In the matter of Stockyard Hill Wind Farm

Permit Application Nos. PL-SP/05/0548, P2009/105, P2009/104

Planning Panels Victoria

Proponent: Stockyard Hill Wind Farm Pty Ltd

Expert Witness Statement of Ian John Smales

Expert of Stockyard Hill Wind Farm Pty Ltd

1 Name and address

Ian John Smales

Biosis Research Pty. Ltd.

38 Bertie St.

Port Melbourne

Vic. 3207

2 Area of expertise

(a) I hold the degree of Master of Science from the University of Melbourne. My Masters dissertation was on the demography of a critically endangered bird, the Helmeted Honeyeater.

(b) For the past 32 years I have been professionally engaged in management, research and assessment of south-eastern Australia's fauna.

(c) I am a member of the Scientific Advisory Panel to the South-West Victoria Brolga Research Project.

(d) I am senior author of *Appendix D Birds and Bats* of the *National Wind Farm Development Guidelines Public Consultation Draft* (Environment Protection & Heritage Council, Commonwealth of Australia October 2009).

(e) I have the lead role in development and application of the Biosis Research Deterministic Collision Risk Model used for assessing potential risks of wind turbine collisions for birds. I have applied the model to assess potential risk for numerous bird species for wind farms proposed and in operation in Victoria, South Australia, Tasmania and Fiji.

(f) My qualifications and experience are detailed in Annexure A.

3 Scope

3.1 Instructions

I was commissioned by Stockyard Hill Wind Farm Pty. Ltd. to:

(a) undertake modelling to evaluate potential risks to Brolgas of collisions with wind turbines and powerlines proposed for the Stockyard Hill Wind Farm; and

(b) to undertake a peer review of Brett Lane & Associate's EPBC Act report.

I have then been asked by Freehills solicitors acting for Stockyard Hill Wind Farm to prepare this witness statement and to

(c) formally adopt the information and opinions contained in technical reports I have prepared and present the findings of my work; and,

(d) respond to any matters relevant to collision risk assessment for Brolgas raised in submissions to the panel which are not covered in my technical reports.

3.2 Process and Methodology

I have used the Biosis Research Deterministic Collision Risk Model to provide predictions of annual average numbers of Brolgas that might collide with wind turbines at Stockyard Hill Wind Farm.

On behalf of the Commonwealth of Australia, the progenitor Biosis Research turbine collision risk model as applied to the Heemskirk Wind Farm proposal, was peer reviewed in 2004 by The Ecology Centre, University of Queensland (Pople, T., Joseph, L., Regan, T. & Possingham, H. 2004. *Review of the Biosis model of collision probabilities for the Heemskirk wind farm development*). That review found the principles and application of the model to be valid for its intended purpose. Whilst some refinements have been made in the interim, the principles underlying the current version of the model have not materially altered from those of the version reviewed by University of Queensland. The model has been accepted by regulatory authorities in all of the jurisdictions in which it has been applied, including the Commonwealth of Australia.

Methods and assumptions used for turbine collision risk assessment are detailed in the following report I prepared for Stockyard Hill Wind Farm Pty. Ltd.:

Modelled risk of Brolga collisions with turbines at the proposed Stockyard Hill Wind Farm. Biosis Research (2009).

REpower Systems MM92 turbines with two different rotor blade lengths are under consideration for use at the Stockyard Hill Wind Farm and thus I undertook collision risk modelling for both. For the purposes of the modelling, a turbine with rotor blade length of 45.2 metres is referred to as 'turbine type 1' and a turbine with rotor blade length of 51.2 metres is referred to as 'turbine type 2'.

Turbine collision risk assessment incorporated potential risks to Brolgas for birds that might interact with turbines during the annual breeding season; during annual migration of Brolgas through the site; and during use by Brolgas of occasional flocking sites. Two scenarios were modelled for migrations through the site. The first scenario assumes that birds may fly between breeding and flocking sites by any random route and thus that it is possible for them to encounter any of the total complement of 242 turbines within the entire wind farm array. The second

scenario assumes that birds preferentially utilise lower-lying and generally the most direct route in making these movements.

