 on Plan 224193, Toodyay  
Lot 3 on Diagram 242, Hoddys Well  
Lot 4 on Diagram 29991, Morangup  
Lot 500 on Plan 36894, Hoddys Well  
Lot 500 on Plan 70304, Morangup  
Lot 52 on Plan 10578, Toodyay  
Lot 53 on Plan 10578, Dumbarton  
Lot 55 on Plan 17738, Dumbarton  
Lot 57 on Plan 21006, Toodyay  
Lot 5 on Plan 9330, Toodyay  
Lot 7 on Plan 9330, Toodyay  
Lot 842 on Plan 224791, Hoddys Well  
Lot 8 on Diagram 71632, Morangup  
Lot M1145 on Diagram 5319, Morangup  
Lot M1258 on Diagram 5321, Hoddys Well  
Lot M1353 on Diagram 5769, Hoddys Well

Lot M1403 on Diagram 6090, Morangup  
Lot M1452 on Diagram 6521, Morangup  
Lot M1970 on Plan 6095, Morangup  
Lot M1971 on Plan 6095, Morangup  
Lot M1972 on Plan 6102, Morangup  
Lot M2026 on Diagram 14664, Toodyay  
Lot M2054 on Plan 6225, Morangup  
Unallocated Crown Land, Toodyay

**3. Area of Clearing**

The Permit Holder must not clear more than 54.87 hectares of native vegetation within the area hatched yellow on attached Plans 7431/1a and 7431/1b.

**4. Application**

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

**5. Type of clearing authorised**

The Permit Holder shall not clear native vegetation unless development of the site occurs within three months of the authorised clearing being undertaken.

**PART II – MANAGEMENT CONDITIONS**

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

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

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

**7. Dieback and weed control**

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

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

**8. Fauna management - black cockatoo nesting trees**

- (a) Within 48 hours of undertaking any clearing of *black cockatoo nesting trees* outside the period 1 March to 31 May, the Permit Holder shall engage a *fauna specialist* to conduct a *fauna survey* of those trees to identify any that are being utilised by:
  - (i) Carnaby's cockatoo (*Calyptorhynchus latirostris*);
  - (ii) Baudin's cockatoo (*Calyptorhynchus baudinii*); and
  - (iii) forest red-tailed black cockatoo (*Calyptorhynchus banksii* subsp. *naso*).
- (b) Where a *black cockatoo nesting tree(s)* being utilised by Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo is identified, the Permit Holder shall monitor the *black cockatoo nesting tree(s)* to determine when the chick(s) has fledged, as determined by the *fauna specialist*; and
- (c) The Permit Holder shall not clear a *black cockatoo nesting tree* identified as being utilised by Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo until the chick(s) has fledged, as determined by the *fauna specialist*.

**9. Fauna management – artificial black cockatoo nest hollows**

- (a) Within six months of clearing of *black cockatoo nesting trees* identified under Condition 8, and before the following *breeding season*, the Permit Holder shall install at least two artificial black cockatoo nest hollows for every *black cockatoo nesting trees* cleared, identified under Condition 8;
- (b) The Permit Holder shall install at least 188 artificial black cockatoo nest hollows;
- (c) The design and placement of the artificial black cockatoo nest hollows must be determined based on the guidelines provided in Schedule 1 and where possible should:
  - (i) be installed within the area hatched red on attached Plan 7431/1c; and/or
  - (ii) be installed within the area hatched red on attached Plan 7431/1d, being Morangup Nature Reserve, R38924; and/or
  - (iii) be installed within the area hatched red on attached Plan 7431/1e, being Woondowing Nature Reserve, R14275.
- (d) The Permit Holder must monitor and maintain the installed artificial black cockatoo nest hollows for a period of at least ten years; and
- (e) Monitoring and maintenance must be undertaken in accordance with the guidelines provided in Schedule 2.

**10. Offset**

The Permit Holder must fund the purchase of 175 hectares of native vegetation within the area cross-hatched red on attached Plan 7431/1c for inclusion of native vegetation into the conservation estate managed by the Department of Biodiversity, Conservation and Attractions.

**PART III - RECORD KEEPING AND REPORTING**

**11. Records must be kept**

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

- (a) In relation to clearing:
  - (i) the location where clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
  - (ii) the date(s) that clearing occurred;
  - (iii) the date that each *habitat tree* was cleared;
  - (iv) the size of the area cleared (in hectares);
  - (v) actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 6 of this Permit; and
  - (vi) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 7 of this Permit.
- (b) In relation to condition 8:
  - (i) the location of the *black cockatoo nesting tree(s)* identified as being utilised by Carnaby's cockatoo or forest red-tailed black cockatoo recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
  - (ii) the evidence by which it was determined the *black cockatoo nesting tree(s)* was being utilised including the date of that determination; and
  - (iii) the evidence by which it was determined the chick(s) had fledged including the date of that determination.

- (c) In relation to condition 9:
- (i) the date that each artificial black cockatoo nest hollow was installed;
  - (ii) the location where each artificial black cockatoo nest hollow was installed recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
  - (iii) a photo of each installed artificial black cockatoo nest hollow;
  - (iv) a description of how the design and placement of each artificial black cockatoo nest hollow was determined based on the requirements of condition 9(b);
  - (v) the dates when each artificial black cockatoo nest hollow was monitored;
  - (vi) the methodology and results of the artificial black cockatoo nest hollow monitoring;
  - (vii) the dates when each artificial black cockatoo nest hollow was maintained; and
  - (viii) a description of the maintenance activities undertaken for each artificial black cockatoo nest hollow.
- (d) In relation to condition 10, the date that the area cross-hatched red was purchased.

## 12. Reporting

- (a) The Permit Holder must provide to the CEO on or before 30 June of each year, a written report:
- (i) of records required under condition 11 of this Permit; and
  - (ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.
- (b) If no clearing authorised under this Permit was undertaken between 1 January to 31 December of the preceding calendar, a written report confirming that no clearing under this permit has been carried out, must be provided to the CEO on or before 30 June of each year.
- (c) Prior to 30 July 2028, the Permit Holder must provide to the CEO a written report of records required under condition 11 of this Permit where these records have not already been provided under condition 12(a) of this Permit.

## DEFINITIONS

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

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

**breeding season** means the period between 1 June and 28 February of any year;

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

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

**fauna specialist** means a person:

- (a) Who holds a tertiary qualification specializing in environmental science or equivalent, has a minimum of two years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed and holds a valid fauna licence issued under the *Wildlife Conservation Act 1950*; or
- (b) Who does not have appropriate professional qualifications, but has a minimum of seven years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed and holds a valid fauna licence issued under the *Wildlife Conservation Act 195*.

**fauna survey** means a field-based investigation of the biodiversity of fauna;

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

**mulch** means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

**weed/s** means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*;  
or
- (b) published in a Department of Biodiversity, Conservation and Attractions Regional Weed Rankings Summary, regardless of ranking; or
- (c) not indigenous to the area concerned.



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Mathew Gannaway  
MANAGER  
NATIVE VEGETATION REGULATION

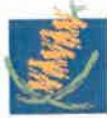
*Officer delegated under Section 20 of the Environmental Protection Act 1986*

28 August 2018

**SCHEDULE 1**

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





## Artificial hollows for Carnaby's cockatoo



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

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

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

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

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



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

## Walls

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

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

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

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## Base

The base of the artificial hollow must be;

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

### Do not use:

- Saw dust or fibre products that will retain moisture.

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



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

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## 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.

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## 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

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## 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.

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## 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.

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## Maintenance and monitoring

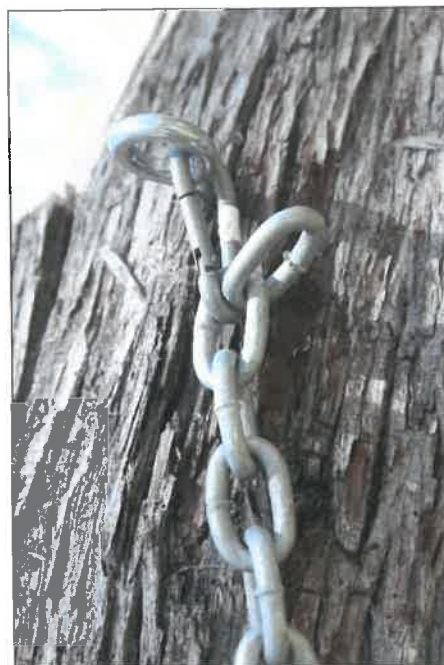
Once artificial hollows have been placed they require monitoring and maintenance to ensure they continue to be useful for nesting by Carnaby's cockatoo. It is important to monitor artificial hollows to determine use by Carnaby's cockatoo, other native species as well as pest species. By undertaking monitoring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

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

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



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



Example fixing for artificial hollow  
Photo by Christine Groom

### Acknowledgements

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

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

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

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

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

#### Further information

Contact [fauna@dpaw.wa.gov.au](mailto:fauna@dpaw.wa.gov.au) or your local office of the Department of Parks and Wildlife  
See the department's website for the latest information: [www.dpaw.wa.gov.au](http://www.dpaw.wa.gov.au)

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## **SCHEDULE 2**

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





## Artificial hollows for Carnaby's cockatoo



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

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

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

Monitoring should be undertaken in order to detect:

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



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

### How do I monitor artificial hollows?

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

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

### **Looking for signs of use**

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

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### **Observing parent behaviour around the hollow**

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

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

---

### **Observing feeding flocks**

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

---

### **Tapping**

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

---

### **Observing insect activity around nest**

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

---

### **Listening for nestlings**

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

---



### ***Looking inside the nest***

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

---

### ***How often should I monitor artificial hollows?***

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

---

### ***How do I maintain artificial hollows?***

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

Maintenance checks should assess the following as a minimum:

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



Artificial hollow base needing repair.  
*Photo by Christine Groom*

### ***Repairing hollows***

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

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

---

**Monitoring of artificial hollows:**

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

**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>

Further information

Last updated 28/04/2015

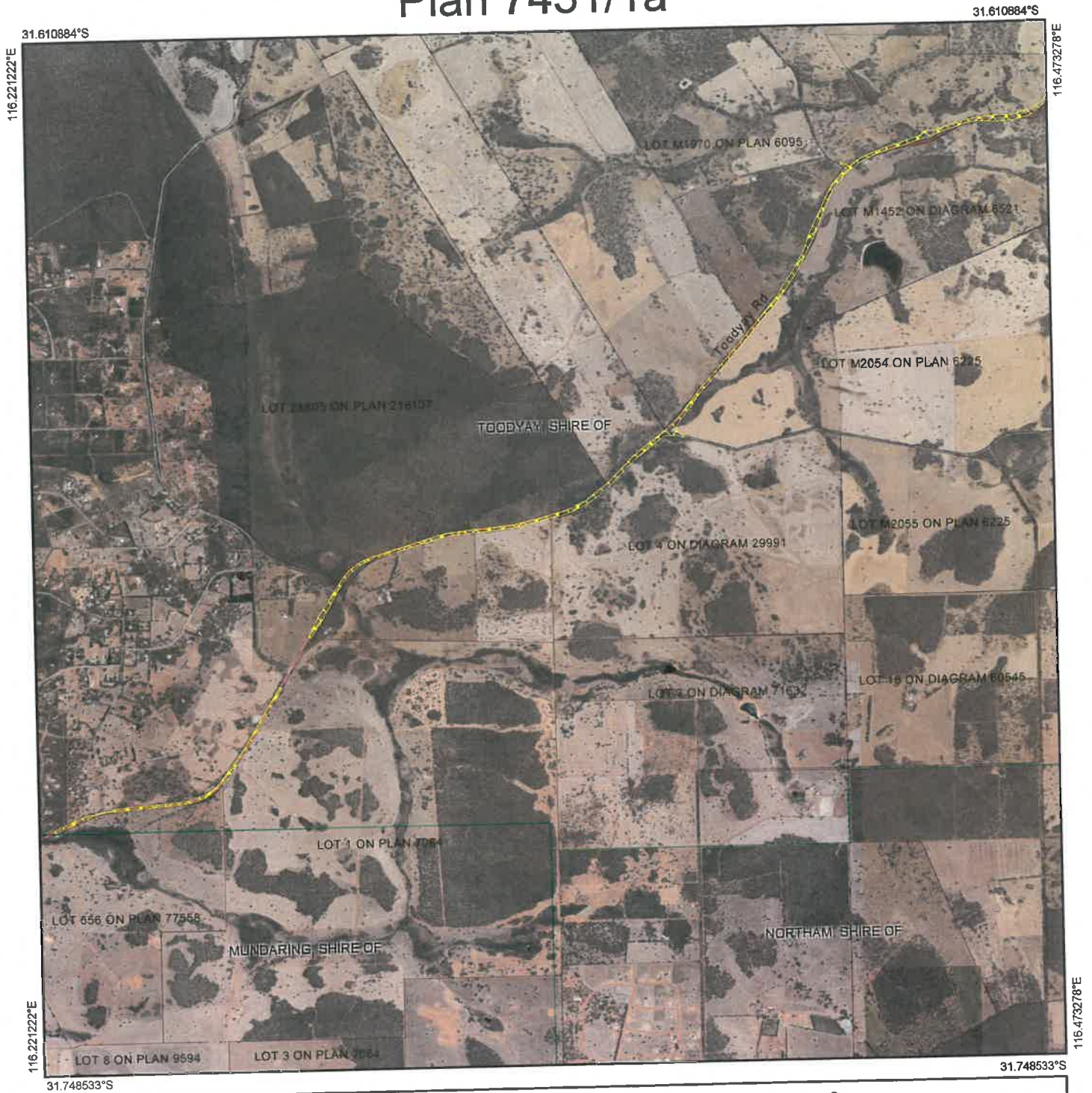
Contact [fauna@dpaw.wa.gov.au](mailto:fauna@dpaw.wa.gov.au) or your local office of the Department of Parks and Wildlife

See the department's website for the latest information: [www.dpaw.wa.gov.au](http://www.dpaw.wa.gov.au)






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# Plan 7431/1a



## Legend

-  Imagery
-  Cadastre (Search)
-  Clearing Instruments Activities
-  Roads
-  Local Government Authority



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 GDA 94 (Lat/Long)  
 Geocentric Datum of Australia 1994

