Boorowa District Landscape Guardians Inc. (BDLG)

Major Project No. 10_0223

PROPOSED RYE PARK WIND FARM

BOOROWA DISTRICT LANDSCAPE GUARDIANS SUBMISSION

04/07/2014

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BDLG submission in response to Environmental Assessment lodged by Epuron Pty Ltd (02 May 2014) Major Project Application 10_0223 – Rye Park Wind Farm

Attachments:

SECTION A
EXECUTIVE SUMMARY

Executive Summary

1. Overview

Primary Submission

1.1 **Major project application 10_0223 ("Application") relating to the Rye Park Wind Farm should be rejected**. Any principled analysis of the available information pertaining to the proposed Rye Park wind farm (**Wind Farm**) should lead to the inevitable conclusion that the significant adverse public impacts of the proposed facility would substantially outweigh any arguable public benefit that might be realised from its establishment.

Alternative Submission

1.2 **Alternatively**, given the NSW Government's present pro-wind policy settings may limit a genuinely principled assessment of the public cost/public benefit of the proposed wind farm, **the Application should not be determined until the serious deficiencies in the Proponent's Environmental Assessment ("EA") have been remedied and an adequate assessment of a number of matters of central relevance has occurred**.

1.3 The conclusions the Proponent uses to support the Application and those of the Proponent's consultant experts lack proper foundation in a number of critical respects, being:

(i) in some cases, the product of invalid methodologies which have produced biased and misleading outcomes; and/or

(ii) in some cases, based on inadequate investigation and/or information.

1.4 The significant failings of the Environmental Assessment (**EA**) lodged by the Proponent, as detailed in this submission, should preclude the proper determination of the Application (otherwise than by rejection, which is warranted in light of the weight of the presently apparent adverse consequences of the proposal) without significant further investigation.

1.5 Furthermore, the Proponent's EA is misleading and deceptive in material respects and therefore undermines the community's entitlement to be properly consulted in relation to the proposed development given its scale and depth of impact. The environmental impacts of the proposed Wind Farm have not been fairly put to the community for response. As a result, the community has not been fairly or adequately consulted – and the Application should not be determined until such time as this critical defect of process has been fully remedied.

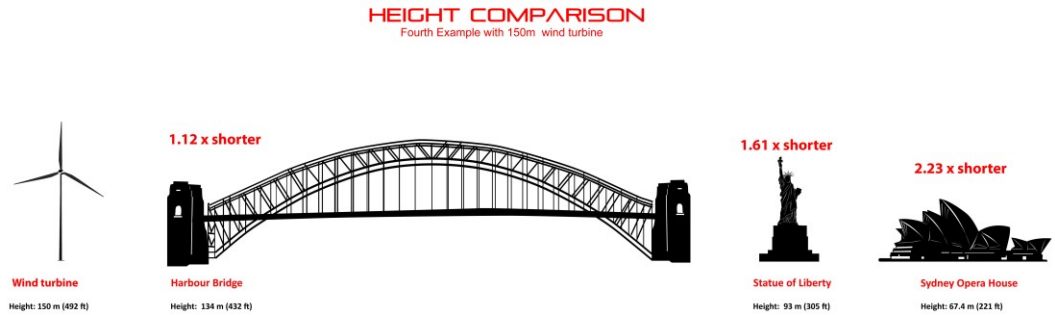
1.6 The Proponent has failed to meet many of the Director General's Requirements (DGR's) and therefore is not eligible for approval.

2. Strategic Justification

2.1 The Proponent has failed to demonstrate that the proposed Rye Park Wind

Farm (**Wind Farm**) is strategically justified

2.2 The necessity of establishing that a proposed major utility project such as this is strategically justified (i.e. that it constitutes the **best choice** in the circumstances) stems from a complex set of considerations. Relevantly, however, those considerations include the fact that such projects frequently have a range of significant adverse effects for exposed populations such as that at Rye Park (as is the case with all wind farm developments) which require strong justification by reference to the public good and which should be minimised or avoided wherever possible. The fact that the proposed Wind Farm involves grafting 68 structures exceeding the harbour bridge in height onto a previously rural landscape and in the immediate surrounds of a village is just one aspect of the significant adverse impact that will attend the construction of the proposed facility.



2.3 Accordingly, it is simply not enough for an applicant to demonstrate that a proposed major utility development is reasonable in a general sense. It must be demonstrated that the proposed development represents the best course in the circumstances. Properly understood, in its EA and in its failure to meet the Director General's Requirements (DGRs) on a range of critical aspects, the Proponent has made no effective attempt to establish that the proposed development is strategically justified, and has therefore failed to satisfy the Director-General's Requirements with respect to strategic justification.

