ALBERTON WIND FARM

BIRD AND BAT SURVEYS

Synergy Wind Pty Ltd

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1. INTRODUCTION

Synergy Wind Pty Ltd engaged Brett Lane & Associates Pty Ltd (BL&A) to carry out pre-construction bird and bat surveys to understand risks and impacts to these animals from the development of the proposed Alberton Wind Farm in South Gippsland. This investigation was commissioned to provide baseline data on the pre-construction utilisation of the wind farm site by birds and bats as a basis for the development of any mitigation measures that may be necessary. In addition a migratory shorebird survey was undertaken along the coast of the Corner Inlet and Nouramunga Marine and Wildlife Reserves, whose main coastlines lie approximately three kilometres south of the proposed wind farm site.

In 2009, BL&A undertook a preliminary bird and bat utilisation survey for the then proposed Alberton and Yarram wind farms. Although field surveys were undertaken, the data were not analysed or presented in a report as the client at the time (ProWind Australia) decided not to proceed with the project. Synergy Wind has now decided to develop this project. The study area has increased from that surveyed in 2009; therefore updated bird and bat utilisation surveys were required to ensure an appropriate impact assessment.

The bird utilisation survey (BUS) scope was consistent with the requirements for a "Level One" bird risk assessment in accordance with 'Wind Farms and Birds - Interim Standards for Risk Assessment' issued by the then Australian Wind Energy Association (AusWEA 2005). This approach has been endorsed in the Clean Energy Council's Best Practice Guidelines (CEC 2013).

Bat surveys were undertaken in accordance with Clean Energy Councils' Best Practice Guidelines (2013) using bat detection systems to record the echolocation calls of bats. Records were made from five sites during February and March 2015. The sites included monitoring with two recorders at a wind mast with one microphone at 50 metres, and another at ground level (1-2 metres) at the same location. The survey sites represented the various habitat types within the wind farm with a focus on the possible presence of threatened species of bats.

This report is divided into the following sections:

Section 2 details the methods for the bird and bat surveys

Section 3 provides the results of the bird utilization survey,

Section 4 presents the results of bat surveys, and

Section 5 comprises the results of migratory bird survey.

This investigation was undertaken by a team from BL&A, comprising Khalid Al-Dabbagh (Senior Zoologist), Chris Doughty (Ornithologist), Inga Kulik (Senior Ecologist & Project Manager) and Brett Lane (Principal Consultant). The Bat call analysis was undertaken by Rob Gration from EcoAerial Pty Ltd.

2. METHODS

2.1. Bird Utilization Survey (BUS)

2.1.1. Fixed-point bird count method

The fixed-point bird count method used to collect bird utilisation data involved an observer stationed at a fixed survey point for 15 minutes a number of times over the survey period (see later). The adequacy of using 15 minutes as an interval to record the presence of birds during bird utilisation surveys was investigated in an earlier study at another wind farm site (BL&A unpublished data). This showed that 82 to 100 percent (average 88 percent) of species actually seen in one hour of surveying were seen in the initial 15 minutes of observation. Based on this result, the period of 15 minutes used in the formal bird utilisation surveys was considered adequate to generate representative data on the bird species in the area during the survey.

During this period, all bird species and numbers of individual birds observed or heard within 200 metres were recorded. The species, the number of birds and the height of the bird when first observed were documented. For species of concern (threatened species, waterbirds and raptors), birds were recorded up to 500 metres from the observer.

The specific turbine option to be installed is still under consideration; however, for the purpose of this report, flight height relative to RSA height is presented as described below. Note that data have been recorded in 10 metre height intervals up to 60 metres and then in 20 metre intervals thereafter, and depending on the final turbine specification, this analysis can be refined.

- **A =** Below RSA (< 35 metres above ground)
- **B =** At RSA (35 – 140 metres above ground)
- **C =** Above RSA (> 140 metres above ground)

The summer bird utilisation surveys were undertaken over five days including from 21st to 25th February 2015. Table 1 indicates when each point was counted on each survey day. This schedule ensured that all points were visited equally at different times of day to allow for time-of-day differences in bird movements and activity. Every survey point was visited eight times over the survey period (Table 1).

Table 1: Times when points were counted for each fixed-point bird count survey day

Day/time	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30
1								B1	B2
2	B2	B3	B4	B5	B6	B7	B8	R1	R2
3	R2	B1	B2	B3	B4	B5	B6	B7	B8
4	B8	R1	R2	B1	B2	B3	B4	B5	B6
5	B6	B7	B8	R1	R2	B1	B2	B3	B4
	13:00	**13:30**	**14:30**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**
1	B3	B4	B5	B6	B7	B8	R1	R2	B1
2	B1	B2	B3	B4	B5	B6	B7	B8	R1
3	R1	R2	B1	B2	B3	B4	B5	B6	B7
4	B7	B8	R1	R2	B1	B2	B3	B4	B5
5	B5	B6	B7	B8	R1	R2			

2.1.2. Locations of survey points

Ten fixed survey points were established: eight impact points and two reference points. Impact points were located near proposed turbine locations and reference points were located at least 500 metres away from proposed turbine locations in areas of similar habitat.

The survey points were distributed as evenly as possible (subject to access constraints) across the proposed wind farm site to maximise coverage in areas where wind turbines will be located (Figure 1). Impact points were positioned on suitable ground allowing a clear view in all directions.

Table 2 below provides a description of the habitats associated with each impact and reference point.

Table 2: Habitat associated with each survey point

Survey point	Habitat
B1	Point located in middle of large open grazing paddock with few scattered trees and a line of introduced pine.
B2	In the middle of large cattle and sheep grazing paddocks; no trees within paddock, but few small dams. The paddock extends south for considerable distance and meets large coastal scrub woodland.
B3	Similar to B1, in a grazing paddock on one side and native vegetation on the other side. The area also contained a fairly large dam.
B4	Set in an ecotone between large grazing paddocks and eucalypt woodland. Birds of both open grasslands and bush shared the site.
B5	Edge of scrub (woodland) overlooking open grazing paddocks. The woodland was a mixture of eucalyptus and tea–trees. Bird life was rich as it represents a mixed habitat (ecotone).
B6	In the middle of paddocks and close to wide line of native trees including a mixture of tea–trees, acacia and eucalypts.
B7	In the middle of a grazing paddock but intersected by several lines of native vegetation.
B8	In the middle of very large dairy cattle grazing fields, no trees in the immediate area of bird count.
R1	Road junction with lines of native trees and bushes and large grazing paddocks.
R2	Similar to R1 located at another road junction with roadside large eucalypt trees and close to Alberton River.

2.1.3. Incidental observations

In addition to the observations during formalised, fixed-point or transect counts, incidental observations of birds of concern (threatened species, raptors, and waterbirds) were made whilst travelling throughout the proposed wind farm site. Notes were also made on birds observed in remnant woodlands and on any early morning and evening roosting movements. Emphasis was placed on observing birds that were moving through the site at RSA height.

2.1.4. Previous Bird Utilization Survey

An earlier BUS was undertaken in January 2009. The survey was a preliminary investigation of two areas, Yarram and the current Alberton location. Eight BUS points were sampled; five of which were at the Alberton section and three points at Yarram.

Currently the new wind farm layout has been changed and the Yarram section has been omitted from the study. The new layout is an expansion of the old Alberton section into similar habitat types.

The data collected in 2009 from the Alberton section was analysed and used to compare bird activity, diversity and use of the wind farm with the current 2015 survey covering the new layout of the proposed wind farm.

2.2. Bat surveys

Automated bat detectors that record the species-specific echolocation calls of free-flying bats were used at five sampling points that were representative of the habitats near wind turbine locations on the proposed wind farm site. At one site, two detectors were used at a meteorological tower, with one microphone at 50 metres and the other at ground level.

The location and characteristics of the recording sites are described below and shown in Figure 1.

Site A1: Installed in the middle of large dairy cattle grazing paddock; no trees close to the recording site.

Site A2: Similar to above, installed in middle of large grazing paddock, but close to a line (windbreak) of native scrub, mostly not suitable for bat roosting.

Site A3: Two detectors; the first installed at 50m height on the wind monitoring mast and the second at ground level underneath the wind mast. The wind mast itself is located in the middle of open grazing paddocks without trees.

Site A4: Located on side of a large dam and in a mixed area of open grazing paddock and edge of large coastal scrub including few eucalypt trees.

Site A5: Located on flat hill among scattered large and mature eucalypt trees with hollows and cleared understorey.

The recording sites represented the range of habitats, particularly in areas where the future wind turbines may be built.

Two models of the bat call ultrasonic detectors were used in the survey, Anabats (Titley Electronics, Ballina, NSW) and SongMeter SM2BAT+ (Wildlife Acoustics Inc., USA). The detectors were programmed to commence recording bat calls approximately 30 minutes before dusk, and to cease approximately 30 minutes after dawn.

Calls from the units were examined by Rob Gration from EcoAerial Pty Ltd, Victoria. Call identification was based on a comparison of the characteristics of bat calls with reference calls from known species recorded across Australia. Identification is largely based on changes to frequency patterns over time, especially as the characteristic frequency changes. Only those recordings that contained at least two definite and discrete calls were classified as bat calls. For most species, a call sequence of at least one second in duration (approximately 20 pulses in the sequence) is required before identification can be made confidently.

Legend

- Development footprint
- Ramsar wetland (Corner Inlet)
- Proposed turbines
- Wind mast
- Bird Ulitisation Survey sites
- Bat recording sites

Kilometers

0 0.5 1 2

Figure 1: Bird and Bat survey

Project: Alberton Wind Farm

Client: Synergy Wind Pty Ltd

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2.3. Timing of bird and bat surveys

The bird utilization survey was conducted over five days, between the 21st and 25th February, 2015. Weather was hot and suitable for birds.

The bat survey was conducted between 26th February and 11th of March 2015, allowing for 13 nights of recording. Due to shorter battery life at sites 2 and 5, recording lasted only 10 days.

2.4. Migratory bird surveys

The migratory bird surveys were conducted between 25th and 27th February, 2015. On the first day, surveys were undertaken by car and foot along the coastline from the land side, while on the second and third day, surveys were undertaken by boat along the edge of the coastline from the water.

