



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 8360/1
Permit Holder:	Water Corporation
Duration of Permit:	6 March 2020 – 6 March 2030

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

ADVICE NOTE

Allocation of pre-impact offset site

In 2016 the former Department of Environment Regulation accepted Reserve 24734, Rocky Gully, as a pre-impact offset site from the Water Corporation. This site was transferred into conservation estate in 2017. The Water Corporation has allocated 45 hectares of this pre-impact offset site as an offset for this Clearing Permit. The offset site contains foraging and potential breeding habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*), forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) and Baudin's cockatoo (*Calyptorhynchus baudinii*).

PART I – CLEARING AUTHORISED

1. Purpose for which clearing may be done

Clearing for the purpose of improving water supply to the towns of Balingup, Mullalyup and Kirup.

2. Land on which clearing is to be done

Lot 10 on Diagram 71544, Mullalyup
Lot 107 on Plan 72190, Mullalyup
Lot 11 on Plan 222858, Mullalyup
Lot 12 on Plan 222858 (Crown Reserve 10708), Mullalyup
Lot 13033 on Diagram 33990 (Crown Reserve 30597), Greenbushes
Lot 13122 on Plan 10273 (Crown Reserve 32659) 508854 Balingup
Lot 13656 on Plan 219732 (Crown Reserve 14719), Mullalyup
Lot 13731 on Plan 30415, (Crown Reserve 6890), Greenbushes
Lot 13801 on Plan 32953, (Crown Reserve 14719), Mullalyup
Lot 200 on Plan 301590, Balingup
Lot 2298 on Plan 229098, Greenbushes
Lot 3 on Diagram 63455, Balingup
Lot 475 on Plan 70508, Mullalyup
Lot 501 on Diagram 97470, Mullalyup
Lot 6 on Plan 10273, Balingup
Lot 6 on Plan 10273, Balingup
Lot 247 on Plan 167542, Balingup
Lot 250 on Plan 10273, Balingup
Lot 6367 on Plan 252367, Greenbushes
Lot 908 on Plan 102431, Balingup
Lot 909 on Plan 102432, Balingup
Railway reserve (PIN 508721), Balingup
Railway reserve (PIN 508856), Balingup

Railway reserve (PIN 1106757), Greenbushes
 Railway reserve (PIN 1039575), Kirup
 Railway reserve (PIN 12018773), Mullalyup
 Road reserve (PIN 11394172), Balingup
 Road reserve (PIN 11398451), Balingup
 Road reserve (PIN 11398466), Balingup
 Road reserve (PIN 11398471), Balingup
 Road reserve (PIN 11398472), Balingup
 Road reserve (PIN 11398474), Balingup
 Road reserve (PIN 11398477), Balingup
 Road reserve (PIN 11534877), Balingup
 Road reserve (PIN 11534882), Balingup
 Road reserve (PIN 11534884), Balingup
 Road reserve (PIN 11584733), Balingup
 Road reserve (PIN 11622106), Balingup
 Road reserve (PIN 11622621), Balingup
 Road reserve (PIN 11534863), Greenbushes
 Road reserve (PIN 11534869), Greenbushes
 Road reserve (PIN 11534870), Greenbushes
 Road reserve (PIN 11534872), Greenbushes
 Road reserve (PIN 11534873), Greenbushes
 Road reserve (PIN 1331797), Mullalyup
 Road reserve (PIN 11429772), Mullalyup
 Road reserve (PIN 11429778), Mullalyup
 Road reserve (PIN 11598631), Mullalyup
 Road reserve (PIN 11622105), Mullalyup
 State forest 20 (PIN 520796), Greenbushes
 State forest 21 (PIN 508362), Kirup
 Unallocated Crown Land (PIN 508858), Balingup
 Water feature (PIN 1249672), Balingup

3. Area of Clearing

The Permit Holder must not clear more than 4.81 hectares of native vegetation within the area hatched yellow on attached Plan 8360/1(a), Plan 8360/1(b), Plan 8360/1(c) and Plan 8360/1(d).

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

This Permit authorises the Permit Holder to clear native vegetation for the project activities described in condition 1 of this Permit to the extent that the Permit Holder has the power to carry out works involving clearing for those *project activities* under the *Water Corporation Act 1995* or any other written law.

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) Immediately prior to undertaking any clearing authorised under this Permit:

- (i) the area cross-hatched yellow on attached Plan 8360/1(a), Plan 8360/1(b), Plan 8360/1(c) and Plan 8360/1(d) shall be inspected by a *fauna specialist* who shall identify *black cockatoo nesting trees*; and
 - (ii) each *black cockatoo nesting tree* identified shall be inspected by a *fauna specialist* for evidence of current or past breeding use by *black cockatoos*.
- (b) Where a *black cockatoo nesting tree(s)* with evidence of current breeding use by *black cockatoos* is identified and cannot be avoided, that tree(s) shall be monitored by a *fauna specialist* to determine when it is no longer in use for that *breeding season*.
- (c) Any *black cockatoo nesting tree(s)* with evidence of current breeding use by *black cockatoos* shall not be cleared while it is in use as determined by the *fauna specialist* under condition 8(b) of this Permit.
- (d) Where a *black cockatoo nesting tree(s)* with evidence of past breeding use by *black cockatoos* is identified and cannot be avoided, that tree(s) shall only be cleared:
- (ii) later the same day of the inspection required under condition 8(a)(ii) of this Permit if that inspection does not identify evidence of current breeding use; or
 - (iii) later the same day of a repeat inspection undertaken by a *fauna specialist* if that inspection does not identify evidence of current breeding use.

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 tree(s)* cleared, identified under Condition 8;
- (b) The Permit Holder shall install at least 20 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 must be installed within the area hatched red on attached Plan 8360/1(e) being Lot 909 on Plan 102432, and Lot 2 on Diagram 51682, Balingup, vested with the Department of Biodiversity, Conservation and Attractions;
- (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 45 hectares of native vegetation within the area cross-hatched red on attached Plan 8360/1(f) for inclusion of native vegetation into the conservation estate managed by the Department of Biodiversity, Conservation and Attractions.

11. Direction of clearing

The Permit Holder shall conduct clearing in a slow, progressive manner from one direction to the other (e.g. west to east) to allow fauna to move into adjacent native vegetation ahead of the clearing activity.

PART III - RECORD KEEPING AND REPORTING

12. Records must be kept

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

- (a) In relation to the clearing of native vegetation authorised under this Permit:
 - (i) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
 - (ii) the date that the area was cleared;
 - (iii) the size of the area cleared (in hectares).
 - (iv) actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 6 of this Permit;
 - (v) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 7 of this Permit;
 - (vi) actions taken in accordance with condition 10 of this Permit; and
 - (vii) actions taken in accordance with condition 11 of this Permit.

- (b) In relation to fauna management pursuant to condition 8 of this Permit:
 - (i) the time(s) and date(s) of inspection(s) by the *fauna specialist*;
 - (ii) a description of the *fauna specialist* inspection methods employed;
 - (iii) the location of each *black cockatoo nesting tree* identified, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (iv) a description of the evidence of current or past breeding use observed for each *black cockatoo nesting tree* identified;
 - (v) a photo of each *black cockatoo nesting tree* with evidence of current or past breeding use identified;
 - (vi) for each *black cockatoo nesting tree* with evidence of current breeding use:
 - (1) the time and date it was determined to no longer be in use for that breeding season; and
 - (2) the evidence by which it was determined to no longer be in use for that breeding season *nesting tree* with evidence of current or past breeding use was cleared.
 - (vii) the time and date each *black cockatoo nesting tree* with evidence of current or past breeding use was cleared.

- (c) In relation to the installation of artificial black cockatoo nest hollows pursuant to condition 9 of this Permit:
 - (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) the dates each artificial *black cockatoo* nest hollow installed was monitored;
 - (v) a description of the monitoring methods employed for each artificial *black cockatoo* nest hollow installed;
 - (vi) a description of the monitoring observations for each artificial *black cockatoo* nest hollow installed;
 - (vii) the date(s) each artificial *black cockatoo* nest hollow installed was maintained;
 - (viii) a description of the maintenance activities undertaken for each artificial *black cockatoo* nest hollow installed; and
 - (ix) the total number of artificial hollows installed.

13. 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 12 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 6 December 2020, the Permit Holder must provide to the *CEO* a written report of records required under condition 12 of this Permit where these records have not already been provided under condition 13(a) of this Permit.

DEFINITIONS

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

black cockatoo(s) means Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorhynchus baudinii*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*);

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 *Eucalyptus salmonophloia* or *Eucalyptus wandoo*) that contain hollows suitable for nesting by Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo;

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

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

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

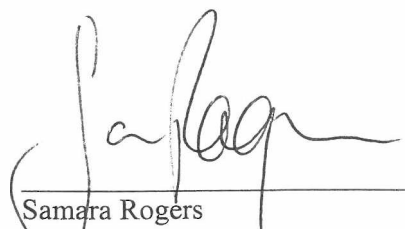
fauna specialist means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of two years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed, or who is approved by the *CEO* as a suitable fauna specialist for the bioregion, and who holds a valid fauna licence issued under the *Biodiversity Conservation Act 2016*.

fill means material used to increase the ground level, or 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.



