

**INDEPENDENT REVIEW OF THE  
ASSESSMENT DOCUMENTATION AND CONCLUSIONS  
FOR THE BALD HILLS WIND FARM (EPBC 2002/730)**

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### **BACKGROUND**

Wind Power Pty Ltd propose to construct and operate a windfarm on about 1340 hectares of land at Bald Hills, near Tarwin Lower in the South Gippsland region of Victoria. The proposal was referred under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and determined to be a controlled action on 21 August 2002. The controlling provisions are listed threatened species and listed migratory species.

The proposal was assessed by accreditation of the Victorian Environment Effects Statement (EES) process under the *Environment Effects Act 1978*. The main issues relate to possible impacts on listed threatened and migratory bird species through potential bird strike, alienation and habitat modification.

The original proposal was for the construction of 84 turbines, subsequently modified by the proponent to 52. The Panel (established under the Victorian EES process) provided its assessment report to the Victorian Minister on 25 June 2004. The proposal was approved by Victoria on 25 August 2004. Victoria's assessment report was received by the Department of Environment and Heritage on 27 August 2004. The section 130 notice was received on 1 September 2004.

This report assesses the adequacy of the bird surveys and conclusions drawn from them.

### **SCOPE**

1. Review the relevant reports from:

- the proponent and their environmental consultants (Brett Lane and Associates, Biosis Research Pty Ltd);
- the Panel established under the Victorian Environment Effects Statement (EES) assessment process; and
- the Victorian Minister for Planning.

2. Provide a written report on their appropriateness and reasonableness in terms of:

- the approach, design and methodology used to survey for listed threatened and migratory bird species on and in the vicinity of the proposal site; and
- the conclusions drawn from the data and results obtained, in terms of:
  - the need to do further species-specific surveys;
  - the relevance of the bird strike modelling; and
  - the likely impacts of the proposal on listed threatened and migratory bird species.

This assessment is presented as a brief summary of information in the bird survey documentation relating to each of the scoping items, followed by comments on that information. An overall statement on adequacy of the survey is presented in the final summary.

#### REPORTS PROVIDED

- Brett Lane & Associates Pty Ltd. Ecological Research & Management (2002). Bald Hills Windfarm. Preliminary Report on Summer Field Season. Report No. 2002-17(1.0). Wind Power Pty Ltd. April 2002.
- Brett Lane & Associates Pty Ltd. Ecological Research & Management (2002). Bald Hills Windfarm. Matters of National Environmental Significance. Report No. 2002-17(2.0). Wind Power Pty Ltd. June 2002.
- Brett Lane & Associates Pty Ltd. Ecological Research & Management (2002). Bald Hills Windfarm. Flora, Fauna and Avian Assessment. Report No. 2002-17(3.0). Wind Power Pty Ltd. November 2002.
- Brett Lane & Associates Pty Ltd. Ecological Research & Management (2003). Bald Hills Windfarm. Flora, Fauna and Avian Assessment. Report No. 2002-17(3.3). Wind Power Pty Ltd. April 2003.
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- Wind Power Pty Ltd. (2003). Supplementary Environmental Effects Statement for the Bald Hills Wind Farm Project. November 2003.
- Brett Lane & Associates Pty Ltd. Ecological Research & Management (2003). Memorandum: Changes to Flora, Fauna and Avian Assessment Matters of National Environmental Significance Report and Bat Investigation Report contained in Appendix 1 to the EES. Wind Power Pty Ltd. November 2003.
- Brett Lane & Associates Pty Ltd. Ecological Research & Management (2004). Fauna Survey Proposed Bald Hills Wind Farm. Report No. 2002-17(5.0). Wind Power Pty Ltd. March 2004.
- Brett Lane & Associates Pty Ltd. Ecological Research & Management (2004). Bald Hills Windfarm. Supplementary Environmental Effects Statement - Additional Information on Flora and Fauna Issues. Report No. 2002-17(7.0). Wind Power Pty Ltd. March 2004.
- Panel (2004). Bald Hills Wind Farm Project EES, EES Supplement and Called-in Planning Permits Panel Report. June 2004.
- Meredith, C. (2004). Peer Review: Flora and Fauna Assessments of the Proposed Bald Hills Wind Farm. Project No. 3979. Biosis Pty Ltd. Sydney & Melbourne. March 2004.