2.5. Limitation

The purpose of the surveys was to collect a range of data, including usage of the site by migratory birds that may only occur at certain times of the year. During summer, birds such as magpies and ravens would mostly be moving in post breeding groups within the study area. Additionally, most migratory bird species, including the summer visitors, would be present in the region.

For these reasons, the utilisation rates and species abundances recorded during the current surveys are considered to be representative of the site during the time of likely highest bird activity. They are also considered to provide a reasonable basis on which to assess the bird risks associated with the proposed Alberton Wind Farm.

The bat survey was carried out in late summer (across February and early March 2014) and has captured the activity of the bats from representative habitats spread across the wind farm site.

The identification of echolocation calls from microbats in south-eastern Australia is facilitated by the fact that many calls are species-specific. However, a limitation of the method is that not all species can be consistently or reliably identified. There is a large overlap in the call characteristics of some species and many calls are attributable only to species “complexes” and not to single species.

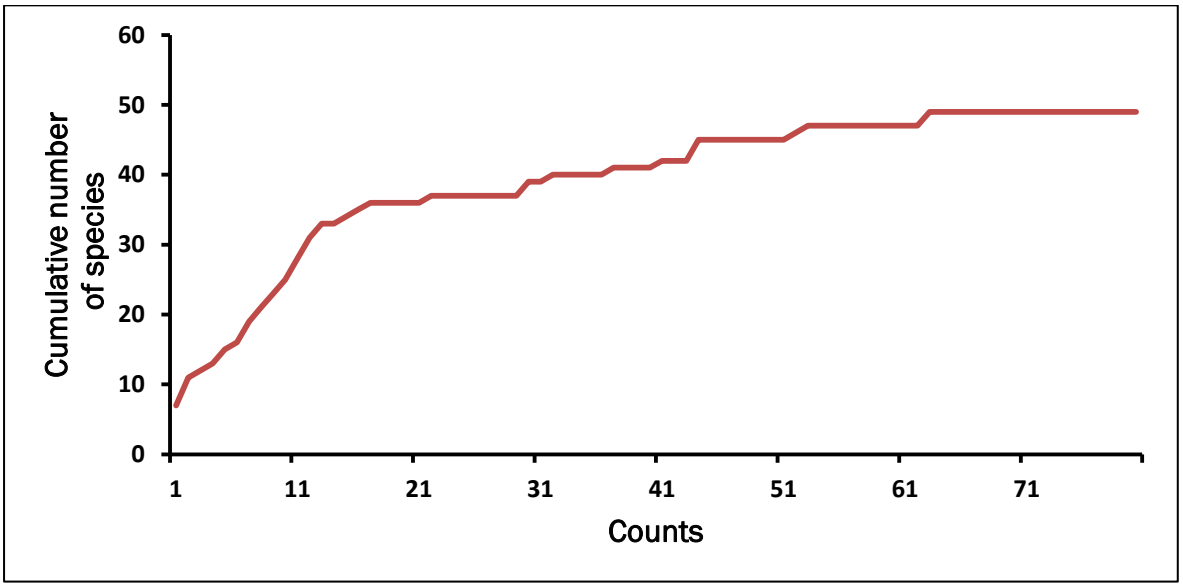
A further limitation in the use of this technique is that it is not possible to census bats accurately. That is, the bat recorder unit may record 10 calls of a particular species but it is not known if this represents 10 individuals or one individual flying past 10 times. Therefore, it is not possible to determine utilisation rates as it is for birds.

3. BIRD UTILISATION SURVEYS RESULTS

3.1. Survey suitability

The cumulative number of bird species observed from the consecutive fixed-point bird counts conducted at the observation points during the summer 2015 survey period has been plotted as shown in Figure 2. The shape of the curve showed that the number of species recorded largely levelled out after approximately 40 to 45 counts, suggesting that most of the bird species in the study area were recorded and that the surveys collectively provide a representative picture of the diversity of bird species regularly flying over the wind farm site during the survey period.

Figure 2: The cumulative number of species of birds recorded during consecutive counts at the impact points on the Alberton Wind Farm.



3.2. Species composition

A total of approximately 160 species of birds were likely to use the 10 km radius search region around the wind farm site (Victorian Biodiversity Atlas 2015); more than 50 of these species were strictly marine species and/or shorebirds and not likely to occur on the wind farm site. Species recorded during the formal 2015 bird utilisation survey from the 10 impact and reference sites included 52 species; 43 species at the impact and 27 species at the reference sites (Table 3).

Bird diversity was not significantly different from that recorded during the summer 2009 survey. The total number of bird species observed was similar (Table 3), but diversity was slightly different as some species recorded during 2009 were not seen in 2015. The habitat was mainly restricted to farmlands surrounded by remnant woodlands or coastal scrub, similar to the five impact points of the 2009 survey (see Appendix 1 for details). The species recorded were predominantly farmland and bushland species.

The number of species recorded at each impact survey point over the summer 2015 survey period ranged between 10 and 20; that of the summer 2009 survey ranged between 15 and 20 species. The distribution of the number of species among the various observation points was similar. However, there was a tendency for the number of species to be higher at points closer to vegetation, such as scattered trees or small

patches of remnant woodland.

Table 3: Numbers of species recorded at impact and reference sites during summer 2015 and summer 2009 bird utilization surveys

Season	Impact Sites	Reference Sites	Total number of species across impact and reference sites
summer BUS 2015	43	27	52
Summer BUS 2009	40	22	45
Combined	57	29	60

3.3. Abundance and height distribution of species

The species observed at the impact and reference points, and their abundance and height distribution during the summer 2015 and summer 2009 seasons of surveys are summarised in Table 4 and 5, with full details in Appendix 1. The total number of birds observed at each point is detailed in Table 6. In season 2009, only five impact points were surveyed at the Alberton section of the wind farm. These corresponded closely to those used in summer 2015.

The five most abundant species at the impact and reference survey points during summer 2015 survey are presented below.

Impact survey points	Reference survey points
Raven sp. (31.2%)	Common Starling (22.6%)
Australian Magpie (8.5%)	Raven spp. (13.7%)
Common Myna (8.5%)	Common Myna (10.9%)
Superb Fairywren (7.0%)	Australian Magpie (9.1%)
Common Starling (6.3%)	Magpie-lark (8.2%)

These species comprised 61.5% of all birds recorded at the impact survey points and 64.5% at the reference survey points.

Bird diversity was similar between the reference points and the impact points, with almost the same species dominating the list of birds but with variations in their ranking due to slight differences in habitat on the reference sites compared with the impact sites. The latter included a wider variety of sites given the larger number of points, ranging from open, treeless paddocks to sites adjacent to remnant woodlands and coastal scrub.

The five most abundant species during summer 2009 were:

Impact survey points	Reference survey points
Common Starling (17.2%)	Common Starling (27.5%)
Eurasian Skylark (8.8%)	House Sparrow (14.1%)
Superb Fairywren (6.2%)	Yellow-rumped Thornbill (7.2%)
European Goldfinch (6.0%)	Australian Magpie (6.9%)
Australian Magpie (5.8%)	Eurasian Skylark (5.6%)

These species comprised 44.0% of all birds recorded at the impact survey points and 61.3% at the reference survey points.

As was the case with the 2015 survey, the impact and reference sites in the 2009 survey were also very similar with almost the same species making up the first five most abundant birds.

The numbers of remaining species were relatively low and were not different between the 2015 and 2009 summer surveys. These species were mostly typical open farmland species or woodland birds that utilized habitats of mixed remnant woodlands and open grasslands.

Although the dominant species of birds were similar in the 2015 and 2009 surveys, with the Common Starling and Australian Magpie among the five most common species; the remaining dominant species showed some changes. Ravens and Common Myna were less abundant in 2009 but increased noticeably in 2015 to dominate the bird fauna. They both moved in large feeding flocks over the proposed wind farm site during summer 2015. Similarly, birds such as the Eurasian Skylark, House Sparrow and European Goldfinches (all exotic species), were less abundant in 2015 and were replaced by more common native birds, such as Superb Fairywren and Magpie-lark.

The mix of habitat surrounding the observation points varied. More birds were recorded at points where there were scattered trees or small woodland remnants, than at points where the habitat comprised cleared paddocks with very few or no trees.

In general, the number of birds recorded at each observation point (Table 6) was similar with little variation between the points, except when large flocks of birds were recorded during the formal count, such as records of flocks of Common Starling or passing flocks of Ravens.

Table 4: Number and height distribution of bird species at the impact survey points during summer 2015 and summer 2009 surveys