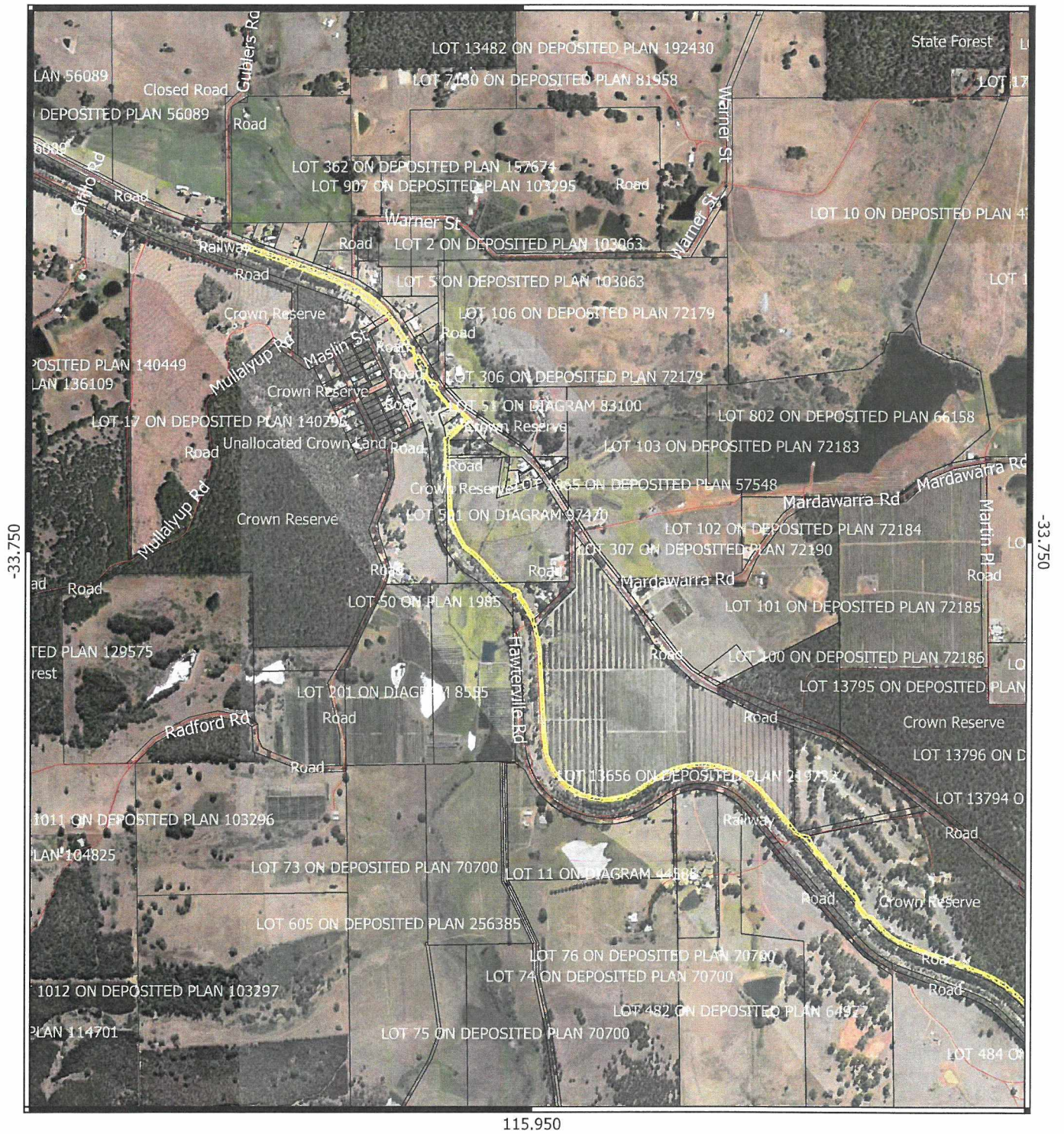
Samara Rogers
MANAGER
NATIVE VEGETATION REGULATION

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

3 February 2020

Plan 8360/1(b)

115.950



Legend

-  CPS areas approved to clear
-  Road Centrelines
-  Cadastre - LGATE 218
- Local Government Authorities



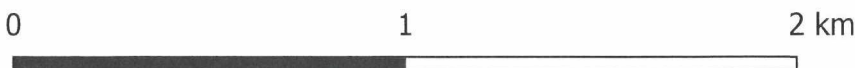
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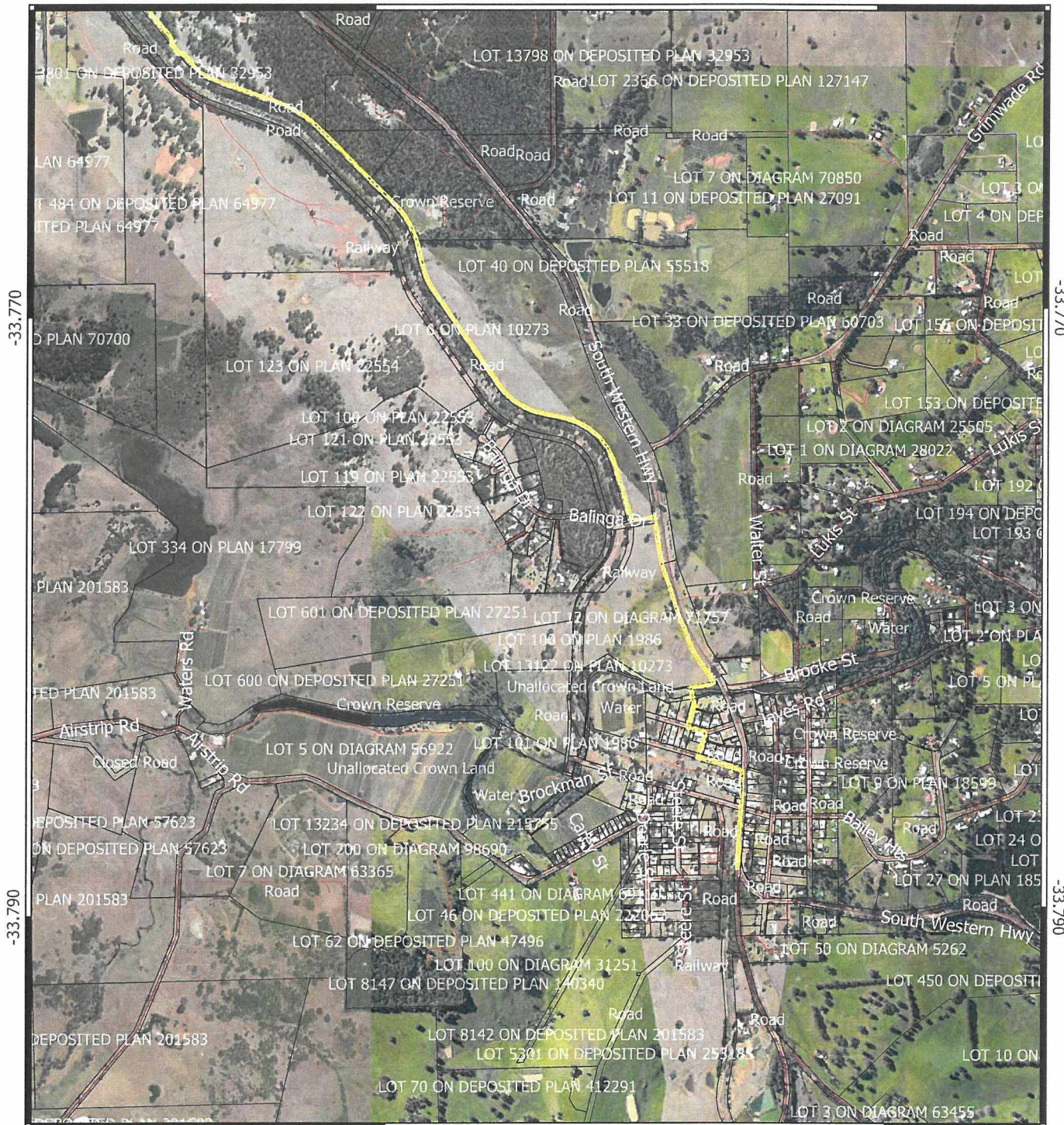


GOVERNMENT OF
WESTERN AUSTRALIA

Plan 8360/1(c)

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Legend

-  CPS areas approved to clear
-  Road Centrelines
-  Cadastre - LGATE 218
-  Local Government Authorities



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GOVERNMENT OF
WESTERN AUSTRALIA

Plan 8360/1(d)



Legend

-  CPS areas approved to clear
-  Road Centrelines
-  Cadastre - LGATE 218
-  Local Government Authorities



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Environmental Protection Act 1986



GOVERNMENT OF
WESTERN AUSTRALIA



Plan 8360/1(f)

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Legend

CPS layers

-  CPS subject to conditions
-  Cadastre - LGATE 218

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Officer delegated under section 20 of the
Environmental Protection Act 1986

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GOVERNMENT OF
WESTERN AUSTRALIA

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.

Base

The base of the artificial hollow must be;

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

Do not use:

- Saw dust or fibre products that will retain moisture.

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



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

Entrance

The entrance of the artificial hollow must;

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

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

Ladder

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

The ladder must be;

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

Do not use:

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

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

Sacrificial chewing posts

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

The sacrificial chewing posts must:

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

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



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

Photo by Rick Dawson

Mountings

The artificial hollows must be mounted such that:

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

Placement

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

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

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

Artificial hollows to be placed in trees require:

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

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

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

Safety

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

Maintenance and monitoring

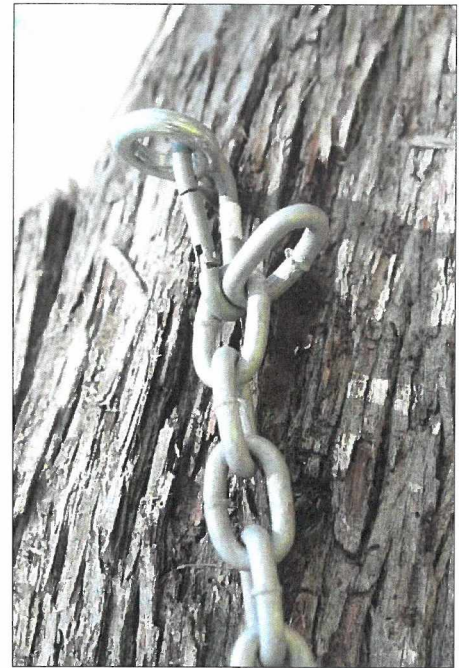
Once artificial hollows have been placed they require monitoring and maintenance to ensure they continue to be useful for nesting by Carnaby's cockatoo. It is important to monitor artificial hollows to determine use by Carnaby's cockatoo, other native species as well as pest species. By undertaking monitoring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

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

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



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



Example fixing for artificial hollow
Photo by Christine Groom

Acknowledgements

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

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

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

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

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

Further information

Last updated 28/04/2015

Contact 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

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SCHEDULE 2

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



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

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

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

Monitoring should be undertaken in order to detect:

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



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

How do I monitor artificial hollows?

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

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

Looking for signs of use

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

Observing parent behaviour around the hollow

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

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

Observing feeding flocks

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

Tapping

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

Observing insect activity around nest

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

Listening for nestlings

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

Looking inside the nest

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

How often should I monitor artificial hollows?

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

How do I maintain artificial hollows?