2.4 Further to the above, the proposed Wind Farm cannot be justified on strategic grounds. The proposed facility is not relevantly fit for purpose, and is without reasonable economic foundation or sufficient environmental merit.

General appropriateness of proposed development

2.5 The Proponent has also failed to demonstrate that the proposed Wind Farm is generally reasonable or appropriate development of the land in issue taking into account the serious and pervasive nature of the proposed Wind Farm's adverse effects.

Adverse effects of the proposed development warrant refusal

2.6 A principled analysis of the available information compels the conclusion that the proposed

development cannot be justified either strategically or generally and should not proceed. In this regard, the BDLG submits that:

(a) the proposed 126-turbine wind farm would compound the region's already significant exposure to currently operational industrial wind facilities (such as Cullerin, Crookwell and Gullen Range wind farms) and proposed developments of Bango, Rugby, Conroy's Gap, Bannister and Yass Valley, and result in an unacceptable and inequitable cumulative impact upon the region. Notably, the Upper Lachlan Shire Council passed a motion refusing to support the proposed Collector Wind Farm on Thursday, 20 September 2012 largely on the grounds of cumulative regional impact and its effects on the local community;

(b) the risk that the proposed Rye Park Wind Farm may adversely affect the health of exposed residents of Rye Park is real, significant and supported by a large and growing body of scientific material (see Section G). In consequence, the risk must compel the application of the precautionary principle and prevent the development from proceeding until such time as the parameters of the risk are fully clarified through appropriate, targeted scientific research and the rational development of standards which can be implemented based on this research;

(c) the proposed Wind Farm will produce noise impacts that will interfere with a significant number of exposed residents' rest and repose (see Section B, expert report of Dr Steven Cooper), including as a result of the production of infrasound (see Dr Cooper's findings from research undertaken within Australia over the last 3 years, canvassed in his expert report). The Proponent has ignored the draft NSW Wind Farm Guidelines, which require consent from non-associated residents to have turbines located within 2km of their homes. This is a disgrace and is not respectful of either the NSW guidelines or the local community. The Proponent has not met their obligation to identify the impact on the local community as per the DGR's;

(d) the overwhelming majority of the local community of Rye Park is opposed to the proposed Wind Farm, and should not, in the circumstances, be forced to live with the proposed industrial facility and all of the attendant risks and impacts. There has been a gross inadequacy of consultation with those living in the project area, as well as in local villages and towns.

The Proponent's application refers to a report 'Community Attitudes to Wind Farms in NSW' from 2010, stating that there was overall support for wind farms. However this is in stark contrast to the attitude of the majority of the local community of Rye Park, a resent public meeting held in Rye Park Hall, on 6th June 2014, reported that 91% of locals in attendance were opposed to the proposed development. The Proponent also refers to "an information 'Open House' day held in Rye Park in July 2012", which was totally inadequate Community Consultation, given that planning for the proposed development has been ongoing for many years in the area.

Further, the recent information day held by Epuron in Rye Park on 21st May 2014, was held during business hours, therefore making it extremely inconvenient for locals to attend. The meeting was not advertised in the Rye Park / Boorowa area and only a few select people were invited. The meeting was also held after the Environmental Assessment lodged;

(e) if the development of the proposed Wind Farm proceeds, the noise, visual impact and other adverse consequences will have a devastating effect upon the amenity of the town of Rye Park and rural residences nearby which will cause significant losses in property values, forcing residents to leave (as has occurred in other Australian wind farm developments, such as at Waubra, Victoria.

See attachments 8 & 9, for further information:

- 8 - Cherry Tree VCAT Statement, Dr Sarah Laurie
- 9 - Explicit Warning Notice, Waubra Foundation

3. Alternatively, Application not presently fit for determination

3.1 The Proponent's EA fails to disclose adequate assessment of several matters of fundamental importance. The inadequacies of assessment stem from one or more of:

(a) the Proponent's dissemination of misleading and deceptive material which has undermined the process of consultation and public comment;

(b) the use of invalid methodologies which have produced relevantly biased conclusions;

(c) inadequately comprehensive investigations into key aspects of the development.

3.2 The inadequacies of assessment mean that the conclusions which are claimed by the Proponent to support the Application lack proper foundation and may not be relied upon.

Failure to deal fairly with the Rye Park Community - Proponent's dissemination of and reliance upon misleading and deceptive material.