Species	Summer 2015 (8 observation points)					Summer 2009 (5 observation points)				
	A	B	C	Total	% imp.	A	B	C	Total	% imp.
Raven spp.	741	2	0	743	31.2	73	3	0	76	4.2
Australian Magpie	199	4	0	203	8.5	103	2	0	105	5.8
Common Myna	203	0	0	203	8.5	72	0	0	72	4.0
Superb Fairywren	166	0	0	166	7.0	112	0	0	112	6.2
Common Starling	145	6	0	151	6.3	302	10	0	312	17.2
Red Wattlebird	135	4	0	139	5.8	58	0	0	58	3.2
Red-browed Finch	86	0	0	86	3.6	36	0	0	36	2.0
House Sparrow	82	0	0	82	3.4	64	0	0	64	3.5
Brown Thornbill	68	0	0	68	2.9	42	0	0	42	2.3
Magpie-lark	58	6	0	64	2.7	59	0	0	59	3.3
Straw-necked Ibis	35	6	0	41	1.7	0	0	0	0	0.0
Yellow-faced Honeyeater	38	0	0	38	1.6	46	0	0	46	2.5
Australian White Ibis	36	2	0	38	1.6	2	3	0	5	0.3
Silvereye	36	0	0	36	1.5	50	0	0	50	2.8
White-eared Honeyeater	36	0	0	36	1.5	20	0	0	20	1.1
Grey Fantail	34	0	0	34	1.4	36	0	0	36	2.0
Crimson Rosella	28	0	0	28	1.2	28	0	0	28	1.5
Eastern Rosella	17	4	0	21	0.9	0	0	0	0	0.0
Willie Wagtail	20	0	0	20	0.8	17	0	0	17	0.9
Grey Butcherbird	19	0	0	19	0.8	0	0	0	0	0.0
Grey Shrike-thrush	16	0	0	16	0.7	13	0	0	13	0.7
Australasian Pipit	15	0	0	15	0.6	24	0	0	24	1.3
White-faced Heron	13	0	0	13	0.5	4	1	0	5	0.3
Nankeen Kestrel	8	3	0	11	0.5	0	0	0	0	0.0
European Goldfinch	10	0	0	10	0.4	108	0	0	108	6.0
Welcome Swallow	10	0	0	10	0.4	86	12	0	98	5.4
Yellow-rumped Thornbill	10	0	0	10	0.4	41	0	0	41	2.3
Noisy Miner	10	0	0	10	0.4	0	0	0	0	0.0
White-throated Needletail	0	10	0	10	0.4	0	0	0	0	0.0
Yellow-tailed Black Cockatoo	4	5	0	9	0.4	4	2	0	6	0.3
White-browed Srubwren	8	0	0	8	0.3	70	0	0	70	3.9
Common Blackbird	6	0	0	6	0.3	24	0	0	24	1.3
Grey Currawong	6	0	0	6	0.3	0	0	0	0	0.0
Pacific Black Duck	6	0	0	6	0.3	0	0	0	0	0.0
Striated Thornbill	6	0	0	6	0.3	0	0	0	0	0.0
Australian Shelduck	2	2	0	4	0.2	0	0	0	0	0.0
Laughing Kookaburra	4	0	0	4	0.2	0	0	0	0	0.0
Spotted Turtle Dove	2	0	0	2	0.1	10	0	0	10	0.6
Red-rumped Parrot	2	0	0	2	0.1	0	0	0	0	0.0
White-plumed Honeyeater	2	0	0	2	0.1	0	0	0	0	0.0
White-throated Treecreeper	2	0	0	2	0.1	0	0	0	0	0.0
Brown Goshawk	0	1	0	1	0.0	0	0	0	0	0.0

Species	Summer 2015 (8 observation points)					Summer 2009 (5 observation points)				
	A	B	C	Total	% imp.	A	B	C	Total	% imp.
Forked-tail Swift	0	1	0	1	0.0	0	0	0	0	0.0
Eurasian Skylark	0	0	0	0	0.0	150	9	0	159	8.8
Fairy Martin	0	0	0	0	0.0	60	10	0	70	3.9
Galah	0	0	0	0	0.0	12	0	0	12	0.7
Rufous Whistler	0	0	0	0	0.0	12	0	0	12	0.7
Blue-winged Parrot	0	0	0	0	0.0	7	0	0	7	0.4
Black Swan	0	0	0	0	0.0	0	3	0	3	0.2
Tree Martin	0	0	0	0	0.0	3	0	0	3	0.2
Australian Wood Duck	0	0	0	0	0.0	2	0	0	2	0.1
Masked Lapwing	0	0	0	0	0.0	2	0	0	2	0.1
Sulphur-crested Cockatoo	0	0	0	0	0.0	2	0	0	2	0.1
Australian Hobby	0	0	0	0	0.0	1	0	0	1	0.1
Brown Falcon	0	0	0	0	0.0	1	0	0	1	0.1
Total	2324	56	0	2380	100	1756	55	0	1811	100

A = below RSA height (<35m); B = at RSA height (35-140m); C = above RSA height (>140m);
% Imp. = Percentage importance
Points data is the sum total from 8 replicate counts

Table 5: Number and height distribution of bird species at the reference survey points during summer 2015 and summer 2009 surveys

Species	Summer 2015					Summer 2009				
	A	B	C	Total	% Imp.	A	B	C	Total	% Imp.
Common Starling	120	7	0	127	22.6	150	6	0	156	27.5
Raven spp.	73	4	0	77	13.7	18	0	0	18	3.2
Common Myna	58	3	0	61	10.9	8	2	0	10	1.8
Australian Magpie	51	0	0	51	9.1	39	0	0	39	6.9
Magpie-lark	46	0	0	46	8.2	8	0	0	8	1.4
Superb Fairywren	33	0	0	33	5.9	16	0	0	16	2.8
Galah	28	0	0	28	5.0	20	0	0	20	3.5
Grey Fantail	16	0	0	16	2.8	16	0	0	16	2.8
Crimson Rosella	16	0	0	16	2.8	0	0	0	0	0.0
Eastern Rosella	13	0	0	13	2.3	0	0	0	0	0.0
Willie Wagtail	12	0	0	12	2.1	1	2	0	3	0.5
Striated Thornbill	10	0	0	10	1.8	0	0	0	0	0.0
Noisy Miner	10	0	0	10	1.8	0	0	0	0	0.0
Red Wattlebird	8	0	0	8	1.4	28	0	0	28	4.9
Grey Butcherbird	8	0	0	8	1.4	0	0	0	0	0.0
Yellow-faced Honeyeater	6	0	0	6	1.1	22	0	0	22	3.9
Silvereye	6	0	0	6	1.1	10	0	0	10	1.8
Brown Thornbill	6	0	0	6	1.1	0	0	0	0	0.0
Yellow-rumped Thornbill	4	0	0	4	0.7	33	8	0	41	7.2
Common Blackbird	4	0	0	4	0.7	8	0	0	8	1.4
Australian Wood Duck	4	0	0	4	0.7	0	0	0	0	0.0
Black-shouldered Kite	0	4	0	4	0.7	0	0	0	0	0.0
White-plumed Honeyeater	4	0	0	4	0.7	0	0	0	0	0.0
Black-faced Cuckoo-shrike	2	0	0	2	0.4	0	0	0	0	0.0
Fairy Martin	0	2	0	2	0.4	0	0	0	0	0.0
Sulphur-crested Cockatoo	0	2	0	2	0.4	0	0	0	0	0.0
Australian Shelduck	0	2	0	2	0.4	0	0	0	0	0.0
House Sparrow	0	0	0	0	0.0	70	10	0	80	14.1
Eurasian Skylark	0	0	0	0	0.0	30	2	0	32	5.6
European Goldfinch	0	0	0	0	0.0	31	0	0	31	5.5
Welcome Swallow	0	0	0	0	0.0	10	6	0	16	2.8
Yellow-tailed Black Cockatoo	0	0	0	0	0.0	8	0	0	8	1.4
Australasian Pipit	0	0	0	0	0.0	2	0	0	2	0.4
Rufous Whistler	0	0	0	0	0.0	2	0	0	2	0.4
Spotted Turtle Dove	0	0	0	0	0.0	2	0	0	2	0.4
	538	24	0	562	100	532	36	0	568	100

A = below RSA height (<35m); B = at RSA height (35-140m); C = above RSA height (>140m)
% Imp. = Percentage importance,
Points data is the sum total from 8 replicate counts.

Table 6: Total number of birds counted at each survey points during summer 2015 and summer 2009 season surveys

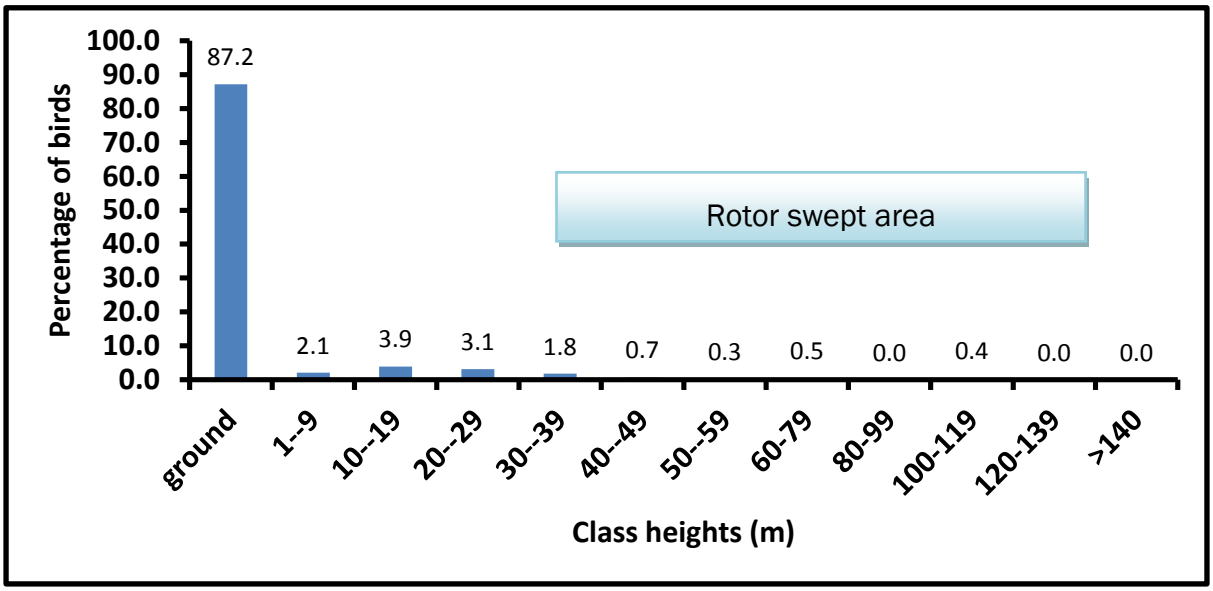
Observation points	Summer 2015 (8 impact points)						Summer 2009 (5 impact points)					
	A	B	C	Total	% Imp.	Density	A	B	C	Total	% Imp.	Density
Point 1	251	6	0	257	10.8	10.2	599	39	0	638	35.2	25.4
Point 2	200	0	0	200	8.4	8.0	238	10	0	248	13.7	9.86
Point 3	170	9	0	179	7.52	7.1	258	0	0	258	14.2	10.3
Point 4	317	10	0	327	13.7	13.0	457	4	0	461	25.5	18.3
Point 5	471	16	0	487	20.5	19.4	204	2	0	206	11.4	8.19
Point 6	221	0	0	221	9.29	8.8						
Point 7	351	7	0	358	15	14.2						
Point 8	343	8	0	351	14.7	14.0						
Total impact	2324	56	0	2380	100	11.8	1756	55	0	1811	100	72.0
R1	280	16	0	296	52.7	11.8	369	32	0	401	16.0	16.0
R2	258	8	0	266	47.3	10.6	163	4	0	167	6.6	6.6
Total Reference	538	24	0	562	100	11.2	532	36	0	568	11.3	11.3

Density = Number of birds/ha/hour
A = below RSA height (<35m); B = at RSA height (35-140m); C = above RSA height (>140m)

3.4. Birds at rotor swept area heights (RSA)

Bird flight heights were classified as being *below* RSA height (less than 35 metres), *at* RSA height (35–140 metres) and *above* RSA height (greater than 140 metres). The data from summer 2015 was used for height analysis as it was more representative of current conditions at the wind farm site. Results (from impact and reference observation points combined) indicated that the majority of birds (approximately 97 percent) were found below RSA heights, with approximately 3.0 percent found at RSA heights. No birds were recorded flying above RSA height, as shown in Figure 3. The results of the height analysis indicated that the large majority of birds using the wind farm site would not be exposed to a risk of collision with operating turbines.