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

Maintenance checks should assess the following as a minimum:

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



Artificial hollow base needing repair.
Photo by Christine Groom

Repairing hollows

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

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

Monitoring of artificial hollows:

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

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>



Clearing Permit Decision Report

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 *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 *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.: 8360/1
EPBC Referral No.: 2017/8059
Permit type: Purpose Permit

1.2. Applicant details

Applicant's name: Water Corporation
Application received date: 07 February 2019

1.3. Property details

Property:

- LOT 10 ON DIAGRAM 71544, MULLALYUP
- LOT 107 ON PLAN 72190, MULLALYUP
- LOT 11 ON PLAN 222858, MULLALYUP
- LOT 12 ON PLAN 222858 (CROWN RESERVE 10708), MULLALYUP
- LOT 13033 ON DIAGRAM 33990 (CROWN RESERVE 30597), GREENBUSHES
- LOT 13122 ON PLAN 10273 (CROWN RESERVE 32659) 508854 BALINGUP
- LOT 13656 ON PLAN 219732 (CROWN RESERVE 14719), MULLALYUP
- LOT 13731 ON PLAN 30415, (CROWN RESERVE 6890), GREENBUSHES
- LOT 13801 ON PLAN 32953, (CROWN RESERVE 14719), MULLALYUP
- LOT 200 ON PLAN 301590, BALINGUP
- LOT 2298 ON PLAN 229098, GREENBUSHES
- LOT 3 ON DIAGRAM 63455, BALINGUP
- LOT 475 ON PLAN 70508, MULLALYUP
- LOT 501 ON DIAGRAM 97470, MULLALYUP
- LOT 6 ON PLAN 10273, BALINGUP
- LOT 6 ON PLAN 10273, BALINGUP
- LOT 247 ON PLAN 167542, BALINGUP
- LOT 250 ON PLAN 10273, BALINGUP
- LOT 6367 ON PLAN 252367, GREENBUSHES
- LOT 908 ON PLAN 102431, BALINGUP
- LOT 909 ON PLAN 102432, BALINGUP
- RAILWAY RESERVE (PIN 508721), BALINGUP
- RAILWAY RESERVE (PIN 508856), BALINGUP
- RAILWAY RESERVE (PIN 1106757), GREENBUSHES
- RAILWAY RESERVE (PIN 1039575), KIRUP
- RAILWAY RESERVE (PIN 12018773), MULLALYUP
- ROAD RESERVE (PIN 11394172), BALINGUP
- ROAD RESERVE (PIN 11398451), BALINGUP
- ROAD RESERVE (PIN 11398466), BALINGUP
- ROAD RESERVE (PIN 11398471), BALINGUP
- ROAD RESERVE (PIN 11398472), BALINGUP
- ROAD RESERVE (PIN 11398474), BALINGUP
- ROAD RESERVE (PIN 11398477), BALINGUP
- ROAD RESERVE (PIN 11534877), BALINGUP
- ROAD RESERVE (PIN 11534882), BALINGUP
- ROAD RESERVE (PIN 11534884), BALINGUP
- ROAD RESERVE (PIN 11584733), BALINGUP
- ROAD RESERVE (PIN 11622106), BALINGUP
- ROAD RESERVE (PIN 11622621), BALINGUP
- ROAD RESERVE (PIN 11534863), GREENBUSHES
- ROAD RESERVE (PIN 11534869), GREENBUSHES
- ROAD RESERVE (PIN 11534870), GREENBUSHES

ROAD RESERVE (PIN 11534872), GREENBUSHES
ROAD RESERVE (PIN 11534873), GREENBUSHES
ROAD RESERVE (PIN 1331797), MULLALYUP
ROAD RESERVE (PIN 11429772), MULLALYUP
ROAD RESERVE (PIN 11429778), MULLALYUP
ROAD RESERVE (PIN 11598631), MULLALYUP
ROAD RESERVE (PIN 11622105), MULLALYUP
STATE FOREST 20 (PIN 520796), GREENBUSHES
STATE FOREST 21 (PIN 508362), KIRUP
UNALLOCATED CROWN LAND (PIN 508858), BALINGUP
WATER FEATURE (PIN 1249672), BALINGUP

Local Government Authority:
Localities:

Shire of Donnybrook-Balingup and Shire of Bridgetown-Greenbushes
Balingup, Mullalyup, Kirup and Greenbushes

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	Purpose category:
4.81		Mechanical Removal	Water/gas/cable/pipeline/power installation

1.5. Decision on application

Decision on Permit Application: Grant

Decision Date: 3 February 2020

Reasons for Decision:

The clearing permit application has been assessed against the clearing principles, planning instruments and other matters in accordance with section 51O of the *Environmental Protection Act 1986*.

It has been concluded that the proposed clearing is at variance with Principles (b), (f) and (h), may be at variance with Principle (e) and (i), and is not likely to be at variance with the remaining Clearing Principles.

Through assessment it has been determined that the application area contains 4.81 hectares of foraging habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*) forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) and Baudin's cockatoo (*Calyptorhynchus baudinii*) (black cockatoos) and 64 potential breeding trees, of which ten contain hollows of a suitable size for breeding (no trees showed signs of current breeding use).

To mitigate the significant environmental impacts identified above, and in accordance with the WA Environmental Offset Policy and Environmental Offsets Guidelines, the applicant has allocated 45 hectares of an advanced offset site (Reserve 52970) to this project, which adequately addresses the residual impact to black cockatoo habitat as a result of clearing.

To ensure black cockatoos are not impacted during the clearing process, a condition has been placed on the clearing permit requiring the Permit Holder to check potential habitat trees for the presence of black cockatoos prior to clearing. The condition will not permit the applicant to clear habitat trees when current black cockatoo breeding evidence has been identified.

To mitigate impacts associated with the loss of ten trees with suitably sized hollows for black cockatoo nesting, the applicant will be required to install artificial nesting hollows at a ratio of 2:1, which will result in the installation of at least 20 nesting hollows within land managed by the Department of Biodiversity, Conservation and Attractions located nearby the application area.

To minimise direct impacts to terrestrial fauna species, a condition has been placed on the clearing permit which requires the applicant to undertake slow, progressive one directional clearing to allow fauna to move into adjacent habitat ahead of the clearing activity.

The proposed clearing may increase the spread of weeds and dieback into adjacent native vegetation, including into Greenbushes State Forest. To minimise this impact, a condition has been placed on the clearing permit requiring the implementation of weed and dieback management measures.

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

In determining to grant a clearing permit subject to offset, fauna management, weed and dieback management conditions, the Delegated Officer found that the proposed clearing is unlikely to lead to an unacceptable risk to the environment.

2. Site Information

Clearing Description	The application is to clear 4.81 hectares of native vegetation within a footprint area of approximately 15.27 hectares, within various private properties, rail and road reserves and unallocated Crown land within the localities of Balingup, Mullalyup, Kirup and Greenbushes, for the purpose of improving water supply (Figures 1 and 2).
Vegetation Description	<p>The application area has been mapped as the following South West Forest vegetation complexes (Mattiske and Havel, 1999):</p> <ul style="list-style-type: none">• Kirup (KR) – described as open forest to woodland of <i>Eucalyptus marginata</i> subsp. <i>marginata</i>-<i>Corymbia calophylla</i>-<i>Banksia attenuata</i>-<i>Xylomelum occidentale</i> on sandy slopes in the humid zone.• Balingup (BL) – described as open forest of <i>Eucalyptus marginata</i> subsp. <i>marginata</i>-<i>Corymbia calophylla</i> on slopes and woodland of <i>Eucalyptus rudis</i> on the valley floor in the humid zone.• Queenwood (QW) – described as open forest of <i>Eucalyptus marginata</i> subsp. <i>marginata</i>-<i>Corymbia calophylla</i> on slopes in the humid zone.• Catterick (CC1) – described as open forest of <i>Eucalyptus marginata</i> subsp. <i>marginata</i>-<i>Corymbia calophylla</i> mixed with <i>Eucalyptus patens</i> on slopes, <i>Eucalyptus rudis</i> and <i>Banksia littoralis</i> on valley floors in the humid zone.• Dwellingup (D1) – described as open forest of <i>Eucalyptus marginata</i> subsp. <i>marginata</i>-<i>Corymbia calophylla</i> on lateritic uplands in mainly humid and subhumid zones.
Vegetation Condition	<p>According to biological surveys which encompassed the application area, the vegetation within the application area ranges between the following conditions (Astron, 2013; GHD, 2017a):</p> <p>Very Good; Vegetation structure altered; obvious signs of disturbance (Keighery, 1994).</p> <p>To</p> <p>Completely Degraded; No longer intact, completely/almost completely without native species (Keighery, 1994).</p> <p>The majority of the vegetation within the application area is in a very good (1.2 hectares) and degraded (Keighery, 1994) condition (1.7 hectares) (Astron, 2013; GHD, 2017a).</p>
Soil types	<p>The seven soil types mapped within the application area are:</p> <ul style="list-style-type: none">• Kirup sandy slopes phase (comprises approximately 1.99 hectares of the application area footprint), which is described as duplex sandy gravels, yellow deep sands, pale deep sands, yellow sandy earths and gravelly pale deep sands;• Kirup gentle slopes phase (comprises approximately 3.98 hectares of the application area footprint), which is described as duplex sandy gravels, loamy gravels, pale deep sands and yellow deep sands;• Dwellingup Subsystem (comprises approximately 2.27 hectares of the application area footprint) is described as divides, lower to upper slopes and hillcrests. Duplex sandy gravels and loamy gravels with minor areas of shallow gravels, deep sandy gravels, yellow deep sands and yellow and pale deep sands, often gravelly;• Balingup footslopes phase (comprises approximately 3.22 hectares of the application area footprint), which is described as friable red-brown loamy earths, brown loamy earths, brown deep loamy duplexes and loamy gravels;• Balingup moderate slopes Phase (comprises approximately 2.69 hectares of the application area footprint), which is described as moderate slope phase, with slopes 15 to 35 per cent, with relief of 60-120 metres and loamy earths and duplexes; and• Yarragil upstream valleys Phase (comprises approximately 1.86 hectares of the application area footprint), is described as having a broader valley floor is than downstream phase, with soil parent material mainly laterite and soils comprising gravels and sands, with a relief 5 to 20 metres and slopes of 3 to 10 per cent.• Mumballup upstream flats Phase (comprises approximately 1.21 hectares of the application area footprint) which is described as flats 50 to 250 metres wide, with heavier soils prone to waterlogging and flooding.

