

Crookwell 3 Wind Farm

Ecology—Adequacy of Response to Submissions

For Crookwell Development Pty Ltd

22 October 2013

0193328_Ecology_R02V01

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Crookwell 3 Wind Farm

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INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) has undertaken this ecological assessment on behalf of Crookwell Development Pty Ltd (CDPL) regarding the Crookwell 3 Wind Farm (the Project). This ecological assessment comprises an addendum to the *Supplementary Report* prepared by ERM in April 2013. This addendum has been prepared to support a revised Response to Submissions (RtS) report and addresses the Flora and Fauna items raised in the following correspondence from the Department of Planning and Infrastructure (DoPI) and the Office of Environment and Heritage (OEH):

- letter: *Adequacy of the Response to Submissions for Crookwell 3 Wind Farm (MP10_0034)* (DoPI, 19 June 2013); and
- letter: *Preferred Project Report for Crookwell 3 Wind Farm (MP10_0034)* (OEH, 10 May 2013).

1.1

BACKGROUND

Prior to accepting the RtS report, DoPI and OEH require that the following items regarding flora and fauna be addressed:

- OEH notes the proximity of the mapped hollows to proposed turbines A12 and A18, and has raised concern that this proximity increases the likelihood of birds and bats that utilise these hollows colliding with turbine rotors;
- ongoing survey of Pejar Dam to record how the water body is utilised through the seasons by sedentary and migratory waterbird species, and the potential impact of the wind farm;
- further surveys for Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*). The results from these winter surveys will determine the need for further surveys and mitigation which may be required for these species;
- OEH notes that the NSW-listed Little Eagle (*Hieraaetus morphnoides*) is at a high risk of blade-strike due to its flight height and flight behaviour. This species nest in tall living trees within remnant patches of open Eucalypt forest or woodland. Nest searches for this and other raptor species should be undertaken as part of the pre-construction surveys and appropriate buffers provided around nests;
- the White-fronted Chat (*Epthianura albifrons*) record appears to be on the road. OEH seeks clarification as to whether the bird was nesting in the road development corridor. If so an adequate buffer around the nest should be incorporated into the mitigation of impacts; and

- OEH notes that in the Supplementary Ecology Report, ERM states "... the installation of turbines within this landscape has the potential to impact the movement patterns of migratory species and should be further addressed as part of an updated assessment of significance." OEH requests this information prior to approval as it will determine appropriate offsetting and potential mitigation required¹.

1.2

LIMITATIONS

This response is prepared with the following limitations:

- this addendum does not address all the biodiversity items raised in the DoPI letter dated 19 June 2013. It relates only to items that are required to be addressed prior to approval. Items that relate to pre-construction activities have not been addressed unless they are relevant to this addendum or were required to be undertaken during winter;
- the survey effort and season comprised two ecologists over a period of six days, the first three days from 23 - 25 July 2013 and a further three days from 6 - 8 August 2013, opportunities to observe flora and fauna were therefore confined to those that are present or visible during this season;
- the survey effort for tree hollows was focussed on the area surrounding turbines A12 and A18; and
- areas of native vegetation to be removed quoted in this addendum report are different to those quoted in the *Supplementary Ecology Report* (ERM 2013). ERM have been advised that the location of the access track in the vicinity of turbine A13 has been adjusted to avoid an area of Box Gum Woodland. Therefore, the total area of Box Gum Woodland to be removed is now 0.03 hectares (ha) and the total area of native vegetation to be removed is now 8.81 ha, compared to 0.64 ha of box gum woodland and 9.45 total ha previously.

¹ This statement was in relation to the Swift Parrot and Regent Honeyeater.

2 METHODS

2.1 LIAISON WITH DOPI AND OEH

A meeting was held with planning officers from the DoPI on 17 July 2013. During this meeting, clarification was sought regarding the requirements raised in the DoPI and OEH letters. A key focus of the meeting with respect to flora and fauna was to clarify the requirement for the inclusion of the winter survey results as part of the final RtS report. It was confirmed that the results of winter surveys would be incorporated into this addendum where they are relevant to the assessment being undertaken.

2.2 FIELD SURVEY

Field surveys were undertaken by two ecologists over six days: from 23 – 25 July 2013; and from 6 - 8 August 2013. Camera traps and songmeters were deployed from 23 July – 08 August 2013.

2.2.1 *Tree Hollow Investigations*

Diurnal Investigations

A search of hollow bearing trees (HBTs) was undertaken in the vicinity of turbines A12 and A18 (see *Figure 2.1a*). Previously mapped hollows were re-visited and additional hollows were recorded. Signs of fauna activity such as scratches on trunks, white wash from birds and worn or gnawed hollow entrances were noted. The number and size of the hollows were recorded for each HBT. Hollows were assigned a size class by diameter as:

- 0 – 5 cm = small;
- 6 – 10 cm = medium; and
- 11 cm and above = large.

Camera Trapping

Remote motion sensitive cameras were deployed in the woodland areas in the vicinity of A12 and A18 (see *Figure 2.1a*). These were aimed at hollows or at the trunks of HBTs. Four cameras were deployed in the vicinity of turbine A12 and were set to record over 14 days. Five cameras were deployed in the vicinity of turbine A18, which were set to record over 13 days.

Bat Call Recording

SongMeter bat recording units were deployed in the woodland areas in the vicinity of turbines A12 and A18 (see *Figure 2.1a*). Four were placed in woodland areas and one was placed adjacent to the woodland, overlooking a dam. Two units were deployed in the area around A12 and recorded for 14 nights. Three units were deployed in the vicinity of A18, which recorded for 13 nights.

Spotlighting and Call Playback

Spotlighting surveys for nocturnal species was conducted in the forested areas surrounding A12 and A18, particularly focused on areas where tree hollows were present and where signs of fauna activity were observed during diurnal tree hollow surveys. Two ecologists walked transects approximately 15 metres apart with the tracking function on a GPS used to ensure thorough coverage of the survey areas. Each ecologist stopped frequently in order to listen for nocturnal mammal and bird calls. Lighting was provided by head torches and Faunatech Spotlights. The surveys were conducted on 24 July at A18 for two hours and at A12 on 7 August 2013 for two hours. A repeat survey was also conducted at A18 for 1.5 hours on 7 August. This repeat survey was conducted to further inform the potential use of the habitat by threatened species.

Call playback was conducted at each survey location for the Powerful Owl followed by the Masked Owl. Calls were broadcast for five minutes, followed by five minutes of listening, which was then repeated twice totalling 30 minutes of survey effort for each location. The Powerful Owl call was broadcast first as this species often takes the longest to respond (Kavanagh, R. *pers comm.*). The call playback was conducted towards the end of the spotlighting session to avoid affecting the detectability of other fauna.

2.2.2

Bird Survey

Pejar Dam

Four monitoring locations were established at Pejar Dam (refer to *Figure 2.1b*). Each location was surveyed by two ecologists for a period of forty minutes, with the abundance of all bird species recorded. Other signs of activity were also recorded such as nests, footprints and feathers. The first survey was conducted on 25 July 2013. The surveys were then repeated at each of the four monitoring locations on 7 August 2013.

