



AN ASSESSMENT OF THE BAT FAUNA AT THE PROPOSED CAPITAL WIND FARM, NSW

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For Connell Wagner Pty Ltd, June 2005**

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¹ This is a requirement of the consultant's insurance company.

EXECUTIVE SUMMARY

Greg Richards and Associates Pty Ltd was commissioned by Connell Wagner Pty Ltd to conduct a 'desktop' assessment of the bat fauna likely to occur at the proposed Capital Wind Farm, NSW, and the potential for impact on these species by the proposal. The desktop assessment preceded a field survey in February/March 2005, and provided background information to ensure that threatened species were targeted by the methodology selected.

Searches of databases and other sources were conducted to generate a list of species recorded within 50km of the project area. This list was then refined to be applicable to the project area, based on ecological requirements of the regional bat fauna, habitats available at the site (based on a site inspection), and records from other windfarm projects in the region.

It was concluded that 12 species could be expected to occur in the project area, including the Yellow-bellied Sheathtail Bat and Eastern Bentwing Bat, both of which are listed as Vulnerable in the NSW Threatened Species Conservation Act. No species listed in the Commonwealth Environment Protection and Biodiversity Conservation Act could be expected in the project area.

Potential impacts upon any high flying bats present in the project area may include loss of roost sites through any tree clearance during the construction phase, and collision with the blades of the wind turbines during operation. Estimation of the probability of collision indicated that there was a low likelihood of the latter, and the viability of local populations of any species is unlikely to be adversely affected by the proposed windfarm.

No threatened species were recorded at sampling sites in the project area, yet the (NSW listed) Eastern Bentwing Bat² and Yellow-bellied Sheathtail Bat occurred at a sampling site southeast of the project area, and over six kilometres from the nearest turbine location.

Collision with turbine blades during annual migrations of the Eastern Bentwing Bat to a "dispersal stopover" cave, to the southeast of the site and well away from the nearest turbine location is considered unlikely for the reasons given below. Occupation of this cave at Mt Fairy occurs from (approximately) mid-February to mid-March each year, when bats are *en route* between a maternity site at Wee Jasper and caves in the coast and ranges. The general landscape of the project area is barren and mostly treeless grazing land, and it would be highly doubtful that migrating bats would commute across it, as opposed to following large tracts of preferred foraging habitat located to the south of the site. This conclusion is supported by the absence of calls recorded at sampling sites within the project area at the same time that an average of 20 calls per night were recorded in the Mt Fairy area.

² Previously known as the Large Bentwing Bat

1.0 INTRODUCTION

The consultant was commissioned by Connell Wagner Pty Ltd to conduct an assessment of the bat fauna likely to occur at the proposed Capital Wind Farm, and to establish whether during its construction and operation there would be any impact upon threatened species. The assessment included a preliminary study of background information, which preceded a field survey, and provided background information to ensure that threatened species were targeted by the methodology selected.

The project took the form of a desktop assessment after a site inspection during November 2004, and a field study in February-March 2005. For the desktop assessment, a bat species list was generated from databases, and potential impacts upon threatened species and any high-flying species were assessed. A *Protected Matters Search Report* (for the area shown on Figure 1) was generated from the Commonwealth Department of Environment and Heritage website to identify any matters of national environmental significance, including any threatened bat species listed in the Environmental Protection and Biodiversity Conservation Act.

2.0 PROJECT AREA & PROJECT DESCRIPTION

The proposed windfarm is located about 10 km south and southwest of the village of Tarago, and approximately 10 km north of Bungendore, NSW (Figure 1), and is described in detail in other reports related to the EIS for the project.

The project area is primarily cleared open grazing land, with a number of small and highly disturbed (grazed) woodland remnants that may provide some habitat resources such as potential roost hollows and foraging areas. The wind farm is also located to the east of Lake George, an area that is devoid of trees. This lake is ephemeral, and at the time of this study it was dry and devoid of trees.