Department of Primary Industries and Regional Development (2017)



Figure 1: Section of northernmost Application Area

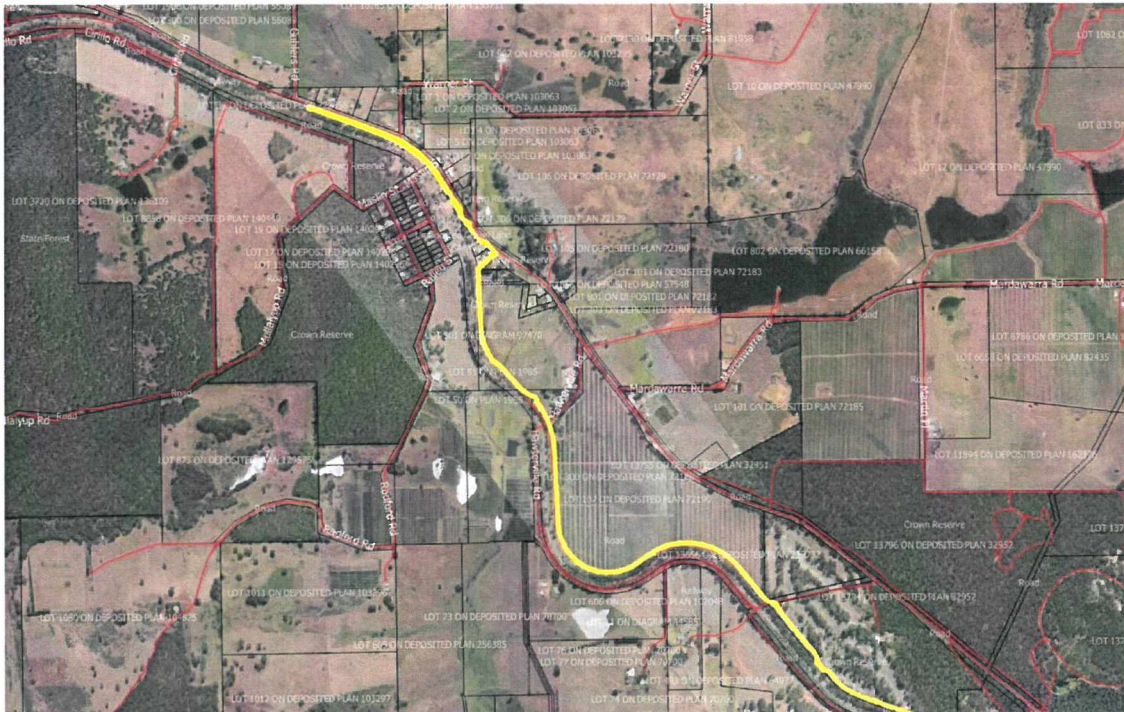


Figure 2: Northern Portion of the Application Area (Part 1)

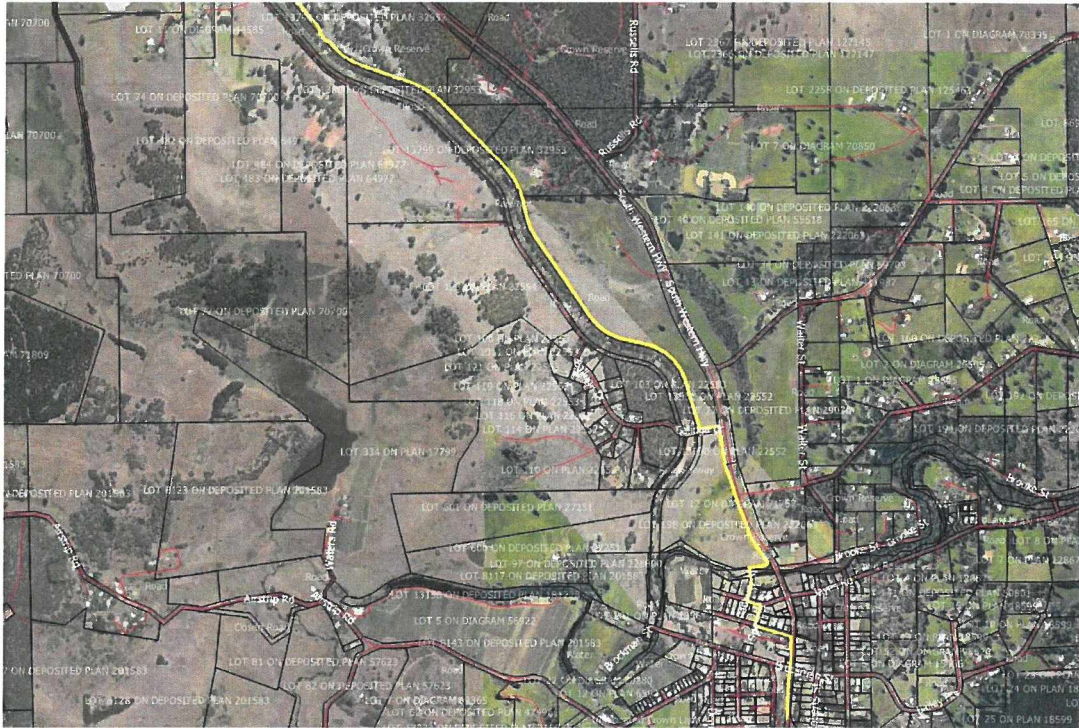


Figure 3: Northern Portion of the Application Area (Part 2)

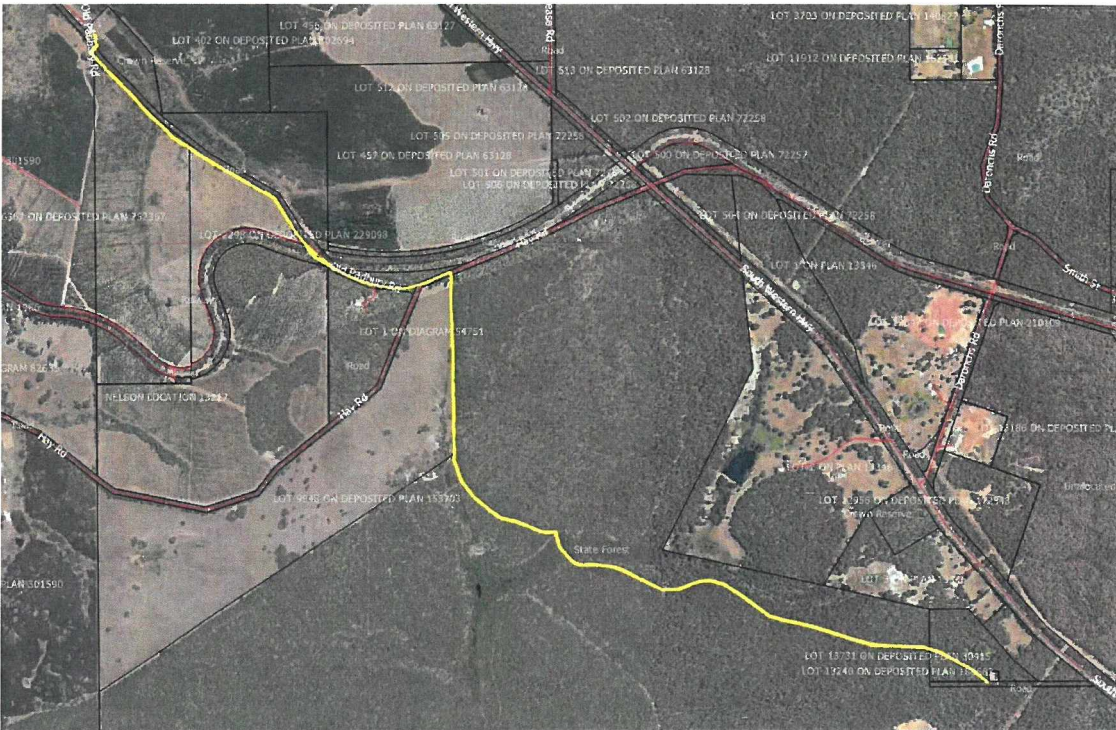


Figure 4: Southern Portion of the Application Area



Figure 5: Application Area Overview

Part 2: Assessment against matters of national environmental significance

3. Assessment of application against Matters of National Environmental Significance

Background

Comments The Water Corporation proposes to construct new infrastructure to improve the supply of water to the towns of Balingup, Mallalyup and Kirup, as a component of the broader Warren Blackwood Water Supply Scheme (the project). The project will involve the clearing of a linear area of around 12.5 kilometres (with an average width of less than 10 metres) and associated works to create a single water supply scheme which will deliver water from a storage facility in Greenbushes to the towns of Balingup, Mallalyup and Kirup, Western Australia.

The project proposes to clear 4.81 hectares of native vegetation within a 15.27 hectare footprint within various private properties, rail and road reserves and unallocated Crown land within the localities of Balingup, Mullalyup, Kirup and Greenbushes. The application area is located 230 kilometres south of Perth and 50 kilometres south of Bunbury.

An initial flora and fauna survey which encompassed the majority of the application area (9.5 kilometres) was undertaken by Astron Environmental Services in 2013. Since this time the Water Corporation has changed the location of some of the components of the project and therefore in 2017 GHD were commissioned to undertake a flora and fauna survey of the areas previously not covered by Astron, which includes around 1 kilometre of the northern portion of the application area, and around 2 kilometres of the southern portion.

The vegetation within the application area ranges in condition from completely degraded to very good (Keighery, 1994) with the majority of the vegetation in a very good and degraded (Keighery, 1994) condition. The two surveys of the application area identified a total of 10 vegetation types, which are described in Tables 1 (GHD survey) and 2 (Astron survey).

Table 1. Vegetation types identified within the GHD survey (GHD, 2017a).

Vegetation Type Code	Vegetation Type	Vegetation Description (* denotes an exotic species)
VT01 (comprises approximately 0.004 hectares of the application area)	Jarrah-Marri woodland over <i>Hibbertia</i> shrubland	<i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> open forest over <i>Hibbertia hypericoides</i> , <i>Hakea lissocarpa</i> shrubland over <i>Patersonia occidentalis</i> <i>Lepidosperma leptostachyum</i> open herbland.
VT03 (comprises approximately 0.007 hectares of the application area)	Jarrah-Marri woodland over <i>Bossiaea</i> shrubland	<i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> forest over <i>Banksia grandis</i> over <i>Bossiaea linophylla</i> shrubland over <i>Pteridium esculentum</i> , <i>Lomandra sericea</i> and <i>Desmocladius fasciculatus</i> open fernland/herbland.
VT04 (comprises approximately 1.18 hectares of the application area)	Jarrah-Marri woodland over blackberry	<i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> and <i>Pinus radiata</i> open forest over <i>Xanthorrhoea preissii</i> isolated shrubs and * <i>Rubus ulmifolius</i> shrubland
VT05 (comprises approximately 0.08 hectares of the application area)	Flooded gum woodland over blackberry	<i>Eucalyptus rudis</i> open woodland over <i>Xanthorrhoea preissii</i> isolated shrubs with * <i>Rubus ulmifolius</i> shrubland.
VT06 (comprises approximately 0.22 hectares of the application area)	Jarrah-Marri woodland over Bugle Lily	<i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> and * <i>Pinus radiata</i> woodland over <i>Xanthorrhoea preissii</i> isolated shrubs over <i>Watsonia meriana</i> var. <i>bulbillifera</i> herbland.
VT07 (comprises approximately 0.25 hectares of the application area)	<i>Eucalyptus</i> spp.-Marri-Pine isolated trees	<i>Eucalyptus</i> spp., <i>Corymbia calophylla</i> and * <i>Pinus radiata</i> isolated trees

Table 2. Vegetation types identified within the Astron survey (Astron, 2013).