Since data for Brolga movements that might be at risk of collisions provided by Brett Lane & Associates (2008) are from a single season, Dr Stuart Muir of Symbolix Pty. Ltd. was commissioned by Biosis Research Pty. Ltd. to provide derivations for average annual numbers of such movements factored to an 80% confidence bound. This was undertaken to provide values that were then used in modelling to represent a broader range of environmental variables that might influence the number of Brolga movements over time. Two reports by Dr Muir outlining these mathematical processes are referenced in 3.3, below.

I have undertaken separate modelling to assess potential risks to Brolgas of collisions with new electricity powerlines proposed for the Stockyard Hill Wind Farm. Methods and assumptions used for powerline collision risk assessment are detailed in the following report I prepared for Stockyard Hill Wind Farm Pty. Ltd.:

Evaluating risk of Brolga collisions with powerlines for the proposed Stockyard Hill Wind Farm. Biosis Research (2009).

I understand that the impact to Brolgas of the internal powerlines for the wind farm are only relevant to the present Planning Application and that consideration of the impact to the Brolga of the external powerline running southward to connect the wind farm to the electricity grid was a condition of the decision of the Victorian Minister for Planning that the project would not require an Environment Effects Statement.

My modelling of powerline collision risk was undertaken for Brolgas using all recorded nesting locations and a single, intermittently used flocking location, all within three kilometres of new powerlines proposed to be built to serve the needs of the Stockyard Hill Wind Farm. These included proposed powerlines internal to the wind farm and an external line. Seventeen breeding sites encompassed by this modelling were located near internal powerlines, while two further breeding sites and the single, intermittently used flocking location were near the external powerline. Annexure B is a map showing the nineteen Brolga breeding sites (numbered red locations) and one flocking location (unlabelled blue location) used for the powerline collision modelling. Inclusion of the external powerline means that results of the modelling are marginally higher than projections would be for just the internal powerlines covered by the present Planning Application.

Along with Biosis Research Senior Botanist Steven Mueck, I also provided Stockyard Hill Wind Farm Pty. Ltd. with a review of a draft report (February 2010) prepared by Brett Lane & Associates about matters of national environmental significance under provisions of the EPBC Act. Our review is in the report provided as Annexure C to this statement, and titled:

Peer review of flora & fauna matters of national environmental significance (EPBC: 2009/4719) for Stockyard Hill Wind Farm. Biosis Research (February 2010).

In undertaking these various investigations I have taken account of matters of relevance contained in State and Commonwealth policies and regulations including:

EPBC Act Policy Statement 2.3 Wind Farm Industry. Commonwealth of Australia (2009);

EPBC Act Policy Statement 1.1 Significant Impacts Guidelines: Matters of National Environmental Significance. Commonwealth of Australia (2009);

Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria Victorian Government Department of Planning & Community Services (2009); and,

Model Permit Conditions for Wind Energy Facilities outlined in *Planning and Environment Regulations 2005 Form 11 Section 97F* for the purposes of the Victorian *Planning and Environment Act 1987*.

3.3 Reports Reviewed to Prepare my Initial Studies

Information and data contained in the following report was used as a basis for derived values and assumptions required to undertake collision risk modelling for Brolgas at Stockyard Hill Wind Farm:

Proposed Stockyard Hill Wind Farm Targeted Brolga Investigations. Brett Lane & Associates (2008). Report No. 7132 (2.1) for Wind Power Pty. Ltd

A number of requisite input values for turbine collision risk modelling for Brolgas were provided in the following reports commissioned by Biosis Research:

Stock Yard Hill Brolga/Windfarm interactions: Adjusting the Observed to the Potential. Symbolix Pty. Ltd. (2008) report prepared by S. Muir for Biosis Research Pty. Ltd.