It is proposed that the project area will have up to 56 turbines located in rows on approximately 4 major ridges and several small hills. The turbines are located in three groups, the Grose Hill, Ellenden and Hammonds Hill Groups (see section 5 and figure 2). The survey included a fourth group the Kalbilli Group that has since been excluded from the project. Survey results for that group are nevertheless included.

The project also includes a 330 kV substation, associated access tracks, and underground cables. A section of overhead powerline will also be included to connect the north-western and western groups of turbines to the substation.

3.0 METHODS

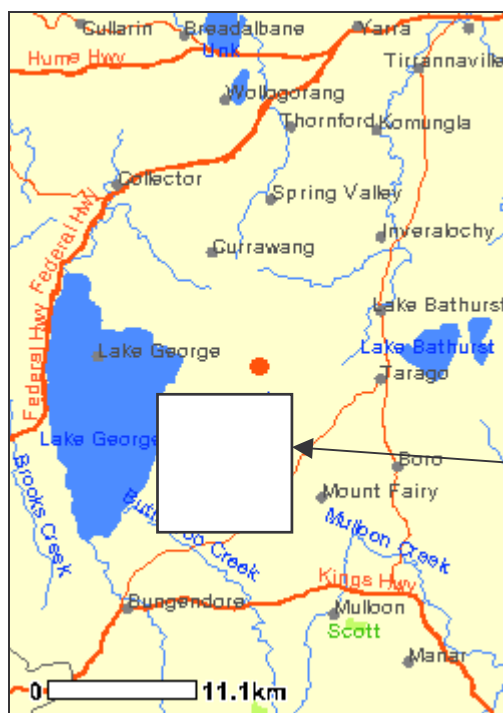
3.1 Background information

A search of the consultant's database of bat distribution records, compiled over the last three decades, was conducted to generate a list of species that could be expected in the study area. The database included records from museums and fauna agencies, personal field records and those of colleagues, and relevant literature. The search area was a 50 x 50 km block centred upon the project area, and had boundaries approximately 149°22'30"E to 149°56'20"E by 34°49'30"S to 35°17'40"S.

Other background information included field guides (Hall and Richards 1979; Churchill 1998) and reports from the author's previous studies conducted at the Crookwell and Blayney wind farms, and the proposed Gunning, Taralga, Bannister and Woodlawn wind farms (Richards 1997, 1999, 2003, 2004). The Woodlawn project is located adjacent the project area of the proposed Capital Wind Farm, and the others (except Blayney) are in the Southern Tableland region and within 50km distant.

A *Protected Matters Search Report* was generated from the Environment Australia website, centred upon a point between the village of Tarago and Lake George. A report area buffer of 20 km was used (Figure 1).

Figure 1: Areas surrounding the proposed Capital Wind Farm that were covered by a *Protected Matters Search Report*. A point centred between Lake George and the village of Tarago was used to locate the search, and a buffer zone of 20 km was assessed.