Vegetation Type Code	Vegetation Description (* denotes an exotic species)
CcEmErW (comprises approximately 0.18 hectares of the application area)	<i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> , <i>Eucalyptus rudis</i> woodland over a tall shrubland including <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> , <i>Agonis linearifolia</i> , <i>Hakea lissocarpa</i> over smaller shrubs such as <i>Phyllanthus calycinus</i> , <i>Acacia pulchella</i> with a dominant sedge layer of <i>Lepidosperma effusum</i> .
EmCcBgPIW (comprises approximately 0.55 hectares of the application area)	<i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> woodland with <i>Banksia grandis</i> and <i>Persoonia longifolia</i> woodland with a mid-storey that may range in the following dominant taxa in the mid-shrub layer: <i>Bossiaea ornata</i> , <i>Hibbertia amplexicaulis</i> over <i>Tetraria capillaris</i> and <i>Desmocladius fascicularis</i> .
EmCcOW (comprises approximately 0.45 hectares of the application area)	<i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> open woodland with a mid-storey that may range in the following dominant taxa in the upper shrub layer: <i>Pteridium esculentum</i> , <i>Hakea amplexicaulis</i> with <i>Bossiaea ornata</i> , <i>Leucopogon nutans</i> as primary dominants in the lower shrubs; over <i>Tetraria</i> species.
EmCcW (comprises approximately 1.61 hectares of the application area)	<i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> woodland with a midstorey that may range in the following dominant taxa in the upper shrub layer: <i>Xanthorrhoea preissii</i> , <i>Macrozamia riedlei</i> , <i>Mirbelia dilatata</i> , <i>Hakea amplexicaulis</i> , <i>Acacia extensa</i> , <i>Leucopogon verticillatus</i> . The following as dominants in the mid shrub layer: <i>Bossiaea ornata</i> , <i>B. linophylla</i> , <i>Hibbertia hypericoides</i> , <i>Phyllanthus calycinus</i> , <i>Pteridium esculentum</i> over sedges including <i>Tetraria capillaris</i> and <i>Patersonia umbrosa</i> var. <i>xanthina</i> .

Description of controlling provision

Comments On 6 November 2017, the proposal was determined to be a controlled action under the *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*) and Baudin's cockatoo (*Calyptorhynchus baudinii*) listed as endangered under the EPBC Act, and on forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) listed as vulnerable under the EPBC Act (collectively known as black cockatoos).

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, 1974). 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, 1980, 1990; Johnstone et al. 2011). There has been an apparent expansion in the breeding range to include areas further west and south since the middle of last century with a more rapid increase into the jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) forests of the south west (Johnstone and Storr 1998; Johnstone et al. 2011). This expansion in breeding range is due to threatening processes such as clearing of breeding habitat and competition for suitable breeding hollows.

The Carnaby's cockatoo was once abundant in Western Australia. Since the late 1940s, the species has suffered a 30 per cent contraction in range, a 50 per cent decline in population, and between 1968 and 1990 disappeared from more than a third of its breeding range (Saunders, 1990; Johnstone and Storr, 1998; Saunders and Ingram 1998; Garnett et al. 2011). Basic ecological theory, expert opinion and recent evidence, suggests that the remaining native and pine plantation foraging habitat on the Swan Coastal Plain is just sufficient to support the current population of Carnaby's cockatoo. Therefore, any reduction in the amount of food source will result in a reduction in the carrying capacity of the region and therefore, a decline in the population of Carnaby's cockatoo.

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 (*Corymbia calophylla*) jarrah (*Eucalyptus marginata*), karri (*Eucalyptus diversicolor*) and tuart (*Eucalyptus gomphocephala*) (Department of Parks and Wildlife (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 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 south-west humid and sub-humid zones of south west Western Australia (DEC, 2008). This species inhabits dense jarrah, karri and marri forests receiving more than 600 millimetres of annual average rainfall (DEC, 2008).

The forest red-tailed black cockatoo is known to nest in the large hollows of marri, jarrah and karri (Johnstone and Kirkby, 1999).

The approved conservation advice identifies the main threats to the forest red-tailed black cockatoo to be illegal shooting, habitat loss through land clearing, nest hollow shortage and competition from other species (DEC, 2008).

Forest red-tailed black cockatoos feed mostly on seeds of marri and jarrah, also *Eucalyptus caesia*, *Eucalyptus erythrocorys* and some introduced eucalypts such as river red gum (*Eucalyptus camaldulensis*) and flooded gum *Eucalyptus grandis*, *Allocasuarina* cones, fruits of snottygobble (*Persoonia longifolia*) and mountain marri (*Corymbia haematoxylon*) (Commonwealth of Australia, 2012).

Baudin's cockatoo

Baudin's cockatoo is endemic to a 2,000 kilometre area of the humid and sub-humid zones of south-west 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 south-west of Western Australia (DEC, 2008).

This species has declined over more than 50 per cent of its range over the past 50 years. 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 Conservation advice for this species states that one of the main threats is habitat loss and nest hollow shortage (DEWHA, 2009).

Baudin's cockatoo feed mostly on marri (seeds, flowers, nectar and grubs) and proteaceous trees and shrubs. This species also feeds on other native seeds and introduced fruits, insects and insect larvae and the pith of kangaroo paw *Anigozanthos flavidus* (Commonwealth of Australia, 2012).

Summary of Impacts

Comments The application area is located within the modelled distribution for all three species of black cockatoo. All three species have been recorded within the survey area or in the immediate vicinity (Astron (2013), GHD (2017a) and GHD (2017c)). The application area is located within the known feeding and breeding range of Carnaby's cockatoo and feeding range and predicted breeding range of the Baudin's cockatoo and the forest red-tailed black Cockatoo (Commonwealth of Australia, 2012).

A total of 477 potential habitat trees were observed within the survey areas (Astron (2013), GHD (2017a) and GHD (2017c)). The application area has been designed so that a total of 64 of these trees are proposed to be cleared. Of these, 14 are hollow bearing, and 10 of these have hollows currently of a suitable size to provide breeding habitat. None of the trees recorded were observed to be actively used by black cockatoos for breeding or roosting at the time of survey (Water Corporation, 2017a, Water Corporation, 2019b, GHD, 2019). Additionally, no evidence of recent use of suitable hollows by black cockatoos (e.g. chews) was recorded (Astron, 2013; GHD 2017a; GHD, 2017c). Foraging evidence was noted across the extent of the areas surveyed (forest red-tailed black cockatoo feeding evidence on marri nuts) (Water Corporation, 2017a, Water Corporation, 2019b, GHD, 2019). A total of 4.81 hectares of foraging habitat is located within the application area, consisting largely of jarrah marri woodland (high quality) and *Eucalyptus rudis* woodland (low quality) (Water Corporation, 2017a; Water Corporation, 2019b, GHD, 2019).

After avoidance, minimisation and mitigation, the proposed clearing will result in the following significant residual impacts:

- Removal of 4.81 hectares of foraging habitat for black cockatoos; and
- Removal of 64 potential breeding trees, including 10 with hollows of a suitable size for black cockatoo nesting.

The Carnaby's cockatoo recovery plan notes that critical habitat for this species includes eucalypt woodlands that provide nest hollows used for breeding, together with nearby vegetation that provides feeding, roosting and watering habitat that supports successful breeding (Parks and Wildlife, 2013).

The recovery plan also acknowledges that decline in Carnaby's cockatoo populations, to date has been brought about primarily by the extensive clearing of nesting and feeding habitat during the 20th century. Continuing threats mostly relate to loss of habitat due to clearing or degradation, competition for nest sites, and loss of individuals due to illegal activities, collisions with motor vehicles and disease (Parks and Wildlife, 2013).

As noted above, the application area contain 4.81 hectares of suitable foraging habitat. The recovery plan states that activities that may have an impact on Carnaby's cockatoo, or its habitat include any activity or action that leads to the permanent loss of eucalypt woodlands within the species range that currently or potentially provide nest hollows for breeding, along with nearby areas that provide important feeding and watering habitat that supports breeding of Carnaby's cockatoo (Parks and Wildlife, 2013). Based on this advice the proposed clearing of 4.81 hectares of foraging habitat and 64 potential breeding trees is considered to be inconsistent with the objectives of the recovery plan.

Public consultation

Comments The clearing permit application was advertised on the Department of Water and Environmental Regulations (DWER) website on 6 May 2019 with a 21 day submission period. No public submissions have been received in relation to this application.

The Water Corporation has advised that all property owners potentially affected by the proposed alignment have been contacted and the appropriate consultation has been undertaken. Further refinement and reduction to the original alignment has resulted in many of the landowners along the original pipe route no longer being impacted (Water Corporation, 2017a).

Avoidance, mitigation and offset

The following avoidance and mitigation measures were provided to DotEE in the EPBC Act referral.

Impact avoidance

The Water Corporation has advised that potential impacts to Matters of National Environmental Significance have been considered during Project design and minimised as far as practical. Specifically, the Project area has been refined to avoid potential breeding trees as much as possible. Approximately 413 potential black cockatoo habitat trees that were recorded during the fauna surveys (including some outside the survey boundary) have been avoided during the design phase of the Project (Water Corporation, 2017a, Water Corporation, 2019b).

The Project area represents the maximum area to be cleared. Within this footprint, opportunities to further reduce clearing will be considered, where practicable. Only the area absolutely necessary for the Project will be disturbed; this will be ascertained by adequate construction planning prior to project implementation. To date, Water Corporation has made considerable effort to minimise the amount of clearing of native vegetation and removal of black cockatoo potential breeding trees required for the Project, including the use of historically cleared areas for the southern portion of the project.