Stock Yard Hill Brolga Investigation: "One-off" flocking on-site. Symbolix Pty. Ltd. (2008) report prepared by S. Muir for Biosis Research Pty. Ltd.

Of relevance to collision risk modelling was also the report:

Predicting impacts of the Stockyard Hill windfarm on the Victorian Brolga Population. M. McCarthy (2009) Applied Environmental Decision Analysis, University of Melbourne.

Information I reviewed relevant to matters of national environmental significance under provisions of the EPBC Act was contained in the draft report:

Proposed Stockyard Hill Wind Farm Assessment of Matters of National Environmental Significance. Brett Lane & Associates (February 2010) report No. 7132 (8.4) for Stockyard Hill Wind Farm Pty. Ltd.

I understand that this Brett Lane & Associates report compiled information relevant to Matters of National Environmental Significance, as defined for the purposes of the EPBC Act, from the report:

Proposed Stockyard Hill Wind Farm Flora and Fauna Assessment. Brett Lane & Associates (2009) report No. 7132 (5.10) for Stockyard Hill Wind Farm Pty. Ltd.

In making my investigations I also took account of information provided in the latter report.

Subsequent to provision of our review of that draft report I have been provided with a copy of the Expert Witness Statement of Brett Lane, which includes some additional and updated information about matters of national environmental significance under provisions of the EPBC Act.

3.4 Persons assisting with this work

For a number of requisite input values for collision risk modelling I relied upon mathematical computations provided by Stuart Muir BSc (Hons), PhD of Symbolix Pty. Ltd. which, in turn, were derived from data provided by Brett Lane and Associates Pty. Ltd. Computations and the rationale underlying them were provided to me in reports prepared by Dr Muir and referenced above.

Stephen Mueck BSc (Hons), MEnvSc, a Senior Botanist at Biosis Research, provided assessment of matters related to flora in our combined review of Brett Lane & Associates report on matters of national environmental significance under provisions of the EPBC Act relative to the Stockyard Hill Wind Farm.

4 Findings

4.1 Summary of Opinions

My reports were exhibited with the planning permit application and I adopt them as the basis for my expert witness statement and evidence. A summary of my findings is provided here.

4.1.1 Turbine collision risk for Brolgas

The annual cycle of the Brolga population in south-western Victoria includes seasonal periods of residence at breeding and flocking sites and movements between them. The birds' behaviour differs according to this annual cycle and modelling was undertaken for each of the seasonal components and results were summed to provide average annual projections of Brolga mortality.

I provided a range of projections for annual average numbers of Brolga mortalities that are contingent on the size of turbine rotors used, mean avoidance capacity of Brolgas, and routes used by the birds during migratory movements. These ranged from a maximum annual average of 0.196 collisions per annum (for the larger rotor span turbine; 95% avoidance rate; and, scenario one migration behaviour) to an annual average minimum of 0.026 collisions per annum (for the smaller rotor span turbine; 99% avoidance rate; and, scenario two migration behaviour). I consider it most likely that Brolgas preferentially migrate over lower-lying and

generally the most direct route in making these movements and thus that migration scenario two is more likely to represent Brolga migration behaviour than is scenario one. On that basis, and the conservative assumptions that the larger turbines are used and that Brolgas exhibit the lowest of the avoidance rates modelled (95%), the number of collisions with turbines can be expected to average 0.101 or fewer per annum.

4.1.2 Powerline collision risk for Brolgas

I provided an assessment of the potential risk to Brolgas of collisions with a number of proposed powerlines connecting generators to substations within the wind farm and to connect the wind farm to the external electricity grid.

Available data about Brolgas and the proposed powerlines, along with information from investigations of the interactions of other crane species with powerlines, was used to provide a methodology for the assessment. Due to various uncertainties in available information, a conservative approach was adopted by incorporation of values that I consider are more likely to overestimate risks than to underestimate them.