Approximate
area of wind
farm site

4.0 RESULTS

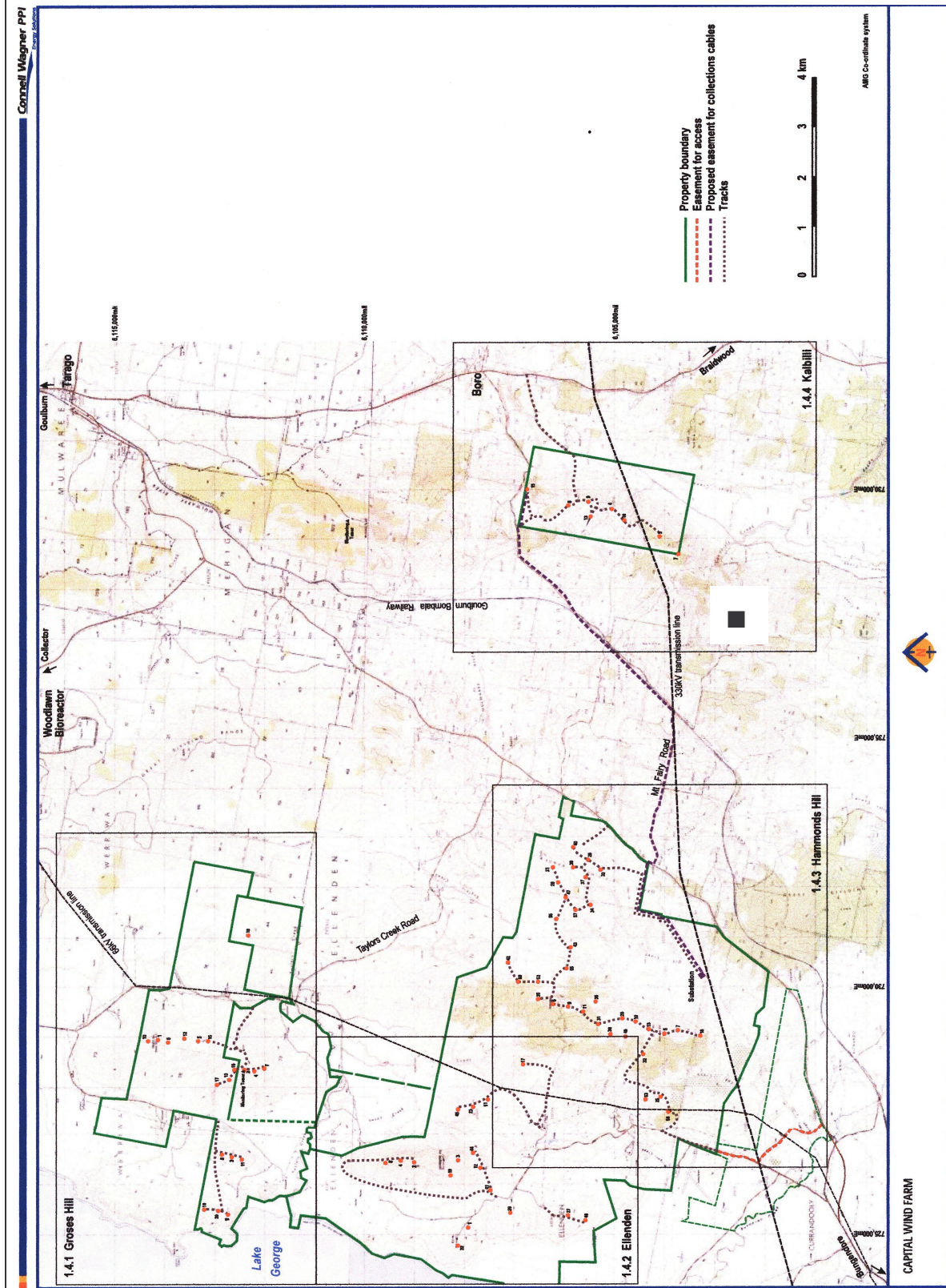
4.1 Regional species list

A list of species recorded from the region is shown in Table 1, and includes five species that are listed as threatened in State and Commonwealth legislation. Because the database search area included several karst areas such as Bungonia Gorge and Wee Jasper, several threatened cave-dwelling species were placed into the regional list. Records of Eastern Bentwing Bats (*Miniopterus schreibersii*) at a cave at Mount Fairy, within the study area, were also noted.

Table 1: Systematic list of species expected in the study area, based on searches of databases for records within approximately 50 km of the proposed Capital Wind Farm. Records from surveys conducted at the Crookwell wind farm, and the proposed Gunning, Bannister, Taralga and Woodlawn wind farms, are included in this Table. Species listed in the Commonwealth Environment Protection and Biodiversity Act and the NSW Threatened Species Conservation Act are shown, and all are listed as Vulnerable. The search area encompassed several karst areas which placed several cave-dwelling species (the Eastern Horseshoe Bat, the Large-eared Pied Bat and the Eastern Bentwing Bat) into the regional list.