Impact reduction

The Water Corporation will prepare a number of management plans for implementation during the Project, including a Construction Environmental Management Framework (CEMF). Environmental management actions that will be addressed in the CEMF and which are associated with fauna and their habitat include:

- Minimise vegetation clearing and the area of disturbance on the ground by utilising existing cleared areas where possible;
- Retention, where possible, of potential black cockatoo habitat trees (particularly hollow-bearing trees). A pre-clearance survey will be undertaken to flag the potential black cockatoo trees within the Project footprint (using distinctive flagging for those with hollows) to allow contractors to see which trees should be avoided where possible;
- A pre-clearing inspection of trees to be cleared will be undertaken to ensure there are no breeding activities present in the trees. If breeding activities are identified, clearing will be avoided until such time nestlings have left the nest without human intervention;
- Compliance with internal clearing procedures and standards;
- All vegetation proposed to be cleared will be clearly demarcated on site prior to the commencement of project activities. Any vegetation or trees that are to be retained will be marked accordingly;
- Clearing of vegetation shall not exceed the limits of clearing and mature trees shall be conserved as far as practicable;
- All staff and contractors involved in clearing activities will be inducted on the potential impacts to fauna and advised to stop works in the vicinity of any injured or shocked animals that are encountered;
- In the event that sick, injured or orphaned native wildlife are located on the Project site, the WILDCARE Helpline will be contacted for assistance;
- Millable timber will be identified and salvaged for re-use;
- No pets, traps or firearms are allowed within the project area;
- Fauna are not to be fed or intentionally harmed or killed;
- Dieback management controls will be implemented during the construction phase of the Project in line with the findings of the dieback assessment and include controls such as cleaning earth moving machinery of soil and vegetation prior to entry and departure to avoid the introduction and/or spread of weeds and dieback; movement of machines and other vehicles will be restricted to the limits of the areas cleared;
- areas to undertake weed control to stop spread of weeds will be identified;
- Control/spray identified significant weeds species within the project area prior to construction to limit the amount of propagative material that may be spread during disturbance; and
- Remove or kill any other weeds growing in Project area that are likely to spread and result in environmental harm to adjacent areas of native vegetation that are in good or better condition. (Water Corporation, 2017a, Water Corporation 2019b).

In addition to the above avoidance and minimisation measures, the applicant has changed the design of the original proposed works. It was initially determined that additional clearing would be required between the northern and southern portions of the original alignment. However, the applicant has since refined this extension to incorporate only existing cleared areas, and no additional clearing to the initial 4.81 hectares will be required.

Offset

The Water Corporation has prepared an Environmental Offset Proposal for this project. The Environmental Offset Proposal aims to counterbalance the following significant residual impacts:

- The clearing of 4.81 hectares of foraging habitat for black cockatoos; and
- The clearing of 64 potential breeding trees of which 10 are of a suitable size for black cockatoo nesting.

The Environmental Offset Proposal proposes to allocate a portion of a pre-impact offset site as an offset for this project. The proposed offset site is Reserve 52970, known as Rocky Gully (Water Corporation, 2019a). The strategic land banking of this site was agreed upon by the former Department of Environment Regulation and the Water Corporation in 2015. The offset site is located approximately 110 kilometres south west of the application area.

As of June 2017 the proposed pre-impact offset site was transferred to the then Department of Parks and Wildlife. Prior to the transfer the site was known as Reserve 24734 and was zoned for 'Public Purposes – Water Reserve' in the Shire of Plantagenet Local Planning Scheme 3.

In July 2016 AECOM undertook a Level 1 Flora, Vegetation and Fauna Survey of the entire Rocky Gully offset site. The offset site largely comprises jarrah and marri mid open forest, with a smaller portion of *Melaleuca preissiana*, *Eucalyptus marginata* subsp. *marginata* and occasional *Eucalyptus rudis* low to mid woodland. The majority of the vegetation recorded was in an excellent (Keighery, 1994) condition (AECOM, 2016).

A total of 119 species from 69 genera and 35 families were recorded within the Rocky Gully offset site during the field assessment. No weed species were recorded (AECOM, 2017).

Baudin's cockatoo was observed within the offset area and the jarrah and marri forest recorded provides suitable foraging and breeding habitat for all three black cockatoo species for (AECOM, 2017).

The AECOM Flora, Vegetation and Fauna Survey identified that the Rocky Gully offset site contains 547 hectares of quality black cockatoo breeding habitat. The mean number of potentially suitable breeding trees per quadrat was 12.625 ($n = 8$, $SD 3.71$). Based on this quadrat representation, it is estimated that as many as 2430 potential breeding trees could occur within a 45 hectare offset area, which is based on an estimate of 54 suitably sized trees per hectare.

In assessing whether the proposed offset is adequately proportionate to the significance of the habitat values for black cockatoos being impacted, DWER undertook a calculation using the Commonwealth Offsets Assessment Guide. The calculation determined that 45 hectares (containing at least 64 potential breeding trees) is required to counterbalance the loss of 4.81 hectares of black cockatoo habitat. The Water Corporation initially proposed to allocate 26 hectares of the site for this project, however after liaising with DWER throughout the assessment, this figure has now been amended to 45 hectares, in line with the offset calculation.

In determining the offset adequacy through use of the Commonwealth Offsets Assessment Guide, consideration was given to the following:

- The presence of suitable foraging and breeding habitat for black cockatoos within the proposed offset area
- The excellent (Keighery, 1994) condition of the vegetation within the proposed offset area
- The very good to degraded (Keighery, 1994) condition of the application area
- The historical zoning of the proposed offset area prior to being within DBCA conservation estate
- The long term and immediate conservation of the proposed offset area, and confidence in long term security given that it forms part of DBCA's conservation estate

Given the above, the allocation of 45 hectares of Reserve 52970 is considered adequate to counterbalance the significant residual impacts to black cockatoo habitat consistent with the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy October 2012 and *WA Environmental Offsets Policy September 2011*.

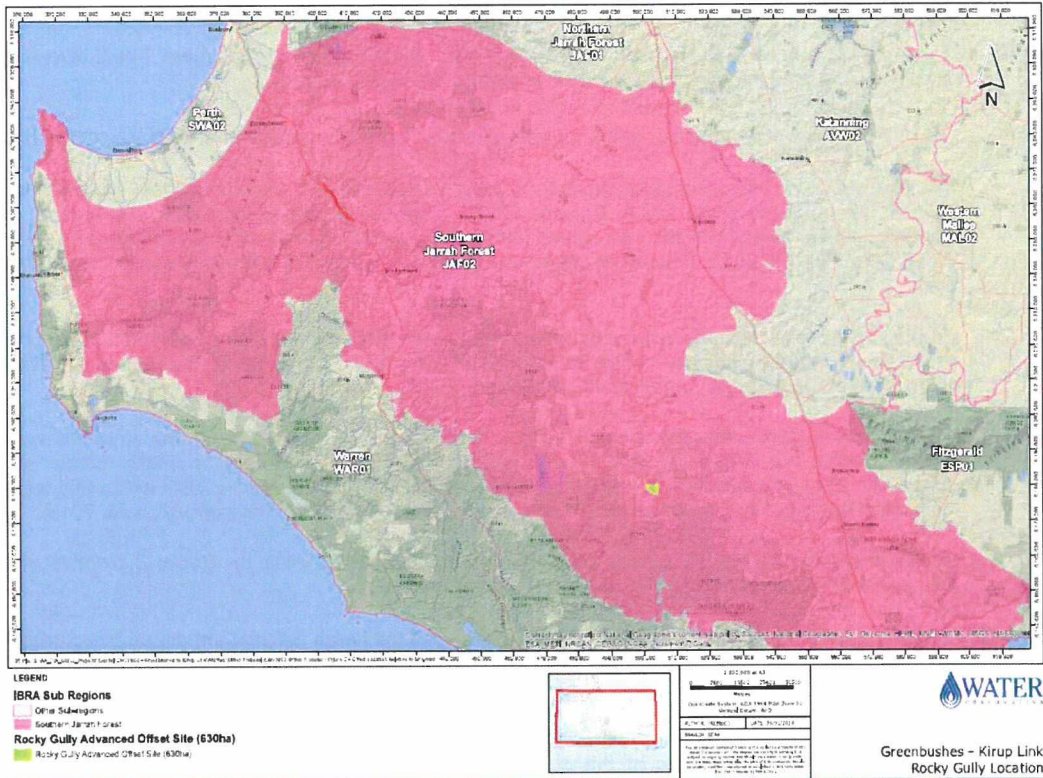


Figure 6: Rocky Gully Offset Site (green) in relation to application area (red) (Water Corporation, 2019a)

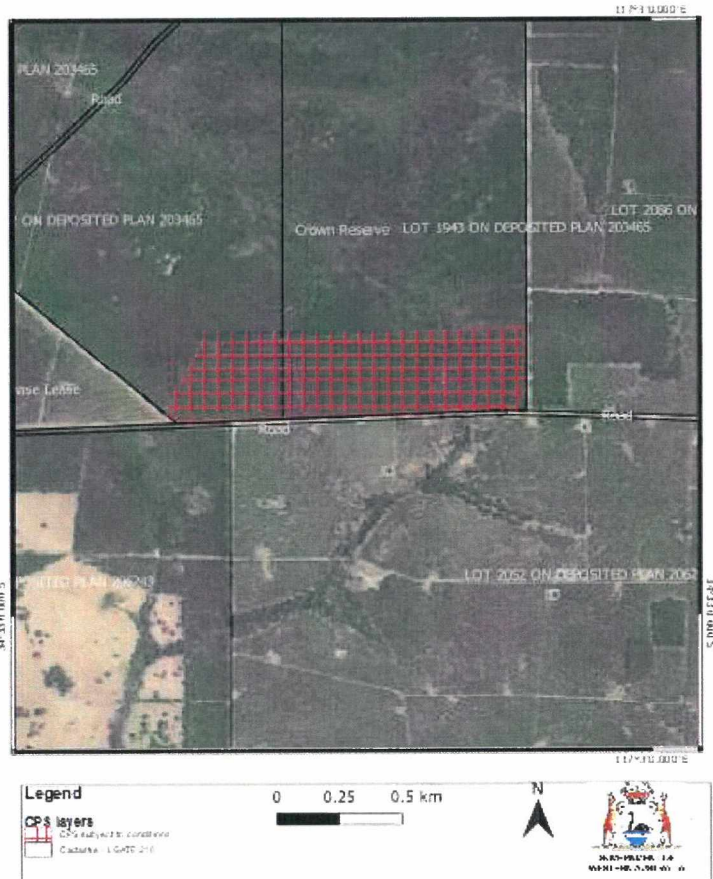


Figure 7: Rocky Gully Offset Site

Other relevant considerations

The following information was provided by the applicant in a letter dated 17 April 2018 (Water Corporation, 2018)

Economic and Social Factors

Capital investment and ongoing value;

The Capital cost estimate is approximately \$8,000,000 for the construction of the project, plus an additional \$2,222,222 that has already been spent on design. The ongoing value is that carting water from Donnybrook will cease and there will be an estimated saving of \$300,000 per annum if all water required is sources from Donnybrook.

Basis for an estimation of cost and /or benefits;

Detailed design has been completed for the project and an estimate has been compiled by the Water Corporation estimators. A financial analysis of the project has also been conducted by the Water Corporation.