3.3 The Proponent has disseminated misleading and deceptive photomontages representing the landscape and visual impact of the proposed Wind Farm that purport to show that these are lesser in degree than it would be in fact. Their actions are similar to those seen in the conduct of wind farm developers in other parts of the world such as the United Kingdom (where guidelines on the use of photomontages for wind farms are being developed to counter underrepresentation of impact to local communities). The Proponent only amended the offending material after it was discovered by a resident to be incorrect.

3.4 The photomontages of the proposed Rye Park Wind Farm grossly misrepresent, by drastically understating, the proximity and scale of the proposed Wind Farm. On this ground alone the Application should be rejected.

3.5 The methodology used by the Proponent in the production of its photomontages does not fairly approximate the perception of the human eye. It vastly reduces the scale and apparent proximity of the wind farm's turbines, and is therefore misleading and deceptive.

3.6 Visual materials of this type carry significant weight and, upon review, affect all aspects of a recipient's perception of the likely impacts of a proposed development (not just the perception of visual impacts). For example, a person shown a development made to appear much more distant than it would in fact be will assume the associated noise impacts to be significantly more attenuated by distance than they would be in fact.

3.7 Of especial note is, that the Proponent fails to give adequate consideration to the cumulative impacts of the proliferation of wind farms throughout the Rye Park region.

4. Noise

4.1 The Proponent's Noise Impact Assessment is not a genuine assessment of the predictable noise impacts of the proposal upon the Rye Park Community. Rather, it is an assessment directed to determining whether or not the proposed wind farm will comply with an arbitrarily selected noise limit of 35 dBa – being the limit imposed by the draft NSW Wind Farm Development guidelines. Owing to the particular characteristics of the environment at the subject site and surrounds (including the present background noise conditions), the Proponent's noise impact assessment simply fails to assess the true noise impacts of the proposed facility upon the community – and therefore fails to meet the requirements of the DGRs. See section B.

4.2 Furthermore, the Proponent's assessment of the predictable noise impacts of the proposed Wind Farm fails to take into account the significant levels of the particular form of infrasound that would be produced by the facility with adverse effects for exposed residents. See, again, section B. The proponents acoustic reports failed to address the DGRs and failed to provide a guarantee that there will be no adverse impacts on local residents.

5. Flora and Fauna

5.1 The EA's Flora and Fauna impacts assessment is also inadequate and the conclusions supportive of the Application based upon this assessment therefore lack proper foundation and may not be relied upon. The expert review of the Flora & Fauna impacts portion of the EA provided by Australian Wildlife Services (**AWS**) (section C) concludes, in part:

5.2 The AWS report recommends that the steps required to remedy the deficiencies in the EA relating to the assessment of impacts on flora & fauna. The Rye Park Wind Farm EA biodiversity impact assessment would be stronger if:

- The 70m infrastructure exclusion buffer at a minimum is implemented in all cases with a recommendation to increase to a radius similar to the turbine height as an appropriate buffer zone.
- Turbines are removed or relocated from areas adjacent to or within high quality habitat or vegetation as per the applied buffer zone.
- In-stream and riparian ecology impacts from works close to waterways and or waterway crossing be considered as per DGRs (in particular with impact to the Southern Pygmy Perch).

- Greater attempts to delineate superb parrot breeding and foraging areas are made.
- Further surveys are conducted for threatened orchids, the Yass Daisy and Superb Parrot flight path surveys across years and within seasons and vantage point surveys conducted at all turbines to increase level of confidence that all species present on site have been identified and the level of impact has been adequately described as required by the DGRs.
- Total vegetation area to be cleared includes areas modified and rehabilitated and hence offset appropriately
- The offset site under consideration is detailed further with particular reference to hollow bearing trees.

6. Assessment of impacts on Indigenous Heritage incomplete and inadequate

6.1 The Proponent has failed to consult with a key Aboriginal group with close connections to the area. The Proponent's assessment of the potential impacts upon indigenous heritage is therefore incomplete in a material respect and consequently inadequate. The Proponent has not consulted Pajong Indigenous Group or Wallabaloola Indigenous Group, who originally inhabited the Pudman Reserve. In addition a local Indigenous Group member who currently owns a home within 2km of the proposed project has not even been consulted.

7. Transport and Traffic

7.1 This environmental assessment produced by Epuron appears to have been rushed. Many of their figures related to transport and traffic volumes do not correlate throughout the EA. Epuron is either negligent or deceptive in its figures and much, if not all of the traffic and transport sections of the EA must be revised.

7.2 The fact that Epuron has not included gravel, concrete or water requirements for the construction of the connection substation, 2 collection substations, control building or the 2 concrete batching plants in the EA shows that Epuron are being deceptive and these figures must be included in any revision of the EA.