Common name	Scientific name	Listed in EPBC Act	Listed in TSC Act
Flying foxes (Pteropodidae)			
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	•	•
Little Red Flying Fox	<i>Pteropus scapulatus</i>		
Sheath-tail Bats (Emballonuridae)			
Yellow-bellied Sheath-tail Bat	<i>Saccolaimus flaviventris</i>		•
Horseshoe bats (Rhinolophidae)			
Eastern Horseshoe Bat	<i>Rhinolophus megaphyllus</i>		
Ordinary bats (Vespertilionidae)			
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	•	•
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>		
Chocolate Wattled Bat	<i>Chalinolobus morio</i>		
Eastern Bentwing Bat	<i>Miniopterus schreibersii</i>		•
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>		
Gould's Long-eared Bat	<i>Nyctophilus gouldi</i>		
Greater Long-eared Bat (SE form)	<i>Nyctophilus timoriensis</i>	•	•
Eastern Broad-nosed Bat	<i>Scotorepens orion</i>		
Large Forest Bat	<i>Vespadelus darlingtoni</i>		
Southern Forest Bat	<i>Vespadelus regulus</i>		
Little Forest Bat	<i>Vespadelus vulturnus</i>		
Freetail bats (Molossidae)			
White-striped Freetail Bat	<i>Tadarida australis</i>		
Eastern Freetail Bat	<i>Mormopterus</i> sp.2		

Figure 2: Map of the proposed Capital Wind Farm project area and environs, showing features relevant to the bat fauna assessment and location of ridges where turbine rows will be placed. Vegetated ridges are shown in brown shading. The approximate location of a 'dispersal stopover' cave roost for the Eastern Bentwing Bat (*Miniopterus schreibersii*) is located about 1 km south of Mt Fairy is indicated by a solid square.



4.2 Local species list

The project area was inspected on 1st November 2004, and ridges where turbines were planned to be located were visually assessed for potential bat habitat. Four woodland remnant sampling sites were established on 21 February 2005. At each site an automated Anabat bat detection system operated over three nights, and for the entire night. Three were located within the area of the Hammonds Hill Group where woodland existed near the turbine sites. The fourth was located more than six kilometres to the south east of the project area within the Kalbilli Group.

Table 2 shows location of the sampling sites, and the raw data collected over three consecutive nights.

The low number of calls recorded at each sample site within the project area, compared with those recorded at a monitoring site in good habitat away from the project area (Table 2) indicates the impact of habitat degradation: there are no threatened species (Eastern Bentwing Bat and Yellow-bellied Sheath-tail Bat) present in the project area, and some species that apparently prefer good habitat are also absent.

Table 2: The number of bat calls recorded at three sampling sites located at degraded woodland remnants within the project area, compared with a sampling site containing prime bat habitat located to the south of the project area in the Mt Fairy region. The total number of calls recorded throughout the night for three consecutive nights (21-23 February 2005) are shown. *Nyctophilus* species are impossible to separate by echolocation call, and hence the two potential species. *N. geoffroyi* and *N. gouldi* are grouped by default.

Location:		Within project area			Out of area
Site number:		1	2	3	4
Easting:		732010	729454	729087	739078
Northing:		610597 2	6106066	6104257	6104412
Scientific name	Common name				
<i>Chalinolobus gouldii</i>	Gould's wattled bat	-	1	-	66
<i>Chalinolobus morio</i>	Chocolate wattled bat	1	-	-	113
<i>Miniopterus schreibersii</i>	Eastern Bentwing bat	-	-	-	81
<i>Mormopterus</i> sp.2	Eastern Freetail	22	11	41	922
<i>Nyctophilus</i> sp./spp.	Longeared bats	1	2	4	127
<i>Saccolaimus flaviventris</i>	Yellow bellied Sheath-tail	-	-	-	14
<i>Scotorepens orion</i>	Eastern Broadnosed bat	-	-	-	34
<i>Tadarida australis</i>	White striped freetail	3	4	4	205
<i>Vespadelus darlingtoni</i>	Large forest bat	7	5	9	126
<i>Vespadelus regulus</i>	Southern forest bat	11	9	17	868
<i>Vespadelus vulturnus</i>	Little forest bat	-	-	1	40
Totals		45	32	76	2596

5.0 DISCUSSION

5.1 Habitat resources for the bat fauna

The majority of the project area is open and cleared agricultural land (Figure 2). Most of the ridges where rows of turbines are planned to be located were totally cleared, but parts of some had potential bat habitat ranging from small woodland remnants to a large tract of forest, as follows:

Groses Hill Group of turbines

The turbine sites within this north-western Group are located on ridges that have been totally cleared and are close to Lake George. The ridges are exposed areas that will experience strong winds. No bat monitoring devices were located here due to the lack of suitable habitat and foraging areas.