Figure 3: The distribution of bird heights observed during summer 2015 bird utilisation surveys at Alberton Wind Farm.



Note: Impact and reference point's data combined

Table 7 shows the total number of individuals from different species observed flying at RSA height at all impact points during summer 2015 BUS. Some 56 birds from 14 different species were observed flying at RSA height at the impact points. This equated to approximately 2.7% of the total number of birds counted at the impact points.

During summer 2009, an almost equal proportion of birds (*c.* 3.0%) was observed flying at RSA heights.

The five most abundant species observed flying at RSA height were:

- White-throated Needletail
- Common Starling
- Magpie-lark
- Straw-necked Ibis
- Yellow-tailed Black Cockatoo

These five species accounted for almost 59.0% of the birds counted at RSA height, with White-throated Needletail comprising the bulk of these flights (17.9%). The five most common birds at RSA height were common species that were widespread across the

Alberton Wind Farm site and the wider region, except for the White-throated Needletail, which is a migratory species (summer visitor) listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Needletail spends only very limited time during the summer in or around the wind farm site, passing through irregularly. These birds are known to fly ahead of weather fronts while in south-eastern Australia. Another species listed on the EPBC Act as a migratory species was recorded: the Fork-tailed Swift, for which only one observation was made of a single bird flying at RSA heights. Both the swift and the Needletail are aerial species spending all their time in the air, feeding on the wing.

Starlings, cockatoos, ibises, magpies, ravens, magpie-larks, wattlebirds, and rosellas are resident birds usually more abundant in late summer, some of which (starling, raven, ibis, rosellas) move and forage in larger flocks.

The remaining birds at RSA heights comprised two birds of prey: Nankeen Kestrel and Brown Goshawk. Raptors usually fly at RSA heights when searching for food.

The distribution of birds flying at RSA heights at each of the eight impact points was random during all seasonal surveys. Birds were not recorded flying at RSA heights at any one survey point more than another, indicating that risk to birds is rather uniformly distributed over the Alberton Wind Farm. At the reference points, birds flying at RSA heights were on average less abundant than at the impact points.

Table 7: Species flying at rotor swept height (RSA) at the impact sites during summer 2015 BUS at Alberton Wind Farm

Species	Summer 2015 survey		% of flights at RSA	% of flights at RSA compared with all birds at RSA	% of flights recorded at RSA compared with all bird flights
	No. of flights at RSA*	Total no. of flights at all heights			
White-throated Needletail	10	10	100	17.9	0.4
Common Starling	6	151	4.0	10.7	0.3
Magpie-lark	6	64	9.4	10.7	0.3
Straw-necked Ibis	6	41	14.6	10.7	0.3
Yellow-tailed Black Cockatoo	5	9	55.6	8.9	0.2
Australian Magpie	4	203	2.0	7.1	0.2
Eastern Rosella	4	21	19.0	7.1	0.2
Red Wattlebird	4	139	2.9	7.1	0.2
Nankeen Kestrel	3	11	27.3	5.4	0.1
Australian White Ibis	2	38	5.3	3.6	0.1
Australian Shelduck	2	4	50.0	3.6	0.1
Raven spp.	2	743	0.3	3.6	0.1
Brown Goshawk	1	1	100	1.8	0.0
Fork-tailed Swift	1	1	100	1.8	0.0
Total of all birds	56	2380		100	2.4

* RSA height = 35 – 140 metres

3.5. Listed species

The majority of birds found to utilise the proposed wind farm site were common birds, however two species listed as migratory (not threatened) under the EPBC Act were recorded within the wind farm boundary during the surveys. These were:

- White-throated Needletail: The Needletail spends only very limited time during the summer in or around the wind farm site, and would pass through the wind farm irregularly. One flock of ten birds was recorded during the BUS counts.
- Fork-tailed Swift: Similar to the Needletail in its ecology and status. There was only one observation of a single bird flying at RSA heights.
- Several other listed migratory bird species characteristic of coastal and marine habitats were observed in the coastal area south of the wind farm site during the migratory bird surveys. None of these were observed to utilize the wind farm site as no habitat suitable for them exists here.

3.6. Raptors and waterbirds

The data from summer 2015 was used to evaluate the number of raptors and waterbirds utilizing the wind farm site.

Raptors

Raptors were uncommon at the wind farm site and only two species were recorded during the formal count (Table 8). None of the raptors observed at Alberton Wind Farm were threatened species, either under national or state conservation legislation. The raptors were generally recorded in low numbers (0.5% of all birds and only 0.2% of those flying at RSA heights). The raw data are presented in Appendix 1.

Nankeen Kestrel was the most abundant raptor species at Alberton Wind Farm (91% of all raptors recorded in 2015). The Brown Goshawk was recorded only once and constituted 8.3% of all raptors observed during formal counts. In 2009, neither of these species was recorded; raptors recorded then comprised one Australian Hobby and one Brown Falcon.

The Wedge-tailed Eagle is considered to be a high profile species and one of the most vulnerable species to collision with operating turbines. This species was observed twice over the wind farm site but outside the formal BUS surveys. No evidence was found of eagles nesting within the wind farm boundary. Based on the above, the wind farm site is likely to be part of the territory of one pair of eagles that reside and probably breed in woodland outside the wind farm site. The pair is likely to forage over the wind farm site itself, although it was not observed regularly during the current survey.

Waterbirds

The proposed Alberton Wind Farm site contained many small farm dams and one fairly large dam near observation point B4. The dams in the study area generally lacked aquatic vegetation and had bare edges trampled by stock. The large dam however included naturally occurring vegetation forming a semi-natural wetland.

Eight waterbird species were recorded during the surveys, comprising 4.3% of all birds observed during the formal counts (Table 8). None of the waterbirds observed were threatened species, either under national or state conservation legislation. Most of the waterbirds were recorded near impact point B1, which was one of the nearest points to the coastal area and the Alberton River.

Most waterbirds recorded were flying below RSA heights; this is not unusual since most of these birds fly at low heights when travelling between dams in the area. The Straw-necked and Australian White Ibises however, fly occasionally at RSA heights. Larger flocks of Straw-necked Ibis might pass across the wind farm site, but such flocks were not recorded during the current observations or in observations made at the coastal areas south of the wind farm site (see coastal and marine bird survey in this report).

Other waterbirds were also recorded utilising the wind farm site. The White-faced Heron was the most commonly recorded other waterbird, occasionally seen flying across open paddocks below RSA height.

Two duck species were also seen foraging at the farm dams and flying across open paddocks between the dams. The Australian Shelduck often flies at RSA heights.

The Australian Wood Duck is another very common farmland waterbird that usually roosts along the edges of farm dams and forages in farm dams and open paddocks next to dams during both day and night. They are gregarious birds, known to move and forage in flocks. Flocks of this species were observed at several farm dams throughout the proposed wind farm site but were not recorded at the observation points during formal counts. This species tends to fly close to the ground when moving between dams and was not observed flying at RSA heights.

Table 8: Raptor and waterbird species recorded at the impact survey points during summer 2015 surveys at Alberton Wind Farm

Species	Total raptors or waterbirds				% imp.	% of all Birds*	%birds at RSA	% of all RSA birds	% RSA birds of all birds
	A	B	C	Total					
Nankeen Kestrel	8	3	0	11	91.7	0.5	27.3	25.0	0.1
Brown Goshawk	0	1	0	1	8.3	0.0	100.0	8.3	0.0
Total raptors	**8**	**4**	**0**	**12**	**100**	**0.5**	**33.3**	**33.3**	**0.2**
Straw-necked Ibis	35	6	0	41	40.2	1.7	14.6	5.9	0.3
Australian White Ibis	36	2	0	38	37.3	1.6	5.3	2.0	0.1
White-faced Heron	13	0	0	13	12.7	0.5	0.0	0.0	0.0
Pacific Black Duck	6	0	0	6	5.9	0.3	0.0	0.0	0.0
Australian Shelduck	2	2	0	4	3.9	0.2	50.0	2.0	0.1
Total waterbirds	**92**	**10**	**0**	**102**	**100**	**4.3**	**9.8**	**9.8**	**0.4**

* Total birds of all species = 2380.
A=below rotor swept area (RSA) height (<35 m); **B=** at RSA height (35-140 m);
C= above RSA height (>140 m) * Total from 8 counts at each impact point.

3.7. Conclusions

The conclusions from the BUS of the Alberton Wind Farm are presented below:

- The study area consists largely of cleared flat areas supporting a low diversity and abundance of common, predominantly farmland birds.
- The study area supports very few raptors or waterbirds, groups considered vulnerable to collision with operating wind turbines. Raptors and waterbirds represented 0.5% and 4.3% respectively of all birds surveyed.

- The diversity of birds was similar across the observation points with common farmland birds dominating the species list. However, there was a tendency for points close to remnant woodland to have higher bird diversity.
- The species recorded flying at RSA heights were all considered common and/or widespread across the Alberton Wind Farm site and the wider region. Raptors were not common, with only 0.2% of all records being recorded at RSA heights. Similarly, few waterbirds were recorded flying at RSA height.
- Two species of listed migratory birds were recorded utilising the study area, the White-throated Needletail and the Fork-tailed Swift. Both are aerial species that fly mostly at and above RSA height, present at the wind farm occasionally.
- The use of the wind farm by birds during the summer 2015 survey was not greatly different from that recorded during the summer 2009 survey. Almost the same common, farmland birds were the dominant species.
- The dominance on the proposed wind farm site of bird species that are common and widespread in farmland landscapes in south eastern Australia makes it highly unlikely that the proposed Alberton Wind Farm will lead to bird impacts of conservation significance or population-scale concern.