Brett Lane & Associates Pty Ltd, Ecological Research & Management (2004). Bald Hills Windfarm SEES: Response to Panel Submissions: Report No. 2002.17(8.2). Wind Power Pty Ltd, April 2004.

Brett Lane & Associates Pty Ltd, Ecological Research & Management (2004). Proposed Bald Hills Windfarm: Summary of Bird Impact Findings. Report No. 2002.17(10.0). Wind Power Pty Ltd, July 2004.

Victorian Minister for Planning (2004). *Environment Effects Act 1978* Bald Hills Wind Farm Assessment. August 2004.

#### REPORTS NOT SIGHTED

Erratum to Brett Lane & Associates Pty Ltd, Ecological Research & Management (2002). Bald Hills Windfarm Preliminary Report on Summer Field Season. Report No. 2002.17C(1.0). Wind Power Pty Ltd, April 2002.

Supplementary report responding to written submissions on the EES and supplementary EES (March 2004), prepared at the request of barristers for the proponent.

#### SURVEY METHODOLOGY & ANALYSIS

No one document contains all the information on the bird surveys. Report 2003.17 (3.3) and its errata contains the core survey results, maps and methods and strike rates from overseas windfarms; Report 2002.17 (8.2) contains further analysis to substantiate claims of adequacy; Report 2002.17(7.0) contains results from other Australian windfarms; Reports 2002.17 (10.0) and 2002.17 (8.2) contain additional information, graphs and tables.

#### *Information Reviewed & Sought by Lane & Associates*

- Primary source was DSE's Atlas of Victorian Wildlife (main source for status and threatened species occurrence)
- Orange-bellied Parrot Recovery Team, via Birds Australia—all sightings of OBP over last 15 years
- Draft Management Plan for Cape Liptrap Coastal Park
- Discussions with stakeholders such as Bird Observers Club of Australia and Birds Australia

#### *Comments on Information Gathering and Literature Review*

Criticism that local bird lists weren't consulted (Panel Report 2004) is warranted, consequently, additional species were discussed in later reports. It is unclear whether the Swift Parrot Recovery Team was consulted regarding winter (mainland) sightings. Nevertheless, neither of these is likely to materially alter the main conclusions.

#### *Point Counts: Survey Design and Methodology*

The survey protocol, as given in Report 2002.17 (3.3), unless otherwise referenced, is:

- Surveyed in each of the four seasons in 2002
- 16 impact sites (where turbines are planned to be sited); 8 reference sites in each season; but Report No. 2002.17C(1.0) states 12 sites in summer.
- Duration at each point: 15 minutes
- 6 days in each season; but summer survey period was given as 5 days in Report No. 2002.17C(1.0).
- Scheduled to cover each of 4 time periods in each 6-day period (0800–1000; 1000–1200, 1200–1430, 1430–1700).
- All species and their flight height recorded within radius of 100 m. Height recorded as either below, at or above the rotor swept area height of 35–105 m, judged by comparison with fence posts of known spacing.

#### *Comments on Survey Design and Methodology*

Point counts are a standard technique for ornithological surveys. The survey design is adequate to determine the relative use of the site by birds, calculated as the utilisation rate.

The basic survey protocol adequately covers seasonal and daily variation within the limited time allowed for survey. In response to comment by the Panel and the public regarding incomplete coverage of daylight hours, further information was provided, based on casual surveys, which suggested that activity around dawn and dusk was unlikely to substantially alter the results. Little consideration seems to have been given to bird movements at night; nocturnal bird utilisation rates might be expected to be low and are hard to detect, so this is not a major flaw.

The usefulness of reference sites is debatable. They were not matched to impact sites, so are not really comparable. Report 2002.17(8.2) gives a comparison of the two types of site for the most abundant species, but makes no statistical comparison, so it is not possible to judge whether reference sites will be representative of impact sites (for future reference should the operation proceed).

Information lacking on methodology in the reports includes:

- Actual survey dates: 27 Feb–2 March, 2–7 May (2003 Memorandum); others not reported?
- Number of observers and their experience with bird surveys: 3 listed in Report No. 2002.17C(2.0)
- Were the same observers employed throughout?

These are not vital but would complete the documentation of the methodology and design.