Ellenden Group (Red Hill and Governors Hill)

This western Group is located on ridges adjacent to the broad treeless plain that is Lake George. Red Hill is mostly cleared apart from several pine trees. The Governors Hill ridgeline is mostly cleared of trees. Some areas of trees are present on the slopes. These ridges will experience strong winds at times. As for Groses Hill, no bat monitoring devices were located here due to the lack of suitable habitat or foraging areas.

Hammond and Big Hill Group

The central Hammond Hill/Big Hill Group of turbines is located in areas of grassland and adjacent open woodland. The ridgelines east of Hammonds Hill are almost totally devoid of trees. The Hammond Hill area, particularly on the western slope contains some areas of remnant woodland and monitoring devices were located here to establish whether the Yellow-bellied Sheath-tail Bat utilised the habitat. Due to grazing by livestock, the habitat may not be preferred by this species. There is some likelihood that the Eastern Bentwing Bat may also utilise this area during the period that the Mount Fairy cave is occupied. Turbines on the Hammond Hill/Big Hill Ridgeline may create issues and the survey aimed to assess which species were present and to gauge the potential impacts. Three bat monitoring devices were located within this group.

Kalbilli Group

This group occurs outside the current project area but was included due to the more extensive layout being considered at the time of survey. It comprises a mostly cleared ridgeline with woodland at the southern and northern ends. A monitoring device (Site 4) was located on the edge of an area of woodland at the southern end of the group.

5.2 Potential for Presence of Threatened Species

Grey-headed Flying Fox (*Pteropus poliocephalus*)

This species is a very rare visitor to the Southern Tablelands region and would be infrequently expected in the project area due to the low availability of primary food resources (eucalypt blossom) and the relatively large distance to nearest known roost sites, which are generally coastal (Hall and Richards 2000). None were detected during the survey.

Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*)

This species is generally rare but widespread throughout NSW and Australia. It appears to live in small colonies that occupy tree hollows, and forages by feeding above the tree canopy (Churchill 1998, Richards 2002). Recent studies in the Cadia Valley (Orange, NSW) indicate that presence of this species may be dictated by extensive high quality habitat with a shrub understorey, in tracts of several hundred hectares (Richards, unpublished). No such habitat appears to be present in the project area in sufficient size. None were detected within the project area.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

This species is highly unlikely to be present in the project area. It was not recorded at the Crookwell, Bannister and Gunning windfarm sites. It is primarily a subterranean roosting species and the nearest known colony is at Bungonia Gorge in the Goulburn area, 60km distant. In the southern latitudes of its range, it appears to be dependent upon the presence of large tracts of sclerophyll forest within the vicinity of a roost site (Churchill 1998; Richards unpublished). It is unlikely that individuals from Bungonia Gorge would commute to forage in woodland remnants and forest in the project area. None were detected during the survey.

Eastern Bentwing Bat (*Miniopterus schreibersii*)

The Eastern Bentwing Bat is known to occupy a cave roost in the project area, in the vicinity of Mount Fairy (Figure 2). This cave is used as a 'dispersal stopover' point during annual migrations from a maternity roost at Wee Jasper (Hall and Richards 2004) to caves in the coast and ranges, which appear to be during the period mid-February to mid-March each year. None were detected within the project area.