7.3 Epuron has failed to outline any of the predicted traffic and transport issues that will arise during the decommissioning and rehabilitation phase of the project. Epuron have failed to outline expected traffic volumes during this period or expected materials required to be carted to the site. ie top soil, gravel etc.

7.4 The material requirements for the Rye Park Wind Farm will mean truck movements in excess of 48,000 over local roads. In addition to this would be 1200 plus over size / over mass truck movements of turbine components plus the delivery of equipment i.e. dozers, graders, cranes, etc. This does not take into account vehicle movements for staff during construction, operation, or decommissioning of the wind farm.

7.5 The cumulative effect if Bango and Rugby wind farms are approved would be large. With an addition of approximately 180 turbines for the two projects, truck movements would exceed 120,000.

The cost to local roads would be at the expense of the communities of Yass, Upper Lachlan and Boorowa. Many of the local roads are not constructed to handle such large volumes of heavy traffic and as such will deteriorate greatly.

7.6 Epuron must undertake greater consultation with the local councils in relation to road conditions as large scales road degradation will result from the volume of heavy traffic. An independent review of all roads involved must be undertaken at Epuron's expense and legally binding contracts entered into between Epuron, local and state government so that all roads are returned to a minimum of pre development condition at Epurons expense. If this is not done it will be the local communities and state government that are required to fund all road repairs. (See section D for full report).

8. Property Values

The Impact of Wind Turbine Developments on Surrounding Rural Land Values in the Southern Tablelands, N.S.W. – Peter Reardon. (See section E and Attachment 11). Conclusions of Report:

8.1 Contray to published reports to date on the issue of impact of wind turbine developments on land values to adjoining or nearby properties, this report provides clear evidence that this type of development has resulted in a negative impact on marketability and the value of properties to varying degrees. Discounts in value as identified of 33% & 60% in the market place cannot be ignored.

8.2 The acknowledgement of this detriment has also been realised by the proponents of the Rugby wind farm proposal near Boorowa N.S.W. We have information indicating that 'Neighbouring Host Agreements' or 'Compensation Deeds' have been agreed to and signed that compensate owners who have a residence within 2 kilometres distance of proposed future wind turbine developments.

8.3 The commentary from key real estate agents who deal in these impacted areas on a daily basis cannot be ignored.

8.4 There are a vast array of property types, sizes, topography, aspects, and improvements. In our professional opinion there is no 'blanket rule' as to the percentage of detriment that can be attributed to any particular property impacted by wind turbines. As a generalisation we consider that the greater the distance, and out of sight position of wind turbines to a residence, the lower the reduced marketability and impact upon value to a property will be. Each property therefore needs to be assessed more on a 'case by case' basis rather than an individual 'blanket rule'.

8.5 Our initial findings detail that the marketability of certain properties (especially those with lifestyle appeal and/or residential improvements) to be the most severely impacted upon by wind turbine developments. This detriment appears to occur from the initial time that a proposal has been advertised within a locality. The public knowledge of the potential for this type of development appears to create some uncertainty in the market place as to the impact that these potential future developments will have. There is therefore reluctance by purchasers to invest into an area where this uncertainty exists not only from the potential of any future financial loss, but also the blight on many

property views and aesthetic appeal, which is a strong consideration by many city based purchasers who acquire properties in the Southern Tablelands.

8.6 Given the number of developments existing, under construction and proposed in the Southern Tablelands, we consider further market evidence will eventuate in the near future.

9. Decommissioning Plan Inadequate

9.1 The Proponent's proposed decommissioning and site rehabilitation plan is inadequate, and will not achieve the necessary rehabilitation of the proposed Wind Farm site (see section F and attachments 12, 13, 14, 15 & 16).

10. Summary

10.1 **The Boorowa District Landscape Guardians propose that the Department should reject outright the Major project application 10_0223 ("Application") relating to the Rye Park Wind Farm.**

10.2 The proposed Wind Farm cannot be justified on strategic grounds or otherwise, and should not be imposed upon a community overwhelmingly opposed to its construction.

10.3 **In the alternative, the EA should be rejected for non-compliance with the DGRs and other material failings, and the Application should not be determined until the very serious deficiencies in the EA and the community consultation process have been fully remedied.**

10.4 The Proponent's submission contains serious deficiencies in key aspects of the proposal that would have significant impacts on the local community we represent. Not only does the Proponent's own submission and actions fall short of what it required under the Director General's Requirements, the information provided by the Proponent's own consultant experts lack proper foundation in a number of critical respects.

10.5 In some cases, the flawed information is the product of invalid methodologies that have produced biased and misleading outcomes. In other cases, this flawed information is based on inadequate investigation and/or information.