Regent Honeyeater / Swift Parrot

Winter surveys were undertaken for the Regent Honeyeater and Swift Parrot in accordance with the *Guidelines for Detecting Birds Listed as Threatened under the Environment Protection and Biodiversity Conservation Act 1999* (2010). This included area searches in suitable habitat, targeting woodland patches with heavily flowering trees, particularly around water points such as dams and creek lines. Other nectivorous nomads such as lorikeets and other honeyeaters were also targeted as mixed flocks may include the Regent Honeyeater and the Swift Parrot. These surveys were conducted throughout the survey period of six days.

A list of Eucalypt species recorded in the Study Area was produced and their corresponding flowering times assessed using *Field Guide to Eucalypts* (Brooker and Kleinig, 1999). This enabled a targeted approach to finding suitable flowering Eucalypt species. Two landowners were also consulted as to whether they had noticed heavily flowering trees during the winter months.

Raptor Nest Survey

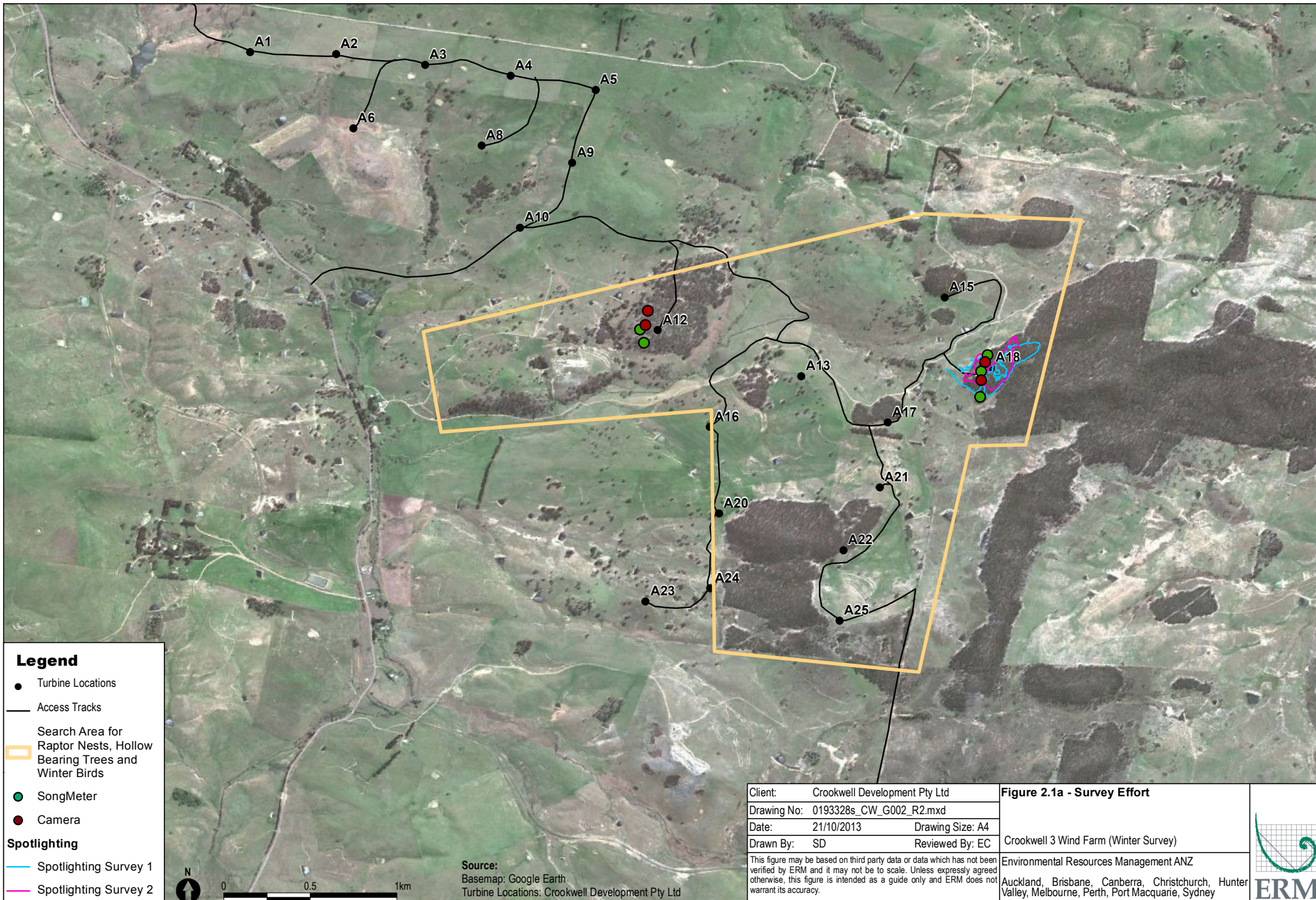
Raptor nest surveys were conducted throughout the search area shown on *Figure 2.1a* and *2.1b*, focusing on woodland and forested areas. Pedestrian searches were conducted in areas of high potential or poor visibility. Areas with high visibility were surveyed using binoculars from vantage points. Where nests were identified, the area below the nest was searched for pellets, white wash and feeding debris. Raptors observed throughout the surveys were observed to determine if they were flying to or from a nest.

White-Fronted Chat

The area where the White-fronted Chat was previously recorded was re-visited to determine the value of the habitat for the species and to ascertain if other individuals were present.

Other Species

All vertebrate species observed during the surveys were noted, with additional locational and abundance detail provided for threatened species or migratory species.





Legend

- Turbine Locations
- Access Tracks
- Pejar Dam Survey Transects



Source:
 Basemap: Google Earth
 Turbine Locations: Crookwell Development Pty Ltd

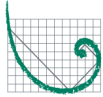
Client:	Crookwell Development Pty Ltd
Drawing No:	0193328s_CW_G002_R3.mxd
Date:	12/09/2013
Drawn By:	SD
Drawing Size:	A4
Reviewed By:	EC

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 2.1b - Survey Effort: Pejar Dam

Crookwell 3 Wind Farm (Winter Survey)

Environmental Resources Management ANZ
 Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



3 RESULTS

3.1 WEATHER CONDITIONS

The prevailing weather conditions during the field survey are provided in *Table 3.1*.

Table 3.1 Prevailing Weather Conditions During Field Survey

Survey period	Temperature (°C)		Max wind gust (km/h)	Total Rainfall (mm)
	Minimum	Maximum		
23-07-13	2.6	10.6	48	0
24-07-13	-3.9	12.8	35	0.2
25-07-13	-6.6	13.6	31	0
26-07-13	-0.6	11.9	35	0
27-07-13	-4.0	15.9	17	0.2
06-08-13	6.0	13.0	63	0.6
07-08-13	3.1	11.2	43	3.2
08-08-13	2.1	11.9	54	0.8

Information sourced from the Australian Government Bureau of Meteorology Goulburn Airport weather station.

3.2 TREE HOLLOW INVESTIGATIONS

3.2.1 Diurnal Investigations

A12

Twelve (12) HBTs were observed in the woodland around turbine A12 and, as some HBTs contained multiple hollows, 30 hollows were recorded in total. The mean tree hollow diameter was calculated for each HBT. Four HBTs supported small hollows (0 – 5 cm), four HBTs had mainly medium hollows (6 – 10 cm) and four HBTs had large hollows (> 11 cm) (see *Figure 3.1*). The large hollows did not exceed 15 cm in diameter.



