

# Bat Activity at Oaklands Hill Wind Energy Facility

Spring 2011

Report to Suzlon Energy Australia.

Dr Matthew Wood



## EXECUTIVE SUMMARY

Bat presence and activity was surveyed at the Oaklands Hill Wind Energy Facility using ultrasonic bat detectors over 10 consecutive nights from 14 to 23 September 2011. A total of 7,529 calls were recorded from nine bat species. Bat activity ranged from 0 to 714 calls / detector-night, with an overall mean ( $\pm$  standard error) of  $125.48 \pm 20.90$  calls / detector-night ( $n = 60$ ). Bat activity varied significantly between species with *Chalinolobus morio* the most common species recorded, averaging  $92.40 \pm 15.18$  calls / detector-night. *Miniopterus schreibersii* was not recorded during the survey.

# CONTENTS

EXECUTIVE SUMMARY .....	ii
CONTENTS .....	iii
LIST OF FIGURES.....	iii
TABLE OF APPENDICES.....	iii
1.0 INTRODUCTION.....	1
2.0 METHODS .....	1
2.1 Oaklands Hill Wind Farm.....	1
2.2 Bat activity.....	1
2.3 Data analysis.....	2
3.0 RESULTS.....	4
4.0 CONCLUSION .....	5
5.0 REFERENCES.....	6
6.0 APPENDICES .....	8

## LIST OF FIGURES

Figure 1. Locations of bat detectors at the Oaklands Hill Wind Farm .....	3
Figure 2. Relative activity of bat species at the Oaklands Hill Wind Farm.....	4

## TABLE OF APPENDICES

Appendix 1. Number of bat calls recorded from each species at each location on the Oaklands Hill wind farm.....	8
---	---

## 1.0 INTRODUCTION

In accordance with the Bat and Avifauna Management Plan (Wood 2011a), monitoring of bat presence and activity is required to be undertaken in autumn and spring prior to commissioning of the Oaklands Hill wind energy facility. The aim of this monitoring program was to firstly determine the bat species present, particularly the presence of the EPBC listed Southern Bent-wing Bat *Miniopterus schreibersii bassanii*, and examine their relative activity on the wind farm site, and secondly to identify which species were most likely to be impacted by the wind farm. The following report documents the relative activity of bat species at the Oaklands Hill wind energy facility during spring 2011.

## 2.0 METHODS

### 2.1 Oaklands Hill Wind Farm

The Oaklands Hill Wind Farm consists of 32 wind turbines and is located approximately 8 km south of Glenthompson in south-west Victoria. The wind farm is located on three privately owned properties on the east and west of Glenthompson-Caramut Road and covers an area of approximately 2,320 ha. All properties within the wind farm boundary are used primarily for agricultural purposes, particularly grazing by domestic stock.

### 2.2 Bat activity

Bat activity was examined using ultrasonic bat detectors (Anabat®, Titley Electronics Pty Ltd). These instruments record the echolocation calls of bats which can be later analysed with software (AnalogW) to determine the species of origin by comparing calls to a reference library of calls. Bat calls are recorded on a digital flashcard (128 Mb) as individual files for each pass of the bat. Bat detectors can detect bats flying up to 30 m away although the range of detection is influenced by the species and orientation of the bat, as well as weather conditions, particularly wind strength, humidity and precipitation. All bat detectors were connected to an external 12V, 7.2Ah lead acid battery and placed in waterproof housing, which was secured to the ground using an elastic strap pegged down with four 250 mm tent pegs. The division ratio and sensitivity of all bat detectors were set to 16 and 6 respectively.