The search area of 100 metres around a central point is adequate for small birds, but may give an underestimate for larger birds, such as raptors and waterbirds. A larger radius (500–800m or so) is recommended for larger, more visible birds with a larger territory. Thus, utilisation rates of large species may be somewhat underestimated.

Presumably, breeding sites were noted, as recommended by AusWEA (2002), for raptors but this is not discussed. Flight paths (identification of which is regarded as best practice by AusWEA) are discussed, and it is unlikely that there are any mass migration routes at the Bald Hills site. Nevertheless, the data could have been used to elucidate flight paths for resident birds such as the Wedge-tailed Eagles (see next section).

Without visiting the site, and with no information in the reports on the experience of the observers etc., it is impossible to judge whether the surveys were likely to have been well conducted in regards to the application of the methodology and observational accuracy. That said, the consultant and the observers listed in an early report are all competent observers and there is no reason to suspect that there were inadequacies of this type.

#### *Point Counts: Survey Effort*

Total survey time per point per season was one hour.

Total time for all points, that is, for each seasonal survey, was 24 hours, or 23 if the initial summer survey was made over 5 days. [NB there are some inconsistencies in reporting of effort: a combined total of 40 hours was stated to have been spent on the summer and autumn surveys, which would equate to 5 survey days in each season (2003 Memorandum).]

Total effort over entire 2002 bird survey 96 hours maximum (or somewhere between 88 and 96 hours, depending on which report is accurate).

#### *Comments on Survey Effort*

Survey effort was low (96 hours maximum over the entire year) as pointed out by the Panel (2004) and Meredith (2003). Nevertheless, later reports showed that the number of species observed approached plateau both on a daily and a seasonal basis, indicating that coverage was adequate at least in terms of detection of species (there were no similar analyses for numbers of birds or bird utilisation rates, which would have been informative, though not vital).

There were several inconsistencies between reports on the effort expended. While this adds to a general feeling of uncertainty about the reliability of the reporting it doesn't alter the overall conclusions.

#### *Presentation and Analysis of Results*

The key results are presented as bird utilisation rate at rotor height: the number of birds flying in the rotor swept angle area per hectare per hour according to species. The groups most at risk of collision, raptors and waterbirds, are broken down into impact and reference sites; the tables presenting this data contained errors that were corrected in the errata document, but the table showing the 'all sites' total (p. 36 Report 2003.17 (3.3)) also appears to be in error and wasn't corrected. Analysis was minimal and no statistics were applied.

#### *Comments on Presentation and Analysis of Results*

The aim was to gather 'bird utilisation rates'. These data are almost always presented as

bird utilisation rates in the rotor swept area, and few general (i.e. site utilization at any height) results are presented. This was because collision was considered a key threat. Certainly the birds flying in the rotor zone are those at risk from collision, and the bird utilisation rate captures these, but this gives only a narrow interpretation of bird use of the site. Other birds that don't fly in that space may still be affected, for example, by alteration. Hence, I believe the data on general bird use of the site (at all heights) should have been presented.

The data is mostly tabulated according to individual species use of the area at rotor height, which allows a simple assessment of collision risk. A ranked listing of species according to their bird utilisation rate is commonly used to quantitative data on bird use of a windfarm site and provides a crude, relative estimate of potential collision rates. High utilisation was considered to equate to high risk, and vice versa; this seems reasonable and pragmatic, although collision risk is not necessarily directly related to frequency of occurrence. No account is made of different bird behaviours, eg speed of flight and patterns of movement across the site, which impact on vulnerability to collision, but this probably isn't warranted because of the low usage and the complexity it would add.

Table 3 is presented of rotor height bird utilisation rates according to survey point (p.34 table 3 Report 2002-17(3.3)), but isn't discussed. The assessment by Meredith (2003) concludes that these rates are low in comparison with other windfarms, but no figures are given. A map of the sites with the rate of utilisation might have been informative. Why were some sites much more heavily used than others? There seem to have been little or no use made of this data. It could, for example, have been used to identify high use sites where the installation of turbines should be avoided. The imperative of siting turbines in places where they will not be close to areas of high bird usage, was an issue arising at the public meetings and was claimed to have been covered by survey techniques (Report No. 2002-17(10.0)). In Report No. 2002-17(3.3) it is stated that *"In view of the insignificant impact on birds that the proposed windfarm is likely to have, mitigation measures related to the siting and layout of the proposed windfarm are not considered necessary"* (p.48). It would still seem desirable to attempt to minimize risk. Even that some data were available on which to potentially base a few adjustments regarding siting. Elsewhere, collision rates have been improved by micro-siting (O'hlander & Rugge 2000).