Source:
 Basemap: Google Earth
 Turbine Locations: Crookwell Development Pty Ltd



Legend	
Hollow Bearing Trees	Threatened Species (Common Name)
● Large	▲ Gang-gang Cockatoo
● Medium	▲ Little Eagle (soaring)
● Small	▲ Scarlet Robin
● Turbine Locations	▲ Varied Sittella
— Access Tracks	▲ Wedge-tailed Eagle
	▲ White-fronted Chat
	▲ White-throated Needletail
	★ Little Eagle Nests
	▲ Squirrel Glider

Client:	Crookwell Development Pty Ltd
Drawing No:	0193328s_CW_G003_R2.mxd
Date:	21/10/2013
Drawn By:	SD
Drawing Size:	A4
Reviewed By:	EC

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Figure 3.1 - Survey Results

Crookwell 3 Wind Farm (Winter Survey)

Environmental Resources Management ANZ
 Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



Thirty (30) HBTs were observed in the woodland around turbine A18, with a total of 56 hollows recorded. Based on the mean diameter for the hollows in each HBT, fourteen of the HBTs are characterised by mainly having small hollows, 15 are characterised by mainly having medium hollows (6 – 10 cm) and one was characterised as containing mainly large hollows (> 11 cm) (see *Figure 3.1*).

3.2.2 *Camera Trapping*

The camera traps deployed in the vicinity of turbine A12 and A18 recorded five native and one introduced species as shown in *Table 3.2*.

Table 3.2 *Species Recorded by Camera Traps*

Scientific Name	Common Name	Location	Abundance
<i>Cormobates leucophaea</i>	White-throated Treecreeper	A12	1
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	A18	3
<i>Microeca fascinans</i>	Jacky Winter	A12	1
<i>Trichosurus vulpecular</i>	Common Brushtail Possum	A12	1
<i>Vulpes vulpes*</i>	European Fox	A18	3
*Introduced species			

The native species recorded are not listed under the EPBC Act or the TSC Act.

3.2.3 *Bat Call Recording*

A total of 979 bat calls were analysed. Nine microbat species were identified with varying levels of confidence (six definite, one probable, three possible, one that could be one of two species, and one that could be one of three species) (see *Table 3.3*). This included two threatened species, neither of which were a definite identification (shown in bold in *Table 3.3*).

Table 3.3 *Bat Species Recorded*

Scientific Name	Common Name	Status TSC Act	Confidence (Number of recordings)
<i>Chalinolobus gouldi</i>	Gould's Wattled Bat	-	Definite (49) / Probable (1)
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	-	Definite (55) / Possible (1)
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	Possible (2)
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	Probable (2) / Possible (8)
<i>Mormopterus</i> sp.		-	Possible (2)
<i>Nyctophilus</i> sp. (<i>N. gouldi</i> or <i>geoffroyi</i>)	Gould's Long-eared Bat or Lesser Long-eared Bat	-	Either (23)

Scientific Name	Common Name	Status TSC Act	Confidence (Number of recordings)
<i>Vespadelus darlingtoni</i>	Large Forest Bat	-	Definite (274) / Probable (237)
<i>Vespadelus regulus</i>	Southern Forest Bat	-	Possible (4)
<i>Vespadelus vulturnus</i>	Little Forest Bat	-	Definite (152) / Probable (49)
<i>Vespadelus vulturnus</i> or or <i>V.regulus</i> or <i>V.darlingtoni</i>	Little Forest Bat or Southern Forest Bat or Large Forest Bat	-	Either (124)

Confidence: Definite - 100% confidence; Probable - over 60% confidence; Possible - between 20 and 60%.

Conservation Status (TSC Act): V - Vulnerable

The possible recordings of the Eastern False Pipistrelle occurred in the vicinity of turbine A12 and A18. The probable / possible recordings of the Eastern Bentwing-bat also occurred in the vicinity of turbine A12 and A18. The songmeters that recorded these species were placed in woodland areas.

3.2.4 *Spotlighting and Call Playback*

Twelve (12) native and two introduced species were recorded during nocturnal spotlighting and call playback. These are shown in *Table 3.4*. Two of the species recorded in the vicinity of turbine A18 are vulnerable species listed under the TSC Act.

Table 3.4 *Species Recorded During Nocturnal Surveys*

Scientific Name	Common Name	Status	Observation Type	Location	Number of records
Birds:					
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar		W	A18	3
<i>Ninox novaeseelandiae</i>	Southern Boobook		O, W	A18	5
<i>Ninox strenua</i>	Powerful Owl	V	W	A18	1
<i>Podargus strigoides</i>	Tawny Frogmouth		W	A18	5
Mammals:					
<i>Macropus giganteus</i>	Eastern Grey Kangaroo		O	A18	
<i>Macropus robustus</i>	Common Wallaroo		O	A12	2
<i>Oryctolagus cuniculus*</i>	European Rabbit*		O	A12	1
<i>Petaurus breviceps</i>	Sugar Glider		O	A18	2
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	O	A18	1
<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum		O	A18	40
<i>Trichosurus vulpecula</i>	Common Brushtail Possum		O	A12, A18	12

Scientific Name	Common Name	Status	Observation Type	Location	Number of records
<i>Vombatus ursinus</i>	Common Wombat		O	A18	1
<i>Vulpes vulpes*</i>	European Fox*		O	A12	1
<i>Wallabia bicolor</i>	Swamp Wallaby		O	A18	1

Conservation Status (TSC Act): V - Vulnerable
Observation Type: O - observed; W - heard call
*Introduced species

3.3 BIRD SURVEY

3.3.1 Pejar Dam

Twenty-four (24) waterbird species were observed during the surveys around Pejar Dam with a total count of 638 individuals. The majority of these are open water species, including diving species such as Coots, Ducks and Grebes. A list of bird species observed is provided in *Table 3.5*.

The shoreline of the dam was moderately to steeply shelving into deep water. This reduces the habitat availability for waders (Charadriiformes family), of which none were observed. No threatened or migratory species were observed.

Table 3.5 Waterbird Species Observations

Scientific Name	Common Name	Number of Records
<i>Anas castanea</i>	Chestnut Teal	6
<i>Anas gracilis</i>	Grey Teal	9
<i>Anas rhynchotis</i>	Australasian Shoveler	9
<i>Anas superciliosa</i>	Pacific Black Duck	6
<i>Aythya australis</i>	Hardhead	63
<i>Biziura lobata</i>	Musk Duck	13
<i>Chenonetta jubata</i>	Australian Wood Duck	2
<i>Corvus coronoides</i>	Australian Raven	1
<i>Cygnus atratus</i>	Black Swan	4
<i>Egretta novaehollandiae</i>	White-faced Heron	5
<i>Eolophus roseicapillus</i>	Galah	4
<i>Fulica atra</i>	Eurasian Coot	367
<i>Gallinula tenebrosa</i>	Dusky Moorhen	8
<i>Grallina cyanoleuca</i>	Magpie-lark	2
<i>Haliastur sphenurus</i>	Whistling Kite	1
<i>Hirundo neoxena</i>	Welcome Swallow	5
<i>Malacorhynchus membranaceus</i>	Pink-eared Duck	11
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	4
<i>Phalacrocorax carbo</i>	Great Cormorant	3
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	19
<i>Podiceps cristatus</i>	Great Crested Grebe	21
<i>Poliocephalus poliocephalus</i>	Hoary-headed Grebe	70
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	1
<i>Vanellus miles</i>	Masked Lapwing	4

3.3.2 *Regent Honeyeater / Swift Parrot*

Winter flowering Eucalypts were not observed in the Study Area during the current field investigations and the analysis of key species present in the Study Area indicate that none of the Eucalypts present are winter flowering species. Therefore, the study area is not considered to provide winter foraging resources for either the Regent Honeyeater or the Swift Parrot.