*Matthew Gennaucy* Date 29/05/2018

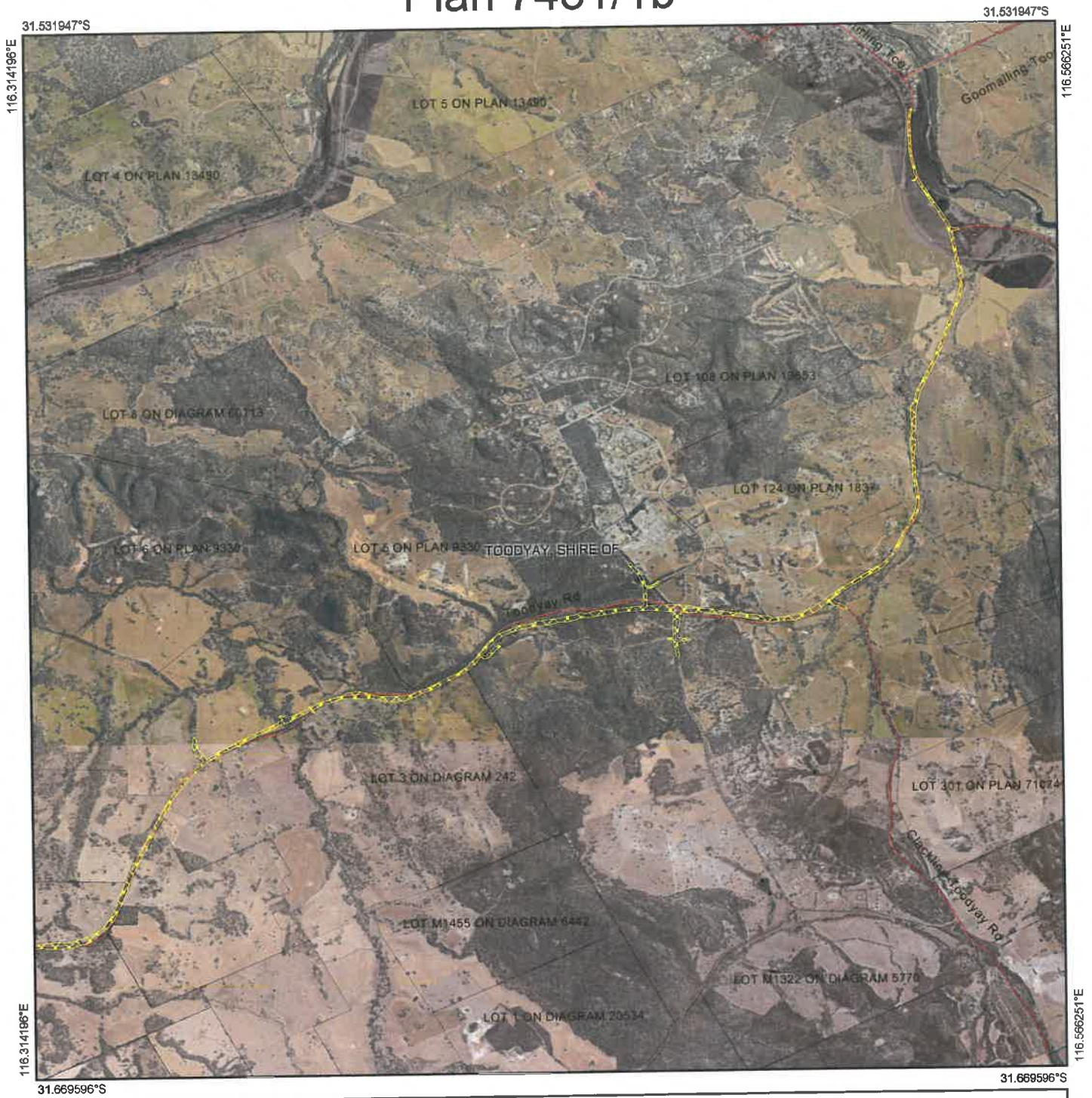
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# Plan 7431/1b



## Legend

-  Imagery
-  Cadastre (Search)
-  Clearing Instruments Activities
-  Roads
-  Local Government Authority



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GDA 94 (Lat/Long)

Geocentric Datum of Australia 1994

*Matthew Gannev* Date 23/05/2018  
**Matthew Gannev**

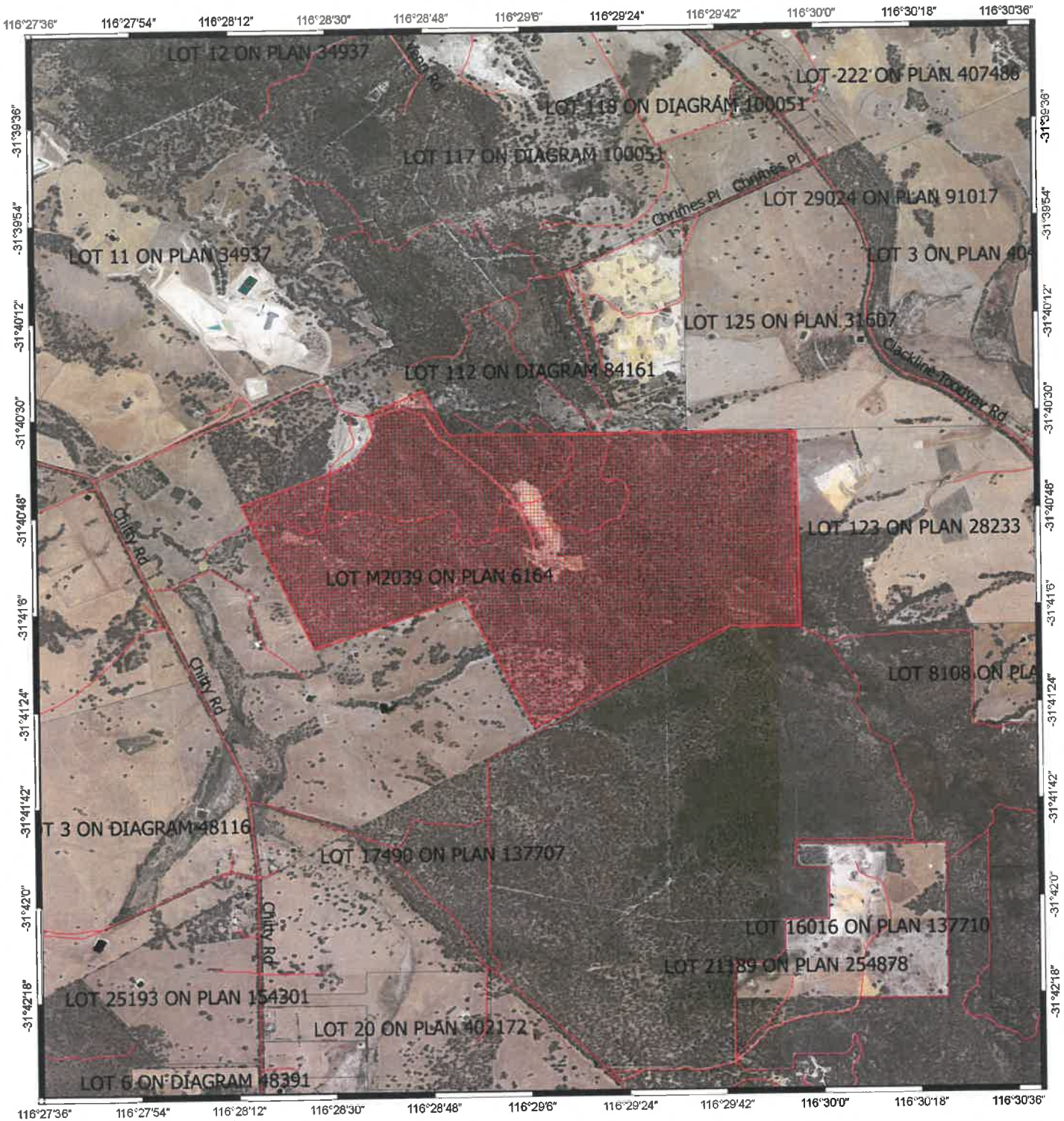
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# Plan 7431/1c



## Legend

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Transportation

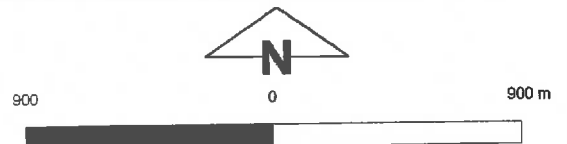
 Roads

Cadastre, LGA and Town Boundaries

 Cadastre

 Local Government Authorities

Wa Now



MGA 94  
Geocentric Datum of Australia 1994

 Date: 28/08/2018  
Mathew Gannaway

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# Plan 7431/1d



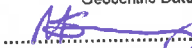
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-  CPS subject to conditions
- Transportation**
-  Roads
- Cadastre, LGA and Town Boundaries**
-  Cadastre
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Mathew Gannaway

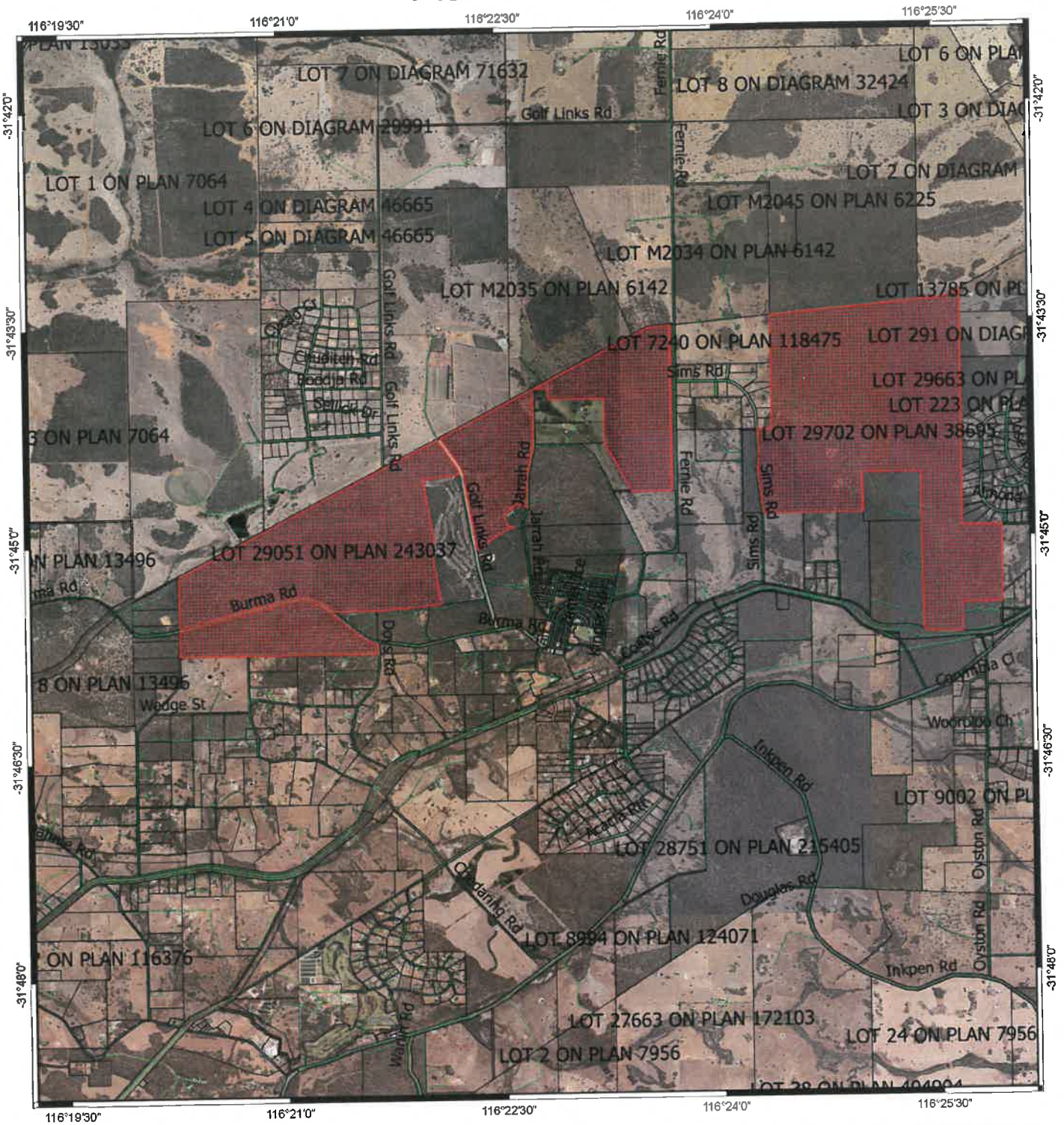
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GOVERNMENT OF  
WESTERN AUSTRALIA



# Plan 7431/1e



## Legend


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-  Cadastre, LGA and Town Boundaries
-  Cadastre
-  Transportation
-  Roads
-  Local Government Authorities
-  Wa Now



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Geocentric Datum of Australia 1994

 Date 23/09/2018  
Mathew Gannaway

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GOVERNMENT OF  
WESTERN AUSTRALIA



This report has been prepared to fulfil the requirements of an accredited environmental assessment process between the Commonwealth and State governments, pursuant to a bilateral agreement established under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report is set out in three parts:

- Part 1: Application and site details;
- Part 2: Assessment against matters of national environmental significance (pursuant to the EPBC Act); and
- Part 3: Assessment against the clearing principles (pursuant to the Western Australian *Environmental Protection Act 1986* (EP Act)). Appeal rights pursuant to section 101A of the EP Act are relevant to this section of the report.

## Part 1: Application and site details

### 1. Application details

#### 1.1. Permit application details

Permit application No.: 7431/1  
EBBC No.: 2016/7665  
Permit type: Purpose Permit

#### 1.2. Applicant details

Applicant's name: Commissioner of Main Roads Western Australia  
Application received: 30 December 2016

#### 1.3. Property details

Property:

- Road Reserve (PIN: 1367743), Bailup
- Road Reserve (PIN: 1367746), Bailup
- Road Reserve (PIN: 1367748), Morangup
- Road Reserve (PIN: 1367747), Morangup
- Road Reserve (PIN: 1367749), Morangup
- Road Reserve (PIN: 1367750), Morangup
- Road Reserve (PIN: 1367753), Morangup
- Road Reserve (PIN: 1190599), Morangup
- Road Reserve (PIN: 1367684), Morangup
- Road Reserve (PIN: 1367821), Morangup
- Road Reserve (PIN: 1367685), Morangup
- Road Reserve (PIN: 1367686), Morangup
- Road Reserve (PIN: 1367687), Morangup
- Road Reserve (PIN: 1367688), Morangup
- Road Reserve (PIN: 1367690), Morangup
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- Road Reserve (PIN: 1367693), Morangup
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- Road Reserve (PIN: 1367824), Morangup
- Road Reserve (PIN: 1367823), Hoddys Well
- Road Reserve (PIN: 1367701), Morangup
- Road Reserve (PIN: 1367822), Morangup
- Road Reserve (PIN: 1367758), Hoddys Well
- Road Reserve (PIN: 1367756), Toodyay
- Road Reserve (PIN: 1367757), Toodyay



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Road Reserve (PIN: 1367759), Hoddys Well  
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Avon Location 28914, Toodyay  
Avon Location 28998, Hoddys Well  
Avon Location 28999, Hoddys Well  
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Lot 10 on Diagram 98737, Hoddys Well  
Lot 1101 on Plan 224298, Morangup  
Lot 11 on Diagram 63896, Hoddys Well  
Lot 11 on Diagram 98737, Hoddys Well  
Lot 123 on Plan 13033, Morangup  
Lot 124 on Plan 1837, Toodyay  
Lot 12 on Diagram 98737, Hoddys Well  
Lot 15 on Plan 44358, Hoddys Well  
Lot 185 on Plan 224214, Toodyay  
Lot 1981 on Plan 224299, Hoddys Well  
Lot 1985 on Plan 249419, Hoddys Well  
Lot 1 on Diagram 13583, Toodyay  
Lot 1 on Diagram 2549, Morangup  
Lot 1 on Diagram 49900, Hoddys Well  
Lot 1 on Diagram 63264, Toodyay

Lot 1 on Plan 18024, Dumbarton  
 Lot 1 on Plan 7064, Bailup  
 Lot 208 on Plan 224215, Toodyay  
 Lot 20 on Diagram 82545, Toodyay  
 Lot 212 on Plan 224214, Hoddys Well  
 Lot 28675 on Plan 13030, Morangup  
 Lot 28805 on Plan 216137, Morangup  
 Lot 28937 on Plan 188322, Morangup  
 Lot 29109 on Plan 191601, Hoddys Well  
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 Lot M1353 on Diagram 5769, Hoddys Well  
 Lot M1403 on Diagram 6090, Morangup  
 Lot M1452 on Diagram 6521, Morangup  
 Lot M1970 on Plan 6095, Morangup  
 Lot M1971 on Plan 6095, Morangup  
 Lot M1972 on Plan 6102, Morangup  
 Lot M2026 on Diagram 14664, Toodyay  
 Lot M2054 on Plan 6225, Morangup  
 Unallocated Crown Land, Toodyay

**Local Government Authority:**  
**Localities:**

Shire of Toodyay  
 Dumbarton and Toodyay and Morangup and Hoddys Well and Bailup

**1.4. Application**

<b>Clearing Area (ha)</b>	<b>No. Trees</b>	<b>Method of Clearing</b>	<b>For the purpose of:</b>
54.87		Mechanical Removal	Road construction or upgrades

**1.5. Decision on application**

**Decision on Permit Application:**

**Decision Date:**

**Reason for Decision:**

Grant

28 August 2018

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

Through assessment it has been determined that the application area contains 33 hectares of foraging habitat for black cockatoos, 1306 potential black cockatoo breeding trees with 94 hollows, 32.5 hectares of suitable habitat for the Chuditch and 38.5 hectares of vegetation in an extensively cleared area.