Many statements are unsubstantiated. Statements that sit-back from coast in the new 52 turbine plan will reduce strike rates in an already low risk area could have been substantiated by data showing that the survey sites on that edge of the farm were indeed little used by birds. Very little comparative data is presented so that statements such as that raptors were observed frequently at the proposed site compared to other farms and (p.36 Report 2002-17(3.3)) are hard to assess and appear to be purely subjective.

Similarly if data on bird movement patterns across the site had been mapped (particularly for residents such as the Wedge-tailed Eagles that might be expected to have regular routes); then the data could have been used to inform placement of turbines. AusWEA (2002) recommend identification of such flight paths.

The survey data could have been better presented, but they appear adequate to support the conclusion that birds were not abundant at the site, including listed threatened and migratory species.

### *Collision Model*

A collision risk model has been developed to attempt to predict the numbers of birds that will collide with operating wind generators by Meredith & Baird (2000), based on Tucker's (1996) model, developed to improve the design of the blades, but it has yet to be 'ground-truthed'. No models have been developed in the US possibly because bird mortalities at windfarms account for only an estimated 0.01 to 0.02% of all avian collisions (Erickson *et al.* 1991). The Meredith & Baird model is most useful for abundant species, and takes into account: the layout of the windfarm; number of generators; generator specifications; wind direction data, as this affects the orientation of generator blades; bird utilisation data. It also includes a number of assumptions about bird flight behaviour relative to the windfarm; flight frequency and bird behaviour of threatened species; and bird avoidance behaviour.

The level of bird activity at Bald Hills would not give meaningful input into the model. Hence, Brett Lane & Associates constructed a simple collision model for the White-throated Needletail, the EPBC listed species, estimated to occur there in significant numbers (Reports 2002.17(3.3) and its errata; and 2002.17(10.0)). Table 2 (p.11 Report 2002.17 (10.0)) gives details of the calculation of a crude estimate of the number of Needletails likely to be killed.

### *Comments on the Collision Model*

The use of a simple collision model or index seems sensible given the low level of bird activity and the untested nature of the only available model. Nonetheless the simple model for Needletails is statistically flawed: all else being equal, reducing the number of turbines increases the predicted number of Needletails killed. That is, 18 when there were 30 generators (Report No. 2002.17(10.0)) and 24 for 52 generators (Report No. 2003.17(3.3) errata). Use of number of birds involved (2400) x avoidance estimate (95%) x airspace estimate (12%) alone would give a more intuitive result, namely 14 birds (for the 52 turbine option).

Actual mortality rates for operating windfarms are more meaningful than these crude estimates. Actual mortality rate is given as 2-4 annually per turbine at various agricultural locations overseas (Report No. 2002.17(93.3)), 2-19 in the US (review by Erickson *et al.* 1991) and about 2 at Australian windfarms (Report No. 2002.17(7.0)). Based on this, perhaps 104 bird mortalities might be expected should the development proceed; these will be mostly common species. From the ranked bird utilisation data in Report No. 2002.17(3.3), p.36 this may well include the listed migratory species, the Wedge-tailed Eagle and White-throated Needletail (though the ranking of the latter is inflated due to one large group). Although regrettable, the loss of a few individuals of either species would not have a significant impact at the population level.

### **CONTROLLING PROVISIONS AS IDENTIFIED BY LANE & ASSOCIATES**

The following Commonwealth EPBC listed species were recorded on the proposed windfarm or in the immediate vicinity, or judged likely to be occasionally present or to occasionally transit the farm (Report No. 2002.17(3.3) and its errata).

*Threatened species:*

- Orange-bellied Parrot
- Swift Parrot

*Migratory species:*

- White-throated Needletail
- Wetland birds—Wood Duck, Australian Shelduck, Pacific Black Duck, Chestnut Teal, Masked Lapwing and Latham's Snipe
- Birds of prey—Wedge-tailed Eagle, Peregrine Falcon Brown Goshawk, Australian Kestrel, Brown Falcon, Swamp Harrier and Black-shouldered Kite. White-bellied Sea-Eagles were not recorded but were considered in one report (Report No. 2002.17(10.0) because they are listed migratory species and occur in the wider area.