The Regent Honeyeater and Swift Parrot were not observed during the survey period. No other birds dependant on nectivory were observed including Lorikeets or aggregations of other Honeyeater species. Two landowners were also consulted, who supported the notion that there were no profusely flowering Eucalypts during the winter months.

3.3.3 *Raptor Nest Survey*

Three nests of the Little Eagle were observed in the same tree (see *Figure 3.1* and *Photograph 3.1*). The nests are approximately 60 centimetres (cm) in diameter and each has a deep base. The nests were considered to be too small to have been built by a Wedge-tailed Eagle (*Aquila audax*).

The nesting tree is emergent from the canopy of the surrounding trees and is 85m up slope from a creek. One of the nests was degraded, however, two of the nests were large and have the potential to be used again. There were no pellets or feeding signs present at the nest, indicating that they are not currently being used. A pair of Little Eagles were observed soaring approximately 600m south east of the nests. No other raptor nests were observed within the Study Area.



Photograph 3.1: Little Eagle Nest

3.3.4

White-Fronted Chat

The area where the White-fronted Chat was previously recorded is considered sub-optimal for the species. The area adjacent to the record had been recently tilled, presumably for improved grassland. There was also an area of grassland close to the record, which was heavily grazed and will not provide important habitat for the species, although the species may forage in the area (refer to *Photo 3.2* and *3.3*). This habitat is widespread through the area. The species typically prefers wetlands or damp areas, which do not occur in the vicinity of the previous sighting. No potential breeding habitat was found within close proximity to the record. Therefore, it is likely that the individual recorded in the previous survey was passing through the area.



Photo 3.2: Recently Ploughed Paddock in Vicinity of White-fronted Chat Record



Photo 3.3: Grazed Paddock in Vicinity of White-fronted Chat Record

3.3.5

Other Species

One threatened species was observed in addition to those discussed above: Scarlet Robin (*Petroica boodang*). This species was opportunistically observed within two woodland areas as shown in Figure 3.1. This species was recorded during previous surveys and a seven part test was undertaken in the *Supplementary Ecology Report* (ERM 2013). The potential impacts to this species were adequately addressed in the previous report and as such, it has not been further assessed.

4.1 HOLLOW BEARING TREES

4.1.1 Vicinity of A12

The HBTs provide potential nesting habitat for small to medium sized parrots such as the Crimson Rosella. This species was observed using the area, however, it was not observed using the hollows. As none of the hollows exceeded 15cm in diameter, there are no suitable hollows for large owls in this area.

Eight of the bat species recorded at the site roost in tree hollows, including the Eastern False Pipistrelle, which is a vulnerable species under the TSC Act. Despite the presence of HBTs in the woodland surrounding turbine A12, it is unlikely that the Eastern False Pipistrelle roosts in this area as there were few records and the species prefers moist habitats with trees taller than 20m (OEH, 2012c).

This habitat occurs to the north and east of turbine A12, where there are large forested tracts interspersed with gullies. This area would provide better quality habitat for roosting and foraging, and hence the 'possible' records of the Eastern False Pipistrelle are likely to have been foraging individuals.

The Eastern Bentwing-bat was recorded in the vicinity of turbine A12 and A18. It roosts in caves and forms discrete populations centred on a maternity cave (OEH 2012d). The nearest known maternity cave is 98 km from the site.

The hollows may provide habitat for possums and gliders however, only one species (Common Brushtail Possum) was recorded during surveys.

The woodland area is small in size (approximately 24ha) and disconnected from large areas of forest. Therefore, its habitat value is reduced with a corresponding low diversity of fauna observed in the field. The woodland surrounding A12 is unlikely to provide important habitat for threatened fauna. Other larger and more continuous forested areas are found within the study area, which provide higher habitat value. The proposed works would not result in the removal of any of the HBTs in the vicinity of turbine A12. The bird and bat species recorded generally forage and fly below the canopy, however there is the potential for impacts due to the proximity of the turbine to this area of habitat. Seven part tests were completed for the Eastern False Pipistrelle and Eastern Bentwing-bat and are provided in *Annex A*. The seven part tests concluded that there would not be a significant impact to these microbat species as a result of the proposed works. Furthermore there are no significant impacts anticipated for other hollow dependant species, including threatened species, given the retention of hollow-bearing trees.

4.1.2

Vicinity of A18

The woodland around turbine A18 is a large area of continuous forest and contains a large number of hollows. The majority would provide suitable habitat for gliders, possums and parrots. A Squirrel Glider (vulnerable under the TSC Act) was observed in the vicinity of turbine A18. Some of the hollows may be suitable for smaller owls such as the Boobook Owl as they have suitable lipped entrances. A Powerful Owl (vulnerable under the TSC Act) was heard in the vicinity of turbine A18 and one hollow may have been suitable for large owls such as the Powerful Owl, however, the entrance was obscured and this could not be confirmed. The HBTs in the vicinity of turbine A18 provide potential habitat for eight of the bat species recorded at the site, including the Eastern False Pipistrelle.

Up to three HBTs will be removed from within the development footprint for turbine A18 (all characterised by mainly small hollows). While these HBTs provide potential habitat for native species that require hollow entrances of less than 5 cm, the HBTs occur at the edge of a large tract of woodland (approximately 168ha) in which numerous other HBTs occur, thereby providing suitable habitat for vulnerable and other species. To minimise impacts to individuals that may inhabit these hollows, a Tree Felling Protocol will be prepared, that includes a requirement to have an ecologist on site during tree removal.

Seven part tests were completed for the Eastern False Pipistrelle and Eastern Bent-wing Bat and are provided in *Annex A*. A seven part test was also completed for the Squirrel Glider and is provided in *Annex A*. The seven part tests concluded that there would not be a significant impact to these species as a result of the proposed works. With appropriate mitigation measures, regarding tree felling, it is considered that the retention of turbine A18 will not pose significant constraints on the ecological resources in the vicinity.

4.2

COLLISION RELATED MORTALITY

Operational wind farms pose a collision risk to birds and bats where rotor strike can cause injury and/or death, as well as alienation of habitat through avoidance of WTGs. Fatalities and injuries are usually caused by a collision with the moving blades (blade strike), or with turbine infrastructure, such as guy lines and powerlines. Lighting on wind farm turbines may also increase the likelihood of blade strike to insectivorous bat species by attracting insects to within the rotor swept area (RSA) (estimated to be between 25 m and 200 m), thus causing bats to forage within this area and interact with the rotors.

Impacts on Birds

The main potential impacts on bird species from an operational wind farm are:

- direct mortality associated with rotor collisions and collisions with other associated infrastructure including towers, guy wires and transmission lines; and
- indirect impacts relating to habitat loss through the effects of the installation of wind farm facilities.