Results suggest that an approximate average of 0.0324 Brolgas per annum may collide with the proposed powerlines during breeding and flocking seasons. Inclusion of the external portion of the line means that results of the modelling are marginally higher than projections would be for the internal powerlines alone covered by the present Planning Application.

4.1.3 Combined risks for Brolgas of turbine and powerline collisions

The results of collision risk modelling are expressed as a projected annual average number of Brolga collisions. It should be noted that the primary objectives of this work are to provide a wind farm proponent and regulatory authorities with bases for decisions about design of a facility and potential for impacts on the population of a significant species. The model's results do not indicate the frequency distribution at which collisions might occur over the life of the wind farm and should not be construed to do so.

The projected annual average number of collisions with both turbines and powerlines were summed and provided to Dr Michael McCarthy for use in Population Viability Analysis (PVA) used to assess potential impacts on the south–western Victorian population of Brolgas. PVA is a process for evaluating potential changes in demographic functioning in terms of altered extinction risk for a population. Positive or negative changes, such as those resulting from management actions or, in the present case, from potential collisions, can be assessed using PVA.

The PVA run by Dr McCarthy for the range of projected numbers of Brolga collisions with turbines and powerlines at Stockyard Hill Wind Farm over a twenty year period indicates that it could result in a very minor increase in the overall mortality rate of the south-western Victorian population (by 0.039% p.a.). The effect of this on increasing extinction risk for the population is considered to be marginal and the PVA indicates that such an effect could be prevented by taking measures that would result in increasing annual recruitment to the adult Brolga population by ~1%.

In my view the PVA has been undertaken in an appropriate manner and its outcomes provide useful quantification of measures required to demonstrate a zero net effect of the Stockyard Hill Wind Farm on the south-western Victorian Brolga population.

4.1.4 Review of matters of national environmental significance under provisions of the EPBC Act

Overall, Mr Mueck and I agree with the assessments of flora and fauna matters as provided in the report *Proposed Stockyard Hill Wind Farm Assessment of Matters of National Environmental Significance* by Brett Lane & Associates 2010. Our review of that work, prepared in February 2010, is provided as Annexure C.

There would appear to be little likelihood of significant impacts, as defined by *EPBC Act Policy Statement 1.1 Significant Impacts Guidelines: Matters of National Environmental Significance* (DEWHA 2009) or by EPBC Act policy statements for particular species or ecological communities, on any matters of national environmental significance that are controlling provisions for the proposed wind farm.

Our review recommended further work on some species and an ecological community that we considered should be undertaken to provide sufficient empirical evidence to support the conclusion that there is little likelihood of significant impacts on flora or fauna that are matters of national environmental significance and could be affected by the Stockyard Hill development.

Subsequent to preparation of our review of that draft report I have been provided with a copy of the Expert Witness Statement of Brett Lane, which includes some additional and updated information about matters of national environmental significance under provisions of the EPBC Act. This provides further information about timing of surveys and survey methods they employed for relevant species and ecological communities. For Striped Legless Lizard and threatened species of flora that could occur on the powerline route they have recommended that pre-construction surveys should be undertaken with a view to micro-siting wind farm infrastructure and the powerline, including power poles.

I consider that information provided to me is sufficient to draw the conclusion that there is little likelihood of significant impacts on EPBC Act listed flora or fauna, provided that the precise locations of wind farm infrastructure, powerpoles and any associated infrastructure are selected with the advice of a qualified botanist and zoologist to ensure that micro-siting avoids any potential for impacts on the Striped Legless Lizard and any species or communities of flora listed under the EPBC Act.

4.2 Response to Key Submissions

I have read submissions to the Panel related to matters of National Environmental Significance (as defined for the purposes of the EPBC Act) and to Brolga collision risk for Stockyard Hill Wind Farm.