Bat detectors were also used to sample the air space within the rotor swept area of the generator blades to identify species that fly at the rotor height of the turbines. This was achieved by hoisting a microphone on an extension cable toward the top of an anemometry mast to a height of approximately 30 m which was a similar altitude to that of the lower blade-swept area of turbines. The microphone cable was tied with cable ties to a nylon rope that looped through a D-ring near the top of the mast to the ground where it was anchored to two metal star-pickets. These pickets were positioned approximately 25 m from the base of the mast and spaced approximately 4 m apart to avoid any potential noise disturbance from the ropes tapping against each other or against the mast during strong winds. The microphone was contained within a curved PVC tube (50 mm diameter) which protected it from rain and directed the face of the microphone away from the mast and in an upward direction.

Bat activity was surveyed at the Oaklands Hill Wind Farm from 7:00 pm to 7:00 am (EST) over 10 consecutive nights from 14 – 23 September 2011. Seven bat detectors were set-out at the wind farm site; six ground based and one at the top of an anemometry mast. The locations of all bat detectors are shown in Figure 1. At completion of the survey, data were downloaded from each flashcard.

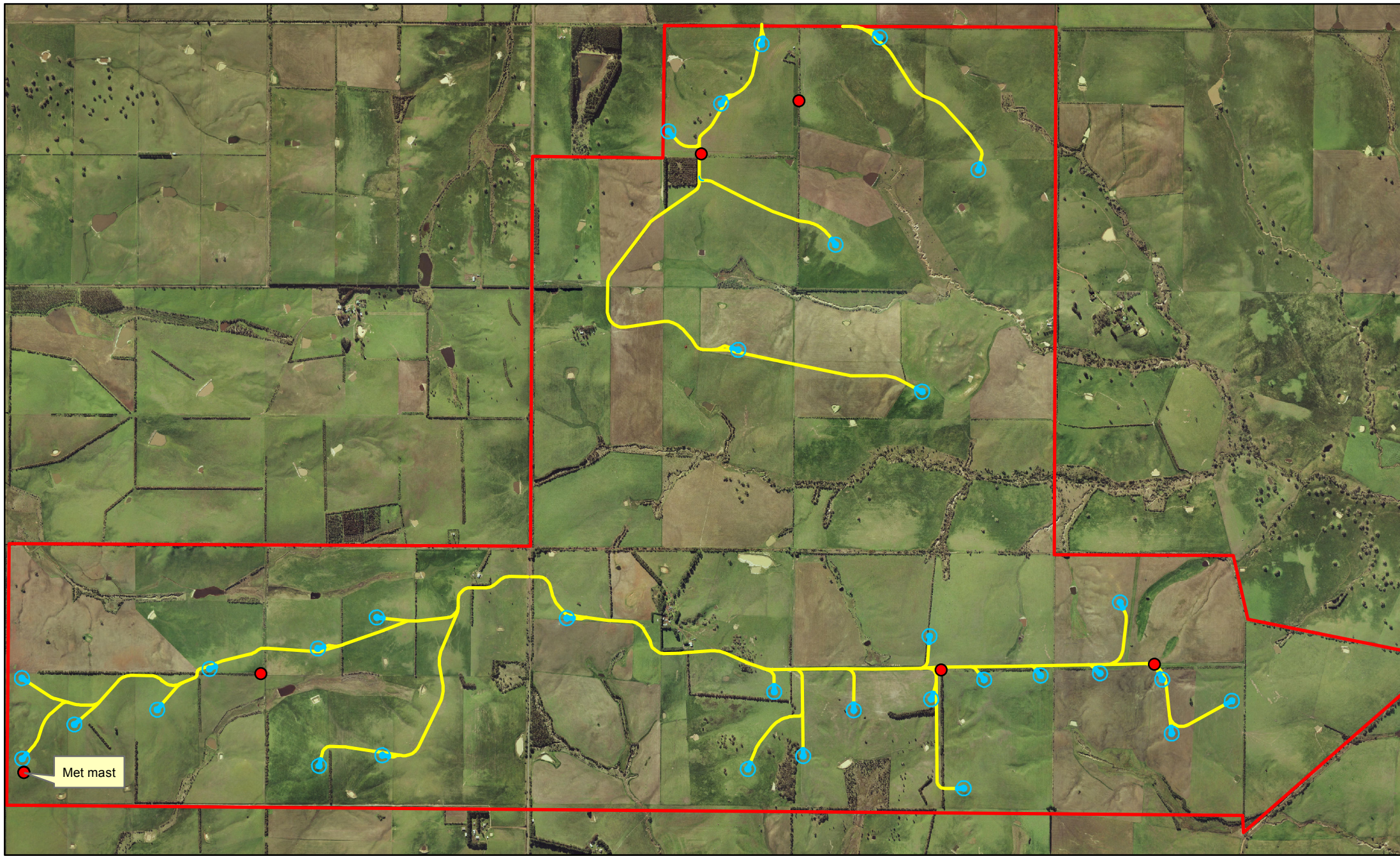
### 2.3 Data analysis

Bat calls downloaded from the flashcards were analysed with AnalookW software to identify, where possible, the species of bat for each sequence of bat calls recorded by comparison to a reference library of bat calls. Some of the data could not be positively identified to species level, due to poor call quality or insufficient call sequence, but were assigned to a group of species that share similar call characteristics.

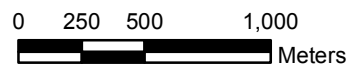
Bat activity at the wind farm was quantified in terms of the total number of bat calls, the mean number of calls per detector-night, and the mean number of calls recorded for each species per detector-night. Chi-square tests were used to examine differences in the activity of each species.

A technical malfunction occurred with the bat detector hoisted near the top of the anemometry mast and as such no bat call data were recorded from this site.

Figure 1. Locations of bat detectors at the Oaklands Hill Wind Farm



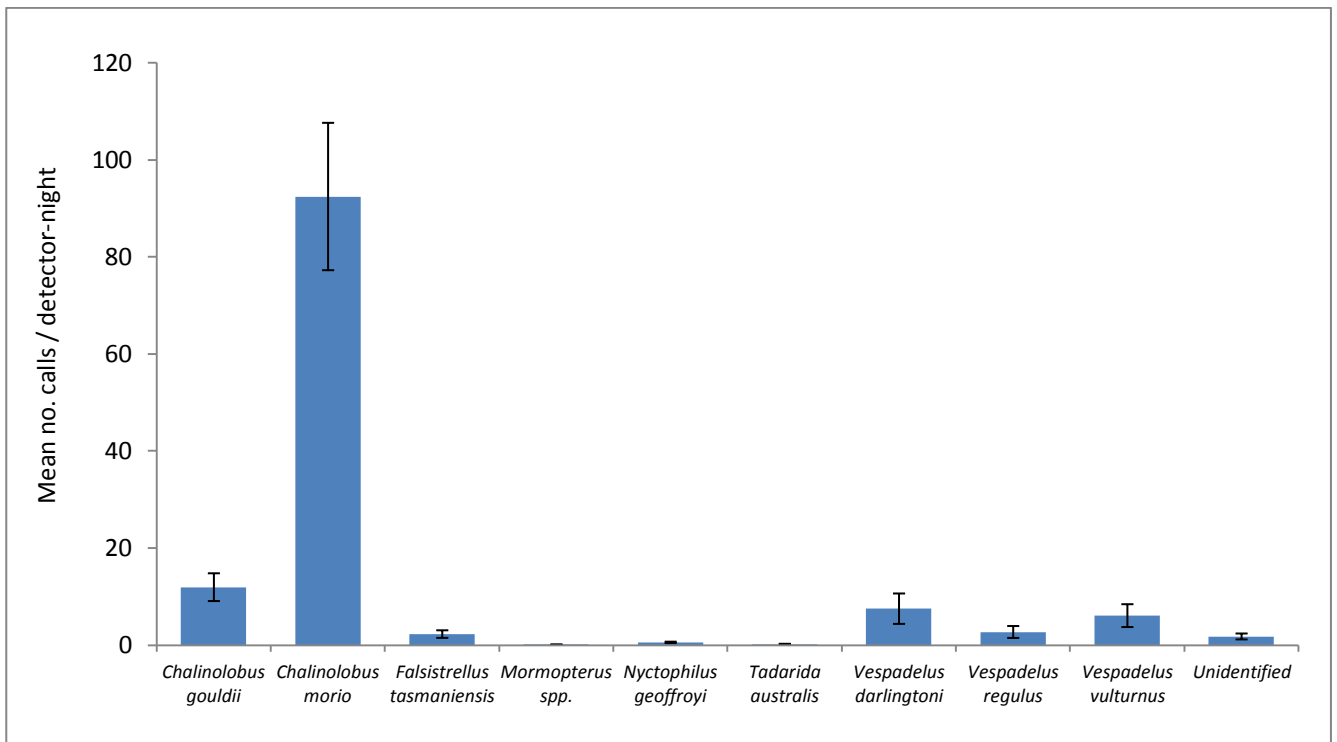
- Bat detectors
- Wind turbines
- access roads
- Wind farm boundary