Greater Long-eared Bat (Southeast form) (*Nyctophilus timoriensis*)

Long-eared Bats typically roost in tree hollows or under exfoliating bark, and are short-range foragers that glean prey from substrates such as foliage and bark (Hosken 1996; Hosken *et al* 1994; Lumsden 1994; Lumsden and Bennett 1995a, 1995b; Lumsden and Bennett 1997; Lunney *et al* 1988; Parnaby 1995; Richards 1983a). Many of these authors consider that this species is primarily a semi-arid species, with preferred foraging in mallee,

dry open woodlands and River Red Gum habitats. There does not appear to be suitable habitat present in the project area. *Nyctophilus* species were detected in the project area but as indicated in Table 2 these are most likely *N. geoffroyi* and/or *N. gouldi*.

5.3 Ecological Characteristics of Expected Species

The ecological characteristics of bat species that could be expected in the proposed Capital Wind Farm and environs were assessed to identify the array of flight and foraging niches of the community in the project area. The list that was compiled from database searches and a *Protected Matters Search Report* (Table 1) was modified to exclude species of doubtful occurrence, based on the distribution and known habitat utilisation patterns outlined in the previous section. All cave-dwelling species, apart from the Eastern Bentwing Bat, known from permanent roosts in large caves in the Bungonia area were excluded from this analysis on the lack of prior records for these species in this general locality and on the basis of similar roost sites apparently being absent in the area.

Generalised foraging modes and strata were based upon Richards (2002 and unpublished). Primary foraging strata were identified but may also include open or grassland habitat, especially if individuals commute between woodland remnants across cleared agricultural land. This assessment is shown in Table 3. It should be noted that the canopy height of the woodland on the upper slopes of the Hammonds Hill area is only about 10 metres, well below the height of the turbine blades.

Table 3: Ecological characteristics of insectivorous bat species expected in the proposed Capital Wind Farm and environs. All cave-dwelling species have also been excluded on the basis of suitable roost sites being absent in the area. Generalised foraging modes and strata are based upon Richards (2002). Foraging strata may also include open or grassland habitat, especially if individuals commute between woodland remnants.

Primary foraging stratum	Primary foraging mode	Species
Above canopy	Prey intercept	Yellow-bellied Sheath-tail Bat
		White-striped Freetail Bat
Around/within canopy	Prey pursuit	Gould's Wattled Bat
		Chocolate Wattled Bat
		Eastern Broadnosed Bat
		Eastern Bentwing Bat
		Large Forest Bat
		Southern Forest Bat
		Little Forest Bat
		Eastern Freetail Bat
Below canopy	Prey gleaning	Lesser Longeared Bat
		Gould's Longeared Bat

6.0 IMPACT ASSESSMENT

6.1 Potential impacts

Two impacts upon the local bat community have potential to occur during the construction and operational phases. These impacts would include some loss of roost sites via tree clearance during the construction phase, and collision with the blades of the wind turbines during operation.

6.1.1 Habitat loss

All species expected in the project area would be impacted by varying extent to the loss of roost sites. A number of these species are known to have several separate tree roosts throughout the landscape that they utilise (Richards, unpublished studies at Cadia Gold Mine, Orange and Cowal Gold Project, West Wyalong). In general, the project will avoid clearing of woodland for placement of turbines and access. Minimising the extent of clearing will reduce the potential for habitat loss.

6.1.2 Collision Impact

The two regional species in the above canopy–prey intercept assemblage (Table 3), the Yellow-bellied Sheath-tail Bat and the White-striped Freetail Bat, have some potential for collision because their ecological niche includes the airspace swept by turbine blades. Other species, such as those in the around-canopy and below-canopy assemblage (Table 3), are likely to have a much lower potential for collision. However, within the project area itself there are no records of the Yellow-bellied Sheath-tail Bat, and very few records (3–4 per site per 3 nights) of the White-striped Freetail Bat (Table 2). Considering this low level of activity, it is highly doubtful that collisions would occur to the extent that the viability of the local or regional population would be affected.

Very little is known about the extent of collision by Australian bats with wind turbines, and very little research appears to have been conducted on this subject. Global data varies extensively, ranging from very high numbers of migrating bats reported killed at several sites in the United States, to very low numbers at sites in Victoria.