10.6 This should result in the Department reaching the inevitable conclusion that the significant and adverse public impacts of the proposed wind farm substantially outweigh any arguable public benefit that might be realised in the establishment of the Rye Park Wind Farm.

10.7 No Application from the Proponent (Epuron) should be countenanced or determined until the serious deficiencies in the Proponent's Environmental Assessment ("EA") have been remedied and an adequate assessment of a number of matters of central relevance has occurred.

SECTION B
NOISE

Noise

1. Overview

The NSW draft wind farm guidelines use the 2003 version of the South Australian EPA Windfarm wind farm noise guidelines where base level for noise assessment had been set at 35 dB(A).

These EPA guidelines are also currently in use in South Australia, and are used as the basis of noise assessment in the approval process of wind turbine developments in that state.
However, it is clear that these noise guidelines are inadequate in protecting residents surrounding operating industrial wind turbine developments, as evidenced by Mary Morris's submission to the *Stony Gap wind turbine development proposal court hearing.* In her submission, it is clear that a large portion of the community surrounding the operational *Waterloo* industrial wind turbine development are experiencing significant impacts to their health as a result of audible and inaudible noise generated by the turbines. This development was built consistent with the same EPA wind turbine guidelines which are in operation in NSW.

(See attachments 2, 3, 4, 5 & 6)

Attachment 2 – A comparison of wind turbine acoustic measurements and analysis, resident responses and wind farm power output during on-off testing at a South Australian wind farm - M Morris, April 2014. Conclusions:

- Shut down 1 at WEST showed that the EPA's conclusion (- that the wind farm does not create an adverse noise impact at this home) is not supported by their own data or by the residents diary entries.
- "A" weighted values may not accurately reflect the impact of the turbines on the residents.
- Operation of the wind farm contributed around 10dB of low frequency noise to the local environment. Limiting compliance assessment to audible parameters does not satisfactorily address the significant impacts caused by LFN from wind turbines.
- Consideration should be given to qualitative as well as quantitative assessment.
- Acoustic analysis of INSIDE measurements, immediately before and after Shutdown 1, show values which exceed SA EPA noise guidelines.
- The EPA could not hear wind farm noise (which was disturbing the residents) on their audio recordings, calling into question the merit of this methodology.
- Noise limits recommended by DEFRA, the Danish authorities and Dr Norm Broner (60dB(C)) were exceeded on May 1st 2013.

Professor Colin Hansen clearly identified inadequacies in the SA EPA Waterloo wind farm Environmental Noise study of 2013 (See attachment 7), which are consistent with the results of the Morris community survey.

Significant concerns have been raised publicly about the conduct of the acoustic monitoring during the EPA acoustic survey which in three instances contravened the SA EPA's own wind farm noise guidelines

with two of the monitors being placed underneath large trees (the guidelines specify that the acoustic monitors should be more than 30 metres away from vegetation) and the other acoustic monitoring was conducted in the backyard of a home in Waterloo township where the microphone was within 5 metres of reflective surfaces. This will have the effect of significantly increasing the background noise, and could explain why the environs of the Waterloo wind development now reveal a “much noisier” rural environment.

Other concerns about this report include the way the South Australian EPA have used the figure of 85 dBG as being a “safe” threshold for infrasound exposure, when the large US government research project led by Dr Neil Kelley established the “safe” infrasound and low frequency noise chronic exposure thresholds to be much lower, in 1985.
If the proponents of the Rye Park wind turbine development were to comply with the draft NSW noise guidelines, given the inadequate nature of these guidelines as evidenced by Mary Morris's Waterloo community survey, the surrounding community of Rye Park will experience impacts to the amenity of their existing acoustic environment.

The proponent has not met their obligation to address the DGRs in relation to identifying the impact that will be generated by the proposed wind turbine development on the local community in their noise assessment report.

2. Acoustic Review Proposed Rye Park Wind Farm by ‘The Acoustic Group’

See full report – Attachment 1

Conclusions of Acoustic Review of Proposed Rye Park Wind Farm:

2.1 The SLR Consulting Australia report into the proposed Rye Park Wind Farm did not address the impact of the proposed wind farm nor identify the occurrences of such impacts or the audibility frequency of such noise (as required under the DGRs).

2.2 The SA EPA guidelines do not meet their own core objectives. Both the 2003 and 2009 guidelines claim they are "not aware of infrasound being present at any modern wind farm site." As such the guidelines require amendments to address such errors and quantification of adverse sleep and health effects.

2.3 Monitoring of the Waterloo Wind Farm in 2013 by Adelaide University clearly shows the presence of infrasound and vibration inside residential dwellings.