### 3.0 RESULTS

A total of 7,529 calls were recorded from nine bat species at the Oaklands Hill Wind Farm. Bat activity ranged from 0 to 714 calls / detector-night, with an overall mean ( $\pm$  standard error) of  $125.48 \pm 20.90$  calls / detector-night ( $n = 60$ ). 108 bat calls could not be identified to species level due to poor call quality or insufficient call sequence but were assigned to groups of species that share similar call characteristics. These were typically from either *Vespadelus darlingtoni*, *V. regulus* or *V. vulturnus*. The number of bat calls recorded from each species on each night at each location on the wind farm site is shown in Appendix 1. Bat activity varied significantly between species ( $\chi^2 = 30932.39$ , d.f. = 8,  $p < 0.001$ ) with *Chalinolobus morio* the most common species recorded, averaging  $92.40 \pm 15.18$  calls / detector-night. *Chalinolobus gouldii*, *Vespadelus darlingtoni* and *V. vulturnus* were recorded at moderate levels of activity whilst other species were recorded at relatively low levels of activity (Figure 2).

Figure 2. Relative activity of bat species at the Oaklands Hill Wind Farm.



## 4.0 CONCLUSION

A total of 7,529 calls were recorded from nine bat species at the Oaklands Hill Wind Energy Facility. Bat activity ranged from 0 to 714 calls / detector-night, with an overall mean of  $125.48 \pm 20.90$  calls / detector-night ( $n = 60$ ). Bat activity varied significantly between species with *Chalinolobus morio* the most common species recorded.

This survey did not record the presence of *Miniopterus schreibersii* at the wind farm, nor was this species recorded in previous bat surveys during November 2006 (Venosta 2007) and March 2011 (Wood 2011b). It is possible that this species may use the site during periods of migration for example, but this would be expected to be infrequent. The Oaklands Hill Wind Farm is therefore unlikely to adversely impact the population of *Miniopterus schreibersii* in south west Victoria.

Bat activity near the top of the anemometry mast was not recorded due to technical problems with the bat detector. However, previous surveys at the Portland wind farms that have sampled the windswept area of rotor blades of similar altitude have indicated that the majority of bat species fly below this height and are therefore unlikely to be impacted by the blades (Wood and Grant 2004, 2005; Wood 2005, 2006a, 2006b, 2006c, 2007a, 2007b, 2008a, 2008b, 2009, 2010a, 2010b, 2010c, 2011c). The autumn bat survey at Oaklands Hill Wind Farm found that *Tadarida australis*, *Chalinolobus gouldii* and *Vespadelus darlingtoni* were the only species recorded flying within the windswept area of rotor blades and their activity at this height was significantly lower than recorded from ground-based detectors. Although *Tadarida australis* was recorded at relatively low levels of activity at the Oaklands Hill Wind Farm (0.16% of all calls), this species is considered to be at greatest risk of blade strike due to its higher altitude of flight. Monitoring of bird and bat mortality at the Yambuk Wind Farm from March 2006 to March 2010 found that *Tadarida australis* accounted for 82% of all bat fatalities (Wood 2011d).