To mitigate the significant environment impacts identified above, and in accordance with the WA Environmental Offset Policy and Environmental Offsets Guidelines, prior to undertaking any clearing, the Permit Holder must fund the purchase of 175 hectares of native vegetation within the area identified in Plan 7431/1c for inclusion into the conservation estate, to be managed by the Department of Biodiversity, Conservation and Attractions. The installation of 188 artificial hollows into the Offset site, Morangup Nature Reserve and/or Woondowing Nature Reserve will mitigate the impacts to the proposed clearing of 94 potential breeding hollows.

To ensure that black cockatoos are not impacted during the clearing process, a condition has been added to the permit requiring the Permit Holder to check hollows for the presence of black cockatoos prior to clearing and not to clear trees where black cockatoos have been identified until a fauna specialist has verified that the hollow/s are no longer being utilised by black cockatoos.

The Delegated Officer determined that the proposed clearing may increase the spread of weeds and dieback into adjacent vegetation. To minimise this impact, a condition has been placed on the permit requiring the implementation of weed and dieback management measures.

After consideration of the above, the Delegated Officer determined that the proposed clearing of 54.87 hectares of native vegetation is not likely to have an unacceptable environmental impact.

Given the above, the Delegated Officer decided to grant a clearing permit subject to conditions.

## 2. Site Information

### Clearing Description

The application is to clear 54.87 hectares of native vegetation within various road reserves and properties for the purpose of widening Toodyay Road for safety improvements (figure 1).

### Vegetation Description

The application area has been mapped as the following:

Beard vegetation associations:

**4:** Medium woodland; marri and wandoo;

**352:** Medium woodland; York gum;

**1006:** Medium woodland; jarrah, wandoo and powderbark; and

**3003:** Medium forest; jarrah and marri on laterite with wandoo in valleys, sandy swamps with teatree and Banksia (Shepherd et al., 2001).

And

South West Forest – Vegetation Complexes:

**Bi:** Woodland of *Eucalyptus loxophleba* on the slopes, flanked by woodlands of *Eucalyptus wandoo*-*Eucalyptus accedens* on the breakaways and upper slopes in the perarid zone;

**Wi:** Mixture of woodland of *Eucalyptus rudis*-*Melaleuca raphiophylla*, low forest of *Casuarina obesa* and tall shrubland of *Melaleuca* spp. on major valley systems in arid and perarid zones;

**Pn:** Open forest of *Eucalyptus marginata* subsp. *thalassica*-*Corymbia calophylla* on slopes and open woodland of *Eucalyptus wandoo* with some *Eucalyptus patens* on the lower slopes in semiarid and arid zones;

**S:** Mosaic of low open woodland of *Melaleuca preissiana*-*Banksia littoralis*, closed scrub of Myrtaceae spp., closed heath of Myrtaceae spp. and sedgelands of *Baumea* and *Leptocarpus* spp. on seasonally wet or moist sand, peat and clay soils on valley floors in all climatic zones;

**Mi:** Open woodland of *Eucalyptus wandoo* over *Acacia acuminata* with some *Eucalyptus loxophleba* on valley slopes, with low woodland of *Allocasuarina huegeliana* on or near shallow granite outcrops in arid and perarid zones;

**D4:** Open forest to woodland of *Eucalyptus marginata* subsp. *thalassica*-*Corymbia calophylla* on lateritic uplands in semiarid and arid zones;

**Y5:** Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica*-*Corymbia calophylla* and woodland of *Eucalyptus wandoo* on lateritic uplands in semiarid to perarid zones;

**Ck:** Woodland of *Eucalyptus wandoo* with mixtures of *Eucalyptus patens*, *Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones; and

**Y6:** Woodland of *Eucalyptus wandoo*-*Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* fs24 subsp. *thalassica*-*Corymbia calophylla* on lateritic uplands and breakaway landscapes in arid and perarid zones (Hedde et al., 1980).

A biological assessment of the application area conducted by AECOM Pty Ltd (AECOM) identified 22 native vegetation communities and one planted community (Table 1) (AECOM, 2016a), namely: Table 1: Vegetation communities recorded in the study area

AECOM vegetation community	Description
CcLeAp	<p><i>Corymbia calophylla</i> with pockets of <i>Casuarina obesa</i> mid open woodland over <i>Leptospermum erubescens</i>, <i>Banksia sessilis</i> var. <i>sessilis</i>, and <i>Hakea prostrata</i> tall shrubland over <i>Acacia pulchella</i> var. <i>pulchella</i>, <i>Bossiaea eriocarpa</i> and <i>Verticordia densiflora</i> var. <i>densiflora</i> mid to low sparse shrubland.</p> <p>This community was isolated to one occurrence within the Study area along Sandplain Road. The condition of the community is Very Good in the northern extent, grading to Good further down slope.</p> <p>The community was recorded on white sand on lower slopes.</p>
CcXpHh	<p><i>Corymbia calophylla</i> and <i>Eucalyptus marginata</i> mid open forest to woodland over <i>Xanthorrhoea preissii</i>, <i>Banksia sessilis</i> var. <i>sessilis</i> and <i>Acacia pulchella</i> mid to tall sparse shrubland over <i>Hibbertia hypericoides</i>, <i>Tetraria octandra</i> and <i>Phyllanthus calycinus</i> low open shrubland.</p> <p>Along roadsides this community was in Completely Degraded to Excellent condition. Disturbance opportunists such as <i>Leptospermum erubescens</i> and <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> were common and <i>Hibbertia hypericoides</i> and smaller herbs were absent.</p> <p>The community was recorded on brown sandy loamy gravel soils on undulating terrain. Despite the roadside vegetation creating a buffer between cleared paddocks and the road verge, invasive weeds were largely absent. This community is significant due to the presence of a large population of <i>Hibbertia montana</i>.</p>
CcXpLb	<p><i>Corymbia calophylla</i> and <i>Casuarina obesa</i> low to mid open woodland over <i>Xanthorrhoea preissii</i>, <i>Leptospermum erubescens</i> and <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> tall open shrubland over <i>Lechenaultia biloba</i>, <i>Bossiaea eriocarpa</i> and <i>Acacia pulchella</i> var. <i>pulchella</i> mid to low open heath shrubland.</p> <p>This community was recorded in Morangup Nature Reserve and was in Excellent condition.</p> <p>The community represents an ecotone of the adjacent heath community EdBn and the Eucalypt woodland. CcXpLb was recorded on mid-sloped of undulating terrain on sandy loam gravel with some exposed laterite rocks. Isolated occurrences of <i>Eucalyptus drummondii</i> were also recorded.</p>
EaXpBe	<p><i>Eucalyptus accedens</i>, <i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> and <i>Corymbia calophylla</i> mid open forest over <i>Xanthorrhoea preissii</i>, <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> and <i>Acacia pulchella</i> var. <i>pulchella</i> mid to tall isolated clumps of shrubs over <i>Bossiaea eriocarpa</i>, <i>Petrophile divaricata</i> and <i>Astroloma epacridis</i> low open shrubland.</p> <p>The community was recorded in Degraded, Good and Excellent condition, on undulating terrain including lateritic outcrops.</p> <p>The community occurs on brown sandy loamy gravel with sparse understorey. Condition was Good to Excellent. This community is significant due to the presence of Priority flora populations including <i>Boronia scabra</i> subsp. <i>condensata</i>, <i>Calytrix oncophylla</i> and <i>Grevillea candolleana</i>.</p>
EIAaAb	<p><i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> mid woodland over <i>Acacia acuminata</i> tall isolated to open shrubland over <i>Avena barbata</i>, <i>Lolium perenne</i> and <i>Arctotheca calendula</i> mixed tall to low tussock grass and herbland.</p> <p>This community was recorded in Good condition, isolated to the northern tip of the Study Area. The community occurs on mid to lower slopes on sandy loam. Mid-storey is predominantly absent, with the understorey dominated by invasive weeds common in the region. This community is isolated to the Avon Wheatbelt IBRA region in the north of the Study area.</p>
EmXpBd	<p><i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> mid open forest over <i>Xanthorrhoea preissii</i>, <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> and <i>Banksia sessilis</i> var. <i>sessilis</i> tall sparse shrubland over <i>Banksia dallanneyi</i> var. <i>dallanneyi</i>, <i>Lepidosperma tenue</i> and <i>Patersonia rudis</i></p>

	<p>low mixed sedge and heath shrubland.</p> <p>The community was recorded in Completely Degraded to Excellent condition.</p> <p>This community was recorded on mid to upper slopes of undulating terrain on sandy loamy gravel with some exposed laterite present. Condition was recorded as Very Good to Excellent. Some areas included a low tree stratum of <i>Banksia grandis</i> and <i>Allocasuarina fraseriana</i>.</p>
<b>EwAaAb</b>	<p><i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> and <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> mid open woodland over <i>Acacia acuminata</i> tall open shrubland over *<i>Avena barbata</i>, *<i>Briza maxima</i> and *<i>Freesia alba x leightlinii</i> tall mixed grass and herbland.</p> <p>Condition was rated as Degraded.</p> <p>This community was isolated to one degraded area that has been historically grazed. This was evident in the lack of native understorey species. The community occurs on a granite outcrop on lower slopes near a minor drainage channel.</p>
<b>EwGtAl</b>	<p><i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>, <i>Corymbia calophylla</i> and <i>Eucalyptus accedens</i> mid open forest over <i>Gastrolobium truncatum</i>, <i>G. parviflorum</i> and <i>Xanthorrhoea preissii</i> mid open shrubland over <i>Acacia lasiocarpa</i> var. <i>sedifolia</i>, <i>Opercularia vaginata</i> and <i>Hakea lissocarpa</i> mid open heath shrubland.</p> <p>The community was considered in Very Good to Excellent condition.</p> <p>This Wandoo woodland was recorded on undulating terrain dissected by numerous minor drainage channels. No water was present at the time of the survey. Plant density increased in the drainage channels however species composition remained the same. This community is significant due to the presence of Priority flora populations including <i>Boronia scabra</i> subsp. <i>condensata</i>, <i>Calytrix oncophylla</i>, <i>Grevillea candolleana</i> and <i>Hibbertia montana</i>.</p>
<b>EwXpTo</b>	<p><i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>, <i>Corymbia calophylla</i> and <i>Eucalyptus accedens</i> mid woodland over <i>Xanthorrhoea preissii</i>, <i>Acacia pulchella</i> and <i>Hakea lissocarpa</i> mid to tall open shrubland over <i>Tetraria octandra</i>, <i>Hypocalymma angustifolium</i> and <i>Tricoryne elatior</i> low to mid open heath shrubland.</p> <p>Condition was recorded as Good to Very Good.</p> <p>This community was recorded on slopes with exposed granite and occasionally exposed laterite.</p>
<b>EdBn</b>	<p><i>Eucalyptus drummondii</i> mid isolated trees over <i>Banksia nivea</i> subsp. <i>Morangup</i> (P2), <i>Kunzea micrantha</i> subsp. <i>micrantha</i> and <i>Hakea incrassata</i> low heathland.</p> <p>EdBn was in Excellent condition, situated in Morangup Nature Reserve on sandy clay red soils.</p> <p>This community lacks a tall to mid shrub stratum. The area is seasonally damp and incorporates a unique floristic composition including two Priority flora populations. For this reason community EdBn is considered significant.</p>
<b>CcAaBj</b>	<p><i>Corymbia calophylla</i> mid open woodland over <i>Astartea affinis</i>, <i>Astartea scoparia</i> and <i>Acacia saligna</i> tall shrubland over <i>Baumea juncea</i> tall sedgeland.</p> <p>This community is limited to one pocket of Very Good and several smaller pockets of Degraded vegetation. The community represents an ecotone of a Eucalypt woodland and a wetland community, with characteristics of both. For this reason, the community was not grouped with other wetland or woodland communities</p> <p>One quadrat was completed on loamy clay soils representing a shallow minor drainage channel. Water was present at the time of the survey.</p>
<b>ErAsOp</b>	<p><i>Eucalyptus rudis</i> subsp. <i>rudis</i>, <i>Casuarina obesa</i> and <i>Melaleuca rhapsiophylla</i> low to mid open forest over <i>Acacia saligna</i>, <i>Acacia acuminata</i> and <i>Acacia burkittii</i> low to tall isolated clumps of shrubs over</p>