2.4 Additional monitoring was undertaken by Adelaide University during the cable outage at Waterloo wind farm to identify the ambient noise in the valley without the operation of the wind farm. Material in relation to the impact residents experienced during the unplanned shutdown of the wind farm (versus operation of the wind farm) and the measurements that were undertaken by Adelaide University would be of assistance to the Determining Authority in obtaining first hand accounts of the impact provided by existing wind farms.

2.5 Affidavits and testimony from the residents in proximity to Waterloo and Hallet wind farms that experience different effects with the wind farm off versus on is consistent with the experience from residents in New South Wales and Victoria that have experienced similar unplanned shutdowns and changes in their daily activities, and in particular sleep patterns.

2.6 Residents near the Cullerin Wind Farm (Edwards M) have reported dramatically improved sleep patterns after the audit testing of the Cullerin Wind Farm in New South Wales where at the end of the completion of the testing there was a problem with the substation (basis of problem unknown) that led to the entire wind farm being off-line for some 10 days.

2.7 The evidence from residents in proximity to wind farms not only in Waterloo and Hallet (being in South Australia) but residents in proximity to Waubra, Cape Bridgewater, Glen Thompson and Macarthur Wind Farms in Victoria, Capital Wind Farm and Cullerin Wind Farm in New South Wales all identify that there is an adverse impact generated by wind farms that purportedly comply with their noise conditions of consent.

2.8 Not all persons are affected by the wind farms in that there is a different sensitivity for various individuals which is a similar pattern for all various environmental impacts. However whereas residents may become habituated to road, aircraft or rail traffic over time it appears that residents exposed to wind farms noise do not habituate to the noise but in fact become more sensitised to the noise over time.

2.9 The use of the dB(A) parameter with respect to determining noise limits for a wind farm does not in any way shape or form address the low frequency noise and the infrasound that is generated by the wind farms.

2.10 There is more evidence coming forward from researchers and communities around the world that there is something when the turbines are in operation that gives rise to an impact. The Cape Bridgewater study that I have undertaken has identified a number of significant factors that lead to adverse impacts.

2.11 The NSW Department of Planning and Infrastructure has a fundamental requirement to protect the health and well-being of communities that are subject to various environmental pollutants. In relation to the matter of noise/vibration and other perceived impacts the use of the SA guideline for wind farms and the draft NSW guideline do not satisfy that requirement.

2.12 I can accept that the SA guidelines as originally developed some 10 or 12 years ago related to smaller turbines, had larger separation distances to residential dwellings and there was insufficient data to look at the health impacts on communities or the potential degradation of the acoustic amenity that those rural communities could experience.

2.13 Even on a dB(A) basis there is still no material to determine the appropriate level that relates to a rural acoustic amenity under the guidelines. Using a base level that is significantly above what is

deemed to be a relatively quiet amenity, must automatically start from the wrong position.

2.14 I have previously issued papers identifying a periodic pattern in the infrasound region that I identified as the "wind turbine signature". That material was subsequently found to be supported by investigations undertaken by NASA in the late 1970s.

2.15 There are measurements conducted by other acousticians in Australia (Huson L in Cherry Tree Wind Farm VCAT hearing and Hansen K private communication) and overseas (Willshire W NASA Technical Memorandum 86409 and Kelly ND Solae Energy Research Institute 1985) show that the infrasound energy continues well past the nominated threshold setbacks of 1 -
2.16 2km, with residents up to 10 km from wind farms, where there are an elevated situation such as the Waterloo Wind Farm, identifying such impacts.

2.17 From a measurement basis with the appropriate gear some researchers are able to identify infrasound frequencies at distances much greater than 10 km. Whether those levels of infrasound are at a level that would interfere with individuals becomes more of an examination of the interaction of such energy with natural resonances of building elements. More research is required in this area to provide a quantitative assessment.

2.18 There is enough material to identify that modern day wind farms can generate an environmental
2.19 "noise" impact pertaining to residential premises.

2.20 My recent work at Cape Bridgewater has revealed noise impacts for internal levels above the Danish EPA target of dBALF of 20 (being 1OH to 160Hz only) and sensation impacts for internal levels above 50 dBC and 50 dB for the 4Hz 1/3 octave band.

2.21 The SLR Consulting Australia report submitted with respect to the Rye Park Wind Farm is titled Noise Impact Assessment, yet I find nothing in the report that identifies what level of impact will occur as a result of the proposal.

2.22 The basis of the SLR Consulting Australia acoustic report appears to assess noise with respect to an external average noise target without necessarily identifying the tolerance in terms of the noise levels and more importantly the impact that would occur.