Potential employment opportunities

Potential employment opportunities expected to be generated at each phase of the project. Up to 30 people will be employed directly during the construction of the project. This number will be higher when taking into account equipment suppliers and deliveries.

Details on any public and stakeholder consultation activities, including the outcomes.

Prior to 2016 the (then) proposed affected landowners were visited in person by a Project Manager of the Water Corporation. Water Corporation reports that there was a mixed response to this consultation with some landowners supporting the proposal and other opposing it (GHD, 2017b). Following this consultation the alignment was further refined to avoid most of the opposing landowner's properties (GHD, 2017b).

Applicant's Environmental History

The following information was provided to DotEE in the EPBC Act referral:

"The magnitude of the Water Corporation's operations across the State of Western Australia and diversity of the natural environment in which it operates is vast. This is reflected in the range of evidence for excellence in environment performance, including the climate adaptation award from the Banksia Environmental Foundation (2013), the Earth awards (2011) for the Walkington Avenue Community Verge Garden Project (Margaret River), the Prime Minister's Award (2004) for environmental excellence in Public Sector Management, the WA Premiers Award (2004), the 2003 Australian Greenhouse Office Gold Award, and the United Nations Association of Australia World Environment Day Award 2004 for excellence in Marine and Coastal Management.

The Water Corporation has been responsible for the safe treatment and distribution of drinking water; collection, treatment and disposal of domestic wastewater; and the transport of drainage water in Western Australia for over 100 years. Over this period the organisation has been at the forefront of environmental management in Western Australia: implementing Environmental Management Systems for elements of the business, becoming one of the first water utilities to sign up for the Greenhouse Challenge in 1999 and more recently, committing to full carbon neutrality by 2030. Sustainability principles were developed and agreed to at a Board level and are now being integrated into all levels of decision making across the Corporation."

"The Water Corporation has had no actions brought against it in relation to its environmental performance under Commonwealth legislation, but has received two modified penalty notices from WA State authorities."

(Water Corporation, 2017a)

Part 3: Assessment against the clearing principles

4. Assessment of application against clearing principles

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

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

The application is to clear 4.81 hectares of native vegetation within various private properties, rail and road reserves and unallocated Crown land within the localities of Balingup, Mullalyup, Kirup and Greenbushes for the purpose of improving water supply.

The majority of the application area (around 9 kilometres of the 12.5 kilometre linear area) was surveyed in 2013 by Astron and the remainder of the area was surveyed by GHD in 2017. With regard to the GHD survey, GHD Botanists conducted a single season vegetation and flora assessment of the survey area on 16-18 May 2017. This assessment was undertaken out of the main flowering season as the majority of the survey area had previously been surveyed (Level 2) by Astron in 2013 (GHD, 2017a).

The field survey was undertaken to verify the results of the desktop assessment, identify and describe the dominant vegetation units, assess vegetation condition and identify and record vascular flora taxa present at the time of survey. Searches for conservation significant or other significant ecological communities and flora taxa were also undertaken (GHD, 2017a).

The Astron field survey was conducted between 14 and 17 October 2013. The survey included nine quadrats and six relevés in representative vegetation associations within the survey area. Targeted searches were undertaken for threatened and priority flora potentially occurring in the survey area as determined by the database searches and literature review (Astron, 2013). The entire survey area was traversed on foot and all species found within the survey area, including introduced species, were listed opportunistically if they did not occur in a quadrat or relevé (Astron, 2013). The vegetation and flora field survey was undertaken in accordance with the requirements of a Level 2 assessment outlined in the EPA's *Position Statement 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection* (2002) and former *Guidance Statement 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (2004).

The survey conducted by Astron identified 206 vascular plant taxa representing 128 genera from 48 families, with 28 taxa being weeds (Astron, 2013). GHD identified 106 flora taxa (including subspecies and varieties) representing 40 families and 74 genera. This total comprised 77 native and 29 introduced flora taxa (GHD, 2017a). The majority of the vegetation within the application area is considered to be in a degraded (1.7 hectares) and very good (Keighery, 1994) (1.2 hectares) condition (Astron, 2013; GHD, 2017a).

According to available datasets, eight priority and one threatened flora species have been recorded within the local area (10 kilometre radius surrounding the application area). Neither of the abovementioned surveys identified priority or threatened flora within the application area. Advice from the Department of Biodiversity, Conservation and Attractions (DBCA) notes that "the application is unlikely to have an impact on currently listed flora and/or vegetation" (DBCA, 2019).

The survey undertaken by Astron (2013) is considered to have been undertaken at the correct time of year, and it is considered that this survey would have identified priority flora species should they occur within the application area. The follow up GHD survey was undertaken at a sub optimal time. However, noting the findings of the Astron survey, comments from DBCA and that no conservation significant flora were identified in the follow up survey, the proposed clearing is unlikely to impact on the conservation status, or local or regional extent of any priority or threatened flora species.

According to available datasets, no priority ecological communities (PEC) have been recorded within the local area, and the application area is not considered to be representative of any known PEC's.

As discussed under Principle (d), the vegetation within the application area is not mapped as a state listed threatened ecological community (TEC) and is not considered to be representative of any state or federally listed TEC's.

As discussed under Principle (b), the application area provides 4.81 hectares of foraging habitat for black cockatoos, which includes 10 trees that have hollows large enough to provide nesting habitat for black cockatoos (Astron, 2013; GHD, 2017a). As discussed under Part 3 of this assessment, the applicant has provided an offset to address the residual impacts to black cockatoos.

While the application area provides significant habitat for black cockatoos, noting that it is unlikely to contain any priority or threatened flora or ecological communities, the vegetation in the application area is not likely to contain a high level of biodiversity. Therefore the proposed clearing is not likely to be at variance with this Principle.

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

Proposed clearing is at variance with this Principle

A total of 10 conservation significant fauna species were considered likely to occur within the application area, being; Carnaby's cockatoo (*Calyptorhynchus latirostris*), forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), Baudin's cockatoo (*Calyptorhynchus baudinii*) (collectively known as black cockatoos), chuditch (*Dasyurus geoffroyi*), masked owl (*Tyto novaehollandiae subsp. novaehollandiae*), south-western brush-tailed phascogale (*Phascogale tapoatafa subsp. wambenger*), peregrine falcon (*Falco peregrinus*), western brush wallaby (*Notamacropus irma*), quenda (*Isoodon obesulus*) and barking owl (*Ninox connivens subsp. connivens*) (GHD, 2017a; Astron, 2013). Of these, evidence of quenda (state listed Priority 4), forest red-tailed black cockatoo, Baudin's cockatoo and Carnaby's cockatoo (state and Commonwealth listed as endangered, endangered and vulnerable respectively) were recorded within the application area (GHD, 2017a; GHD, 2017b and Astron, 2013).

In 2013 Astron was commissioned by the applicant to undertake a flora and fauna survey of the majority of the application area, which included a black cockatoo habitat assessment. This survey identified three fauna habitats in the survey area, being (Astron, 2013):

- high quality jarrah-marri woodland
- flooded gum creeklines; and
- cleared areas

An additional flora and fauna survey was undertaken by GHD (2017a) to cover those portions of the application area not previously covered in Astron's (2013) survey. GHD was also engaged to revisit the areas previously surveyed by Astron and repeat the black cockatoo habitat assessment to ensure consistency. The survey also identified evidence of the same four fauna species as identified within Astron's survey (GHD, 2017a).

Black cockatoos breed in large hollow-bearing trees, generally within woodlands or forests or in isolated trees (Commonwealth of Australia, 2012). These species nest in hollows in live or dead trees of karri, marri, wandoo, tuart, salmon gum, jarrah, flooded gum, York gum, powder bark, bullich and blackbutt (Commonwealth of Australia, 2012).

Four hundred and thirteen potential habitat trees were identified within the larger survey areas by Astron 2013 and GHD (2017a and 2017b) (some records were located just outside of the survey areas). Of these 413 trees, 64 are located within the application area, and 10 trees contained hollows of a suitable size for nesting by black cockatoos. None of these trees showed evidence of current or previous black cockatoo use (i.e. old chew marks) (Astron, 2013, GHD, 2017a; GHD, 2017b).

To ensure that black cockatoos are not impacted during the clearing process, the applicant will be required to engage a fauna specialist to check habitat trees for the presence of black cockatoos prior to clearing. The applicant will not be permitted 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 for nesting.

Black cockatoos have a preference for foraging 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. (Commonwealth of Australia, 2012). Old and fresh black cockatoo foraging evidence was recorded scattered throughout the application area (on Marri nuts). It is considered that the entirety of the application area contains significant foraging habitat for black cockatoos (Water Corporation, 2019b, GHD, 2019).

With regard to western ringtail possums, which are known from the local area, the Astron (2013) and GHD (2017a) surveys did not record any evidence of western ringtail possums within the application area. The Astron (2013) survey noted that this species was identified as having a low likelihood of occurrence within the application area based on a lack of consistent habitat. The GHD (2017a) survey noted that previous records of western ringtail possums are sparsely scattered in the local region and while the species may potentially occur within native vegetation surrounding the survey area, the population density is likely to be very low. Noting this information, the proposed linear clearing is not likely to impact on significant habitat for this species.

Noting that the peregrine falcon (listed as other specially protected fauna under the BC Act) and western brush wallaby (listed as priority 4) are highly mobile species with large home ranges that don't rely on specialist niche habitats, the proposed clearing is not likely to impact on significant habitat for these species.

The GHD survey identified 2.98 hectares of suitable habitat for the chuditch (listed as specially protected fauna under the BC Act), quenda (state listed as Priority 4), masked owl (state listed as Priority 3), barking owl (state listed as Priority 3) and south western brush-tailed phascogale (listed as other specially protected fauna under the BC Act) within the application area. Given the linear nature of the proposed clearing and extent of vegetation remaining in the local area (approximately 60 per cent), the application area is not likely to contain significant habitat for these species. The proposed clearing may however directly impact on these species through inadvertent fatalities associated with mechanical clearing, should they occur within the application area at the time of clearing. To minimise this risk, the applicant will be required to undertake slow, progressive, directional clearing methods from one direction to the other to allow fauna to disperse ahead of the clearing activity.

Noting that the application area contains significant habitat for black cockatoos, the proposed clearing is at variance with this Principle.

Taking into account the applicant's avoidance and minimisation measures (outlined in Part 2 of this assessment), it is considered that a suitable offset will counterbalance significant residual impacts to black cockatoos.

As a condition of the Clearing Permit, the applicant will be required to allocate 45 hectares of a banked offset site to this project. The applicant will also be required to install artificial nesting hollows at a ratio of 2:1, which will result in the installation of at least 20 nesting hollows within land managed by the Department of Biodiversity, Conservation and Attractions nearby the application area.