Alienation of habitat is a further consideration related to rotor strike, as it indicates a measure of “avoidance” of WTGs by birds and bats. The avoidance rate for birds in Australia is generally considered to be in the order of 95% to 99% (Smales 2005). This avoidance effect essentially leads to a loss of habitat within the footprint of the proposed development.

The birds that are likely to utilise the HBTs in the vicinity of turbine A12 and A18 generally fly below canopy height or just above it. Canopy height in the Study Area is typically 10 – 15 m in height. As such, these species may fly within the RSA, however, they are more likely to fly below the RSA, thereby significantly reducing the risk of a rotor strike on these species.

A report produced for the Department of Environment and Heritage in 2005 carried out modelling to gauge the cumulative impacts of wind farm developments on the Swift Parrot, across its range in south eastern Australia. The modelling provides a measure of the potential risk at different rates at which birds might avoid collisions (Smales 2005). The report concluded that the number of Swift Parrots that might be killed on average per annum at each wind farm, according to three avoidance rates modelled a cumulative total of between 0.08 and 0.13 Swift Parrots per year at all of the sites the population is likely to encounter within its natural range. This equates to slightly more or less than a single parrot killed every ten years (Smales 2005). Therefore, the cumulative impacts of collision with turbines on the overall population of Swift Parrots as predicted by the modelling for all current and presently proposed wind farms as of 2005 within the species’ range are very small (Smales 2005).

Impacts on Bats

Limited data is available on wind farm impacts on bats in Australia. In Australia, bats display some migratory behaviour but migrations are local and not considered to cover significant distances (BL&A 2011). The Eastern Bentwing-bat migrates annually to maternity caves, where the females breed and hibernate.

Males remain dispersed throughout suitable habitat, and females emerge following the breeding period, to disperse across the landscape. The nearest known breeding colony of the threatened Eastern Bentwing-bat is at Wee Jasper, over 90 km south west of the Study Area. Due to the distance from the maternity site, and the fragmentation of suitable habitat in the Study Area, it is not expected that significant numbers of individuals congregate in the Study Area at any stage. Therefore the proportion of Eastern Bentwing-bat that would be at risk of rotor collision impacts in the Study Area is relatively low. Both the Eastern False Pipistrelle and the Eastern Bentwing-bat are considered to have the potential to fly at RSA height within the Study Area. Both of these species fly above the canopy of forest and woodland areas and fly lower in open areas. Canopy heights in the woodland areas around turbine A12 and A18 are typically 10 - 15 m in height. RSA height has been conservatively estimated at 25 - 200 m. It is likely that some bats would fly within the RSA and as such collisions may occur. However, as both species were recorded in small numbers within the Study Area, it is unlikely that the Study Area represents an important roost or foraging site for either of these species. It is therefore unlikely that a significant number of rotor collision deaths will occur as a result of the proposed action.

As the bat species recorded generally forage and fly below the canopy or just above it, there is the potential for impacts due to the proximity of the turbine to this area of habitat and therefore seven part tests were completed for the Eastern False Pipistrelle and Eastern Bentwing-bat and are provided in *Annex A*. The seven part tests concluded that there would not be a significant impact to these species as a result of the proposed works given that the area of habitat to be removed is small and that the turbines are isolated. Other areas of habitat in better condition are located in the vicinity of the Study Area, to north east and would provide more suitable habitat.

4.3

BAROTRAUMA

The decompression hypothesis proposes that many bats are killed by barotrauma caused by rapid air-pressure reduction near moving turbine blades (Baerwald 2008). Barotrauma involves tissue damage to air-containing structures caused by rapid or excessive pressure changes, pulmonary barotrauma is lung damage due to expansion of air in the lungs that is not accommodated by exhalation (Baerwald 2008). As with any airfoil, moving wind- turbine blades create zones of low pressure as the air flows over them. Animals entering these low pressure areas may suffer barotrauma (Baerwald 2008).

Species most at risk of barotrauma within the Study Area are species of microbats. Where reliable data are available, the bat deaths reported range from 1.6 per turbine per year to over 90 bats per turbine per year (ABS Undated).

Within the Study Area, the threatened microbat species most at risk of mortality due to the effects of barotrauma are the Eastern Bentwing Bat and the Eastern False Pipistrelle, both of which were identified during the field surveys, as both of these species may forage above canopy height and as such, may fly close enough to turbine blades to cause barotrauma.

Seven part tests were completed for the Eastern False Pipistrelle and Eastern Bentwing-bat and are provided in *Annex A*. The seven part tests concluded that there would not be a significant impact to these species as a result of the proposed works, due largely to the turbines being located on the edge of the woodland area and that the impacted vegetation is small and isolated.

4.4 *PEJAR DAM*

The surveys undertaken at Pejar Dam did not identify any threatened or migratory birds. Details of the survey methods, effort, locations and results have been provided above to inform future ongoing monitoring.

4.5 *REGENT HONEYEATER AND SWIFT PARROT*

The surveys targeting the Regent Honeyeater and Swift Parrot did not identify the species at the site. Flowering Eucalypts were not observed during the survey period and an analysis of the Eucalypt species that occur in the Study Area confirmed they are not winter flowering species.

Therefore, it is unlikely that the Regent Honeyeater or Swift Parrot would use the site. Seven part tests were completed for these species in the *Supplementary Ecology Report* (ERM 2013). These tests were updated based on this further data and are provided in *Annex A*. The seven part tests concluded that there would not be a significant impact to the Regent Honeyeater or the Swift Parrot as a result of the proposed works, given that both species have not been recorded in the Study Area and their preferred habitat is not present. Therefore, it is unlikely that the species occur in the Study Area and that the proposed action would have a significant impact on the species..

4.6 *LITTLE EAGLE*

The two potential Little Eagle nests are shown on *Figure 3.1*. Both nests are in the same tree, which is located approximately 310m from the nearest turbine (A27). All other turbines are greater than 700m from the potential nests.

Nest searches for the Little Eagle and other raptors were required as part of the pre-construction surveys. As such, the results of the searches are presented here to inform the buffers required during the construction phase. Further impact assessment to that provided in the *Supplementary Ecology Report* (ERM 2013) has not been undertaken. It is considered that all turbines are at a sufficient distance from the potential nests such that specific buffers areas are not required during construction. The woodland area in which the nest tree occurs will not be impacted by the proposed works.