One submission to the Planning Panel (VicRoads, submission 37) raises the matter that the EPBC Act listed Endangered Hoary Sunray *Leucochrysum albicans* subsp. a*lbicans* var. *tricolor* is known from the road reserve of the Beaufort – Skipton Road and has not been considered in assessment of the proposed powerline in this reserve. I agree that this species should be considered and measures applied to ensure that there is no significant impact on that species. I recommend that prior to powerline construction the precise locations of powerpoles and any associated infrastructure should be selected with the advice of a qualified botanist, to ensure that micro-siting is undertaken so that any potential impacts on this species are avoided.

A number of submissions mention the matter of potential for Brolgas to collide with wind turbines and/or powerlines proposed for Stockyard Hill Wind Farm.

One submission to the Planning Panel (Mount Emu Creek Landcare Network, submission 289) says that no modelling assessing the potential risks of powerline collisions for Brolgas could be found. My report, *Evaluating risk of Brolga collisions with powerlines for the proposed Stockyard Hill Wind Farm* specifically addresses that issue.

One submission to the Planning Panel (Mr H. Cummings, submission 94) is detailed in relation to the Biosis Research avian collision risk model, as used to assess risks of turbine collisions for Brolgas at Stockyard Hill Wind Farm. I believe my responses to matters raised in that submission, below, also address matters about collision risk modelling raised in other submissions. In summary, Mr Cummings' submission:

(a) suggests that the Biosis Research Collision Risk Model is flawed and that this is demonstrated by results for Wedge-tailed Eagles at Woolnorth Wind Farm in Tasmania and by results for raptors at Yambuk Wind Farm in Victoria;

(b) appears to take issue with the use of a collision avoidance rate for Brolgas; and,

(c) is critical of the use of input values derived from data collected by Brett Lane and Associates Pty. Ltd.

Points raised in the submission are addressed below.

(a) The assertion that 18 Wedge-tailed Eagles have been killed in two years at Woolnorth Wind Farm is factually incorrect. 'Woolnorth' is comprised of two wind farms, Bluff Point Wind Farm which was commissioned in early 2002 and Studland Bay Wind Farm which was commissioned in early 2007. In eight years of operation 12 Wedge-tailed Eagles are known to have been killed in collisions with turbines at Bluff Point and in two years of operation four Wedge-tailed Eagles are known to have been killed in collisions with turbines at Studland Bay (C. Hull, Roaring 40s Renewable Energy Pty. Ltd. pers. comm. 3rd February 2010). The recorded mortalities are based on a regime of active searches for dead birds around all turbines. Accounting for the differential commissioning dates for the two facilities, the combined annual average number of Wedge-tailed Eagle mortalities for the Woolnorth wind farms is 3.49 (95% confidence interval 1.99, 5.66) (S. Muir, Symbolix Pty. Ltd. pers. comm. 29th January 2010).

In 2007 Biosis Research undertook final collision modelling using eagle movement data from Bluff Point for the period from 2002 – 2006. For a 90% avoidance rate (see point b), below) this provided an estimate of 1.92 Wedge-tailed Eagle mortalities per annum (Smales 2007). In January 2010 Biosis Research undertook updated collision modelling using available eagle movement data from Studland Bay. For a 90% avoidance rate this provided an estimate of 2.07 Wedge-tailed Eagle mortalities per annum (Garvey & Smales 2010). For a 90% avoidance rate the model's prediction for the two wind farms combined is thus 3.99 Wedge-tailed Eagle mortalities per annum which is slightly higher than the actual mortality that has been experienced and well within the 95% confidence interval for the annual average of actual mortalities. The example of Wedge-tailed Eagles at Woolnorth wind farms demonstrates that the Biosis Research collision risk model is an accurate predictive tool.

Mr Cummings' submission says that, "[Biosis Research] modelled negligible deaths at Yambuk, yet Pacific Hydro's own report shows the raptor population has collapsed in under five years". Mr Cumming does not reference a source for his assertion that Biosis Research modelled negligible raptor mortalities at Yambuk Wind Farm. The most recent collision risk modelling undertaken for Yambuk Wind Farm by Biosis Research (Gilmore *et al.* 2004) provided an estimated annual average of 3.58 collision mortalities for nine raptor species combined. Relative to collision risk projections for numerous other wind farms in south-eastern Australia, I consider that to be a high collision rate projection and not a negligible rate.