	<p><i>*Oxalis pes-caprae</i>, <i>*Avena barbata</i> and <i>*Oxalis corniculata</i> low mixed herb and tussock grassland.</p> <p>This community is isolated to one area near Toodyay. It represents the Avon River and is considered a Degraded major drainage channel. No water was present at the time of the survey. The understorey is dominated by weed species with no low native shrubs present.</p>
ErMvLd	<p><i>Eucalyptus rudis</i> subsp. <i>rudis</i> and <i>Corymbia calophylla</i> mid open woodland over <i>Melaleuca viminea</i> subsp. <i>viminea</i>, <i>Melaleuca preissiana</i> and <i>Acacia saligna</i> tall open shrubland over <i>Lepidosperma drummondii</i>, <i>Ficinia nodosa</i> and <i>Juncus pallidus</i> tall sedgeland.</p> <p>The community was recorded in Degraded to Good condition.</p> <p>This community is associated with shallow wetlands. The tree stratum is only present on the edge of the wetland, with the centre predominantly sedges and rushes.</p>
ErPICc	<p><i>Eucalyptus rudis</i> subsp. <i>rudis</i> and <i>Melaleuca raphiophylla</i> mid woodland over <i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>, <i>Acacia extensa</i> and <i>Acacia divergens</i> tall shrubland over <i>Chorizema cordata</i> low isolated heath shrubland.</p> <p>This community is isolated to one wetland within Morangup Nature Reserve and is considered in Very Good to Excellent Condition.</p> <p>The unique wetland composition may be attributed to evidence of recent fire. The lower shrub stratum is absent, with a tall shrub thicket providing more than 50% cover. Condition was recorded as Excellent.</p>
ErToLm	<p><i>Eucalyptus rudis</i> subsp. <i>rudis</i> and either <i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> or <i>Corymbia calophylla</i> mid open forest over <i>Typha orientalis</i>, <i>Melaleuca incana</i> subsp. <i>incana</i>, and <i>Trymalium odoratissimum</i> subsp. <i>odoratissimum</i> tall open rushland over <i>Lepyrodia muirii</i>, <i>Alexgeorgea nitens</i> and <i>*Avena barbata</i> tall mixed rush and grassland.</p> <p>ErToLm was recorded in Degraded to Very Good condition.</p> <p>This community represents a major drainage channel with water present at the time of the survey. The drainage channel is wide and has shallow slopes. Soils include red brown sandy loam. Condition was recorded as Good to Very Good. At some locations, the invasive <i>Typha orientalis</i> is present and has displaced native rushes and sedges.</p>
EwAbBs	<p><i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>, <i>Eucalyptus rudis</i> subsp. <i>rudis</i> and <i>Allocasuarina huegeliana</i> low to mid open forest over <i>Acacia burkittii</i>, <i>Acacia saligna</i> and <i>Trymalium odoratissimum</i> subsp. <i>odoratissimum</i> tall open shrubland over <i>Bossiaea spinescens</i>, <i>Acacia pulchella</i> and <i>Hibbertia commutata</i> low to mid heath shrubland.</p> <p>This drainage community represents minor to major drainage channels with steep slopes. The water present has encouraged weed dispersion along the river therefore condition was recorded as Good to Degraded. Dense patches of <i>*Romulea rosea</i> var. <i>australis</i>, <i>*Freesia alba</i> x <i>leightlinii</i>, <i>*Arctotheca calendula</i>, and <i>*Oxalis pes-caprae</i> were recorded. These weeds have displaced the majority of native herbs and low shrubs.</p>
EwHuAn	<p><i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> mid open forest over <i>Hakea undulata</i>, <i>Banksia sessilis</i> var. <i>sessilis</i> and <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> tall isolated shrubs over <i>Alexgeorgea nitens</i>, <i>Opercularia vaginata</i> and <i>Daviesia hakeoides</i> subsp. <i>hakeoides</i> low mixed sedge and herbland.</p> <p>This community was isolated to one area within the Study area and was recorded in Very Good to Excellent condition.</p> <p>It lies adjacent to a drainage channel community and upland Eucalypt woodland, and has a unique composition lacking most of the shrub stratum. The community was recorded on lower slopes on sandy loam gravel and was in Excellent condition with some evidence of tracks.</p>
MpHvLI	<p><i>Melaleuca preissiana</i> and <i>Corymbia calophylla</i> low to mid woodland over <i>Hakea varia</i>, <i>Xanthorrhoea preissii</i> and <i>Kunzea micrantha</i> subsp. <i>micrantha</i> tall open shrubland over <i>Lepidosperma longitudinale</i>, <i>Cyathochaeta avenacea</i> and <i>Mesomelaena tetragona</i> closed sedgeland.</p>

	<p>Condition was considered Very Good to Excellent.</p> <p>This community is associated with shallow wetlands. No water was present at the time of survey. The community lacks a mid to tall tree stratum with the exception of the edge of the community. Isolated clumps of <i>Viminaria juncea</i> were also recorded. The community is located on brown loam clay with soils observed to be moist.</p>
<b>Calo</b>	<p><i>Calothamnus</i> thicket.</p> <p>No quadrats were completed within this community due to restricted size, low environmental value, and difficult access through thicket. The community comprised of <i>Calothamnus rupestris</i> species with scattered <i>Hakea</i> species.</p>
<b>Main Roads Rehabilitation</b>	No sites were completed within this vegetation community. Relevés and observations were made as the Study area was traversed.
<b>Native Trees / Trees Mix</b>	<p>Comprised of native trees in paddocks or on roadsides where understorey has been cleared/grazed.</p> <p>Relevés were completed within this community. Cockatoo tree data was also used to identify tree species present. Dominant trees included:</p> <ul style="list-style-type: none"> <li>· <i>Corymbia calophylla</i></li> <li>· <i>Eucalyptus accedens</i></li> <li>· <i>Eucalyptus loxophleba</i></li> <li>· <i>Eucalyptus rudis</i> subsp. <i>rudis</i></li> <li>· <i>Eucalyptus wandoo</i> subsp. <i>wandoo</i></li> <li>· <i>Eucalyptus patens</i>.</li> </ul>
<b>EwBsLp</b>	<p><i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> and <i>Corymbia calophylla</i> mid woodland over <i>Banksia squarrosa</i> subsp. <i>squarrosa</i>, <i>Leptospermum erubescens</i> and <i>Banksia sessilis</i> var. <i>sessilis</i> tall shrubland over <i>Leucopogon propinquus</i>, <i>Dillwynia laxiflora</i> and <i>Hibbertia commutata</i> low isolated heath shrubland.</p> <p>This community represents cleared areas where native species have returned either as a result of rehabilitation or natural succession. Species diversity is similar to adjacent native vegetation however species composition includes a higher density of disturbance opportunists such as <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> and <i>Banksia sessilis</i>. Geomorphology appears altered and soils are comprised mostly of gravel and sand.</p> <p>This community is significant due to the presence of Priority flora populations.</p>

**Vegetation Condition**

Excellent; Vegetation structure intact; disturbance affecting individual species, weeds non-aggressive (Keighery, 1994).

to

Completely Degraded: No longer intact; completely/almost completely without native species (Keighery, 1994).

**Soil type**

The application area is mapped as the following landform types:

**Jelcobine York Subsystem:** Areas of soils derived from freshly exposed rock. This unit is typified by the red soils of the Avon Valley but also includes areas of similar, but often greyer and lighter textured soils to the east of the valley;

**Steep Rocky Hills 2 Subsystem (Jc):** Areas of steep, rocky hills;

**Avon Subsystem (Jelcobine):** Alluvial terraces and floodplains that occur adjacent to the Avon, lower Mortlock and lower Dale rivers;

**Williams Subsystem (Jelcobine):** Valley floors of the major tributary streams in the western part of the survey area;

**Hamersley Subsystem (Jc):** Narrow, minor drainage lines that occur predominantly within the York unit and lead down to major drainage systems such as the Avon and Dale rivers;

**Leaver Subsystem:** Gravelly slopes and ridges of the western Darling Plateau. Gravelly yellow and red duplexes, gravelly deep clayey sands and sandy loams over laterite and clay. *C. calophylla*, *Banksia* spp., *Adenanthos* with *E. wandoo* and *E. marginata* on clay;



**Yalanbee Subsystem (253By);** Undulating, Darling Range upland. Pisolitic gravelly, yellowish brown soils that vary from loamy sands to clays, with pockets of pale sands and rock. *E. marginata* and *C. calophylla* and *Banksia* on sand, *E. wandoo* clays and *E. accedens* on crests;

**Clackline, Steep Rocky Hills 1 Subsystem:** Areas of rock outcrop and steep rocky hills;

**Michibin Subsystem:** Gentle to moderate hill slopes of freshly weathered soils. Red and yellowish brown loams and clays, often gravelly with rocky areas and lateritic crests. *E. loxophleba* and *E. wandoo*. *Casuarina* on rock and *E. marginata* and *E. accedens* on gravel;

**Yalanbee Subsystem (253Wn):** Residual plateau at the top of the landscape shallowly dissected by Pindalup valleys. Pisolitic gravelly, yellowish brown soils that vary in texture from loamy sands to clays, with pockets of pale sands and areas of outcropping laterite;

**Pindalup 4 Phase:** Valley floors with imperfectly drained yellow duplex soils and yellow and brown massive earths. *C. calophylla* woodland with some *E. rudis* in drainage depressions and *Acacia* spp.;

**Pindalup 1 Phase:** Very gently to gently inclined sideslopes (<10%) with well drained gravelly brownish sands, pale brown sands and earthy sands. *E. wandoo* woodland with some *E. loxophleba* and *Acacia* spp.; and

**Pindalup 5 Phase:** Broad, level to gently inclined (<5%) valley floors with very poorly drained uniform grey or brown clays or clay loams (DAFWA, 2017).

#### Comments

The description and condition of the vegetation in the application area was determined from a site inspection conducted by officers of the former Department of Environment Regulation (DER) (now Department of Water and Environmental Regulation [DWER]) on 17 February 2017 (DER, 2017) and from biological surveys undertaken by AECOM which contained a flora and fauna assessment in Spring 2015, February 2016 and Spring 2016 (AECOM, 2016a; MRWA ,2017b).



Fig 1: Map of the application area



## Part 2: Assessment against matters of national environmental significance

### 3. Assessment of application against Matters of National Environmental Significance

#### Background

Main Roads Western Australia (MRWA; the applicant) proposes to clear 54.87 hectares (ha) of native vegetation within various road reserves and properties for the purpose of widening the Toodyay Road for safety improvements.

The applicant advised that the "Wheatbelt has been identified as having some of the most dangerous roads in Western Australia, with Toodyay Road ranked as the highest risk route in WA. The Wheatbelt section of Toodyay Road has a crash rate which is 5 times the State average" (MRWA, 2017b).

The applicant advised that for the Wheatbelt section of Toodyay Road, a total of 50 crashes with 16 Killed or Seriously Injured (KSI) crashes were recorded over the last 5 years (2011 to 2015). MRWA Wheatbelt Region is proposing to improve the safety of Toodyay Road as a result of these serious safety concerns. This project will involve the widening of a section of the road from approximately SLK 12 to SLK 40, with realignments to remove substandard curves that impair driver vision. The project will also include; passing lanes, culvert extensions and additions; intersection upgrades and road realignments where required to provide passing opportunities, remove dangerous curves and improve sightline distances (MRWA, 2017b; MRWA, 2018b).

The application area is situated within the Avon Wheatbelt and Jarrah Forest Interim Biogeographic Regionalisation of Australia (IBRA) bioregion, Shire of Toodyay, approximately two kilometres south-west of the Toodyay town site.

The study area was surveyed by AECOM in spring 2015 (AECOM, 2016a). The study area was referred as "the environmental values within a 100-200 metre corridor along Toodyay Road for approximately 52 kilometres on both sides of the road between Toodyay and the Red Hill Waste Facility". This included a fauna assessment plus targeted surveys for black cockatoos. Significant trees, foraging and roosting habitat were targeted as per the referral requirements for the Commonwealth Department of the Environment and Energy (DoEE). A flora assessment was also undertaken by AECOM to identify threatened and priority flora species, vegetation type and condition and ecological communities (MRWA, 2017b). An additional survey was undertaken in February 2016 for the Wheatbelt section of Toodyay Road, to survey areas that were added to the project after the 2015 survey, and to provide additional data as per the rare and priority flora requirements of the former Department of Parks and Wildlife (Parks and Wildlife) at that time. Additional data provided to Parks and Wildlife, included the exact population counts of priority flora in the survey area, as well as clarification on the absence or presence of the Commonwealth-listed critically endangered 'Eucalypt Woodlands of the Western Australian Wheatbelt' (WA Wheatbelt Woodlands) threatened ecological community (TEC).

The applicant advised that due to an extremely dry summer, the February 2016 survey was not robust. An additional spring survey was then commissioned for 2016, to provide more vigorous flora population counts, survey additional areas added to the project design since February 2016, and address habitat data for red-tailed black cockatoos that was missing from the original report (MRWA, 2017b).

The AECOM biological assessment identified 21 native vegetation communities within the survey area and one planted (AECOM, 2016a). These included nine Eucalypt woodlands, eight wetlands, one heath community and four disturbed/degraded communities (as outlined within section 2). Of the 22 communities, five are considered significant (CcXpHh, EaXpBe, EdBn, EwBsLp and EwGtAl) as they support populations of priority flora species. Furthermore, an additional two communities are significant as they support a unique composition of species in Morangup Nature Reserve (MRWA, 2017b).

The vegetation in the application area is in an Excellent to a Completely Degraded (Keighery, 1994) condition (DER, 2017; MRWA, 2017b).

## Description of controlling provision

On 8 April 2016, the project was determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the following controlling provisions: Listed Threatened Species and Communities. The proposed action is considered likely to have a significant impact on Carnaby's cockatoo (*Calyptorhynchus latirostris*) listed as endangered under the EPBC Act, forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) listed as vulnerable under the EPBC Act and Baudin's cockatoo (*Calyptorhynchus baudinii*) listed as vulnerable under the EPBC Act. Throughout the following assessment these three species will be collectively referred to as black cockatoos.

The proposed action also has the potential to significantly impact the vulnerable chuditch (*Dasyurus geoffroi*), and the critically endangered WA Wheatbelt Woodlands TEC.

### Carnaby's cockatoo

Currently, the overall population trend for the Carnaby's cockatoo is one of decline due to the loss and fragmentation of habitat as a result of clearing of native vegetation (Saunders 1990; Johnstone and Storr, 1998; Saunders and Ingram, 1998; Garnett et al., 2011). Carnaby's cockatoo is endemic to the south-west of Western Australia. Breeding takes place between late July and December and occurs mostly in the inland Wheatbelt region of its distribution, in areas receiving between 300 and 750 millimetres of annual average rainfall (Saunders, 1990). During the non-breeding season (January to July) the majority of the birds move to the higher rainfall coastal regions of their range including the midwest coast, swan coastal plain and south coast (Saunders, 1990; Saunders and Ingram, 1998; Johnstone et al., 2011).

Carnaby's cockatoo preferred habitat is remnant native eucalypt woodlands, especially those of salmon gum (*Eucalyptus salmonophloia*) and wandoo (*Eucalyptus wandoo*), and in shrubland or kwongan heathland dominated by plants of the Proteaceae family. It also occurs in forests containing marri, jarrah, karri (*Eucalyptus diversicolor*) and tuart (*Eucalyptus gomphocephala*) (Parks and Wildlife, 2013).

Carnaby's cockatoo nests in large hollows in tall, living or dead eucalypts. It nests most commonly in smooth-barked wandoo and salmon gum, but birds have also been recorded breeding in red morrell (*Eucalyptus longicornis*), York gum (*Eucalyptus loxophleba*), tuart, flooded gum (*Eucalyptus rudis*), swamp yate (*Eucalyptus occidentalis*), gimlet (*Eucalyptus salubris*) and marri, and are said to nest in any species of eucalypt with a suitable hollow (Parks and Wildlife, 2013).