4. BAT SURVEY RESULTS

4.1. Species recorded

Eight species of bats and three species complexes were recorded during the summer 2015 survey from five recording sites. The recorded species are listed in Table 10, including their conservation status and sites at which they were recorded.

The eight species identified at the wind farm site are known to be widespread and common. One species, the Eastern Falsistrellus is uncommon, although widespread in its distribution (Menkhorst 1995).

In addition to those bats identified to species level, three species complexes were recorded indicating calls that are indistinguishable between two or more species and could be either. The bat species complexes involved common and widespread species.

During the bat survey, no threatened bat species were recorded within the wind farm site.

The common species of bats were recorded from various sections of the wind farm and were not particularly restricted to certain habitats within the wind farm site. Site four however supported the highest number of species. This site was an ecotone between coastal scrub, open grazing paddock and a large, well vegetated farm dam. It seems likely that the open water of the dam was the major attraction for bats at this site.

Long-eared bats are difficult to distinguish to species level, and hence are grouped under their generic name as a species complex. The species that are likely to occur at the site are the Lesser Long-eared Bat *(Nyctophilus geoffroyi)* and Gould's Long-eared Bat *(N. gouldi)*.

Table 9: Bat species recorded at the Alberton Wind Farm during the summer 2015 survey

Common name	Scientific name	sites with records	Conservation status
White-striped Freetail Bat	*Tadarida australis*	2, 3, 4, 5,	Common & secured
Southern Freetail bat	*Mormopterus planiceps*	4	Common & secured
Eastern Freetail Bat	*Mormopterus ridei*	4	Common & secured
Gould's Wattled Bat	*Chalinolobus gouldi*	4, 5	Common & secured
Chocolate Wattled Bat	*Chalinolobus morio*	1, 2, 3, 4,	Common & secured
Eastern Falsistrellus	*Falsistrellus tasmaniensis*	4, 5	uncommon but secured
Large Forest Bat	*Vespadelus darlingtoni*	All sites	Common & secured
Little Forest Bat	*Vespadelus vulturnus*	1, 2, 3, 4	Common & secured
Species complexes			
Gould's Wattled Bat / Freetail Bat sp	*C. gouldi / Mormopterus sp2 & sp4*	All sites	
Long-eared Bat	*Nyctophilus sp*	1, 2, 3, 4	
Forest Bat sp	*V. darlingtoni / V. Regulus / V. vulturnus*	1, 2, 3, 5	

4.2. Bat activity

Bat activity at the proposed Alberton Wind Farm is similar to other wind farm sites located in comparable landscape settings in south-eastern Australia (BL&A unpubl. data). Bat activity during the nights of recording varied between the different species, time of recordings and the habitats at the recording sites. A summary of relative activity of the eight bat species and three species-complexes expressed as the total number of calls per site and average calls per night for each species from the five different sites are shown in Table 11.

The Large Forest Bat and Little Forest Bat were recorded most frequently, with their calls constituting about 49.4% and 25.0%, respectively of all bat calls. The remaining species were recorded less frequently, between 1 call (0.2%) for the Eastern Freetail Bat up to 42 calls (7.9%) for the Gould's Wattled Bat.

The nightly activity of each bat species varied widely without any obvious trends. The activity is probably the product of the site characteristics and the prevailing weather conditions on the day of recording. Weather was fine during most of the recording nights allowing bat activity most nights over the wind farm site.

Table 10: Summary of the average number of call per night recorded for the various bat species at each of the five recording sites at Alberton Wind Farm

Species	Site 1		Site 2		Site 3*		Site 4		Site 5		Total	Average/ night
	Total calls	Average/ night	Total calls	Average/ night	Total calls	Average/ night	Total calls	Average/ night	Total calls	Average/ night		
White-striped Freetail Bat	0	0.0	2	0.2	5	0.4	4	0.3	15	1.5	26	1.1
Southern Freetail bat	0	0.0	0	0.0	0	0.0	27	2.1	0	0.0	27	1.2
Eastern Freetail Bat	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	1	0.0
Gould's Wattled Bat	0	0.0	0	0.0	0	0.0	5	0.4	37	3.7	42	1.8
Chocolate Wattled Bat	1	0.1	2	0.2	3	0.2	27	2.1	0	0.0	33	1.4
Eastern Falsistrellus	0	0.0	0	0.0	0	0.0	5	0.4	2	0.2	7	0.3
Large Forest Bat	3	0.2	1	0.1	7	0.5	249	19.2	3	0.3	263	11.4
Little Forest Bat	4	0.3	5	0.5	34	2.6	90	6.9	0	0.0	133	5.8
Species complexes												
Gould's Wattled Bat / Mormopterus sp	5	0.4	8	0.8	22	1.7	518	39.8	7	0.7	560	24.3
Long-eared Bat	1	0.1	3	0.3	2	0.2	4	0.3	0	0.0	10	0.4
Forest Bat sp	7	0.5	4	0.4	12	0.9	80	6.2	0	0.0	103	4.5
Number of files	57		43		127		1864		192		2283	
Identified to species level	8		10		49		408		57		532	
Identified to call complex	13		15		36		602		7		673	
Unidentified (poor quality)	36		18		42		854		128		1078	

* Site 3 data are for the ground level only
The number of nights of recording was: site 1, 3, and 4 =13 nights; sites 2, 5 = 10 nights.

4.3. Bats flying at rotor swept height

The Anabat recorder which was installed at 50 metres above the ground on the wind mast (Site 3 at 50 m) failed to record any bat calls. The failure was probably technical due to failed microphone or loose connection when installed up the top of the wind mast; however, the machines did have a log file indicating that it was ready to receive bat calls. Hence it could also mean that no bats were flying at this height. The survey was planned to be repeated in late October 2015, but due to inclement weather no Anabat recorder could be installed at height.

At site 3 (ground), which was recording concurrently with the 50 m high recorder mostly forest bat calls were recorded, a species group that usually flies at low heights and rarely at 50 metres as well as a few calls from the White-striped Freetail Bat.

At other wind farm sites surveyed by BL&A, where bat call recordings have been made at heights of 50m above the ground using the wind mast, very few bat calls were recorded at this height comprising usually around 1 to 2 percent of total bat calls recorded (BL&A unpublished data). Most of the bat calls at height recorded at other wind farm sites were from the common White-striped Freetail Bat, a species known to fly at heights of 50m or more (Churchill 1998). This analysis confirms that only a small proportion of bats on the site would actually be exposed to collision risk with operating turbines and that the majority of these bats would be the White-striped Freetail Bat.

4.4. Conclusions

The findings from the summer bat utilisation surveys at the proposed Alberton Wind Farm site are as follows:

- Eight bat species and three species complexes were recorded from monitoring at five sites during the survey;
- None of the bats recorded is classified as threatened under national or state biodiversity legislation.
- Bat species were more frequently recorded at site 4 (408 identifiable bat calls). The site was located within a coastal scrub and grassland ecotone and a large, well vegetated farm dam with a large area of open surface water occurring nearby.
- There was much less bat activity in open, cleared paddocks (sites 1, 2 and 3).
- As open pasture is the most extensive habitat within the wind farm site and the habitat in which most turbines will be built, bat activity near proposed turbines is likely to be comparatively low.
- Numbers of bats using the bulk of the proposed site are considered comparatively low, resulting in a correspondingly low assessed collision risk.
- Based on the foregoing results, it is not anticipated that the proposed Alberton Wind Farm will have an impact on bats at a level that will be of any conservation concern.

5. MIGRATORY SPECIES SURVEYS

The proposed Alberton wind farm lies approximately three kilometres north of the potential migratory shorebird habitats in the Corner Inlet and Nooramunga Marine and Wildlife Reserves. Corner Inlet is a Ramsar Wetland listed under the EPBC Act (see Figure 2). A migratory bird survey has been undertaken of these habitats to ascertain the numbers and behaviour of any listed migratory shorebirds that use the area.

The listed migratory shorebird survey focussed on tidal wetlands south of the proposed wind farm site. The background paper for the EPBC Act draft policy statement regarding migratory shorebirds (DEWHA 2009) recommends four replicate surveys over the period when the majority of the shorebirds are present in the area and one winter survey. This first survey was undertaken in late February/early March 2015 to provide a first overview of migratory birds present in the nearby habitats.

5.1. Survey area and methods

The study area comprised all coastal habitats and seashores, including the intertidal area extending from Port Albert west to the northern shores of Sunday Island and Snake Island, and close to Port Welshpool (Figure 4).

The coastal area is approximately 3 to 5 km away at different points from the southern boundary of the proposed wind farm site.

The survey was undertaken at low tide by both walking through the coastal areas and mudflats and by boat. Coastal birds were watched at low and high tide to establish their pattern of movements and roosting sites.

The survey was carried out during the period 25th to 27th February 2015, a time when most migratory shorebird species were at peak numbers (the exception is the winter-visiting Double-banded Plover from New Zealand).

5.2. Results

The species, time when observed and conservation status of migratory birds recorded during February survey are listed in Table 11.

A summary of observations for each of the above birds is discussed below:

Pied and Sooty Oystercatchers (non-migratory): The most common species at the shores of the study area. When feeding or roosting they spread throughout the whole area.

Eastern Curlew: Similar to the oystercatcher, common and feed and roost throughout the whole of the study area.

Whimbrel: This species was found to feed as a flock, primarily at Lipscore Point on Sunday Island.

Bar-tailed Godwit: The species ecology is similar to the Whimbrel where they feed in flocks, primarily at Lipscore Point on Sunday Island.

Common Greenshank: Found to feed in flocks, mainly close to the jetty on Sunday Island.

Red Knot and Great Knot: Both found to feed within Bar-tailed Godwit flocks.

Red-necked Stint: Common shorebirds found feeding in the mudflats throughout the study area.

In addition other waterbirds were also recorded within the study area. These included:

Royal Spoonbill (non-migratory): A large flock of 100 birds was found at a high-tide roost at McMillons Beach at Port Albert.