Bat activity is influenced by a number of factors, including bat abundance, forage availability, weather conditions, floristic and structural attributes of vegetation and proximity to roost sites and fresh water. The highly variable nature of bat activity, as determined by the number and frequency of their calls, necessitates a large sample of bat detector-nights to provide an accurate assessment of bat activity. Surveys of bat presence and activity at the Oaklands Hill Wind Farm conducted in autumn and spring 2011 have sampled a total of 130 bat detector-nights, including 10 from within the windswept area of turbine blades. This is considered to



be an adequate sample to examine the bat species present on site, their relative activity and to identify those species at highest risk of blade strike.

## 5.0 REFERENCES

Venosta M. (2007). *Bird Utilisation, Brolga and Bat studies at the Oaklands Hill Wind Farm site, Glenthompson, Victoria*. Biosis Research Pty Ltd.

Wood M. and Grant C. (2004). *Portland Wind Energy Project - Bat activity at the proposed Yambuk wind energy facility - Spring 2004*. Australian Ecological Research Services Pty Ltd.

Wood M. and Grant C. (2005). *Portland Wind Energy Project - Bat Activity at the Proposed Wind Energy Facilities at Yambuk, Cape Nelson, Cape Bridgewater and Cape Sir William Grant - Summer 2004 – 2005*. Australian Ecological Research Services Pty Ltd.

Wood M. (2005). *Portland Wind Energy Project - Pre-construction Bat Activity at the Yambuk, Cape Sir William Grant, Cape Nelson and Cape Bridgewater Wind Energy Facilities – Autumn 2005*. Australian Ecological Research Services Pty Ltd.

Wood M. (2006a). *Portland Wind Energy Project - Pre-construction Bat Activity at the Cape Sir William Grant, Cape Nelson and Cape Bridgewater Wind Energy Facilities – Spring 2005*. Australian Ecological Research Services Pty Ltd.

Wood M. (2006b). *Portland Wind Energy Project - Pre-construction Bat Activity at the Cape Sir William Grant, Cape Nelson and Cape Bridgewater Wind Energy Facilities – Summer 2005-06*. Australian Ecological Research Services Pty Ltd.

Wood M. (2006c). *Portland Wind Energy Project - Pre-construction Bat Activity at the Cape Bridgewater Wind Energy Facility - Summer 2004/05 - Autumn 2006*. Australian Ecological Research Services Pty Ltd.

Wood M. (2007a). *Portland Wind Energy Project - Pre-construction Bat Activity at the Cape Sir William Grant, Cape Nelson and Cape Bridgewater Wind Energy Facilities – Autumn 2006*. Australian Ecological Research Services Pty Ltd.

Wood M. (2007b). *Portland Wind Energy Project - Pre-construction Bat Activity at the Cape Nelson Wind Energy Facility – Spring 2006*. Australian Ecological Research Services Pty Ltd.

Wood M. (2008a). *Portland Wind Energy Project - Pre-construction Bat Activity at the Cape Sir William Grant Wind Energy Facility – Spring 2006*. Australian Ecological Research Services Pty Ltd.

Wood M. (2008b). *Portland Wind Energy Project - Pre-construction Bat Activity at the Cape Bridgewater Wind Energy Facility – Spring 2006*. Australian Ecological Research Services Pty Ltd.

Wood M. (2009). *Impact assessment of the Cape Bridgewater and Cape Nelson South wind energy facilities - Spring 2009*. Australian Ecological Research Services Pty Ltd.