The Carnaby's cockatoo recovery plan (Parks and Wildlife, 2013) summarises habitat critical to the survival of Carnaby's cockatoos as:

- the eucalypt woodlands that provide nest hollows used for breeding, together with nearby vegetation that provides feeding, roosting and watering habitat that supports successful breeding;
- woodland sites known to have supported breeding in the past and which could be used in the future, provided adequate nearby food and/or water resources are available or are re-established; and
- in the non-breeding season the vegetation that provides food resources as well as the sites for nearby watering and night roosting that enable the cockatoos to effectively utilise the available food resources.

The recovery plan also states that success in breeding is dependent on the quality and proximity of feeding habitat within 12 kilometres of nesting sites (Parks and Wildlife, 2013). Along with the trees that provide nest hollows, the protection, management and increase of this feeding habitat that supports the breeding of Carnaby's cockatoo is a critical requirement for the conservation of the species (Parks and Wildlife, 2013).

### Forest red-tailed black cockatoo

The forest red-tailed black cockatoo is endemic to the southwest humid and sub-humid zones of southwest Western Australia and inhabits jarrah, karri and marri forests receiving more than 600 millimetres of annual average rainfall (DEC, 2008).

The forest red-tailed black cockatoo occurs in one population of approximately 15,000 individuals and is known to nest in the large hollows of marri, jarrah and karri (Johnstone and Kirkby, 1999).

The main identified threats to the forest red-tailed black cockatoo are illegal shooting, habitat loss through land clearing, nest hollow shortage and competition from other species (DEC, 2008; DEWHA, 2009).

The forest red-tailed black cockatoo is listed as fauna that is rare or likely to become extinct under the Western Australian *Wildlife Conservation Act 1950* (WC Act) and currently has a ranking of vulnerable (Parks and Wildlife, 2014).

### Baudin's cockatoo

Baudin's cockatoo is endemic to a 2,000 kilometre area of the humid and sub-humid zones of southwest Western Australia and is generally contained within the 750 millimetre isohyet of average annual rainfall. This species is locally resident, but at the end of the breeding season (January), the birds move away from the breeding area and form flocks that move in response to changing food resources (DEC, 2008).

Baudin's cockatoo mainly feeds on the seeds of marri and nest in mature trees such as marri, karri, jarrah and Wandoo in the lower southwest of Western Australia (DEC, 2008).

The range of this species has declined by more than 50 per cent over the past 50 years (Garnett and Crowley, 2000). The principal cause of the decline in range was clearing of the eastern margins of the forests for agriculture and the current primary threat to the population is illegal shooting (DEC, 2008). The main identified threats to the Baudin's cockatoo are illegal shooting, habitat loss through land clearing, nest hollow shortage and competition from other species (DEC, 2008).

Baudin's cockatoo is listed as fauna that is rare or likely to become extinct under the WC Act and currently has a ranking of endangered (Parks and Wildlife, 2014).

### Chuditch

The chuditch is the largest carnivorous marsupial (family Dasyuridae) occurring in Western Australia. At the time of European settlement, chuditch were present in all mainland Australian States, and the Northern Territory, however they are now only present in approximately five per cent of their former range. Most chuditch are now found in varying densities throughout the jarrah forest and south coast of Western Australia (DEC, 2012).

Chuditch use a range of habitats including forest, mallee shrublands, woodland and desert. The most dense populations have been found in riparian jarrah forest. Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) and sufficient prey biomass (large invertebrates, reptiles and small mammals) to survive. They are capable of travelling long distances and have large home ranges, and even at their most abundant, chuditch are generally present in low numbers. For this reason they require habitats that are of a suitable size and not excessively fragmented (DEC, 2012).

The total chuditch population as of 2007 was estimated to be less than 10,000 individuals (DEC, 2007) with probably 75 per cent of these occurring in the eucalypt forests and woodlands, and mallee heath and shrublands of the south-west and south coast of Western Australia.

### Eucalypt Woodlands of the Western Australian Wheatbelt

The WA Wheatbelt Woodlands TEC was listed as critically endangered under the EPBC Act on 4 December 2015. This TEC is defined as eucalypt woodlands that formerly were the most common type of vegetation across the Wheatbelt landscape of south-western WA, i.e. inland between the Darling Range and western edge of the goldfields. This TEC is dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition.

The WA Wheatbelt Woodlands TEC is endemic to south-western WA. It occupies a transitional zone between the wetter forests associated with the Darling Range and the southwest coast, and the low woodlands, mallee and shrublands of the semi-arid to arid interior. This TEC is generally associated with the flatter, undulating relief, including drainage lines and saline areas. It does not typically occur on granite outcrops or hills of lateritic gravel but may extend to the base of outcrops, where they are replaced by non-eucalypt woodlands or shrublands (TSSC, 2015).

The WA Wheatbelt Woodlands TEC occurs in one of the most intensively cleared regions of Australia. Those woodland patches that remain are typically small, highly fragmented and have been disturbed to some extent. Table 3 of the EPBC Act *Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt* (Approved Conservation Advice) indicates the condition thresholds for this TEC, and describes key diagnostic factors including structure, remnant size, composition and condition factors to determine if this TEC is present (TSSC, 2015).

## **Summary of Impacts**

### Black cockatoos

According to DoEE's EPBC Act referral guidelines for Western Australia's three threatened black cockatoo species, the application area is within the known breeding range for Carnaby's cockatoo (SEWPaC, 2012). According to these guidelines, part of the application area is within an area where Baudin's cockatoo are likely to occur and forest red-tailed black cockatoos may occur.

The proposed clearing of 54.87 ha includes 1360 potential breeding trees for black cockatoo species and 94 hollows. Potential breeding trees 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. For most tree species, suitable DBH is 500 millimetres. For salmon gum and wandoo, suitable DBH is 300 millimetres.

The vegetation within the application area also consists of no more than 33 ha of foraging habitat for Carnaby's cockatoo; 29.5 ha of foraging habitat for Baudin's black cockatoo; and no more than six ha of foraging habitat for red-tailed black cockatoo (MRWA, 2017b).

A site visit of the application area conducted by DER officers in February 2017 observed numerous potential breeding trees containing hollows suitable for black cockatoo species. In addition, the application area is located in a confirmed breeding area for Carnaby's cockatoos. Black cockatoos generally forage within a 12 kilometre radius of their nest site (SEWPaC, 2012). The application area contained foraging habitat for black cockatoos in an Excellent to Degraded (Keighery, 1994) condition and foraging evidence by black cockatoos in the form of chewed banksia and marri was located within the application area (DER, 2017).

The Carnaby's Cockatoo Recovery Plan notes that there are multiple reasons for the decline of Carnaby's cockatoos, however the decline to-date has primarily been brought about by the extensive clearing of nesting and feeding habitat (Parks and Wildlife, 2013). Loss of breeding habitat, together with foraging areas and watering sites within foraging distance of breeding sites is one of the key threatening processes contributing towards the decline of the species. In particular, the loss or degradation of feeding habitat adjacent to breeding sites is considered to pose the greatest risk to Carnaby's cockatoos (Parks and Wildlife, 2013). Additionally, the long-term survival of Carnaby's cockatoos depends on the availability of suitable breeding habitat and tree hollows, and foraging habitat capable of providing enough food to sustain the population (Parks and Wildlife, 2013).

The Recovery Plan for forest red-tailed black cockatoo and Baudin's cockatoo states that critical habitat for the survival of important populations of these species comprises all marri, karri and jarrah forests, woodlands and remnants in the south-west of Western Australia receiving more than 600 millimetres of annual average rainfall (DEC, 2008). The Recovery Plan also states that two of the main threats is habitat loss through land clearing and nest hollow shortage (DEC, 2008). As the application area contains suitable foraging habitat for the forest red-tailed black cockatoo and Baudin's cockatoo, and may provide nest hollows for breeding, the application area contains important habitat for these species.

Given the application area is located in a confirmed breeding area for Carnaby's cockatoos and contains 1360 potential breeding trees for black cockatoo species and 94 hollows, the breeding habitat within the application area is likely to contain critical habitat for Carnaby's cockatoo. In addition, as the application area comprises of up to 33 ha of foraging habitat for black cockatoos, the application area is considered important for the long term protection of black cockatoos.

### **Chuditch**

The chuditch is known to occur in the local area. A targeted chuditch survey was undertaken in late 2016 (AECOM, 2016b). No indirect evidence of the chuditch was recorded along transects in any of the vegetation units/habitats searched and no chuditch were recorded in the survey area utilising camera traps. It is believed that the chuditch would be at low abundance, if present (AECOM, 2016b).

The application area contains linear corridors and 32.5 ha of suitable habitat that may be utilised by the chuditch to move through the area, if present (AECOM, 2016b). Given the application area comprises 32.5 ha suitable habitat for chuditch, the habitat may be critical to the survival and maintenance of important chuditch populations.

### **Eucalypt Woodlands of the Western Australian Wheatbelt**

The Approved Conservation Advice for the WA Wheatbelt Woodlands TEC indicates that further clearing and fragmentation of this TEC should be avoided or restricted (TSSC, 2015). The Approved Conservation Advice also states that where there are likely to be potentially significant impacts to the ecological community, proposals should be explicit about the total and cumulative impacts of an activity. This is most relevant for activities planned to be undertaken in stages, or that comprise a series of related projects but are effectively one broader activity in terms of impacts, such as road works undertaken in stages.

AECOM visited patches of native vegetation within the study area that are located in the Avon Wheatbelt IBRA region and assessed to determine whether the WA Wheatbelt Woodlands TEC occurred within the study area. The report states that a total of 14.30 ha of woodland native vegetation was considered to potentially represent the *Eucalyptus* woodlands of this TEC as these patches occur within the Wheatbelt bioregion portion of the study area (majority of the area of impact is within the northern jarrah forest). The AECOM biological assessment stated that all vegetated sections of the survey corridor were traversed on foot and the vegetation was assessed against the key diagnostic features and condition thresholds as published in the Approved Conservation Advice (AECOM, 2016a).

In the December 2016 Impact Assessment, the applicant advised that no more than 10 ha of the WA Wheatbelt Woodlands TEC is proposed to be cleared (MRWA, 2017a). In an updated January 2017 Impact Assessment, the applicant advised that following receipt of advice from Parks and Wildlife it had been identified that the vegetation in the survey area did not meet the definition of this TEC (MRWA, 2017b).

As discussed in the assessment under Part 3, Principle (d), the applicant commissioned Woodman Environmental to undertake additional spring surveys in all patches of vegetation within the survey area potentially representative of the TEC (MRWA, 2017c). Woodman Environmental mapped a total of 0.43 hectares of the WA Wheatbelt Woodlands TEC within the survey area, with a maximum of 0.004 hectares of this TEC within the application area (MRWA, 2017c).

The applicant advised that the mapped patch occurs on the edge of Toodyay town site and has been subject to weed invasion and also has a low species diversity (MRWA, 2017c).

The applicant provided an updated version of the Toodyay Road Widening and Upgrade Works: Wheatbelt Woodland Threatened Ecological Community Survey report (Woodman, 2018), which included additional information within Appendix F, such as photographs and additional field notes and shapefiles of the site locations referred to in the report. The additional information and clarification provided by the applicant confirmed that the assessment undertaken by Woodman Environmental was appropriate and that therefore the application area comprises of 0.004 hectares of the WA Wheatbelt Woodland (MRWA, 2018b).

Given the above, the vegetation within the application area comprises of 0.004 hectares of TEC. Noting the amount is relatively small, 0.004 hectares within a 0.43 hectare patch and the TEC patch has been subject to weed invasion, the proposed clearing is not likely to have a significant impact on this TEC.

## Public consultation

The clearing application was advertised for public comment online on 3 February 2017 and in *The West Australian* newspaper on 6 February 2017. The public comment period ended on 24 February 2017.

One public submission was received regarding potential impacts on fauna habitat and the Eucalypt Woodlands of the Western Australian Wheatbelt and provided recommendations for offsets.

On 16 May 2017, DER wrote to the applicant, requesting a response to the public submission. On 18 May 2017 the applicant provided a response to the public submission, which is available to view online at <ftp://ftp.dec.wa.gov.au/Permit> (reference CPS 7431/1).

## Avoidance, mitigation and offset

### Avoidance and Mitigation

The applicant advised that the project has been "modified several times to minimise clearing as far as possible, and that every effort has been made to protect environmental features during project development" (MRWA, 2017c), including:

- An entire population of *Hibbertia montana* (Priority 4) (1770 plants) were removed from the project. The design was amended to retain 60 per cent of the individuals and no more than 792 *Hibbertia montana* will be removed for the project;
- A number of priority flora were identified adjacent to the road in the project envelope. The design has attempted to 'weave' in between populations of priority flora and black cockatoo habitat trees, where safety allows. The envelope was modified and priority flora clearing has been minimised where possible. The number of *Grevillea candolleana* (Priority 2) plants that were to be removed for the project was reduced from 13 to 10, which accounts for 3.6 per cent of this species recorded in the spring survey. A total of 37 *Boronia scabra* subsp. *condensata* (Priority 2) plants were to be removed for the project. This has been reduced to 10 plants, and accounts for 3.11 per cent of this species recorded in the spring surveys;
- The project was amended to avoid removing any vegetation associated with the Morangup Nature Reserve;
- The locations of potential breeding trees for black cockatoos identified in the spring survey were provided to the designers, and changes made to the design to minimise the number of trees to be removed;
- One known black cockatoo breeding tree was observed to be in use during the spring survey in 2015. This tree is outside the project design;
- The applicant owns a parcel of land which was identified as Eucalypt woodland in Good condition (Keighery, 1994), and dieback free. Drainage control was implemented to reduce the risk of dieback infestation at this location. Further, the applicant is liaising with the local government to assess whether an old school on this parcel of land meets the criteria to be included in the municipal register. The applicant is proposing to include this block into the adjacent landowner's holdings, and to place a conservation covenant on it;
- The project was surveyed for dieback infestation, and the project design was modified to include drainage along protectable features such as the Morangup Nature Reserve, to prevent water runoff from the road that could potentially result in dieback contamination and spread;
- No clearing is permitted for site offices or laydown. The project will utilise existing cleared areas for these facilities;
- Three dams around east of Sandplain Road and Salt Valley Road are known to be used by fauna in the local region. The project has been modified to prevent impacts to one of the three dams, the others will be reconstructed;
- Consultation with the Whadjuk and Ballardong Aboriginal groups has resulted in requests to minimise the impacts to waterways, where possible. The applicant is investigating the viability of waterway improvements along the road where works are conducted, including potential for planting riparian vegetation to reduce sedimentation. This will be dependent upon final design and the width of the road reserve at these locations, as well as the condition of adjacent vegetation;
- Three waterways were originally to be impacted by the project. The project design has been changed, with batters steepened, in order to prevent construction in river beds and modifications to waterways at these locations;
- Chuditch was identified as a species potentially impacted by the project. A detailed survey was undertaken in late 2016. No chuditch were observed and no indirect evidence of chuditch was found in the survey area. Up to 32.5 ha of potential chuditch habitat will be cleared for the project;
- Where possible, driveways and other access points were provided in already cleared locations, providing it was safe to do so;
- A number of offset options were considered for this project, including the revegetation of the roadside corridor to replace fauna linkages removed for the project. Unfortunately this was not considered a viable offset option as the road corridor is not able to be placed under a Conservation Covenant due to its long linear nature that is subject to edge effects; and
- Moving the road was also considered, to avoid clearing native vegetation. This was not considered feasible due to landowner and stakeholder issues, as well as budgetary constraints. The widening of Toodyay Road is costing an average of \$880,000 per kilometre, the realignment sections are in excess of \$2.8 million per kilometre. Realignment is not considered feasible for this road length (MRWA, 2017c).