Black-faced Cormorant (non-migratory): almost strictly marine species, common on the shores of the study area.

Little Egret (non-migratory): Rather common, usually found in association with wetlands, creeks and rivers and might occasionally feed in farm dams.

Gull-billed Tern: An uncommon tern along the shores of Port Albert and Port Welshpool. The birds observed were in full breeding plumage indicating that these birds may breed in the area.

White-billed Sea-Eagle: An uncommon eagle, usually found along the shores of southern Victoria. They are mainly restricted to the coastal habitats but might occasionally travel inland along large rivers.

White-throated Needletail: A summer visitor to the area. This bird was described above with other species in the BUS section of this report.

Table 11: Shorebird species recorded during 25th to 27th February 2015 survey at the coastal area south of Alberton Wind Farm.

Species	Number birds seen in February			Conservation status*
	25th	26th	27th	
Pied Oystercatcher		250	300	
Sooty Oystercatcher		46	58	NT (DEPI),
Eastern Curlew	11	22	12	VUL (DEPI), EPBC (m)
Whimbrel		30	28	VUL (DEPI), EPBC (m)
Bar-tailed Godwit		135	1124	EPBC (m)
Common Greenshank		11	12	EPBC (m)
Red Knot		0	18	EN (DEPI 13); EPBC (m)
Great Knot		0	2	EN (DEPI 13); EPBC (m)
Red-necked Stint		4	320	EPBC (m)
Other waterbirds				
Royal Spoonbill	100			NT (DEPI)
Black-faced Cormorant		30		NT (DEPI)
Little Egret			3	EN (DEPI 13)
White bellied Sea-eagle		1	1	VUL (DEPI);
Gull-billed Tern		2	9	EN (DEPI 13); EPBC (m)
White-throated Needletail		3		VUL (DEPI), EPBC (m)

EPBC (m) - protected under the Environmental Protection and Biodiversity Conservation Act 1999 as a migratory species.

DEPI - protected under Department of Environment and Primary Industries Advisory List of Threatened Vertebrate fauna in Victoria (2013).

5.3. Implications

Birds observed during the February survey in the coastal wetlands, mainly between three and five kilometres south of the wind farm site included threatened and listed migratory species. Some were threatened under the Victorian Threatened Vertebrate Fauna Advisory List (DEPI 2013), and almost all were protected under the EPBC Act 1999 as listed migratory species.

During the bird utilization survey undertaken during February 2015; none of these birds were recorded in or near the wind farm site, except for the White-throated Needletail and Fork-tailed Swift, which are not waterbirds but aerial species that fly over all habitats (for impacts on these species, see Section 3.5).

Bird species recorded in this survey were strictly intertidal shore or marine birds unlikely to fly inland and utilize dams or other wetlands within the wind farm site. Consequently none of the populations of the above birds would be impacted upon by the construction and operation of the proposed wind farm.

There is a possibility that, when migrating to and from the coastal habitats nearby, shorebirds may fly across the proposed Alberton Wind Farm site. Shorebird migration has been described by a number of authors (Lane & Jessop 1985; Piersma et al. 1990; Swennen 1992; Tulp et al 1994). These studies show that wherever it has been studied shorebird migratory departure has remarkably consistent characteristics, described below.

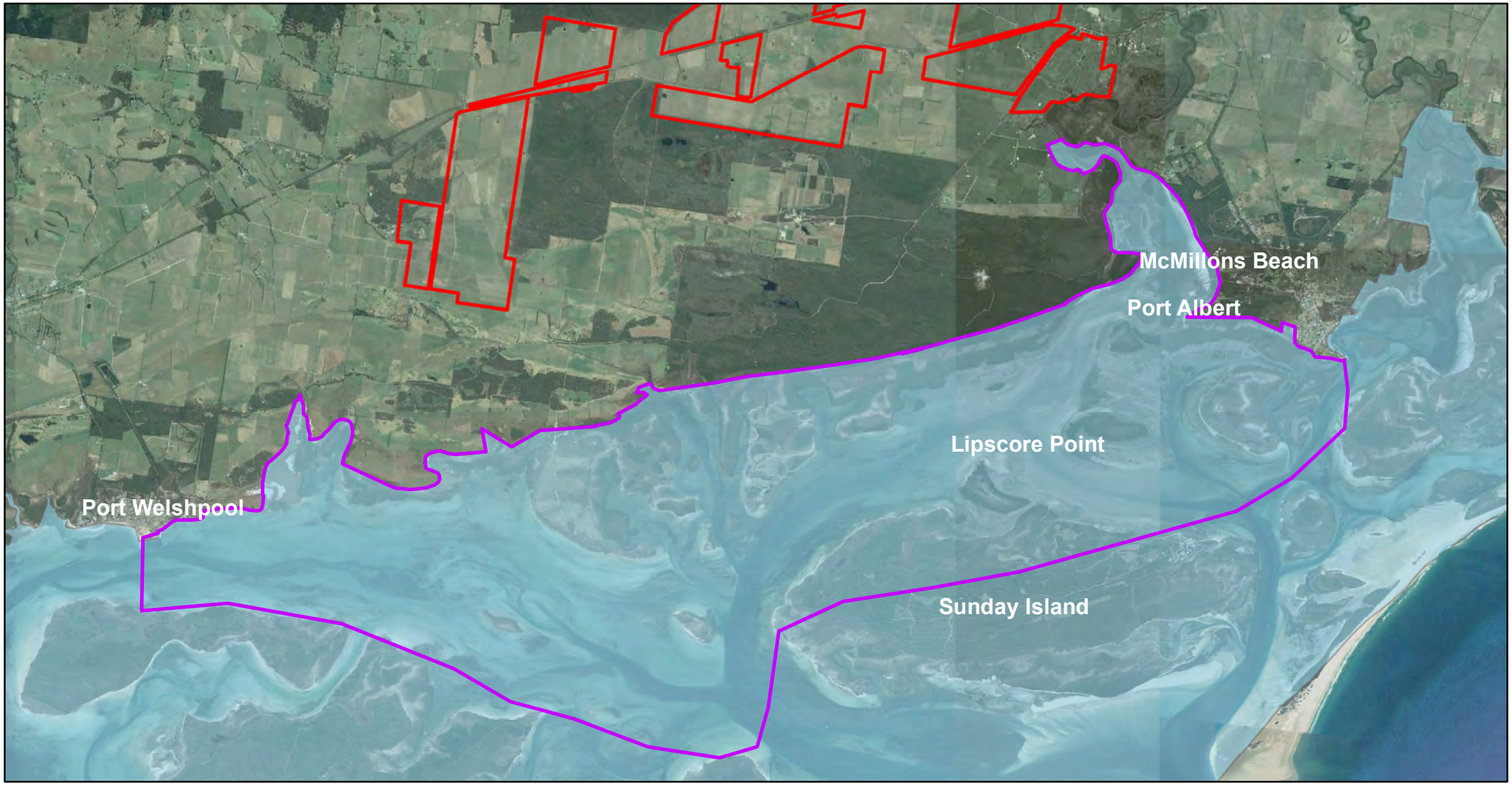
- Shorebirds depart in flocks of between 5 and 250 birds, with occasional observations of larger flocks (averages: 52, Lane & Jessop 1985; 10 – 151, depending on species, Piersma et al. 1990;127, Swennen 1992; 13 – 94, depending on species, Tulp et al. 1994).
- They fly in an elongated, shallow “V” formation, termed an “echelon” (see Piersma et al. 1990).
- Shorebirds are very vocal when they depart, calling unceasingly to one another rather loudly compared with their normal calling during flight.
- They ascend rapidly and steeply, and are usually still ascending when lost from sight by the observer. Estimates of climb rate vary, with larger, heavier species of shorebirds climbing at slower rates (Piersma et al. 1990, 1997). Rates of ascent for smaller shorebirds in West Africa were between 0.7 and 0.92 metres per second. Optimal climb rates of approximately twice this have been predicted for shorebirds by Hedenstrom and Alerstam (1994).
- Observations of flight altitude using weather radar show that during migration, shorebirds fly at between 0.5 and 6 kilometres (Williams et al. 1981; Piersma et al. 1990; Tulp et al. 1994). Altitudes of migration given in the last two studies are of birds still ascending when they disappeared from sight, often at altitudes of greater than one kilometre, and are therefore likely to be at the lower range of altitude estimates for level migratory flight. The first two studies used radar on oceanic islands to study shorebirds on long-distance, level, migratory flights. Altitudes in these circumstances ranged from 2.5 to 6 kilometres.

- Ground speeds for migrating shorebirds range between 20 km/h and 91 km/h (Lane & Jessop 1985; Tulp et al. 1994), although both studies were of birds climbing with varying strength winds affecting them.

Given the consistent behaviour of migratory shorebirds and their high rate of climb on departure, it is highly unlikely that shorebirds migrating northwards from the nearby intertidal habitats would be low enough by the time the crossed the proposed wind farm site to interact with operating wind turbines.

Observations at a wind farm in South Australia (BL&A, unpublished data) indicated that operating wind turbines sited within 300 metres of coastal shorebird habitats did not alter the distribution and abundance of shorebirds compared with their distribution and abundance before wind farm construction commenced.

In view of these findings, considering the main coastal habitats are located at least three kilometres from the boundary of the proposed Alberton Wind Farm and having regard to the observed movement of migratory species within but not beyond the coastal habitats during the current survey, the likelihood that the wind farm will have a significant impact on the migratory species in nearby habitats is considered very low. For this reason and again considering the distance from the shore, the project will not affect the ecological character of the Corner Inlet Ramsar Site.



Legend

- Shorebird survey study area
- Wind Farm boundary
- Ramsar wetland (Corner Inlet)

Kilometers
0 1 2 4

Figure 4: Shorebirds survey

Project: Alberton Wind Farm

Client: Synergy Wind Pty Ltd

Project No.: 14107	Date: 19/06/2015	Created By: M. Ghasemi / I. Kulik

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6. REFERENCES

Australian Wind Energy Association (AusWEA) 2005, Wind Farms and Birds: Interim Standards for Risk Assessment, Report prepared by: Brett Lane and Associates and AIRA Professional Services, Report No. 2003.35(2.2), July 2005.