*Comments on species identified as listed by the Commonwealth*

Without visiting the site, the list appears to be comprehensive. It covers the species identified during the literature and field surveys and submissions from the public and the Panel.

**LANE & ASSOCIATES' SUMMARY OF LEGISLATIVE AND POLICY IMPLICATIONS**

***Report 2002.17 (3.3)(2004)***

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, nationally threatened and listed migratory bird species must be considered.

*Neither 'of the nationally threatened bird species that occur in the region has been recorded on the windfarm sites and no suitable habitat for them exists on the sites. Furthermore, the likelihood of the proposed windfarm significantly affecting these species is negligible. For these reasons, the proposed windfarm will not have a significant impact on nationally threatened bird species. In consideration of the Administrative Guidelines on Significance under the Act, impacts on nationally threatened species are not significant as there are no important populations of these species on the site or critical habitats for them. For this reason, the proposed windfarm will not:*

- *Lead to a long term decline in the size of an important population of a*
- *Reduce the area of occupancy of an important population; or*
- *Fragment an existing important population into two or more populations;*
- *Adversely affect habitat critical to the survival of a species; or*
- *Disrupt the breeding cycle of an important population; or*
- *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or*
- *Result in invasive species that are harmful to a species becoming established in*

*that species' habitat; or*

- *Interfere with the recovery of the species.'*

In regard to migratory species, *'the proposed windfarm sites are not important habitat [as] defined in the Administrative Guidelines on Significance, that is, they are not:*

- *Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion [of] the population;*
- *Habitat utilised by a migratory species that is at the limit of the species range;*  
*or*
- *Habitat within an area where the species is declining.*

*None of the listed migratory species that have been recorded on the site or in the region will be significantly affected by the proposed windfarm. A small number of the White-throated Needletails may be affected each spring/summer, but the numbers are not considered to be significant at a population scale. In consideration of the Administrative Guidelines on Significance under the Act... the proposal will therefore not:*

- *Substantially modify, destroy or isolate an area of important habitat of the migratory species; or*
- *Result in invasive species that are harmful to the migratory species becoming established in an area of important habitat of the migratory species; or*
- *Seriously disrupt the lifecycle of an ecologically significant proportion of the population of the species.'*

*Report 2002.17 (10.0)(2004) reiterates the above, in brief:*

- Targeted threatened species studies are not warranted.
- No significant issues emerged, so no additional investigations are warranted.

#### *Comment on Overall Conclusions*

Despite reservations about the survey and presentation of results, I agree that the use of the proposed site by the listed species seems to be low and therefore presents minimal risk to the populations, recruitment or displacement/alteration. The Panel (2004) also concluded that overall the site had low levels of utilisation and is not likely to be a site of particularly high risk for bird mortality (p. 172) but felt that insufficient information was provided to assess the EPBC listed species. In response, Lane and Associates provided additional information in Report 2002.17 (8.2). I agree with the Panel that the listed species were treated unevenly and that the issues surrounding some were dismissed a little too readily. Some of the reports suggest that Swift Parrots may infrequently visit the site but these received less attention than Orange-bellied Parrots, for which it was considered that the occasional bird may fly across the site in the migration season. (Report 2002.17(10.0). Movements of both the Swift Parrot and Orange-bellied Parrot on the mainland are poorly understood. For example, in recent years Orange-bellied Parrots have been discovered to winter away from what were thought to be traditional sites, often in company with Blue-winged Parrots (which occur on the site) and on a greater range of weed species than was formerly realised (Starks

2004) That said, the likelihood of collision for these two species is negligible given our current knowledge of use of the site by these species.

Report 2002.17(8.2) also gave a more structured assessment of migratory species. The main outcome was that all were too uncommon to be at significant risk of collision and the likely collision rate was unlikely to impact on populations. I agree with this assessment. Nevertheless, given that wedge-tailed eagles and Brown Falcon have been killed in collisions at other Australian windfarms, and are in the size range of birds most at risk, a greater analysis and discussion of their situation ahead of this would have been prudent.

These criticisms aside, the overall conclusion is reasonable that is: (1) there is no need for further species-specific surveys (pre-approval) and (2) any impact of the proposal on listed threatened and migratory bird species is likely to be minor.