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

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

According to available datasets, one threatened flora species has been recorded within the local area, being *Caladenia harringtoniae*.

Astron's survey, which covered the majority of the application area, identified that two threatened flora species had the potential to occur within the survey area based on the suitability of available habitat, being *Brachyscias verecundus* and *Caladenia harringtoniae*. The survey noted that the survey corridor was traversed on foot, targeting potential habitat for both taxa, but neither were located despite intensive searches in areas of potential habitat (creeklines, moss swords) (Astron, 2013). The survey noted that seasonal conditions and the timing of the survey were optimal record these two taxa (Astron, 2013).

Similarly, the GHD survey, which incorporated searches for conservation significant flora taxa over those portions of the application area not surveyed by Astron, did not identify any threatened flora species (GHD, 2017a). It is noted that this survey was undertaken outside of the optimum timing range to identify the above-mentioned species. However the likelihood of threatened flora occurring within the application area was considered low.

Given the above, the application area is not likely to contain, or be necessary for the continued existence of threatened flora, and the proposed clearing is not likely to be at variance with this Principle.

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

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

According to available datasets, there are no state listed TEC's mapped within the local area. GHD's survey advised that none of the vegetation types described for the survey area are synonymous with any known TEC's and Astron's survey noted that none of the vegetation associations mapped within the application area are considered to be rare or restricted (Astron, 2013; GHD, 2017a).

Noting these findings, and based on the vegetation types mapped within the application area, the vegetation within the application area is not likely to be representative of any known state listed TEC's.

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

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

Proposed clearing may be at variance with this Principle

The application area is located within the Jarrah Forest Interim Biogeographic Regionalisation of Australia (IBRA) bioregion. This IBRA bioregion has approximately 53.4 per cent of its pre-European vegetation extent remaining (Government of Western Australia, 2019).

The application area is mapped as South West Forest vegetation complexes KR, BL, QW, D1 and CC1 which retain approximately 58, 29.4, 38.3, 86.8 and 61.1 per cent of their pre-European vegetation extents respectively (Government of Western Australia, 2019).

Aerial imagery and available GIS datasets indicate that the local area retains approximately 60 per cent native vegetation cover.

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).

One of the mapped vegetation complexes (BL) retains marginally less than the recommended 30 per cent threshold. However, noting that this complex retains 17,474 hectares of native vegetation, should all of the application area be representative of this vegetation type (mapped over around 25 per cent of the proposed clearing footprint), the proposed clearing would result in the loss of 0.027 per cent of the remaining mapped occurrence of this vegetation type. Noting this, the proposed clearing is not likely to significantly reduce the remaining extent of this vegetation type.

Noting that the application contains significant habitat for black cockatoos, it does comprise an extensively cleared vegetation complex. However noting that the Bioregion and the local area retain more than 50 per cent native vegetation, the application area is not considered to be within an area that has been extensively cleared.

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

	Pre-European (ha)	Current Extent (ha)	Remaining (%)	Extent remaining in DBCA managed lands (%)
IBRA Bioregion				
Jarrah Forest	4,506,660	2,406,938.6	53.4	39.4
Vegetation Complexes – South West Forests				
Kirup - KR	3,459	2,037	58	36.8
Dwellingup – D1	208,490	181,038	86.8	82.3
Catterick – CC1	27,385	16,733	61.1	55.5
Balingup - BL	59,446.6	17,474	29.4	15.3
Queenwood - QW	1,418	542.4	38.3	12

(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 with this Principle

According to available datasets, the application area intersects six watercourses, including three creeks, being Spring Creek, Balingup Brook and Mullalyup Brook, and some minor drainage lines. Of these, the proposed clearing will impact on vegetation growing in association with Spring Creek, noting that the intersecting portions of the other two creeks did not contain any native vegetation.

The vegetation within the application area associated with Spring Creek was described as marri, jarrah and flooded gum woodland in a very good (Keighery, 1994) condition (Astron, 2013). Noting that the proposed clearing will result in the clearing of riparian vegetation growing in association with Spring Creek, the proposed clearing is at variance with this Principle.

The applicant has advised that given the linear nature of the construction footprint, the existence of historical vehicle tracks at the locality (which will be used where practicable) and the limited extent of proposed clearing associated with this watercourse (approximately 0.05 hectares), the impact to the riparian vegetation is unlikely to be significant (Water Corporation, 2019b, GHD, 2019).

The applicant has drafted a Construction Environment Management Framework which outlines management objectives and performance criteria to manage potential impacts to watercourses including the implementation of surface water control structures (sediment traps) where necessary and remediation when evidence of erosion, or disturbance to natural drainage flow is identified (Water Corporation, 2019b).

Noting the above, the proposed clearing is not likely to have a significant impact on the larger extent of riparian habitat growing in association with Spring Creek and impacts to this watercourse are expected to be minimal.

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

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

The Department of Primary Industries and Regional Development (2017) has mapped seven soil types within the application area, being;

- Kirup sandy slopes phase (comprises approximately 1.99 hectares of the application area footprint), which is described as duplex sandy gravels, yellow deep sands, pale deep sands, yellow sandy earths and gravelly pale deep sands;
- Kirup gentle slopes phase (comprises approximately 3.98 hectares of the application area footprint), which is described as duplex sandy gravels, loamy gravels, pale deep sands and yellow deep sands;
- Dwellingup Subsystem (comprises approximately 2.27 hectares of the application area footprint) is described as divides, lower to upper slopes and hillcrests. Duplex sandy gravels and loamy gravels with minor areas of shallow gravels, deep sandy gravels, yellow deep sands and yellow and pale deep sands, often gravelly;
- Balingup footslopes phase (comprises approximately 3.22 hectares of the application area footprint), which is described as friable red-brown loamy earths, brown loamy earths, brown deep loamy duplexes and loamy gravels;
- Balingup moderate slopes Phase (comprises approximately 2.69 hectares of the application area footprint), which is described as moderate slope phase, with slopes 15 to 35 per cent, with relief of 60-120 metres and loamy earths and duplexes; and
- Yarragil upstream valleys Phase (comprises approximately 1.86 hectares of the application area footprint), is described as broader valley floor, with soil parent material mainly laterite and soils comprising gravels and sands, with a relief 5 to 20 metres and slopes of 3 to 10 per cent.
- Mumballup upstream flats Phase (comprises approximately 1.21 hectares of the application area footprint) which is described as flats 50 to 250 metres wide, with heavier soils prone to waterlogging and flooding.

The two Kirup soil types, and Dwellingup Subsystem are described as having highly permeable soil types and therefore are not likely to cause appreciable land degradation in the form of water erosion or water logging.

These soil types are however prone to wind erosion, noting they comprise lighter sandy soils. The Balingup, Yarragil and Mumballup soil types are generally described as being heavier, less permeable and less prone to wind erosion, but at greater risk of waterlogging and water erosion.

While the risks of wind and water erosion for the mapped soil types are acknowledged, the proposed clearing of 4.81 hectares within a corridor of 10 metres or less, over a linear distance of around 12.5 kilometres, is not likely to result in appreciable land degradation as a result of wind or water erosion.

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

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

Proposed clearing is at variance with this Principle

According to available datasets, the southern portion of the application area (linear distance of around four kilometres) intersects Greenbushes State Forest (the State Forest). The proposed clearing will result in the direct removal of native vegetation from the State Forest. The proposed clearing may also result in the spread of weeds and dieback into the adjoining native vegetation within the State Forest. The biological survey by Astron (2013) which covered the majority of the application area identified twenty-eight introduced flora species within the larger survey area, including *Rubus ulmifolius* (blackberry), which is listed as a declared pest under the *Biosecurity and Agriculture Management Act 2007*.

Noting that the proposed clearing will result in the removal of native vegetation from the State Forest and increase the potential for weeds and dieback to spread into the State Forest, the proposed clearing is at variance with this Principle.

The applicant will be required to undertake weed and dieback management measures to assist in minimising the impact of weeds and dieback spreading into the State Forest.

Noting this requirement, the proposed clearing of a linear portion of around four kilometres at a width of 10 metres or less isn't expected to impact significantly on the environmental values of the State Forest, which comprises a total area of around 3,700

hectares. It is also noted that the applicant has proposed to offset the residual impacts of the proposed clearing, as described under Part 2 section 3.

(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 may be at variance with this Principle

According to available datasets, groundwater salinity within the application area is mapped at between 500 and 1000 total dissolved solids, milligrams per litre. This level of groundwater salinity is classified as 'marginal'. Noting this, and the extent of clearing over a linear distance of around 12.5 kilometres, the proposed clearing is not likely to increase groundwater salinity levels, or result in the surface expression of salinity.

As discussed under Principle (f), the application area intersects six watercourses. The proposed clearing will impact on native vegetation growing in association with one of these (Spring Creek). Noting this, the proposed clearing may increase short term sedimentation, and the potential deterioration in the quality of surface water of Spring Creek, particularly if there is any surface water flow at the time of clearing. Therefore the proposed clearing may be at variance with this Principle.

The applicant has drafted a Construction Environment Management Framework which outlines management objectives and performance criteria to manage potential impacts to watercourses, including the implementation of surface water control structures (sediment traps) where necessary and remediation when evidence of erosion, or disturbance to natural drainage flow is identified (as required) (Water Corporation, 2019b).

Given the minimal extent of clearing associated with this watercourse (approximately 0.05 hectares), and that no water extraction, dewatering or drainage modifications are required, it is expected that impacts of sedimentation as a result of clearing will be short term and localised.

(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 with this Principle

The application consists of the proposed clearing of 4.81 hectares of native vegetation over a linear distance of around 12.5 kilometres. Given the linearity of the application area and high permeability of the majority of mapped soil types, the proposed clearing is not likely to increase the incidence or intensity of flooding.

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

Planning instruments and other relevant matters.

One Aboriginal Site of Significance intersects the application area. The applicant will be notified of its responsibilities under the *Aboriginal Heritage Act 1972*.

The clearing permit application was advertised on the Department of Water and Environmental Regulations (DWER) website on 6 May 2019 with a 21 day submission period. No public submissions have been received in relation to this application.

The applicant initially applied for a clearing permit on 9 January 2018, to clear the same area as currently under application. However during the assessment of that application the applicant determined that additional clearing would be required. The applicant noted that the extension would require additional biological information to inform environmental impacts, and subsequently the applicant withdrew the application.

The applicant undertook further biological surveys to cover additional areas proposed for clearing, and subsequently submitted the current application to clear. However the applicant later determined that the additional clearing would not be required, as existing cleared areas could be utilised. As a result, the proposed clearing area remains at 4.81 hectares.

5. References

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