### Offset

The applicant identified the following significant residual environmental impacts associated with the proposed clearing:

- Up to 33 hectares of foraging habitat for Carnaby's cockatoo to be cleared;
- Up to 29.5 hectares of foraging habitat for Baudin's cockatoo to be cleared;
- Up to 6 hectares of foraging habitat for red-tailed black cockatoo to be cleared;
- Up to 1360 breeding trees for black cockatoo species and 94 hollows to be cleared;
- Up to 32.5 hectares of chuditch habitat to be cleared;
- Clearing of three Priority flora species, *Grevillea candolleana* (Priority 2), *Boronia scabra* subsp. *condensata* (Priority 2) and *Hibbertia montana* (Priority 4);

- Up to 1,573 hectares of wetland vegetation and 1,965 ha of riparian vegetation; and
- 38.5 hectares of the vegetation to be cleared is within an extensively cleared landscape.

To counterbalance the above impacts associated with matters of national environmental significance, the applicant proposed an offsets package that consists of the acquisition of 150 hectares of native vegetation in the Shire of Toodyay. The acquired land is proposed to be added to the Department of Biodiversity, Conservation and Attractions (DBCA) conservation estate and will also be placed under a conservation covenant to be managed in perpetuity for conservation (MRWA, 2018c). DBCA advised that they approve the identified site as an addition to their conservation estate.

In assessing whether the proposed offset is adequately proportionate to the significance of the environmental values being impacted, the DWER undertook a calculation using the Commonwealth Offsets Assessment Guide. The calculation indicated that 175 hectares of native vegetation in an excellent condition is required to counterbalance the above impacts. The native vegetation is to include:

- 175 hectares of foraging habitat for Carnaby's cockatoo and potential breeding trees;
- 107 hectares of foraging habitat for Baudins cockatoo;
- 22 hectares of foraging habitat for red-tailed black cockatoo;
- 94 hectares of chuditch habitat; and
- 134 hectares of vegetation in an extensively cleared landscape.

The offset proposal also includes the installation of 188 artificial nesting hollows into the Offset site, Morangup Nature Reserve and/or Woondowing Nature Reserve.

Given the above, the acquisition of 175 hectares into conservation estate is considered adequate to counterbalance the significant residual impacts to black cockatoo habitat, chuditch habitat and a significant remnant in a highly cleared landscape is consistent with the *EPBC Act Environmental Offsets Policy October 2012* and *WA Environmental Offsets Policy September 2011*.

It is noted that DWER considers the installation of 188 artificial hollows into the Offset site, Morangup Nature Reserve and/or Woondowing Nature Reserve will mitigate the impacts to the proposed clearing of 94 potential breeding hollows.

The applicant advised that the *Clackline Flora, Vegetation and Fauna Assessment* undertaken at the proposed offset property is provided as Appendix B of the Offset Proposal. Based on the results of this assessment, the applicant is confident that the proposed offset site contains sufficient potential breeding trees and suitable hollows to offset the Project impacts.

To provide further certainty to DoEE, the applicant proposed to undertake additional survey of the proposed offset site to quantify the number of potential breeding trees and the number of trees with hollows present. In addition, the applicant advised that the surveys will also identify whether there are enough trees to support 188 artificial hollows (MRWA 2018c). The applicant also advised that extensive consultation with DBCA will be undertaken to determine the most appropriate locations for the artificial hollows in the offset site. If the installation of all nesting hollows within the offset site is not considered appropriate, then the applicant will consult with DBCA to determine appropriate locations on nearby land (MRWA, 2018d); namely Morangup Nature Reserve and/or Woondowing Nature Reserve.

**Methodology**      References:  
                           MRWA (2017c)  
                           MRWA (2018c)  
                           MRWA (2018d)

### **Other relevant considerations**

The following advice has been provided by the applicant in the supporting documentation (MRWA, 2017a; MRWA, 2017b) provided to DoEE.

### **Economic and Social Matters**

The applicant has advised that the "project will employ 30-50 people and is expected to be constructed in stages, as funding permits. The total cost will be approximately \$66.9 million" (MRWA, 2017b).

The applicant has advised that the "project will increase safety, which is the main impetus; however will also increase freight efficiency and support development in the surrounding region. Congestion is expected to be reduced by 20-50%, safety improved by 10 to 39% (RPS, 2016). It is expected that road fatalities could reduce by up to 60% with the installation of passing lanes. Additionally, a study by the Bureau of Infrastructure, Transport and Regional Economics of 128 road and rail projects in Australia found that the economic return was \$2.65 for every \$1 invested" (MRWA, 2017b).

The applicant advised that the "State Government estimates that the Shire's population will increase to approximately 5,750 residents by 2031 which represents an increase of 23.9% from 2014. In 2013/2014, there were 2,540 vehicles per day on Toodyay Road west of Dryandra Road, and 2,000 vehicles per day north of Fernie Road, and between 218 and 348 heavy vehicles per day. An improvement to safety is a key driver and will remain an important issue as the population rises and traffic volumes increase" (MRWA, 2017b).



## Applicant's Environmental History

The applicant is a State agency and has a sound record of responsible environmental management and environmental management systems.

The applicant seeks to achieve balanced and sustainable outcomes for the community with responsible environmental stewardship in developing and maintaining the road network critical to its success. The applicant is committed to:

- protecting and enhancing the environmental values of road reserves;
- minimising the impact on the natural environment of roads and road use; and
- conserving natural resources and minimising energy consumption and waste.

A corporate Environmental Management System facilitates management of environmental risks and performance improvement. The independently certified and audited system is integrated into all key processes including planning, delivery, maintenance, network operations and supporting services.

The applicant holds Certificate No. EMS 530437 and operates an Environmental Management System which complies with the requirements of ISO 14001:2004 for the following scope: Main Roads Total Management System comprising Planning, Delivery, Maintenance, Network Operations and Supporting Services. Officially registered since 14 July 2005 under Certificate 149459.

## Part 3: Assessment against the clearing principles

### Assessment of application against clearing principles

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

#### Proposed clearing is at variance to this Principle

The applicant proposes to clear 54.87 ha of native vegetation within various road reserves and properties between SLK 12.75 to SLK 40.30, for the purpose of widening the Toodyay Road for safety improvements.

The application area was surveyed by AECOM Pty Ltd in spring 2015 (AECOM, 2016a). This included a fauna assessment plus targeted surveys for black cockatoos. Significant trees, foraging and roosting habitat were targeted as per the referral requirements for DoEE. A flora assessment was also undertaken by AECOM to identify threatened and priority flora species, vegetation type and condition and ecological communities (MRWA, 2017b). An additional survey was undertaken in February 2016 for the Wheatbelt section of Toodyay Road, to survey areas that were added to the project after the 2015 survey, and to provide additional data as per the former Parks and Wildlife (now DBCA) requirements regarding rare and priority flora. Additional data provided to Parks and Wildlife, included the exact population counts of priority flora in the survey area, as well as clarification on the absence or presence of the WA Wheatbelt Woodlands TEC.

The applicant advised that due to an extremely dry summer, the February 2016 survey was not robust. An additional spring survey was then commissioned for 2016, to provide more vigorous flora population counts, survey additional areas added to the project design since February 2016, and address habitat data for red-tailed black cockatoos that was missing from the original report (MRWA, 2017b).

As discussed within Part 2, the AECOM biological assessment identified 22 native vegetation communities within the survey area, including one planted (AECOM, 2016a). These included nine Eucalypt woodlands, eight wetlands, one heath community and four disturbed/degraded communities. Of the 22 communities, five are considered significant (CcXpHh, EaXpBe, EdBn, EwBsLp and EwGtAl, as outlined in Table 1) as they support populations of priority flora species and/ or have unique vegetation composition (MRWA, 2017b):

Table 2: Vegetation communities considered to be significant for priority flora

Vegetation community	Description and condition	Ha to be cleared
CcXpHh	<i>Corymbia calophylla</i> and <i>Eucalyptus marginata</i> mid open forest to woodland over <i>Xanthorrhoea preissii</i> , <i>Banksia sessilis</i> var. <i>sessilis</i> and <i>Acacia pulchella</i> mid to tall sparse shrubland over <i>Hibbertia hypericoides</i> , <i>Tetraria octandra</i> and <i>Phyllanthus calycinus</i> low open shrubland. Condition ranged from Completely Degraded to Very Good. This community is significant due to the presence of a large population of <i>Hibbertia montana</i> .	10.24
EwGtAl	<i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> , <i>Corymbia calophylla</i> and <i>Eucalyptus accedens</i> mid open forest over <i>Gastrolobium truncatum</i> , <i>G. parviflorum</i> and <i>Xanthorrhoea preissii</i> mid open shrubland over <i>Acacia lasiocarpa</i> var. <i>sedifolia</i> , <i>Opercularia vaginata</i> and <i>Hakea lissocarpa</i> mid open heath shrubland. The community was considered in Very Good to Excellent condition. This community is significant due to the presence of Priority flora populations including <i>Boronia scabra</i> subsp. <i>condensata</i> , <i>Calytrix oncophylla</i> , <i>Grevillea candolleana</i> and <i>Hibbertia montana</i> .	8.979
EwBsLp	<i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> and <i>Corymbia calophylla</i> mid woodland over <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> , <i>Leptospermum erubescens</i> and <i>Banksia sessilis</i> var. <i>sessilis</i> tall shrubland over <i>Leucopogon propinquus</i> , <i>Dillwynia laxiflora</i> and <i>Hibbertia commutata</i> low isolated heath shrubland. This community is in Good condition. This community is significant due to the presence of Priority flora populations.	0.459
EaXpBe	<i>Eucalyptus accedens</i> , <i>Eucalyptus wandoo</i> subsp. <i>wandoo</i> and <i>Corymbia calophylla</i> mid open forest over <i>Xanthorrhoea preissii</i> , <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> and <i>Acacia pulchella</i> var. <i>pulchella</i> mid to tall isolated clumps of shrubs over <i>Bossiaea eriocarpa</i> ,	7.24

	<i>Petrophile divaricata</i> and <i>Astroloma epacridis</i> low open shrubland. Condition was Good to Excellent. This community is significant due to the presence of Priority flora populations including <i>Boronia scabra</i> subsp. <i>condensata</i> , <i>Calytrix oncophylla</i> and <i>Grevillea candolleana</i> .	
EdBn	<i>Eucalyptus drummondii</i> mid isolated trees over <i>Banksia nivea</i> subsp. Morangup (P2), <i>Kunzea micrantha</i> subsp. <i>micrantha</i> and <i>Hakea incrassata</i> low heathland. EdBn was in Excellent condition, situated mostly in Morangup Nature Reserve on sandy clay red soils. This community lacks a tall to mid shrub stratum. The area is seasonally damp and incorporates a unique floristic composition including two Priority flora populations. For this reason community EdBn is considered significant.	0.1

The vegetation in the application area is in an Excellent to a Completely Degraded (Keighery, 1994) condition (DER, 2017; MRWA, 2017b).

The AECOM survey identified 362 native flora taxa, representing 161 genera and 54 families. The most abundant families included Fabaceae (pea family) with 62 species, Myrtaceae with 33 species and Proteaceae with 32 species. Native species represented 90 per cent of all species collected (AECOM, 2016a).

The AECOM survey identified seven priority flora species within the survey area in the September and November 2015 field surveys. Follow-up surveys in February and September 2016 mapped population boundaries and counted the number of individuals for the species identified, including *Banksia nivea* subsp. Morangup (P2), *Boronia scabra* subsp. *condensata* (P2), *Calytrix oncophylla* (P2), *Grevillea candolleana* (P2), *Verticordia citrella* (P2), *Hibbertia montana* (P4) and *Caladenia integra* (P4) (AECOM, 2016a).

*Grevillea candolleana* (P2) is a spreading shrub, growing to 0.2-0.8 metres high. It has white to cream flowers and flowers from August to September. It has been recorded on laterite and laterite loamy soils and hillsides. This species is known from 16 populations from 5 locations over a small range of approximately 43km East-West and 25km North-South between Lower Chittering, Toodyay and Clackline (Parks and Wildlife, 2017a). AECOM's targeted searches in 2015 and 2016 identified a total of 276 individuals and up to 10 plants are within the application area (MRWA, 2017b). Parks and Wildlife advised that the proposed clearing of 10 plants would not be considered to have a significant impact on the conservation of this species (Parks and Wildlife, 2017a).

*Boronia scabra* subsp. *condensata* (P2) is an erect shrub, growing to 0.25-0.7 metres high. It has pink flowers and flowers in August. It has been recorded on sandy clay or gravel soils on upper slopes and edges of lateritic breakaways. This species is known from 5 locations and at two of these locations, plants have not been observed since the 1980's (Parks and Wildlife, 2017a). AECOM's survey identified a total of 321 *B. scabra* subsp. *condensata* plants from two distinct populations (MRWA, 2017b) which Parks and Wildlife advised are new locations and are located some distance from previously recorded locations (Parks and Wildlife, 2017a). Given this, populations in this local area are of conservation significance to this species.

The applicant advised that no more than 10 plants of the 321 plants are within the application area that are proposed to be cleared. Parks and Wildlife advised that the proposed clearing of 10 *Boronia scabra* subsp. *condensata* plants would not be considered to have a significant impact on the conservation of this species (Parks and Wildlife, 2017a). Parks and Wildlife also advised that disturbance to the habitat for this species should be minimised to avoid any unnecessary indirect or direct impact to this species.

*Hibbertia montana* (P4) is an erect, straggling or sprawling shrub, growing to 0.1-0.7 metres high. It has yellow flowers and flowers in July to October. It has been recorded on loam over granite, lateritic soils and gravel on granite rocks, lateritic ridges and boulders and hills. This species is known from approximately 15 locations over a range of 190km North-South and 100km East-West. This species has been recorded as locally frequent and common with some locations recording 100+, 500+ and 1000+ plants (Parks and Wildlife, 2017a). The application area is located within the known range of the species. The AECOM survey found a total of 1,909 plants in three populations within and extending beyond the study area (AECOM, 2016a). The applicant advised that no more than 792 of the 1,909 *Hibbertia montana* plants are within the application area. Parks and Wildlife advised that whilst this level of impact is high, this species will still be represented locally by those plants that remain and the proposed clearing would not be considered to have a significant impact on the conservation of this species (Parks and Wildlife, 2017a).