4.7

OFFSETS

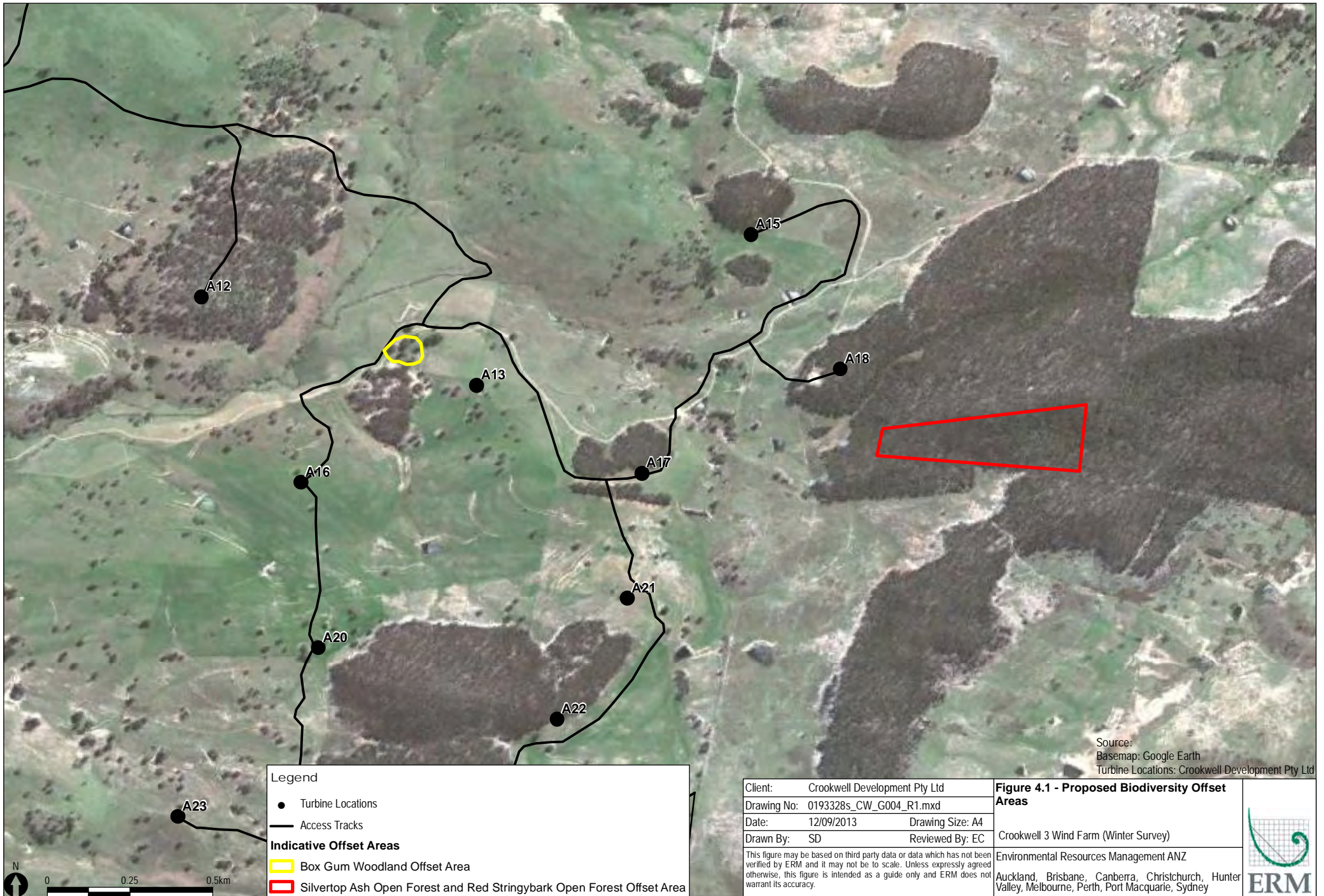
The proposed works will result in the removal of 8.81ha of native vegetation. It is noted that the location of an access track has been adjusted to avoid an area of Box Gum Woodland Endangered Ecological Community (EEC) and therefore, the total area of native vegetation to be removed has been reduced since the *Supplementary Ecology Report* was prepared. Native vegetation to be removed is comprised of the following:

- 2.45ha of Silvertop Ash Open Forest (including 1.89ha of open forest and 0.56ha of derived native grassland);
- 6.33ha of Red Stringybark Open Forest (including 1.37ha of open forest and 4.96ha of derived native grassland); and
- 0.03ha of Box Gum Woodland (comprising 0.03ha of derived native grassland).

Crookwell Development Pty Ltd is proposing that offsets will be secured in areas of Silvertop Ash Open Forest, Red Stringybark Open Forest and Box Gum Woodland within the Study Area (see *Figure 4.1*). A combined offset of 26.34 – 30ha is proposed for the Silvertop Ash Open Forest and Red Stringybark Open Forest, providing an offset ratio of 3:1. An offset area of 0.15ha is proposed for the Box Gum Woodland, which equates to an offset ratio of 5:1. Due to the small size of this proposed offset area, it is likely that the Box Gum Woodland offset area will be extended to provide an enhanced environmental outcome and a more sustainable offset.

It is proposed that the mechanism to secure the offset will be a conservation Property Vegetation Plan (PVP), to be entered into with the Hawkesbury Nepean Catchment Management Authority (HNCMA), once the project is approved. The proposed Silvertop Ash Open Forest and Red Stringybark Open Forest offset area occurs within an existing PVP that will expire at the end of 2013.

Final details of the offset, including the quantum of offset, location, management and securing mechanism will be included in an offset strategy that reflects the requirements associated with the final approved Project. The offset strategy will be prepared and its approval gained by OEI and DP&I prior to commencement of works.



Legend

- Turbine Locations
- Access Tracks

Indicative Offset Areas

- Box Gum Woodland Offset Area
- Silvertop Ash Open Forest and Red Stringybark Open Forest Offset Area

Client:	Crookwell Development Pty Ltd
Drawing No:	0193328s_CW_G004_R1.mxd
Date:	12/09/2013
Drawn By:	SD

Drawing Size:	A4
Reviewed By:	EC

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 4.1 - Proposed Biodiversity Offset Areas

Crookwell 3 Wind Farm (Winter Survey)
 Environmental Resources Management ANZ
 Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



Source:
 Basemap: Google Earth
 Turbine Locations: Crookwell Development Pty Ltd

RECOMMENDATIONS

The following measures are recommended, based on the above further survey and assessment:

- include the results of the HBT survey and the nocturnal surveys in the tree felling protocol so that the species that are known to occur in the area can be targeted during pre-clearance surveys;
- incorporate the results of the winter survey into ongoing monitoring programs and the Bird and Bat Adaptive Management Plan;
- designate the woodland within the Crookwell 3 South Site in which the potential Little Eagle nests occur as a no-go area; and
- preparation of an offset strategy in consultation with OEHL for the Project, following approval being obtained.

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Annex A

Assessments of Significance (Seven Part Tests)

7 Part Test - Eastern False Pipistrelle and Eastern Bentwing-Bat

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

The Eastern False Pipistrelle is listed as vulnerable under the TSC Act. It prefers moist habitats, with trees taller than 20m. It generally roosts in Eucalypt hollows, but has also been found under loose bark on trees or in buildings. It forages for beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer (OEH 2012c). The species was recorded with a confidence level of 'possible' in the vicinity of turbine A12 and A18. The nearest record is approximately 22km to the south east of the site (OEH 2013).

Eastern Bentwing-Bat (*Miniopterus schreibersii oceanensis*)

The Eastern Bentwing-bat is listed as vulnerable under the TSC Act. Caves are the primary roosting habitat, but the species also uses derelict mines, storm-water tunnels, buildings and other man-made structures. They form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves. The species hunts in forested areas where it catches moths and other flying insects above the tree tops (OEH 2012d). The species was recorded with a confidence level of 'possible' and 'probable' on the site in the vicinity of turbine A12 and A18. The nearest record is approximately 22 km to the south east of the site (OEH 2013).