SUMMARY

Although all aspects of the bird survey have been presented in a piecemeal manner and could have been improved upon, the basic survey seems adequate. The data are sufficient to suggest that the site does not support an abundance of birds or a concentration of bird activity, and has few if any listed threatened species, and low numbers of listed migratory species.

The survey design is adequate to broadly cover seasonal and daily variation in bird utilisation. The effort is low, but given the absence of threatened species, or at least their rarity or infrequent use of the site, a greater effort does not seem warranted.

For similar reason, more sophisticated modeling would seem inappropriate and unlikely to yield meaningful predictions.

Additional, species-specific surveys are unlikely to add much value or additional information in terms of EPBC requirements, and any impacts on bird populations appear likely to be negligible.

## REFERENCES

- AusWEA (2002). Best practice guidelines for wind energy projects in Australia. Australian Wind Energy Association ([www.auswea.com.au](http://www.auswea.com.au))
- Erickson, W.P., Johnson, G.D., Strickland, M.D., Young D.P. jnr, Sernka, K.J. & Good, R.E. (1991). Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee (NWCC) Resource Document.
- Meredith, C. W. and Baird, R. (2000). Avian risk assessment for the West Coast Windfarm Project in Tasmania. Report to Hydro Electric Corporation, Hobart, Tasmania.
- Starks, J. (2004). Where have all the Orange-bellied Parrots gone? *Wingspan* 14 (2): 26-27.
- Thelander, C.G. & Ruge, L. (2000). Avian risk behaviours and fatalities at Altamont Pass Wind Resource Area—March 1998 to February 1999. Prepared by BioResource Consultants for National Renewable Energy Laboratory, Golden, Colorado. ([http://www.nrel.gov/windavian lit.html](http://www.nrel.gov/windavian/lit.html)).
- Tucker, V .A. (1996). Using a collision model to design safer wind turbine rotors for birds. *Journal of Solar Energy Engineering* 118: 263-269.

**APPENDIX I: SUMMARY OF DOCUMENTATION PROVIDED**

Date	Report	Contents	Comments
April 2002	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2002). Bald Hills Windfarm Preliminary Report on Summer Field Season. Report No. 2002.17C(1.0). Wind Power Pty Ltd, April 2002. pp. 5.	An early, report that lays the basis for the methodology, which has since been developed further	Says 12 impact sites, over 5 days (discrepant with main report)
June 2002	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2002). Bald Hills Windfarm: Matters of National Environmental Significance. Report No. 2002.17C(2.0). Wind Power Pty Ltd, June 2002. pp. 10.	Laid the basis for further studies. Lists overseas collision rates.	8 Blue-winged Parrots and 4 Brown Falcons seen (in summer + autumn) but main report (Report No. 2002.17(3.3) & errata) lists only 6 and 2, respectively, for all four seasonal surveys.  Says 5 days of surveys in summer, 6 in autumn. Later reports give 6 days in each season.
November 2002	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2002). Bald Hills Windfarm: Flora, Fauna and Avian Assessment. Report No. 2002.17(3.0). Wind Power Pty Ltd, November 2002. pp. 65.	Very similar to Report No. 2002.17(3.3).	
April 2003	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2003). Bald Hills Windfarm: Flora, Fauna and Avian Assessment. Report No.	Survey methods, lumped results and conclusions.  Collision data from o'seas windfarms  Table of results by survey site	Surveyed according to US National Wind Coordinating Committee standards for bird utilisation studies at wind farm sites (Anderson et al 1999). Found high bird usage at Impact sites