*Drosera sewelliae* (P2) is a fibrous-rooted, rosetted perennial herb, growing to 0.06 meters high, to 0.025 metres wide. It has orange flowers and flowers in October and has been recorded on laterite and silica sand soils. None of the AECOM surveys were undertaken during October, with the latest spring survey being undertaken between the 16<sup>th</sup> and 20<sup>th</sup> in November 2015 (AECOM, 2016a). Parks and Wildlife advised that given the surveys were not undertaken in October, *D. sewelliae* may not have been able to be reliably detected (Parks and Wildlife, 2017a). Parks and Wildlife advised that suitable habitat for this species may be present in four (CcXpBe, EaXpBe, EmXpBd and EwXpTo) of the 22 vegetation types mapped in the AECOM surveys (Parks and Wildlife 2017a). If *Drosera sewelliae* (P2) is present within the application area, the impacts could have the potential to be significant, however would depend on the proportional impact to the population (Parks and Wildlife, 2017a).

*Banksia nivea* subsp. Morangup (P2), *Verticordia citrella* (P2) and *Calytrix oncophylla* (P2) populations were also recorded in the AECOM surveys and are located adjacent to the application area (AECOM, 2016a). *Banksia nivea* subsp. Morangup (P2) and *Verticordia citrella* (P2) are only known from one location and *Calytrix oncophylla* (P2) is only known from two locations. Parks and Wildlife advised that given this, the populations of these species located adjacent to the application are considered locally and regionally significant and should be protected from indirect impacts (Parks and Wildlife, 2017a).



Priority flora species *Verticordia lindleyi* subsp. *lindleyi* (P4), *Beaufortia purpurea* (P3), *Lasiopetalum trichanthera* (P3), *Tetratheca pilifera* (P3), *Sowerbaea multicaulis* (P4), *Lasiopetalum glutinosum* subsp. *glutinosum* (P3), *Chordifex chaunocoleus* (P4) and *Verticordia serrata* var. *linearis* (P3) are all located within close proximity to the application area. Parks and Wildlife advised that if these species are impacted by the proposed clearing, the impact is not likely to be significant (Parks and Wildlife, 2017a).

The applicant provided an Environmental Management Plan (EMP) that includes management actions to assist in the protection of the Priority flora populations which are located adjacent to the application area (MRWA, 2017b). Management actions include pegging the approved clearing boundary and flagging Priority flora within 5 metres of the clearing boundary. The EMP also includes management actions to reduce dust from road works and changes to surface drainage. Whilst there is still the potential for indirect impacts to occur on Priority flora located adjacent to the application area, Parks and Wildlife advised that it is unlikely that these impacts will be significant to any of these species (Parks and Wildlife, 2017a).

No rare flora listed under the EPBC Act or the WC Act were identified during the AECOM surveys (AECOM, 2016a; MRWA, 2017b).

The application area comprises of 0.004 hectares of the WA Wheatbelt Woodlands TEC, which is discussed further in principle (d).

The application area is located within a confirmed breeding area for Carnaby's cockatoos and contains 1360 potential breeding trees for black cockatoo species and 94 hollows. The application area also comprises of up to 33 ha of foraging habitat for black cockatoos. In addition, the application area comprises of habitat for the chuditch and provides an important ecological linkage facilitating landscape connectivity and contributing to fauna dispersal between larger isolated bushland fragments. It is considered that the vegetation within the application area comprises significant habitat for indigenous fauna, which is discussed further in principle (b).

Noting that the mapped Beard vegetation associations (4 and 352), South West Forest Vegetation complexes Bi, Wi and Mi and the Avon Wheatbelt IBRA Bioregion retain less than the recommended 30 per cent threshold level, which is discussed further in principle (e), the application area provides an important ecological linkage, facilitates landscape connectivity and contributes to fauna dispersal between larger isolated bushland fragments in an extensively cleared area.

On the basis that the application area contains priority flora and significant habitat for threatened black cockatoos and chuditch, contains the critically endangered WA Wheatbelt Woodlands TEC and occurs within an area that has been extensively cleared, it is considered that the vegetation within the application area comprises a high level of biodiversity.

Given the above, the proposed clearing is at variance to this Principle.

Flora management measures implemented through the approved Environmental Management Plan will mitigate the impacts to priority flora.

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

#### **Proposed clearing is at variance to this Principle**

A search of NatureMap identified ten fauna species listed as rare or likely to become extinct under the WC Act within the local area (20 kilometre radius), including the woylie (*Bettongia penicillata* subsp. *ogilbyi*), forest red-tailed black cockatoo (*Calyptorhynchus banksii* subsp. *naso*), Baudin's cockatoo (*Calyptorhynchus baudinii*), Carnaby's cockatoo (*Calyptorhynchus latirostris*), bilby (*Macrotis lagotis*) and chuditch (*Dasyurus geoffroyi*) (Parks and Wildlife 2007-). The rainbow bee-eater (*Merops ornatus*) is protected under international agreement and has also been recorded within a 20 kilometre radius of the application area (Parks and Wildlife, 2007- ).

Carnaby's cockatoo (*Calyptorhynchus latirostris*) is listed as endangered under the EPBC Act, forest red-tailed black cockatoo (*Calyptorhynchus banksii* subsp. *naso*) listed as vulnerable under the EPBC Act and Baudin's cockatoo (*Calyptorhynchus baudinii*) listed as vulnerable under the EPBC Act.

According to DoEE's EPBC Act referral guidelines for Western Australia's three threatened black cockatoo species, the application area falls within the known breeding range for Carnaby's cockatoo (SEWPaC, 2012). According to these guidelines the part of the application area is within an area where Baudin's cockatoo are likely to occur and forest red-tailed black cockatoos may occur.

Carnaby's cockatoo nests in large hollows in tall, living or dead eucalypts. It nests most commonly in smooth-barked wandoo and salmon gum, but birds have also been recorded breeding in red morrell, York gum, tuart, flooded gum (*Eucalyptus rudis*), swamp yate (*Eucalyptus occidentalis*), gimlet and marri, and are said to nest in any species of eucalypt with a suitable hollow (Parks and Wildlife, 2013).

The application area was surveyed by AECOM in spring 2015. This included a fauna assessment plus targeted survey for black cockatoos. Significant trees, foraging and roosting habitat were targeted as per the referral requirements for DoEE's EPBC Act referral guidelines for Western Australia's three threatened black cockatoo species. An additional spring survey was conducted in spring 2016 to address habitat data for Red-tailed black cockatoos that was missing from the original report (MRWA, 2017b). A chuditch targeted survey for spring 2016 was also conducted to determine the presence and value of the application area to this species (AECOM, 2016b).

AECOM identified six fauna habitats in the application area:

- Eucalypt woodlands;
- Native Shrubland;
- Heath;
- Wetland;
- Isolated trees; and
- River (MRWA, 2017b).

The AECOM surveys recorded Carnaby's black cockatoo and the red-tailed black cockatoo in the application area. A survey of black cockatoo potential breeding trees identified 1360 potential breeding trees, of which at least 94 have hollows that provide nesting opportunities for black cockatoos (MRWA, 2017b; AECOM, 2016a). Potential breeding trees 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 DBH to develop a nest hollow. For most tree species, suitable DBH is 500 millimetres. For salmon gum and wandoo, suitable DBH is 300 millimetres. In addition, the application area is located in a confirmed breeding area for Carnaby's cockatoos. A site inspection conducted by former DER officers in February 2017 confirmed the presence of numerous potential breeding trees containing large hollows suitable for black cockatoo species (DER, 2017).

Black cockatoos have a preference for feeding habitat that includes jarrah and marri woodlands and forest heathland and woodland dominated by proteaceous plant species such as *Banksia* sp., *Hakea* sp. and *Grevillea* sp. (SEWPaC, 2012). The AECOM surveys also identified that the vegetation within the application area consists of:

- Up to 33 ha of foraging habitat for Carnaby's cockatoo, of which 59.8 per cent is in Degraded or Completely Degraded (Keighery, 1994) condition and 40.2 per cent is in good (Keighery, 1994) or better condition;
- Up to six ha of foraging habitat for the red-tailed black cockatoo, of which 99.9 per cent is in a Good or better condition; and
- Up to 29.5 ha of foraging habitat for the Baudin's black cockatoo, of which 58% is in a Degraded or Completely Degraded (Keighery, 1994) condition and 42 per cent in a Good (Keighery, 1994) or better condition (MRWA, 2017b).

Given the application area is located in a confirmed breeding area for Carnaby's cockatoos and contains 1360 potential breeding trees for black cockatoo species and 94 hollows, the breeding habitat within the application area is likely to contain critical habitat for Carnaby's cockatoo. In addition, as the application area comprises of up to 33 ha of foraging habitat for black cockatoos, the application area is considered important for the long term protection of black cockatoos.

The applicant advised that further impacts to black cockatoos will be managed through an Environmental Management Plan, by clearing breeding trees with hollows outside the breeding season wherever possible. "Where this is not possible, an assessment of hollows will be made and birds relocated" (MRWA, 2017b).

The chuditch has disappeared from approximately 95 per cent of their former range in the last 200 years. The primary causes of this reduction were habitat removal, the spread of introduced predators and active persecution by humans. Most chuditch are now found in varying densities throughout the jarrah forest and south coast of Western Australia (DEC, 2012). The most dense populations have been found in riparian jarrah forest. Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) and sufficient prey biomass (large invertebrates, reptiles and small mammals) to survive. They are capable of travelling long distances and have large home ranges, and even at their most abundant, chuditch are generally present in low numbers. For this reason they require habitats that are of a suitable size and not excessively fragmented (DEC, 2012). A DER site inspection found suitable habitat for the chuditch throughout the application area (DER, 2017).

A targeted chuditch survey was undertaken in late 2016 (AECOM, 2016b). No evidence of the chuditch was recorded along transects in any of the vegetation units/habitats searched and no chuditch were recorded in the survey area utilising camera traps. It is believed that the chuditch would be at low abundance, if present (AECOM, 2016b). The application area contains linear corridors and 32.5 ha of suitable habitat that may be utilised by the chuditch to move through the area, if present (AECOM, 2016b). Given the application area comprises 32.5 ha suitable habitat for chuditch, the habitat may be critical to the survival and maintenance of important chuditch populations and is considered significant habitat.

The Woylie were found across most of southern and central Australia prior to European settlement and the introduction of feral cats and foxes. The woylie is endemic to the south-west of WA but they are now only known from two areas: Upper Warren and Dryandra Woodlands. There are also translocated populations at Batalling, and inside fenced areas in Mt Gibson, Karakamia and Whiteman Park and also in New South Wales and South Australia, and on islands in SA (DBCA, 2017). The application area is not likely to comprise of habitat for the Woylie.

The Bilby used to exist across most of the arid and semi-arid areas of mainland Australia. In Western Australia, the bilby is now largely restricted to the Gibson, Little Sandy and Great Sandy Deserts, and parts of the Pilbara, Dampierland, Central Kimberley and Ord-Victoria Plains bioregions (DBCA, 2017). The application area is not likely to comprise of habitat for the Bilby.

The rainbow bee-eater occurs in numerous habitats including open forests and woodlands, shrublands, in cleared or semi-cleared habitats such as areas of human habitation and farmland. It prefers open, cleared or lightly-timbered areas that are often, but not always in close proximity to permanent water (DotE, 2015). The application area may include suitable habitat for this species given the vegetation type and its close proximity to watercourses, however noting the highly mobile nature of this species it is considered that the proposed clearing is unlikely to significantly impact upon the conservation status of this species.

On the basis that the application area comprises significant habitat for black cockatoos, comprises of habitat for the chuditch

and provides an important ecological linkage facilitating landscape connectivity and contributing to fauna dispersal between larger isolated bushland fragments in an extensively cleared area, it is considered that the vegetation within the application area comprises significant habitat for indigenous fauna.

Given the above, the proposed clearing is at variance to this Principle.

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

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

According to available databases, 13 rare flora species have been recorded within a 20 kilometre radius of the application area.

Flora surveys undertaken by AECOM in Spring 2015, February 2016 and Spring 2016 did not identify any rare flora species within the area. The timing was acceptable for identification of the majority of conservation significant flora within the local area (AECOM, 2016a; MRWA, 2017b).

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

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

**Proposed clearing may be at variance to this Principle**

According to available databases, the application area is located within the mapped area within which the WA Wheatbelt Woodlands TEC is located.

The WA Wheatbelt Woodlands TEC was listed as critically endangered under the EPBC Act on 4 December 2015. This TEC is defined as eucalypt woodlands that formerly were the most common type of vegetation across the Wheatbelt landscape of south-western WA, i.e. inland between the Darling Range and western edge of the goldfields. This TEC is dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition.

The WA Wheatbelt Woodlands TEC is endemic to south-western WA. It occupies a transitional zone between the wetter forests associated with the Darling Range and the southwest coast, and the low woodlands, mallee and shrublands of the semi-arid to arid interior. This TEC is generally associated with the flatter, undulating relief, including drainage lines and saline areas. It does not typically occur on granite outcrops or hills of lateritic gravel but may extend to the base of outcrops, where they are replaced by non-eucalypt woodlands or shrublands (TSSC, 2015).

The WA Wheatbelt Woodlands TEC occurs in one of the most intensively cleared regions of Australia. Those woodland patches that remain are typically small, highly fragmented and have been disturbed to some extent. Table 3 of the Approved Conservation Advice indicates the condition thresholds for this TEC, and describes key diagnostic factors including structure, remnant size, composition and condition factors to determine if this TEC is present (TSSC, 2015).

AECOM visited patches of native vegetation within the study area that are located in the Avon Wheatbelt IBRA region and assessed to determine whether the WA Wheatbelt Woodlands TEC occurred within the study area. The report states that a total of 14.30 ha of woodland native vegetation was considered to potentially represent this TEC as these patches occur within the Wheatbelt bioregion portion of the study area (majority of the area of impact is within the northern jarrah forest). The AECOM biological assessment advised that all vegetated sections of the survey corridor were traversed on foot and the vegetation was assessed against the key diagnostic features and condition thresholds as published in the Approved Conservation Advice (AECOM, 2016a).

In the December 2016 Impact Assessment, the applicant advised that no more than 10 ha of the WA Wheatbelt Woodlands TEC is proposed to be cleared (MRWA, 2017a). In an updated January 2017 Impact Assessment, the applicant advised that following advice from Parks and Wildlife it had been identified that the vegetation in the survey area did not meet the definition of this TEC (MRWA, 2017b).

Parks and Wildlife advised DWER that upon review of the seven representative observation points that the consultants selected for verifying the presence of the WA Wheatbelt Woodlands TEC, it appears that not all the Eucalyptus Woodlands have been surveyed (Parks and Wildlife, 2017b). Parks and Wildlife advised that throughout the survey report the minimum patch sizes are not defined for any of the observation points, and that the report states that these patches fail to meet the criteria as this TEC, however does not use the full suite of diagnostic characteristics outlined in the Approved Conservation Advice (Parks and Wildlife, 2017b).