Brett Lane and Associates (2003) stated that there would be very little collision impact on the White-striped Freetail Bat at the six turbine Wonthaggi windfarm (Victoria) because it was to be located in primarily cleared agricultural land. At the 84 turbine Bald Hills windfarm (Victoria), because it was located in similar sub-optimal habitat, it was concluded that the mortality level would be less than one bat per turbine per year, with the White-striped Freetail Bat being at the greatest risk (Anon 2003).

Data provided on the Environment Victoria website suggested a low risk to White-striped Freetail Bat populations. Monitoring surveys conducted between 2000 – 2003 at the Codrington Windfarm (14 turbines) recorded only two individuals killed by collision, and at the Toora (12 turbines) six White-striped Freetail Bats and one

Chocolate Wattled Bat were killed. This equates to 0.04 and 0.14 bat deaths/turbine/year at Codrington and Toora respectively.

However, nothing is known about the likelihood of an individual bat to not visualise a turbine blade, and there appears to be no scientific information on this subject. Given the large profile of a blade and the obvious fact that bats can detect large objects (for example, tree branches, moving vehicles, walls of buildings) and small fast moving objects (insects) then one would assume that the probability of a bat not perceiving or distinguishing a blade in the open air would be very low. However, there may be other unknown issues, such as suction effects.

Nevertheless, the placement of turbines in primary bat habitat could initially lead to an increased risk to high flying bats that feed above the forest canopy, and would have been of concern for the conservation of the Eastern Bentwing Bat at the Kalbilli site.. The exclusion of the Kalbilli Group from the project area now avoids this risk. No Eastern Bentwing Bats were detected at the Hammonds Hill site and it is unlikely that they transit this area on route between Wee Jasper and the Mt Fairy stopover cave. The direct route is to the south of the project area where there are lower valleys with greater tree cover that may be more favourable for migrating bats.

6.2 Impact mitigation

6.2.1 Habitat loss

Renewable Power Ventures has advised that as far as possible, clearing of trees, dead or alive, will be avoided.

Should clearing be necessary, the impact of loss of tree hollow roost sites during vegetation clearance can be reduced or offset if pre-clearing surveys are conducted to determine if roosts are present. If bat roosts are recorded in trees to be removed, then several strategies can be incorporated. In the case of common species that have multiple roosts in their landscape, monitoring at dusk over several days will reveal when the roost has been vacated and the tree can then be felled. The assumption is made that species with roost flexibility will adapt to the loss of one roost, as they would if the roost was lost naturally through bushfire or tree senescence.

For species that may be fixed to a single unique roost type, such as the Yellow-bellied Sheath-tail Bat, there is potential to relocate the roost itself to a location where no clearance impacts would occur. There are several examples where this action has been successfully carried out (Rhodes and Hall 1997; Richards, unpublished data; Dr L.S. Hall, University of Queensland (ret.), pers. comm.). The absence of this species at the site negates the need for this mitigation.

6.2.2 Collision impacts

The mitigation of collision impacts is far more difficult to resolve. Many suggestions proffered in publications and on websites (particularly those based in the USA) are impractical and of doubtful effectiveness. There is an apparent dearth of information on successful strategies that are based on formal trials. Most suggestions are untested and are applied to entire windfarms.

The lack of threatened species in the project area reduces the significance of this issue for the project.

7.0 CONCLUSIONS AND RECOMMENDATIONS

It appears that for the wind farm project area comprising the Grose Hill, Ellenden and Hammonds Hill Groups there would be minor impacts and issues to address.

No threatened species were recorded at sampling sites in the project area. Accordingly, an eight part test was not undertaken and a Species Impact Statement is not required. Also, no species listed under the EPBC Act were recorded in the project area, and on this basis it is not necessary to refer the project.

Despite the above, trees that are required to be cleared should be assessed during preclearance surveys that identify any potential roosts. Clearing should be conducted under supervision of a person experienced in directing a bulldozer to lay trees down gently without damage, with a potential roost facing skywards, allowing any bats or other fauna to depart the following night.

Any collision monitoring program that may be established, particularly at any turbine sites that are near large woodland remnants, should include bats.

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