	2002.17(3.3). Wind Power Pty Ltd, April 2003. pp. 68. pp. 9.		6 & 16, and reasonably high at 4, 5, 9 & 10; no attempt to explain differences in bird utilisation (eg landform or habitat) and no indication that this knowledge was used to re-site turbines etc.  16 impact and 8 reference sites, each surveyed for 15 min, on 6 days in each of four season, in each of four periods of the day, in 2002. Counted birds at rotor swept area height. Not clear how or why reference points were chosen. Doesn't give dates of surveys.
April 2003	Wind Power Pty Ltd (2003). Environmental Effects Statement for the Bald Hills Wind Farm Project. Appendices 2003. pp. c. 400.	Includes Brett Lane & Associates Pty Ltd, Ecological Research & Management (2003). Bald Hills Windfarm: Flora, Fauna and Avian Assessment. Report No. 2002.17(3.3). Wind Power Pty Ltd, April 2003.	
August 2003	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2003). Bald Hills Windfarm: Flora, Fauna and Avian Assessment Errata. Report No. 2003.17(3.3) Errata. Wind Power Pty Ltd, 24 August 2003.	Corrections to data on waterbird and raptor utilisation of site.	As with all reports only gross summaries – need to see use of particular sites.
No date, possibly August 2003	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2003). Memorandum: Changes to Flora, Fauna and Avian Assessment,	Addresses changes due to revised windfarm layout. States that the reduction to 52 generators, plus greater setback from the coast and the open water of the wetland reserve ie >800m,	Inconsistent discussion of data given as errata.  Effort involved not clear in this document: raptor text discusses number of birds in relation to number

	Matters of National Environmental Significance Report and Bat Investigation Report contained in Appendix 1 to the EES. Wind Power Pty Ltd. pp. 7.	and increased spacing, does not significantly change the conclusions in the Flora, Fauna and Avifauna Assessment, the Matters of National Environmental Significance report or the Bat Investigation report contained in Appendix 1 of the EES. Also contains errata.	of survey sites; waterbird text discusses 'effort'.  Greater no. of raptor species at impact sites than at reference sites; could be interpreted as indicating that the site is important for raptors (see comment 2. above).  Survey dates given: 27 Feb-2 March, 2-7 May; states 40 hours of surveys were made over these summer/winter surveys.  States that dense arrays are usually totally avoided ('overseas studies show') but movement through when inter-turbine distance is >300m (Winkelman 1994?). However, density and spacing are not given for Bald Farms (assumed to be 300 m or more).
September 2003	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2003) Bald Hills Windfarm: Supplementary Report on Flora and Fauna. Report No. 2003.17(6.0). Wind Power Pty Ltd, September 2003. pp. 11.	Additional information to Report No. 2002.17(3.3) in response to submissions, including information on:  Adequacy of surveys.  Likelihood of waterbirds being excluded from the Bald Hills Wetland.  Impacts on birds of prey.  Impacts on wildlife corridors.  Effects on bird movements between reserves.	1. States ' <i>The surveys involved a statistically rigorous design that aims to generate data on actual numbers of birds flying over the area where the proposed wind generators will be installed. This provides a very direct measurement of the species and relative abundance of birds at a location and height where collisions with wind generators might occur</i> ' No statistical analyses provided.  2. says 27 raptors in 24 days of survey is not a significant number but gives

		Impacts on the Orange-bellied Parrot. Powerline impacts	no comparative data.
November 2003	Wind Power Pty Ltd. (2003). Supplementary Environmental Effects Statement for the Bald Hills Wind Farm Project. November 2003. pp. c. 400.	Includes Appendix 2. Memorandum below	
March 2004	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2004). Fauna Survey—Proposed Bald Hills Wind Farm. Report No. 2002.17(5.0). Wind Power Pty Ltd, March 2004. pp. 13.	Doesn't cover birds	
March 2004	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2004). Bald Hills Windfarm: Supplementary Environment Effects Statement—Additional Information on Flora and Fauna Issues. Report No. 2002.17(7.0). Wind Power Pty Ltd, March 2004. pp. 17.	Includes 1. Risk to Orange-bellied Parrot and need for future off-sets to compensate for any risk. Concluded off-sets not appropriate. 2. Defence of adequacy of surveys 3. Collision data from Australian windfarms	Similar to other reports (eg, Report No. 2003.17(6.0).)
March 2004	Meredith, C. (2004). Peer Review: Flora and Fauna Assessments of the Proposed Bald Hills Wind Farm. Project No. 3979. Biosis Pty Ltd., Sydney & Melbourne. March 2004. pp. 10.	Report prepared for Wind Power Pty Ltd. assesses bird related documents: Brett Lane & Assoc. Report Nos.: 2002.17(3.3) and its errata; 2003.17(6.0); November 2003 Memorandum. 1. Assessment against relevant policies and strategies. 2.	