Wood M. (2010a). *Impact assessment of the Cape Bridgewater and Cape Nelson South wind energy facilities - Summer 2009-10*. Australian Ecological Research Services Pty Ltd.

Wood M. (2010b). *Impact assessment of the Cape Bridgewater and Cape Nelson South wind energy facilities - Autumn 2010*. Australian Ecological Research Services Pty Ltd.

Wood M. (2010c). *Impact assessment of the Cape Bridgewater and Cape Nelson South wind energy facilities - Spring 2010*. Australian Ecological Research Services Pty Ltd.

Wood M. (2011a). *Oaklands Hill Wind Energy Facility - Bat and Avifauna Management Plan*. Australian Ecological Research Services Pty Ltd.

Wood M. (2011b). *Bat activity at Oaklands Hill Wind Energy Facility - Autumn 2011*. Australian Ecological Research Services Pty Ltd.

Wood M. (2011c). *Impact assessment of the Cape Bridgewater and Cape Nelson South wind energy facilities - Summer 2010-11*. Australian Ecological Research Services Pty Ltd.

Wood M. (2011d). *Yambuk Wind Farm Bat and Avifauna Mortality Monitoring Program, March 2006 - March 2010*. Australian Ecological Research Services Pty Ltd.

## 6.0 APPENDICES

Appendix 1. Number of bat calls recorded from each species at each location on the Oaklands Hill wind farm.

Location	Date	Species or species group											Total calls	
		Cg	Cm	Ft	Msp	Ng	Ta	Vd	Vr	Vv	Vr/Vv	Vd/Vr/Vv		
Oaklands Hill Wind Energy Facility	Base of Tower	14/09/2011	1	-	-	-	-	-	-	-	-	-	-	1
		15/09/2011	-	-	-	-	-	-	-	-	-	-	-	0
		16/09/2011	-	-	-	-	-	-	-	2	-	-	-	2
		17/09/2011	1	-	-	-	-	-	-	1	-	-	-	2
		18/09/2011	1	1	1	-	-	2	-	-	-	-	-	5
		19/09/2011	-	-	-	-	-	-	-	-	-	-	-	0
		20/09/2011	-	-	-	-	-	-	-	-	-	-	-	0
		21/09/2011	1	-	2	-	-	-	-	-	-	-	-	3
		22/09/2011	-	-	-	-	-	-	-	-	-	-	-	0
		23/09/2011	-	-	-	-	1	-	-	-	-	-	-	1
		Total calls	4	1	3	0	1	2	0	3	0	0	0	14
	OHWF#1	14/09/2011	6	8	-	-	-	-	1	-	-	-	-	15
		15/09/2011	1	9	-	-	-	-	1	1	-	-	-	12
		16/09/2011	3	28	-	-	-	-	2	-	-	-	-	33
		17/09/2011	31	37	-	5	-	1	11	4	-	1	-	90
		18/09/2011	10	16	-	-	3	2	2	2	1	-	-	36
		19/09/2011	3	21	38	-	-	-	-	-	-	-	-	62
		20/09/2011	-	34	-	-	1	-	-	-	-	-	-	35
		21/09/2011	19	43	2	-	3	-	4	-	1	2	-	74
		22/09/2011	8	32	-	-	-	-	-	-	-	-	-	40
		23/09/2011	-	13	1	-	-	-	-	-	-	-	-	14
		Total calls	81	241	41	5	7	3	21	7	2	3	0	411
	OHWF#2	14/09/2011	41	264	-	-	-	-	21	1	-	7	-	334
		15/09/2011	18	90	-	-	-	-	9	-	-	3	-	120
		16/09/2011	12	113	2	-	5	-	40	2	3	1	-	178
		17/09/2011	141	221	3	-	3	-	182	70	65	29	-	714
		18/09/2011	15	79	1	-	-	2	6	-	2	1	-	106
		19/09/2011	8	99	-	-	-	-	8	-	-	1	1	117
		20/09/2011	14	181	-	-	-	-	-	-	1	-	-	196
		21/09/2011	51	92	-	-	1	1	5	2	3	2	-	157
		22/09/2011	11	61	-	-	-	-	1	-	1	-	1	75
		23/09/2011	1	208	4	-	2	-	26	8	14	4	-	267
		Total calls	312	1408	10	0	11	3	298	83	89	48	2	2264