(b) 'Avoidance rate' is a measure of the capacity for different species of birds to avoid collisions with turbines. Since birds have capacity to avoid collisions with potential obstacles, the use of such a rate is valid and an important component of risk modelling. The international literature (reviewed in Chamberlain et al. 2006) indicates that the majority of bird species have avoidance capacity higher than 90% and for many species the rate is closer to 100%. There are no empirical data obtained from operational wind farms about the capacity for Brolgas to avoid collisions with turbines. On the basis of indications from other crane species, as outlined in my report, I consider it reasonable that Brolgas will have an avoidance rate of 95% or higher. For this reason, I have provided mortality predictions for 95%, 98% and 99%. This approach and use of these rates is routine in collision risk modelling and does not entail the use of a 'special' rate for Brolgas.

The Wedge-tailed Eagle is a species that appears to exhibit a lower avoidance rate than most bird species (S. Muir, Symbolix Pty. Ltd, unpublished data), which is why the 90% avoidance rate has been provided in Biosis Research collision risk modelling for that species at Woolnorth since 2006.

(c) The data for Brolga movements from which inputs to the collision risk model were derived were provided to Biosis Research Pty. Ltd by Brett Lane and Associates Pty. Ltd. I have no reason to doubt the veracity of the data provided to me. The data were collected over a single year and thus

do not allow the assessment of inter-year variation. Therefore, an 80 percentile confidence bound was applied to values required for use in the model, such as the number of Brolga flights that were of sufficient height to be at potential risk of collision. This approach provides for a substantial increase in such potential risk factors sufficient to account for considerable variation over and above values supplied directly from the base data and, in my opinion, is sufficient to account for environmental variables likely to affect collision risk for Brolgas at Stockyard Hill Wind Farm.

References

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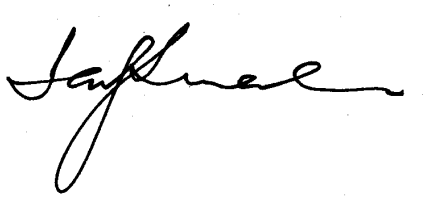
Garvey, N. & Smales, I. 2009 *Avifauna Collision Risk Update 2009 Surveys Studland Bay Wind Farm North West Tasmania.* Biosis Research report for Roaring 40s Renewable Energy Pty. Ltd.

Gilmore, D., Meredith, C. & Einoder, L. 2004. *Avifauna Monitoring Survey – Winter 2002 Yambuk Wind Farm.* Biosis Research report for Pacific Hydro Pty. Ltd

Smales, I. 2007. *A review of collision risk modelling for Wedge-tailed Eagles at the Bluff Point Wind Farm, Tasmania.* Biosis Research report for Hydro Tasmania Consulting.

5 Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Planning Panel.



29th March 2010

Annexure A - Curriculum Vitae of Ian John Smales

Position

Senior Consultant Zoologist, Biosis Research Pty. Ltd.

Qualifications

MSc. University of Melbourne

Professional associations

Member: IUCN Species Survival Commission, Re-Introduction Specialist Group

Member: International Wader Study Group

Member: Helmeted Honeyeater National Recovery Team

Member: Orange-bellied Parrot National Recovery Team (1994 – 2003)

Committee Member: ARAZPA Australasian Species Management Program (2001 – 2003)

Member: ASMP Passerine and Non-Passerine Taxon Advisory Groups (1997 - 2003)

Employment history and achievements

2003–present Senior Consultant Zoologist, Biosis Research Pty Ltd

1990–2003 Conservation Biologist, Conservation and Research Department, Zoological Parks and Gardens Board of Victoria

1989 Contractor to Department of Conservation and Environment, Victoria for establishment of Recovery Team for the Helmeted Honeyeater.