Clean Energy Council 2013, Best Practice Guidelines – for implementation for wind energy projects in Australia. 2013.

Churchill, S 2008, *Australian Bats* (2nd. Ed.), Allen & Unwin, Crows nest, NSW.

DEPI (Department of Environment and Primary Industries) 2013, Advisory List of Threatened Vertebrate Fauna in Victoria. Department of Environment and Primary Industries (then DSE), East Melbourne, Victoria.

DEWHA (Department of the Environment, Water, Heritage and the Arts), 2009, Significant impact guidelines for 36 migratory shorebird species - Migratory species: EPBC Act policy statement 3.21 (Draft), 2009.

Hederstron, A and Alerstam, T (1994) Optimal climbing flight in migrating birds: predictions and observations of knot and turnstone. *Anim. Behav.* 48: 47-54.

Lane, B A and Jessop, A (1985) Tracking of migrating waders using in north-western Australia using meteorological radar. *Stilt* 6: 17-29.

Lane, B A (1987) 'Shorebirds in Australia.' Nelson, Melbourne.

Menkhorst, P. W. 1955, *Mammals of Victoria*, Oxford University Press, Melbourne.

Piersma, T; Zwarts, L and Bruggemann, J H (1990) Behavioural aspects of the departure of waders before long distance flights: flocking, vocalisations, flight paths and diurnal timing. *Ardea* 78: 157-184.

Piersma, T; Hedenstrom, A and Bruggemann, J H (1997) Climb and flight speeds of shorebirds embarking on an intercontinental flight; do they achieve the predicted optimal behaviour? *Ibis* 139: 299-304.

Richards, G, Hall, L and Parish, S 2012, *A natural history of Australian bats, Working the night shift*, CSIRO Publishing, Collinwood, Australia.

Swennen, C (1992) Observations on the departure of Knots from the Dutch Wadden Sea in spring. *Wader Study Group Bull.* 64, Suppl.: 87-90.

Tulp, I; McChesney, S and De Goeij, P (1994) Migratory departures of waders from north-western Australia: behaviour, timing and possible migration routes. *Ardea* 82: 201-221.

Williams, T C; Williams, J M; Ireland, L C and Teal, J M (1981) Autumnal bird migration over the western North Atlantic Ocean. *Amer. Birds*. 31: 251-267.

Williams, T C and Williams, J M (1988) Radar and visual observations of autumnal (southward) shorebird migration in Guam. *Auk* 107: 404-406.

Appendix 1: Details of bird utilization surveys during summer 2015

Note: A = below RSA; B = RSA height; C = above RSA

A - Summer 2015 impact points

Summer 2015	P 1			P 2			P 3			P 4			P 5			P 6			P 7			P 8			Total			
21 to 25 Feb 2015	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	Total
Australasian Pipit	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	15	0	0	15
Australian Hobby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Australian Magpie	21	0	0	22	0	0	20	0	0	32	4	0	28	0	0	23	0	0	24	0	0	29	0	0	199	4	0	203
Australian White Ibis	16	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	36	2	0	38
Australian Wood Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Australian Shelduck	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	4
Black Swan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-faced Cuckoo-shrike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-shouldered Kite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue-winged Parrot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown Goshawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
Brown Thornbill	0	0	0	0	0	0	12	0	0	8	0	0	20	0	0	8	0	0	20	0	0	0	0	0	68	0	0	68
Common Blackbird	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6	0	0	6
Common Myna	82	0	0	11	0	0	18	0	0	4	0	0	0	0	0	14	0	0	36	0	0	38	0	0	203	0	0	203
Common Starling	20	0	0	36	0	0	0	0	0	0	0	0	0	0	0	16	0	0	20	0	0	53	6	0	145	6	0	151
Crimson Rosella	2	0	0	0	0	0	7	0	0	4	0	0	10	0	0	0	0	0	5	0	0	0	0	0	28	0	0	28
Dusky Woodswallow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eastern Rosella	3	0	0	0	0	0	6	0	0	4	0	0	0	4	0	0	0	0	4	0	0	0	0	0	17	4	0	21
Eurasian Skylark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
European Goldfinch	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	10
Fairy Martin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fork-tailed Swift	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Galah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gang-gang Cockatoo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Summer 2015	P 1			P 2			P 3			P 4			P 5			P 6			P 7			P 8			Total			
21 to 25 Feb 2015	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	Total
Grey Butcherbird	0	0	0	0	0	0	6	0	0	4	0	0	2	0	0	7	0	0	0	0	0	0	0	0	19	0	0	19
Grey Currawong	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6
Grey Fantail	0	0	0	0	0	0	0	0	0	8	0	0	6	0	0	6	0	0	14	0	0	0	0	0	34	0	0	34
Grey Shrike-thrush	1	0	0	0	0	0	0	0	0	4	0	0	11	0	0	0	0	0	0	0	0	0	0	0	16	0	0	16
House Sparrow	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	0	0	82	0	0	82
Laughing Kookaburra	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
Magpielark	8	0	0	4	0	0	6	0	0	6	4	0	4	0	0	8	0	0	16	0	0	6	2	0	58	6	0	64
Masked Lapwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nankeen Kestrel	6	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	8	3	0	11
Noisy Miner	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	10	0	0	10
Pacific Black Duck	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6
Raven spp.	49	0	0	85	0	0	39	0	0	132	2	0	146	0	0	92	0	0	100	0	0	98	0	0	741	2	0	743
Red Wattlebird	19	0	0	0	0	0	2	2	0	52	0	0	40	2	0	18	0	0	4	0	0	0	0	0	135	4	0	139
Red-browed Finch	0	0	0	0	0	0	0	0	0	0	0	0	66	0	0	20	0	0	0	0	0	0	0	0	86	0	0	86
Red-rumped Parrot	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Rufous Whistler	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silvereye	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0	0	36	0	0	36
Spotted Turtle Dove	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Straw-necked Ibis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	6	0	15	0	0	35	6	0	41
Striated Pardalote	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striated Thornbill	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6
Sulphur-crested Cockatoo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Superb Fairywren	0	0	0	0	0	0	41	0	0	24	0	0	66	0	0	5	0	0	30	0	0	0	0	0	166	0	0	166
Tree Martin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wedge-tailed Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Welcome Swallow	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	10
White-browed Srubwren	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8
White-eared Honeyeater	2	0	0	0	0	0	4	0	0	20	0	0	8	0	0	0	0	0	2	0	0	0	0	0	36	0	0	36
White-faced Heron	8	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	13	0	0	13

Summer 2015	P 1			P 2			P 3			P 4			P 5			P 6			P 7			P 8			Total			
21 to 25 Feb 2015	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	Total
White-plumed Honeyeater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	2
White-throated Needletail	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	10	0	10
White-throated Treecreeper	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Willie Wagtail	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	2	0	0	14	0	0	20	0	0	20
Yellow-faced Honeyeater	2	0	0	0	0	0	0	0	0	8	0	0	28	0	0	0	0	0	0	0	0	0	0	0	38	0	0	38
Yellow-rumped Thornbill	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	10	0	0	10
Yellow-tailed Black Cockatoo	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	5	0	9
Totals	251	6	0	200	0	0	170	9	0	317	10	0	471	16	0	221	0	0	351	7	0	343	8	0	2324	56	0	2380
No. species at points	18			10			15			18			20			13			19			11						

B - Reference points summer 2015

Summer 2015		R 1			R 2			Total		
21 to 25 Feb 2015	A	B	C	A	B	C	A	B	C	Total
Australasian Pipit	0	0	0	0	0	0	0	0	0	0
Australian Hobby	0	0	0	0	0	0	0	0	0	0
Australian Magpie	31	0	0	20	0	0	51	0	0	51
Australian White Ibis	0	0	0	0	0	0	0	0	0	0
Australian Wood Duck	0	0	0	4	0	0	4	0	0	4
Australian Shelduck	0	2	0	0	0	0	0	2	0	2
Black Swan	0	0	0	0	0	0	0	0	0	0
Black-faced Cuckoo-shrike	2	0	0	0	0	0	2	0	0	2
Black-shouldered Kite	0	0	0	0	4	0	0	4	0	4
Blue-winged Parrot	0	0	0	0	0	0	0	0	0	0
Brown Falcon	0	0	0	0	0	0	0	0	0	0
Brown Goshawk	0	0	0	0	0	0	0	0	0	0
Brown Thornbill	6	0	0	0	0	0	6	0	0	6
Common Blackbird	2	0	0	2	0	0	4	0	0	4
Common Myna	24	3	0	34	0	0	58	3	0	61
Common Starling	50	7	0	70	0	0	120	7	0	127
Crimson Rosella	16	0	0	0	0	0	16	0	0	16
Dusky Woodswallow	0	0	0	0	0	0	0	0	0	0
Eastern Rosella	7	0	0	6	0	0	13	0	0	13
Eurasian Skylark	0	0	0	0	0	0	0	0	0	0
European Goldfinch	0	0	0	0	0	0	0	0	0	0
Fairy Martin	0	2	0	0	0	0	0	2	0	2
Forked-tail Swift	0	0	0	0	0	0	0	0	0	0
Galah	28	0	0	0	0	0	28	0	0	28
Gang-gang Cockatoo	0	0	0	0	0	0	0	0	0	0
Grey Butcherbird	4	0	0	4	0	0	8	0	0	8
Grey Currawong	0	0	0	0	0	0	0	0	0	0
Grey Fantail	8	0	0	8	0	0	16	0	0	16
Grey Shrike-thrush	0	0	0	0	0	0	0	0	0	0
House Sparrow	0	0	0	0	0	0	0	0	0	0
Laughing Kookaburra	0	0	0	0	0	0	0	0	0	0
Magpie-lark	26	0	0	20	0	0	46	0	0	46
Masked Lapwing	0	0	0	0	0	0	0	0	0	0
Nankeen Kestrel	0	0	0	0	0	0	0	0	0	0
Noisy Miner	0	0	0	10	0	0	10	0	0	10
Pacific Black Duck	0	0	0	0	0	0	0	0	0	0
Raven spp.	30	0	0	43	4	0	73	4	0	77
Red Wattlebird	8	0	0	0	0	0	8	0	0	8
Red-browed Finch	0	0	0	0	0	0	0	0	0	0
Red-rumped Parrot	0	0	0	0	0	0	0	0	0	0
Rufous Whistler	0	0	0	0	0	0	0	0	0	0
Silvereye	0	0	0	6	0	0	6	0	0	6
Spotted Turtle Dove	0	0	0	0	0	0	0	0	0	0