Location	Date	Species or species group											Total calls		
		Cg	Cm	Ft	Msp	Ng	Ta	Vd	Vr	Vv	Vr/Vv	Vd/Vr/Vv			
Oaklands Hill Wind Energy Facility	OHWF#3	14/09/2011	1	11	-	-	-	-	-	-	-	-	-	-	12
		15/09/2011	1	50	-	-	-	-	-	-	1	1	-	-	53
		16/09/2011	15	20	-	-	-	-	31	-	-	1	-	-	67
		17/09/2011	15	24	1	-	-	-	9	-	1	3	-	-	53
		18/09/2011	10	38	1	-	-	-	3	4	2	1	-	-	59
		19/09/2011	-	5	1	-	-	-	-	-	-	-	-	-	6
		20/09/2011	-	7	-	-	-	-	-	-	-	-	-	-	7
		21/09/2011	5	37	1	-	-	-	1	-	-	-	-	-	44
		22/09/2011	-	-	-	-	-	-	-	-	-	-	-	-	0
		23/09/2011	1	27	1	-	-	-	-	-	-	-	-	-	29
	Total calls	48	219	5	0	0	0	44	4	4	6	0	0	330	
	OHWF#4	14/09/2011	11	19	1	-	-	1	4	-	-	-	1	-	37
		15/09/2011	10	20	-	-	-	-	1	1	1	-	-	-	33
		16/09/2011	1	34	-	-	-	-	3	-	-	-	-	-	38
		17/09/2011	34	369	8	-	-	-	12	13	2	-	-	-	438
		18/09/2011	73	183	13	-	-	-	17	14	2	-	1	-	303
		19/09/2011	2	15	-	-	-	1	3	-	-	-	-	-	21
		20/09/2011	-	44	1	-	-	-	2	-	-	-	-	-	47
		21/09/2011	10	50	3	-	-	1	2	1	-	-	-	-	67
		22/09/2011	4	16	2	-	-	1	-	-	-	1	-	-	24
		23/09/2011	3	269	1	-	1	-	11	11	19	6	-	-	321
	Total calls	148	1019	29	0	1	4	55	40	24	7	2	2	1329	
	OHWF#5	14/09/2011	3	277	-	-	1	-	-	1	58	2	-	-	342
		15/09/2011	5	190	-	-	2	-	8	1	84	-	-	-	290
		16/09/2011	9	166	6	-	-	-	-	-	1	-	-	-	182
		17/09/2011	43	490	24	-	1	-	10	17	80	19	-	-	684
		18/09/2011	12	180	7	-	-	-	-	-	1	-	-	-	200
		19/09/2011	5	350	-	-	1	-	7	2	5	1	-	-	371
		20/09/2011	-	404	-	-	2	-	-	-	7	13	-	-	426
		21/09/2011	29	176	7	-	5	-	-	4	3	1	1	-	226
		22/09/2011	17	247	-	-	-	-	2	-	-	2	-	-	268
		23/09/2011	-	176	4	-	1	-	5	-	6	-	-	-	192
	Total calls	123	2656	48	0	13	0	32	25	245	38	1	1	3181	

Cg = *Chalinolobus gouldii*, Cm = *Chalinolobus morio*, Ft = *Falsistrellus tasmaniensis*, Msp = *Mormopterus* spp., Ng = *Nyctophilus geoffroyi*, Ta = *Tadarida australis*, Vd = *Vespadelus darlingtoni*, Vr = *Vespadelus regulus*, Vv = *Vespadelus vulturinus*.