(a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Eastern False Pipistrelle

There are a number of hollow bearing trees in the vicinity of turbine A12 and A18. There is the potential for tree-roosting bats to be vulnerable to habitat loss and modification, especially the loss of hollow bearing trees. Hollow bearing trees would not be removed in the vicinity of turbine A12 and three HBTs would be removed in the vicinity of turbine A18. However, tree-dwelling bats are known to use multiple tree hollows for roosts within their home range and therefore, the loss of these hollows is unlikely to result in a significant impact on these species. Due to the small area of woodland to be lost and the large home range of this species 'it is unlikely that the life cycle of the Eastern False Pipistrelle would be disrupted such that a viable local population would be placed at risk of extinction. It is recommended that a tree felling protocol be prepared that includes a requirement for a fauna ecologist to be present at the time the hollow bearing trees are felled to capture and translocate any fauna using the hollows.

Eastern Bentwing-bat

The site comprises potential foraging habitat only for the Eastern Bent-wing Bat. No breeding habitat occurs at the site for this species. As the area of woodland to be removed is small and only comprises foraging habitat, it is unlikely that its removal would significantly impact on the life cycle of the Eastern Bentwing Bat.

Both the Eastern False Pipistrelle and the Eastern Bentwing-bat are considered to have the potential to fly at RSA height within the Study Area. Both of these species fly above the canopy of forest and woodland areas and fly lower in open areas. Canopy heights in the woodland areas around turbine A12 and A18 are typically 10 - 15 m in height. RSA height has been conservatively estimated at 25 - 200 m. It is likely that some bats would fly within RSA and as such collisions would occur however, as both species were recorded in small numbers within the Study Area, it is unlikely that the Study Area represents an important roost or foraging site for either of these species.

It is therefore unlikely that a significant number of rotor collision deaths will occur as a result of the proposed action although it is acknowledged that some collision deaths may occur. The proposed action is unlikely to impact the life cycle of any of the threatened bat species such that viable local populations of these species will be placed at risk of extinction.

(b) *in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

There are no endangered bat populations currently listed in the area, under Schedule 1 of the TSC Act.

(c) *in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

Not applicable.

(ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local*

7 Part Test - Eastern False Pipistrelle and Eastern Bentwing-Bat

occurrence is likely to be placed at risk of extinction,

Not applicable

(d) *in relation to the habitat of a threatened species, population or ecological community:*

(i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

The proposal will result in the removal of three HBTs in the vicinity of turbine A18. The HBTs may provide roosting habitat for the Eastern False Pipistrelle. A small area (less than 0.2ha) of potential foraging habitat for both species will also be removed.

(ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The habitat in the vicinity of turbine A12 is isolated from other areas of habitat. The proposed works would not further increase this isolation or fragmentation. The habitat in the vicinity of A18 occurs at the edge of a woodland area and incorporates an area cleared for a former quarry. The proposed works would not result in isolation or fragmentation of this habitat.

(iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the Locality,*

The habitat to be removed may provide foraging habitat for both threatened bats. The three HBTs may also provide potential shelter and roosting habitat for the Eastern False Pipistrelle.

The habitat in the vicinity of turbine A12 is small in area (approximately 21.7ha) and is isolated, thereby reducing its habitat value. The habitat in the vicinity of turbine A18 occurs at the edge of a large (approximately 168ha) woodland area. The development footprint incorporates areas that have been cleared.

Other areas of native vegetation that are larger, in better condition and comprise a series of gullies and riparian areas would provide more suitable habitat for these species. This includes the large areas forested areas to the north east of the site. Numerous HBTs will also be retained in the vicinity of turbines A12 and A18. As such, the site is unlikely to be significant to the long-term survival of the species.

(e) *whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

Critical habitat cannot be declared for vulnerable species under Part 3 of the TSC Act.

(f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,*

A recovery plan or threat abatement plan has not been prepared for the Eastern False Pipistrelle or the Eastern Bentwing-bat.

(g) *whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Vegetation clearance that results in habitat loss is listed as a KTP under the TSC Act. The threatened bats are listed in the final determination as species that are adversely affected by this KTP. Approximately 3.26ha of open forest will be cleared under the proposal.

Loss of hollow bearing trees is a KTP under the TSC Act. Three hollow bearing trees will be removed in the vicinity of turbine A18 as part of the proposed action. These hollows may provide potential habitat for the Eastern False Pipistrelle.

Conclusion

The proposed development will result in the removal of approximately 3.26 ha of potential foraging habitat for the threatened bats and three hollow bearing trees that may provide shelter and roosting habitat for the Eastern False Pipistrelle. The area of habitat that will be removed is small and, in the case of woodland around turbine A12, isolated. Other areas of habitat in better condition are located in the vicinity of the Study Area, to north east and would provide more suitable habitat. The species also have large home ranges. It is recommended that a tree felling protocol be prepared that includes a requirement for a fauna ecologist to be present at the time the hollow bearing trees are felled to capture and translocate any fauna using the hollows. With the implementation of these measures, it is considered that the proposed action would not have a significant impact on the threatened bats.

7 Part Test - Squirrel Glider

7 Part Test – Squirrel Glider

This species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. It prefers mixed species stands with a shrub or Acacia midstorey and requires abundant tree hollows for refuge and nest sites. This species was recorded while spotlighting in the vicinity of turbine A18.

(a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The proposal will involve removal of three HBTs in an area where a Squirrel Glider was recorded during surveys. Approximately 3.26 ha of potential foraging habitat will also be removed. The infrastructure has been sited to avoid disturbance to habitat as much as possible and is located on the edge of a large tract of woodland (approximately 168ha) in which numerous HBTs occur.

Due to the small area of woodland to be lost and the presence of large areas of nearby suitable habitat, it is unlikely that the life cycle of the Squirrel Glider would be disrupted such that a viable local population would be placed at risk of extinction. It is recommended that a tree felling protocol be prepared that includes a requirement for a fauna ecologist to be present at the time the HBTs are felled to capture and translocate any fauna using the hollows.

(b) *in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

(c) *in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

Not applicable.

(ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

Not applicable

(d) *in relation to the habitat of a threatened species, population or ecological community:*

(i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

The proposal will result in the removal of three HBTs in the vicinity of turbine A18. The HBTs may provide habitat for the Squirrel Glider. Approximately 3.26 ha of potential foraging habitat will also be removed.

(ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The habitat in the vicinity of A18 occurs at the edge of a woodland area and incorporates an area cleared for a former quarry. The proposed works would not result in isolation or fragmentation of this habitat.

(iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the Locality,*

The habitat to be removed may provide foraging and nesting habitat for the Squirrel Glider. The habitat in the vicinity of turbine A18 occurs at the edge of a large (approximately 168ha) woodland area. The development footprint incorporates areas that have been cleared.

Large forested areas occur to the north east of the site and would provide important habitat for the species. Numerous HBTs will also be retained in the vicinity of turbine A18. As such, the site is unlikely to be significant to the long-term survival of the species.

(e) *whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

Critical habitat cannot be declared for vulnerable species under Part 3 of the TSC Act.

(f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,*

A recovery plan or threat abatement plan has not been prepared for the Squirrel Glider.

(g) *whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Vegetation clearance that results in habitat loss is listed as a KTP under the TSC Act. The Squirrel Glider is listed in the final determination as a species that is adversely affected by this KTP. Approximately 3.26ha of woodland will be cleared under the proposal.

Loss of hollow bearing trees is a KTP under the TSC Act. Three hollow bearing trees will be removed in the vicinity of turbine A18 as part of the proposed action. These hollows may provide potential habitat for the Squirrel Glider.