Summer 2015		R 1			R 2			Total		
21 to 25 Feb 2015	A	B	C	A	B	C	A	B	C	Total
Straw-necked Ibis	0	0	0	0	0	0	0	0	0	0
Striated Pardalote	0	0	0	0	0	0	0	0	0	0
Striated Thornbill	0	0	0	10	0	0	10	0	0	10
Sulphur-crested Cockatoo	0	2	0	0	0	0	0	2	0	2
Superb Fairywren	22	0	0	11	0	0	33	0	0	33
Tree Martin	0	0	0	0	0	0	0	0	0	0
Wedge-tailed Eagle	0	0	0	0	0	0	0	0	0	0
Welcome Swallow	0	0	0	0	0	0	0	0	0	0
White-browed Srubwren	0	0	0	0	0	0	0	0	0	0
White-eared Honeyeater	0	0	0	0	0	0	0	0	0	0
White-faced Heron	0	0	0	0	0	0	0	0	0	0
White-plumed Honeyeater	0	0	0	4	0	0	4	0	0	4
White-throated Needletail	0	0	0	0	0	0	0	0	0	0
White-throated Treecreeper	0	0	0	0	0	0	0	0	0	0
Willie Wagtail	12	0	0	0	0	0	12	0	0	12
Yellow-faced Honeyeater	0	0	0	6	0	0	6	0	0	6
Yellow-rumped Thornbill	4	0	0	0	0	0	4	0	0	4
Yellow-tailed Black Cockatoo	0	0	0	0	0	0	0	0	0	0
Totals	280	16	0	258	8	0	538	24	0	562

C- Summer 2009 impact points

Summer 2009	P 1			P 2			P 3			P 4			P 5			Total			
4 to 9 / 01 / 2009	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	Total
Australasian Pipit	0	0	0	18	0	0	6	0	0	0	0	0	0	0	0	24	0	0	24
Australian Hobby	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Australian Magpie	22	0	0	13	0	0	26	0	0	18	2	0	24	0	0	103	2	0	105
Australian White Ibis	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	5
Australian Wood Duck	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Black Swan	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3
Black-faced Cuckoo-shrike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue-winged Parrot	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	7	0	0	7
Brown Falcon	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Brown Goshawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown Thornbill	0	0	0	0	0	0	16	0	0	26	0	0	0	0	0	42	0	0	42
Common Blackbird	0	0	0	0	0	0	4	0	0	16	0	0	4	0	0	24	0	0	24
Common Myna	28	0	0	44	0	0	0	0	0	0	0	0	0	0	0	72	0	0	72
Common Starling	246	10	0	10	0	0	0	0	0	0	0	0	46	0	0	302	10	0	312
Crimson Rosella	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	28	0	0	28
Dusky Woodswallow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eastern Rosella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurasian Skylark	4	1	0	60	6	0	40	0	0	4	0	0	42	2	0	150	9	0	159
European Goldfinch	36	0	0	4	0	0	10	0	0	44	0	0	14	0	0	108	0	0	108
Fairy Martin	60	10	0	0	0	0	0	0	0	0	0	0	0	0	0	60	10	0	70
Galah	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	12	0	0	12
Gang-gang Cockatoo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey Butcherbird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey Currawong	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey Fantail	0	0	0	0	0	0	0	0	0	30	0	0	6	0	0	36	0	0	36
Grey Shrike-thrush	0	0	0	1	0	0	1	0	0	7	0	0	4	0	0	13	0	0	13
House Sparrow	36	0	0	28	0	0	0	0	0	0	0	0	0	0	0	64	0	0	64
Laughing Kookaburra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magpielark	20	0	0	12	0	0	21	0	0	0	0	0	6	0	0	59	0	0	59

Summer 2009	P 1			P 2			P 3			P 4			P 5			Total			
4 to 9 / 01 / 2009	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	Total
Masked Lapwing	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Nankeen Kestrel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific Black Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raven spp.	11	0	0	31	3	0	6	0	0	10	0	0	15	0	0	73	3	0	76
Red Wattlebird	8	0	0	0	0	0	16	0	0	18	0	0	16	0	0	58	0	0	58
Red-browed Finch	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	36	0	0	36
Rufous Whistler	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	12	0	0	12
Silvereye	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	50	0	0	50
Spotted Turtle Dove	0	0	0	2	0	0	0	0	0	8	0	0	0	0	0	10	0	0	10
Straw-necked Ibis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striated Pardalote	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striated Thornbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulphur-crested Cockatoo	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	2
Superb Fairywren	9	0	0	0	0	0	34	0	0	59	0	0	10	0	0	112	0	0	112
Tree Martin	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
Wedge-tailed Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Welcome Swallow	66	12	0	0	0	0	16	0	0	0	0	0	4	0	0	86	12	0	98
White-browed Srubwren	0	0	0	0	0	0	14	0	0	52	0	0	4	0	0	70	0	0	70
White-eared Honeyeater	0	0	0	0	0	0	2	0	0	16	0	0	2	0	0	20	0	0	20
White-faced Heron	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4	1	0	5
Willie Wagtail	15	0	0	0	0	0	0	0	0	2	0	0	0	0	0	17	0	0	17
Yellow-faced Honeyeater	0	0	0	0	0	0	4	0	0	35	0	0	7	0	0	46	0	0	46
Yellow-rumped Thornbill	27	0	0	0	0	0	14	0	0	0	0	0	0	0	0	41	0	0	41
Yellow-tailed Black Cockatoo	2	0	0	2	0	0	0	0	0	0	2	0	0	0	0	4	2	0	6
Totals	599	39	0	238	10	0	258	0	0	457	4	0	204	2	0	1756	55	0	1811
No. species at points	19			16			19			19			15						

D- Summer 2009 reference points

Summer 2009	R 1			R 2			Total			
4 to 9 / 01 / 2009	A	B	C	A	B	C	A	B	C	Total
Australasian Pipit	0	0	0	2	0	0	2	0	0	2
Australian Hobby	0	0	0	0	0	0	0	0	0	0
Australian Magpie	16	0	0	23	0	0	39	0	0	39
Australian White Ibis	0	0	0	0	0	0	0	0	0	0
Australian Wood Duck	0	0	0	0	0	0	0	0	0	0
Black Swan	0	0	0	0	0	0	0	0	0	0
Black-faced Cuckoo-shrike	0	0	0	0	0	0	0	0	0	0
Blue-winged Parrot	0	0	0	0	0	0	0	0	0	0
Brown Falcon	0	0	0	0	0	0	0	0	0	0
Brown Goshawk	0	0	0	0	0	0	0	0	0	0
Brown Thornbill	0	0	0	0	0	0	0	0	0	0
Common Blackbird	0	0	0	8	0	0	8	0	0	8
Common Myna	8	0	0	0	2	0	8	2	0	10
Common Starling	112	6	0	38	0	0	150	6	0	156
Crimson Rosella	0	0	0	0	0	0	0	0	0	0
Dusky Woodswallow	0	0	0	0	0	0	0	0	0	0
Eastern Rosella	0	0	0	0	0	0	0	0	0	0
Eurasian Skylark	28	2	0	2	0	0	30	2	0	32
European Goldfinch	17	0	0	14	0	0	31	0	0	31
Fairy Martin	0	0	0	0	0	0	0	0	0	0
Galah	20	0	0	0	0	0	20	0	0	20
Gang-gang Cockatoo	0	0	0	0	0	0	0	0	0	0
Grey Butcherbird	0	0	0	0	0	0	0	0	0	0
Grey Currawong	0	0	0	0	0	0	0	0	0	0
Grey Fantail	0	0	0	16	0	0	16	0	0	16
Grey Shrike-thrush	0	0	0	0	0	0	0	0	0	0
House Sparrow	70	10	0	0	0	0	70	10	0	80
Laughing Kookaburra	0	0	0	0	0	0	0	0	0	0
Magpie-lark	8	0	0	0	0	0	8	0	0	8
Masked Lapwing	0	0	0	0	0	0	0	0	0	0
Nankeen Kestrel	0	0	0	0	0	0	0	0	0	0
Pacific Black Duck	0	0	0	0	0	0	0	0	0	0
Raven spp.	12	0	0	6	0	0	18	0	0	18
Red Wattlebird	24	0	0	4	0	0	28	0	0	28
Red-browed Finch	0	0	0	0	0	0	0	0	0	0
Rufous Whistler	0	0	0	2	0	0	2	0	0	2
Silvereye	10	0	0	0	0	0	10	0	0	10
Spotted Turtle Dove	2	0	0	0	0	0	2	0	0	2
Straw-necked Ibis	0	0	0	0	0	0	0	0	0	0
Striated Pardalote	0	0	0	0	0	0	0	0	0	0
Striated Thornbill	0	0	0	0	0	0	0	0	0	0
Sulphur-crested Cockatoo	0	0	0	0	0	0	0	0	0	0
Superb Fairywren	6	0	0	10	0	0	16	0	0	16
Tree Martin	0	0	0	0	0	0	0	0	0	0
Wedge-tailed Eagle	0	0	0	0	0	0	0	0	0	0
Welcome Swallow	6	4	0	4	2	0	10	6	0	16
White-browed Srubwren	0	0	0	0	0	0	0	0	0	0
White-eared Honeyeater	0	0	0	0	0	0	0	0	0	0

Summer 2009	R 1			R 2			Total			
4 to 9 / 01 / 2009	A	B	C	A	B	C	A	B	C	Total
White-faced Heron	0	0	0	0	0	0	0	0	0	0
Willie Wagtail	1	2	0	0	0	0	1	2	0	3
Yellow-faced Honeyeater	0	0	0	22	0	0	22	0	0	22
Yellow-rumped Thornbill	21	8	0	12	0	0	33	8	0	41
Yellow-tailed Black Cockatoo	8	0	0	0	0	0	8	0	0	8
Totals	369	32	0	163	4	0	532	36	0	568