		<p>Assessment of avian fauna issues.</p> <p>Concluded that the lack of specific surveys for non-avian fauna were inconsistent with guidelines for planning windfarms in Victoria. Birds OK in relation to policies etc. Notes a relatively low survey effort but believes it is adequate given that the site has low bird activity and endangered species are not present (which would warrant greater effort or the use of risk prediction techniques).</p>	
April 2004	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2004). Bald Hills Windfarm SEES: Response to Panel Submissions. Report No. 2002.17(8.2). Wind Power Pty Ltd, April 2004. pp. 35.	<p>Provides extra information on bird impacts for the Panel including technical information addressing issues raised in submissions. Includes questions asked by the Panel about bird movements/patterns.</p> <p>Additional info/discussion on daily timing of surveys.</p> <p>Table of change to bird numbers at Toora Windfarm resulting from the operation.</p>	<p>Provides a fuller analysis of certain points. Demonstrates that the number of species approaches a plateau by the end of the study (and within survey periods). Argues that this would mean that any extra species detected would not be common enough to be at high risk of collision.</p> <p>The report (and others) assumes all species are equal in terms of risk of collision, provided they fly at rotor swept height. This is pragmatic but unlikely to be realistic.</p>
June 2004	Panel (2004). Bald Hills Wind Farm Project EES, EES Supplement and Called-in Planning Permits Panel Report. June 2004. pp. 413.	<p>Report from the Panel appointed by the Victorian Minister for Planning under the Victorian Environmental Effects Statement as part of the assessment process.</p> <p>Main bird issues identified from</p>	<p>I agree that survey work and the bird investigation in general is poorly documented but that OBP unlikely to be harmed.</p>

		<p>submissions were those concerning impact on birds and the adequacy of the survey in terms of prediction of impacts. Pp. 157-175 detail issues; recommendations pp. 176-180.</p> <p>Panel notes that the no. of surveys was confusing and that bird surveys were poorly documented.</p> <p>Panel overall in favour of approval, but make 21 recommendations, 2 relating to birds (concerns with survey/methodology/findings).</p>	
July 2004	Brett Lane & Associates Pty Ltd, Ecological Research & Management (2004). Proposed Bald Hills Windfarm: Summary of Bird Impact Findings. Report No. 2002.17(10.0). Wind Power Pty Ltd, July 2004. pp. 23.	<p>Overview of key bird issues</p> <p>Summary of discussion with relevant agencies/community groups</p> <p>Scoping process</p> <p>Design of survey, timing etc.</p> <p>A summary of predicted impacts</p> <p>Sources of data: surveys, Birds Australia, OBP recovery Team, DSE Atlas of Victorian Wildlife was main source.</p> <p>Further information/discussion of waterbirds in relation to the wetland</p> <p>Information/discussion on communally roosting birds</p>	<p>Not clear why Brown Falcons and Wedge-tailed Eagles were considered low collision risk when they often flew in the rotor swept height and have been killed at other windfarms (see Report No.2002.17(7.0). WTE listed migratory sp under the EPBC Act Further investigation seems warranted.</p> <p>Reference sites questionably useful (they differed from impact sites in the number of species, abundance etc and there was no analysis to test whether they were statistically comparable/similar). Perhaps reference sites will be more useful in assessing the impact if the farm proceeds, although four need to be replaced anyway.</p> <p>Table 2 (p.11) gives details of the</p>

			<p>calculation of a simplistic estimate of the number of Needletails likely to be killed. This is statistically flawed: reducing the number of turbines increases the predicted number killed. Use of No. birds involved (1) x avoidance estimate (5) x airspace estimate (6) alone would be better.</p>
<p>August 2004</p>	<p>Victorian Minister for Planning (2004). <i>Environment Effects Act 1978</i> Bald Hills Wind Farm Assessment. August 2004. pp. 23.</p>	<p>Considers various values including those of the flora and fauna in the light of relevant legislation and policy. Reviewed panel findings and response by Lane &amp; Associates to request for a simple and clear summary of bird survey results (Report No. 2002:17 (10.0)).</p> <p>Concluded that the survey methodology was adequate and any bird mortality would not be a significant threat to listed species. No impediment to a permit based on potential bird impacts.</p>	

Anderson, R; Morrison, M; Sinclair, K and Strickland, D (1999) 'Studying wind energy/bird interactions: A guidance document.' National Wind Coordinating Committee/RESOLVE, Washington D.C., USA.