1978–1987 Ranger, Fisheries and Wildlife Division, Victoria (subsequently Department of Conservation, Forests and Lands).

Ian Smales, Senior Consultant Zoologist with Biosis Research Pty. Ltd., has an extensive knowledge of the fauna of south-eastern Australia. He has over thirty years of professional experience in wildlife research and natural resource management with the public and non-government sectors. Ian has broad field experience investigating the distribution and habitat requirements of Australian vertebrate fauna and has undertaken specialist research into the ecology and taxonomy of birds, reptiles and frogs. He has authored more than sixty scientific papers and reports in those fields.

Ian has been Senior Zoologist with the Melbourne office of Biosis research since 2003. In this role he has led and managed numerous investigations of flora and fauna for a wide range of clients and projects. He has very substantial expertise in assessments of fauna for wind industry developments in Tasmania, Victoria, South Australia and in Fiji. He has the principal role in development and application of the Biosis Research deterministic model for assessment of bird collision risks with wind turbines.

He has particular expertise with recovery programs for threatened species and communities and has undertaken projects in that field for birds and mammals in Victoria, Tasmania and South Australia. With Victoria's former Fisheries and Wildlife Division (1978-87), he worked for the Wildlife Management Section in the operation and management of natural reserves. There he undertook a major investigation of the biology, population dynamics and status of the critically endangered Helmeted Honeyeater. From

1990 to 2003 Ian was Conservation Biologist with the Zoological Parks and Gardens Board of Victoria, where he had responsibility for conservation programs for a wide range of threatened species. In that role he was a member of the interdisciplinary Recovery Team for the Orange-bellied Parrot undertook fieldwork with reintroduction of parrots in western Tasmania. He continues as a member of the Recovery Team for the Helmeted Honeyeater. He is a member of the Species Survival Commission of the International Union for the Conservation of Nature (Reintroduction Specialist Group).

The following is a selection of publications and reports Ian has authored, or co-authored:

Publications

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Smales, I., Brown, P., Menkhorst, P., Holdsworth, M. & Holz, P. 2000. Contribution of captive management of Orange-bellied Parrots *Neophema chrysogaster* to the recovery programme for the species in Australia. *International Zoo Yearbook* 37: 171-178

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Smales, I. 2005. Modelled cumulative impacts on the Swift Parrot of wind farms across the species' range in south-eastern Australia. Biosis Research Pty. Ltd (for Australian Department of the Environment and Heritage)

Smales, I. 2005. Modelled cumulative impacts on the White-bellied Sea-eagle of wind farms across the species' Australian range. Biosis Research Pty. Ltd (for Australian Department of the Environment and Heritage)

Smales, I. 2006. Impacts of avian collisions with wind power turbines: an overview of the modelling of cumulative risks posed by multiple wind farms. Biosis Research Pty. Ltd (for Australian Department of the Environment and Heritage)

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Smales, I. 2008. Assessment of marine mammals, birds and reptiles for the Victorian Desalination Project, Bass Coast, Victoria: Existing Conditions and Impact Assessment Report. Biosis Research Pty. Ltd (for GHD Pty. Ltd.)

Smales, I. 2009. Evaluating risk of Brolga collisions with powerlines for the proposed Stockyard Hill Wind Farm. Biosis Research Pty. Ltd (for Stockyard Hill Wind Farm Pty. Ltd.)

Smales, I. 2009. Modelled risk of Brolga collisions with turbines at the proposed Stockyard Hill Wind Farm. Biosis Research Pty. Ltd (for Stockyard Hill Wind Farm Pty. Ltd.)

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Annexure B

Map of Brolga breeding and flocking locations relative to proposed internal and external powerlines for Stockyard Hill Wind Farm.

Annexure C

Peer review of flora & fauna matters of national environmental significance (EPBC: 2009/4719) for Stockyard Hill Wind Farm. **Biosis Research Pty. Ltd.**