7 Part Test – Squirrel Glider

Conclusion

The proposed development will result in the removal of approximately 3.26ha of potential foraging habitat for the Squirrel Glider and three HBTs that may provide nesting habitat. However, the habitat in the immediate environs of turbine A18 occurs at the edge of a large (approximately 168ha) woodland area and the development footprint incorporates areas that have been cleared. Numerous HBTs will also be retained in the vicinity of turbine A18. Large forested areas occur to the north east of the site and would provide important habitat for the species.

It is recommended that a tree felling protocol be prepared that includes a requirement for a fauna ecologist to be present at the time the hollow bearing trees are felled to capture and translocate any fauna using the hollows. With the implementation of these measures, it is considered that the proposed action would not have a significant impact on the threatened bats.

7 Part Test – Swift Parrot and Regent Honeyeater

Swift Parrot

This species was not recorded during field investigations and has not been recorded within the Locality. Swift Parrot migrates to the Australian south-east mainland between March and October, and occur in areas where Eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*) and White Box (*E. albens*).

Regent Honeyeater

This species was not recorded during field investigations. There have been no recordings of this species within the Locality. The Regent Honeyeater inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes, providing potential foraging habitat for this species. However, winter flowering Eucalypts were not observed in the Study Area and the analysis of key species present in the Study Area indicate that there are no winter flowering species present.

Winter flowering Eucalypts identified as preferred nectar resources for these two migratory species do not occur in the Study Area. No winter flowering Eucalypts were observed in the Study Area during field investigations. Further, an analysis of key species present in the Study Area identified that there are no winter flowering species present. Therefore, there are unlikely to be winter foraging resources for the Swift Parrot or the Regent Honeyeater.

The Regent Honeyeater and Swift Parrot were not observed during the survey period. No other birds dependant on nectivory (such as Lorikeets or aggregations of other Honeyeater species) were observed. Two landowners were also consulted, who supported the notion that there were no profusely flowering Eucalypts during the winter months.

(a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The proposal would involve the installation of up to 29 individual wind towers standing up to 150m at the top of the blade and associated construction compounds, crane pads and access tracks. The placement of these elements has taken into consideration the geographical and environmental constraints of the site. To facilitate the installation of the above infrastructure the proposal would result in the removal of a combined 3.26ha of woodland that includes 1.89ha of Silvertop Ash Open Forest and 1.37ha of Red Stringybark Open Forest associated with the development footprint. These woodland remnants in the Study Area lack winter flowering Eucalypt species and therefore, do not comprise the preferred habitat for the species.

Blade strike to birds is an inherent risk to any wind energy installation. The instances of blade strike on the Swift Parrot have been assessed using collision risk modelling undertaken by Biosis research in 2005 (Smales 2005). The study concluded that there is actually a very low (approximately 0.08 – 0.13) chance of Swift Parrots mortality from blade strike. Similar rates could be applied to the Regent Honeyeater; however, these would represent a worst case scenario as the Regent Honeyeater's flight paths are generally much lower than those of the Swift Parrot.

Neither of these species were recorded in the Study Area and vegetation characterising the area does not support suitable winter foraging habitat. The proposed actions will not affect the life cycle of the species such that a viable local population of either species is likely to be placed at risk of extinction.

7 Part Test – Swift Parrot and Regent Honeyeater

(b)	<i>in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,</i>
	Not applicable.
(c)	<i>in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</i>
	<i>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i>
	Not applicable.
	<i>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,</i>
	Not applicable
(d)	<i>in relation to the habitat of a threatened species, population or ecological community:</i>
	<i>(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and</i>
	The proposal would result in the removal of a combined 3.26ha of woodland habitat. This habitat does not support preferred winter flowering foraging resource for either species and is therefore not suitable habitat for either of the migratory species.
	<i>(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</i>
	No contiguous woodlands with high species richness were recorded in the Study Area; therefore the woodland habitat is already considered fragmented. The proposed action would not increase this fragmentation.
	<i>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the Locality,</i>
	The woodland remnants in the Study Area and the woodland area that extends to the north east of turbine A18 lack winter flowering Eucalypt species and therefore, do not comprise the preferred habitat for the species. The Proposed actions will therefore not affect the long-term survival of the species within the Locality.
(e)	<i>whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),</i>
	No critical habitat for these species has been identified within the Study Area. Due to previous land use and agricultural clearing, there are no contiguous woodland areas with high species richness located within the Study Area. The woodland within the Study Area would at best, provide an occasional stopover point for these migratory species. Therefore the proposed action is not likely to have an adverse effect on any critical habitat for the above mentioned species (either directly or indirectly).
(f)	<i>whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,</i>
	There are national recovery plans for both the Swift Parrot and the Regent Honeyeater.

Swift Parrot

The plan considers the conservation requirements of the species across its range, identifies the actions to be taken to ensure its long-term viability in nature and the parties who will undertake these actions. This species is mainly threatened by loss of and alteration of habitat from forestry activities including firewood harvesting, clearing for residential, agricultural and industrial developments, attrition of old growth trees in the agricultural landscape, suppression of forest regeneration, and frequent fire. The Swift Parrot is also threatened by the effects of climate change; food and nest source competition; flight collision hazards; psittacine beak and feather disease; and illegal capture and trade.

The overall objective of this plan is to prevent further population decline of the Swift Parrot and to achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. These objectives will be achieved by implementing recovery actions for each of the following specific recovery objectives:

Objective 1: To identify and prioritise habitats and sites used by the species across its range, on all land tenures.

Objective 2: To implement management strategies to protect and improve habitats and sites on all land tenures

7 Part Test – Swift Parrot and Regent Honeyeater

Objective 3: To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD).

Objective 4: To monitor population trends and distribution throughout the range.

Regent Honeyeater

The objectives, criteria and actions proposed in the recovery plan for this species are based on a thorough review of the biological and ecological information available at the time of writing. However, it is emphasised that our knowledge of the habitat requirements of the Regent Honeyeater, and of seasonal or drought-induced movements, is still deficient, and that the adequacy of these actions will need to be reassessed as new information becomes available.

Long-term objectives [to be achieved within two decades] include:

1. To ensure that the species persists in the wild.
2. To achieve a down-listing from nationally endangered to vulnerable by stabilising the population and securing habitat extent and quality in the main areas of occupancy.
3. Achieve increasing reporting rates (5%) in areas previously used regularly, e.g. Munghorn Gap, Bendigo, north-east Melbourne, Eildon area.

Potential habitat for the species in the form of winter flowering Eucalypts do not occur in the Study Area and the species are unlikely to occur. Therefore, the proposed action is not inconsistent with the objectives of the above recovery plans.

(g) *whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Clearing of native vegetation is a key threatening process that will occur as part of the proposed action. The vegetation to be removed does not comprise the preferred habitat for these species. The proposed action involves minimal clearing, with one turbine and its associated infrastructure removed from the Project to avoid habitat removal. A series of mitigation measures are proposed, which aim to protect the remaining areas of habitat and reduce the impacts associated with habitat loss. An offset strategy will be prepared for the proposed action to provide alternative areas of habitat for native species. Therefore, the operation of these key threatening processes have been minimised and the residual impact is considered to be minimal.

Conclusion

The species have not been recorded in the Study Area and their preferred habitat is not present. Therefore, it is unlikely that the species occur in the Study Area. It is unlikely the proposed action would have a significant impact on the species.

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