Parks and Wildlife advised DWER that patches of native vegetation which may represent the WA Wheatbelt Woodlands TEC found in the northern jarrah forest that received less than 600mm rain have not been surveyed (Parks and Wildlife 2017b). Parks and Wildlife advised that the boundary between eastern jarrah forest and Wheatbelt vegetation is not a fine line and that there are pockets of woodlands that appear very similar to this TEC in the area (Parks and Wildlife 2017b). Parks and Wildlife advised that there are additional patches mapped as likely to be this TEC around this area that apparently have not been surveyed patches, and that these patches should be considered using all attributes mentioned in the description/minimum condition outlined in the Approved Conservation Advice (Parks and Wildlife, 2017b).

Parks and Wildlife advised DWER that the survey has not provided the information required to determine if all patches are part of the WA Wheatbelt Woodlands TEC. It is recommended that the areas mentioned above are surveyed and the

diagnostic characteristics outlined in the Approved Conservation Advice applied to determine if patches are this TEC. The observation points selected for consideration have not been assessed using the key diagnostic characteristics outlined in the Approved Conservation Advice, and patches of vegetation mapped as *Eucalyptus* woodland that may constitute this TEC appear not to have been surveyed (Parks and Wildlife, 2017b).

The applicant commissioned Woodman Environmental to undertake additional spring surveys in all patches of vegetation within the survey area potentially representative of the TEC (MRWA, 2017c). Woodman Environmental mapped a total of 0.43 hectares of the WA Wheatbelt Woodlands TEC within the survey area, with a maximum of 0.004 hectares of this TEC within the application area (MRWA, 2017c).

The applicant advised that the mapped patch occurs on the edge of Toodyay town site and has been subject to weed invasion and also has a low species diversity (MRWA, 2017c)

DWER sought additional advice from DBCA on Woodman Environmental's diagnostic assessment of the quadrat data and the determination of certain quadrats. DBCA advised that the consultants had only applied selected key diagnostic characteristics in the approved Conservation Advice to the quadrat based dated and therefore the dominance, co-dominance, species present and condition for Wheatbelt woodland patches/occurrences may not be fully represented in the report provided (DBCA, 2018).

DWER sought further surveys and analysis on certain established quadrats, to determine if patches represented the TEC. DWER also requested additional details to be provided, including shapefiles and site observation data.

The applicant provided an updated version of the Toodyay Road Widening and Upgrade Works: Wheatbelt Woodland Threatened Ecological Community Survey report (Woodman, 2018), which included additional information within Appendix F, such as photographs and additional field notes and shapefiles of the site locations referred to in the report. The additional information and clarification provided by the applicant confirmed that assessment undertaken by Woodman Environmental was appropriate and that therefore the application area comprises of 0.004 hectares of the WA Wheatbelt Woodland (MRWA, 2018b).

The Approved Conservation Advice for the WA Wheatbelt Woodlands TEC indicates that further clearing and fragmentation of this TEC should be avoided or restricted (TSSC, 2015). The Approved Conservation Advice also states that where there are likely to be potentially significant impacts to this TEC, proposals should be explicit about the total and cumulative impacts of an activity (TSSC, 2015). This is most relevant for activities planned to be undertaken in stages, or that comprise a series of related projects but are effectively one broader activity in terms of impacts, such as road works undertaken in stages (TSSC, 2015).

Given the above, the vegetation within the application area comprises of 0.004 hectares of TEC. Noting the amount is relatively small, 0.004 hectares within a 0.43 hectare patch and the TEC patch has been subject to weed invasion, the proposed clearing is not likely to have a significant impact on this TEC.

Given the above, the proposed clearing may be at variance to this Principle.

Weed and dieback management practices will mitigate potential impacts to this occurrence of the TEC as a result of the proposed clearing.

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

#### **Proposed clearing is at variance to this Principle**

The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001).

As indicated in Table 2, Beard vegetation associations 4 and 352, South West Forest Vegetation complexes Bi, Wi and Mi and the Avon Wheatbelt IBRA Bioregion are less than the recommended 30 per cent retention threshold. On this basis it is considered that the application area is located within an extensively cleared area.

The application area provides an ecological linkage that is considered to facilitate landscape connectivity and contribute to fauna dispersal between larger isolated bushland fragments in an extensively cleared landscape. In addition, the vegetation within the application area includes significant habitat for black cockatoos and the chuditch, and contains the critically endangered WA Wheatbelt Woodlands TEC. On this basis the vegetation within the application area is considered to be significant as a remnant.

Given the above, the proposed clearing is at variance to this Principle.

**Table 2: Vegetation Extents**

	Pre-European (ha)	Current Extent (ha)	Remaining (%)	Extent in DBCA Managed Lands (%)
<b>IBRA Bioregion*</b>				
Avon Wheatbelt	9,517,109	1,763,063	19	10
Jarrah Forest	4,506,660	2,422,783	54	69
<b>Beard Vegetation Association in Avon Wheatbelt Bioregion*</b>				
4	10,333	1,929	19	5
352	630,581	109,441	17	9
<b>Beard Vegetation Association in Jarrah Forest Bioregion*</b>				
4	1,022,713	286,299	28	23
352	31,607	6,646	21	22
1006	44,908	21,794	49	46
3003	66,452	39,081	59	46
<b>South West Forest – Vegetation Complexes</b>				
Bi	36,054	10,531	29	2
Wi	28,984	7,662	26	0.3
Pn	167,149	128,674	77	60
S	53,658	40,732	76	64
Mi	168,040	43,815	26	5
D4	132,416	115,671	87	70
Y5	126,610	84,032	66	39
Ck	164,283	64,689	39	20
Y6	198,396	93,230	47	21

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

**Proposed clearing is at variance to this Principle**

The application area is intersected by a number of minor non perennial watercourses, a mapped basin geomorphic wetland and areas subject to inundation.

The applicant advised that no more than 1.57 ha of wetland vegetation and 1.97 ha of riverine vegetation is proposed to be cleared (MRWA, 2017b). The applicant advised that a 'bed and banks' permit under the *Rights in Water and Irrigation Act 1914* (RIWI Act) has been obtained for the project (MRWA, 2017b).

Based on the presence of watercourses and associated vegetation within the application area, it is considered that the application area includes vegetation that is growing in, or in association with, a watercourse or wetland.

Given the above, the proposed clearing is at variance to this Principle.

Although riparian vegetation is located within the application area, due to the presence of existing culverts and drainage infrastructure associated with the existing roadway, its removal is not likely to impact on the environmental values of the associated watercourses.

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

**Proposed clearing may be at variance to this Principle**

The soils within the application area have been mapped by Northcote et al. (1960-68) as soil types JZ2, Qb29, Tf3 and Oc30. These soil types are described as:

- JZ2: Dissected plateau having a gentle to moderately undulating relief, and with broad swampy drainage-ways and basins. It is characterized by lateritic gravels and block laterite: the chief soils are ironstone gravels with sandy and earthy matrices.
- Qb29: Rolling to hilly with some steep slopes; gneissic rock outcrops common: chief soils are hard neutral red soils.
- Tf3: Low hilly to hilly terrain that occupies a zone flanking unit. It comprises valleys that are frequently narrow and have short fairly steep pediments, along with breakaways, mesas, and occasional granite tors. Chief soils are hard acidic yellow mottled soils along with sandy acidic yellow mottled soils, all of which contain moderate to large amounts of ironstone gravels in their surface horizons.
- Oc30: River terraces. Chief soils are hard alkaline red soils.

Land degradation mapping indicates that a majority of the application area falls within the category for moderate wind erosion risk. Given the linear nature of the clearing, the proposed clearing is unlikely to result in appreciable land degradation in the form of wind erosion.

The clearing of native vegetation in the Wheatbelt region and its replacement with shallow rooted, annual cropping species has resulted in a rise in salinity and associated land degradation (DoW, 2005). Groundwater salinity mapped within 25 per cent of the application area is 14,000-35,000 milligrams per litre of total dissolved salts which is considered highly saline. Land degradation mapping also indicates a moderate to high salinity risk or presently saline (DAFWA, 2017) within portions of the application area, with a majority of the application area mapped as moderate to high salinity risk (DAFWA, 2017). Given this and noting that the local area is extensively cleared, the proposed clearing has the potential to increase land degradation in the form of salinity.

Although the application area is of a linear nature, portions of the application area are mapped as moderate to high salinity risk or presently saline and a high flood risk. Noting that the proposed clearing is located within an extensively cleared area, the proposed clearing may contribute to an increase in salinity and may cause appreciable land degradation.

The applicant advised that the project runs parallel to distributaries of the Swan River in a number of places and these areas have a high flood risk (MRWA, 2017b). The applicant also advised that correspondence from the Commissioner of Soil and Land Conservation identified a risk of soil erosion resulting from the project, due to steepness of batters and design of table drains (MRWA, 2017b).

The applicant advised that measures listed below can be implemented to reduce the flow velocity and subsequent risk of soil erosion:

- Economical channel lining (i.e. use of vegetation or rock).
- Off-shoot drains, levees and table drain blocks where practical.
- Appropriate sized culvert openings with the provision of wingwalls, headwalls, cut off walls, aprons and rock protection at the outlet when warranted.
- Provision of energy dissipating structures where required.

Given the above, the proposed clearing may be at variance to this Principle.

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

**Proposed clearing may be at variance to this Principle**

The application area is adjacent to Morangup Nature Reserve (R38924). The proposed clearing may impact adjacent conservation areas through the introduction and spread of weeds and dieback.

The application area provides an ecological linkage that is considered to facilitate landscape connectivity and contribute to fauna dispersal between larger isolated bushland fragments in an extensively cleared landscape. The vegetation within the application area is likely to act as an ecological linkage for fauna into adjacent conservation reserves.

Given the above, the proposed clearing may be at variance to this Principle.

Weed and dieback management measures implemented through an approved Environmental Management Plan will mitigate the impacts of the introduction and spread of weeds and dieback.

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

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

The clearing of native vegetation in the Wheatbelt region and its replacement with shallow rooted, annual cropping species has resulted in a reduction in water use by vegetation (evapotranspiration) (DoW, 2005). This has in turn caused a rise in watertables and mobilisation of salt previously stored deep within the soil profile (DoW, 2005).

The application area currently intersects a number of minor, non-perennial watercourses; a mapped basin geomorphic wetland and areas subject to inundation.

As discussed under Principle (f), the applicant advised that no more than 1.57 ha of wetland vegetation and 1.97 ha of riverine vegetation is proposed to be cleared, and that a 'bed and banks' permit under the RIWI Act has been obtained for the project (MRWA, 2017b).

The proposed clearing is unlikely to impact surface water as there are already culverts in place and additional clearing of watercourses is unlikely to be necessary.

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

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

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

The application area is located in a medium to low rainfall area, where the average rainfall is 600 to 800 millimetres per year.



Based on the low rainfall and the linear nature of the clearing, it is considered that the proposed clearing is unlikely to cause, or exacerbate the incidence or intensity of flooding.

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

#### **Planning instruments and other relevant matters.**

The proposed clearing of 54.87 ha is for the purpose of widening Toodyay Road for safety improvements between SLK 12.75 to SLK 40.30, within the Shire of Toodyay.

This application was received on 28 December 2016 and was formally accepted on 2 February 2017.

The application area is located within the Avon River Surface Water Area which is an area proclaimed under the RWI Act, where there may be a requirement to obtain a permit to interfere with the bed and banks of a water course. The former Department of Water (DoW) advised that the issue of a permit is not guaranteed but if issued will contain a number of conditions (DoW, 2017). The applicant is encouraged to contact the DoW Swan Avon Region Office to discuss water management options (DoW, 2017). The applicant advised that a Bed and Banks permit has been obtained for the works (MRWA, 2017b).

The applicant advised that a majority of the project is in a *Waterways Conservation Act 1976* Management Area, and is identified as a sensitive water resource in '*Water Quality Protection Note 44: Roads near sensitive water resources*'. The applicant advised that the project has been designed in accordance with the protection note so as to minimise impacts to waterways (MRWA, 2017b).

The application area intersects three Aboriginal Sites of Significance: Swan River, MGE#1 and MGE#2. It is the applicant's responsibility to ensure that these sites are not disturbed during the clearing process.

This application was advertised for public comment online on 3 February 2017 and in *The West Australian* newspaper on 6 February 2017 with a 21 day submission period. One public submission was received regarding potential impacts on fauna habitat and the WA Wheatbelt Woodlands TEC and provided recommendations for offsets. These concerns have been addressed in clearing principles (a), (b), (c), (d) and (e). On 18 May 2017, the applicant provided a response to the public submission, which is available to view online at [ftp://ftp.dec.wa.gov.au/Permit](http://ftp.dec.wa.gov.au/Permit) (reference CPS 7431/1).

A direct interest email was sent to the Shire of Toodyay on 2 February 2017. To date, no response has been received from the Shire.

#### **4. Applicant's Submissions**

- On 24 August 2017, a DWER Delegated Officer wrote to the applicant, outlining the abovementioned environmental impacts and recommended that measures to avoid and minimise impacts and invited the applicant to provide advice addressing the issues. The Delegated Officer advised that prior to determining an offset, DWER required all patches of native vegetation that may be representative of the WA Wheatbelt Woodlands TEC must be considered and assessed against the key diagnostic factors including structure, remnant size, composition and condition, to accurately determine extent of this TEC within the application area and the impacts of the proposed clearing. The Delegated Officer provided the applicant 30 days written notice to advise DWER on how they wish to proceed with the application;
- On 30 August 2017, the applicant wrote to DWER and advised that additional spring surveys will be conducted;
- On 26 October 2017, the applicant emailed DWER requesting an extension of time to provide additional information;
- On 27 October 2017, a DWER Delegated Officer granted an extension of time until the 15 December 2017;
- On 15 December 2017, the applicant provided a response to the issues raised in DWER's letter dated 24 August 2017. The applicant advised that 0.004 hectares of the WA Wheatbelt Woodlands TEC is proposed to be cleared;
- On 23 January 2017, a DWER Delegated Officer wrote to the applicant and advised that the survey and report provided did not contain the information needed to determine if all patches of native vegetation are representative of the WA Wheatbelt Woodlands TEC. DWER requested additional surveys and a revised analysis. The Delegated Officer provided the applicant 60 days written notice to advise DWER on how they wish to proceed with the application;
- On 12 February 2018 and 28 February 2018, the applicant provided further clarification on the survey efforts, including photographs, shapefiles, additional information and field notes;
- On 29 March 2018, the applicant provided a revised offset proposal;
- On 14 May 2018 and 6 June 2018, the applicant provided further information to support the offset proposal; and
- On 27 July 2018, the applicant provided comments on the draft clearing permit.

#### **5. References**

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GIS Database List

- SAC Bio datasets (February 2017)
- Hydrography, linear
- Aboriginal Sites of Significance
- RIWI Areas
- Hydrography, linear
- Groundwater Salinity
- Pre-European vegetation
- DPaW Estate
- Soils, statewide
- Salinity Risk