2.23 To date there is no material from the Applicant to guarantee there will be no adverse impacts from the proposed wind farm. In fact there is no identification of what impacts (adverse or acceptable) that residents will receive as a result of the proposed wind farm.

2.24 The planning authority needs to establish/guarantee what levels of noise and infrasound are acceptable in terms of the community and will not give rise to noise impacts or sleep disturbance before granting any consent.

SECTION C
FLORA AND FAUNA

Flora and Fauna

1. Comments on the Rye Park Wind Farm Environmental Assessment by 'Australian Wildlife Services'

See full report – Attachment 10

In June 2014, Australian Wildlife Services was engaged to undertake a brief review of the Rye Park Wind Farm Environmental Assessment (EA) (Eupron 2014) as it related to likely impacts to biodiversity.

The Rye Park Wind Farm EA seeks to assess the likely impact of the proposed development on threatened biodiversity including several species and communities which are Matters of National Environmental Significance (MNES) and/or listed under relevant State and Commonwealth legislation. The Rye Park Wind Farm proposal was declared a Controlled Action on the 24th April 2014 due to the potential risks to MNES, in particular listed threatened species and communities. ngh Environmental, a consultancy company, was hired by Eupron to undertake the Biodiversity Assessment (BA).

ngh Environmental undertook surveys to frame the likely impacts to present or possible threatened flora and fauna caused by the proposed development. Within the EA, it is likely that most species that occur on site have been identified, although there is local knowledge of Crimson Spider Orchid, Tarengo Leek Orchid and high likelihood of Yass Daisy, Powerful Owl, Barking Owl and Koalas present on site considering recent records within the adjacent proposed Rugby Wind Farm site. Furthermore, the EA does not assess the likely impact to known populations of the threatened Southern Pygmy Perch within Blakney and Pudman Creeks.

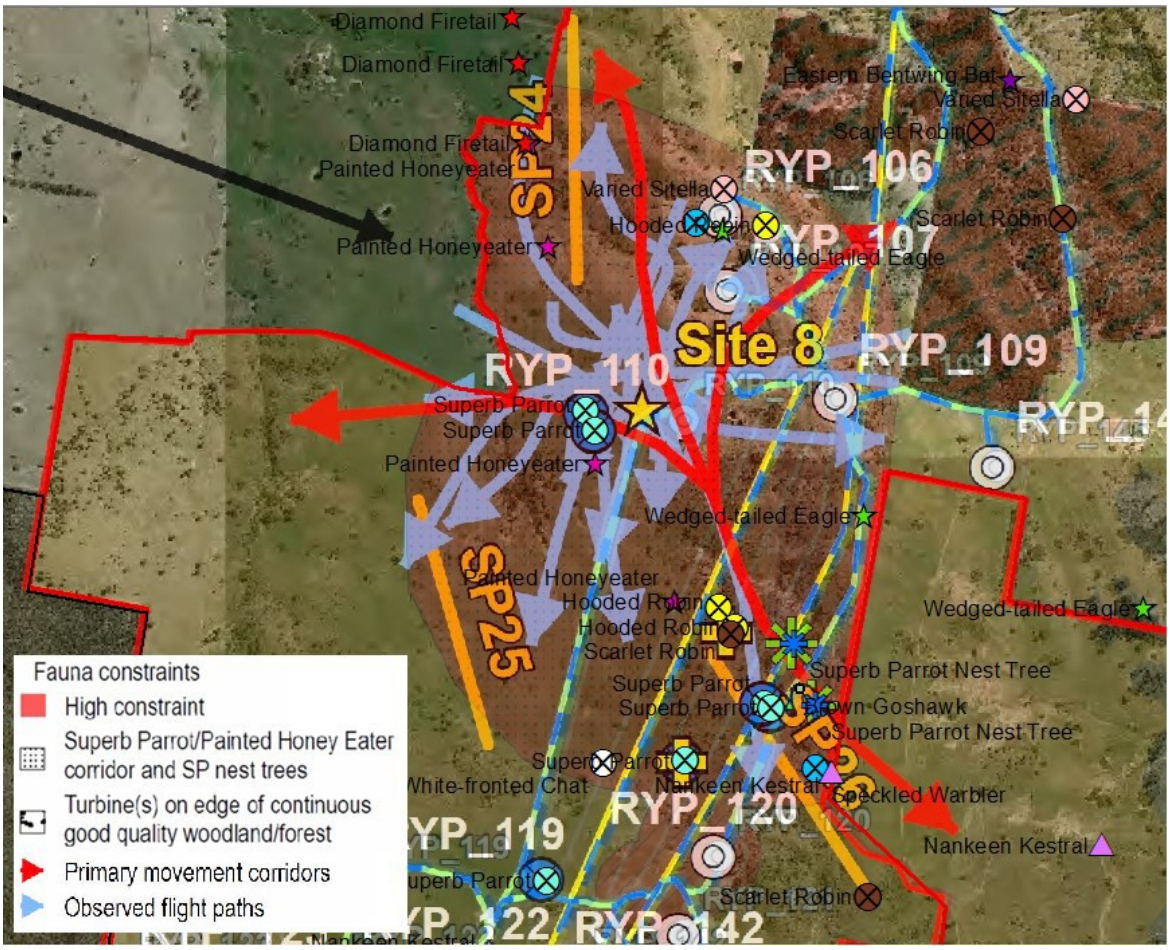
The EA states that little or no impact is expected for most species and communities present based on the results of ngh's surveys and identified habitat within the project area; however, it is of AWS' opinion that:

- Up to 20 turbines still remain within or adjacent to highly important and constrained flora and fauna habitat despite a commitment from the proponent to maintain a 70m buffer around these areas and to avoid impact 'where possible' as per the Director General's Requirements (DGRs).

- Four or more turbines in the southern section of the wind farm demonstrate high levels of collision and habitat loss risk to the Superb Parrot within documented high use superb parrot flight path zones (within Rotor Swept Area) and high constraint Painted Honeyeater – Superb Parrot habitat and/or breeding area.

- A few inconsistencies or inadvertent errors occur within the documents regarding total area of native vegetation and threatened communities to be cleared as required by the DGRs.

- Turbines where threatened bats have been recorded may pose higher risk of barotrauma and collision but locations have not been mapped or provided.



Map 1 Superb Parrot movement observations and turbine adjacency to high constraint fauna habitat (exert from mapping in Eupron 2014)

- The potential impact of barotrauma does not appear to be assessed in detail as required by the
- DGRs.

- Recent and very close Koala, Powerful Owl, Barking Owl, Rainbow Bee-eater, White-throated Needletail and Eastern Bentwing Bat records at the adjacent Rugby Wind Farm should be considered (see REpower 2013). (see Map 2)

- Impact to the Southern Pygmy Perch (*Nannoperca australis*) was not considered and local records and knowledge of Crimson spider orchid (*Caladenia concolor*) and potentially the Tarengo Leek Orchid (*Prasophyllum petilum*) should be followed up.

- Survey effort and methods were generally sufficient to detect most species present. Many techniques in the latter year surveys (2013-14) were developed in consultation with the OEH
- and thus it can be assumed appropriate levels of scrutiny were placed on the methods. However, AWS has the questions and comments regarding lack of repeat visits, timing of surveys and survey effort (see Attachment 10 for more details).

- There is confusion within the EA to whether the proposed transmission lines are to be 330 kv overhead line with a required 60m width clearance (stated in the EA see Table 3-1 page 64) or a
- 132 kv overhead transmission line with 45m width required clearance (Table 7-2 BA).

- Worst case scenario vegetation clearing area in the EA appears to be for permanent loss only.
- Modified and rehabilitated areas do not appear to be included in these estimations. As per the
- DGRs, the 'worst case' estimate of vegetation to be cleared in hectares should be provided
- including quantifying impacts by vegetation type and threatened species habitat.

- Fragmentation is an impact of this development despite claims in the EA that fragmentation is unlikely – removal of 114-119ha of vegetation in an over cleared landscape and individual tree loss can destroy connectivity and cause fragmentation and isolation of habitat patches. The importance of even single or small clump of paddock trees for habitat connectivity is discussed by Fischer & Lindenmayer (2002), Manning et al (2006), Manning & Lindenmayer (2009) and Doerr et al (2011).

- The EA agrees that impact is likely to impact many biodiversity aspects but maintains that mitigation measures reduce the risk or impact to minor impacts. However, mitigation and risk levels lack key thresholds as alluded to in the BA "**Step 5 – Key thresholds".**

- Although micrositing infrastructure and "avoid where possible" can be effective in minimising impacts, they cannot be relied on for avoiding all possible impacts, especially where conflicting design requirements are present. It is also a non-transparent process where it is difficult for anyone other than the proponent to make the assessment of where risk is too high to a particular species or community.

- Cumulative impact and adjacency of neighbouring wind farms has been underplayed – nearest turbine of the Rugby Wind Farm is 970m from RYP_1. Cumulative impacts should be considered significant for clearing of EECs in the region and for threatened bird habitat within by the South Western Slopes Important Bird Area.

The Rye Park Wind Farm EA biodiversity impact assessment would be stronger if:

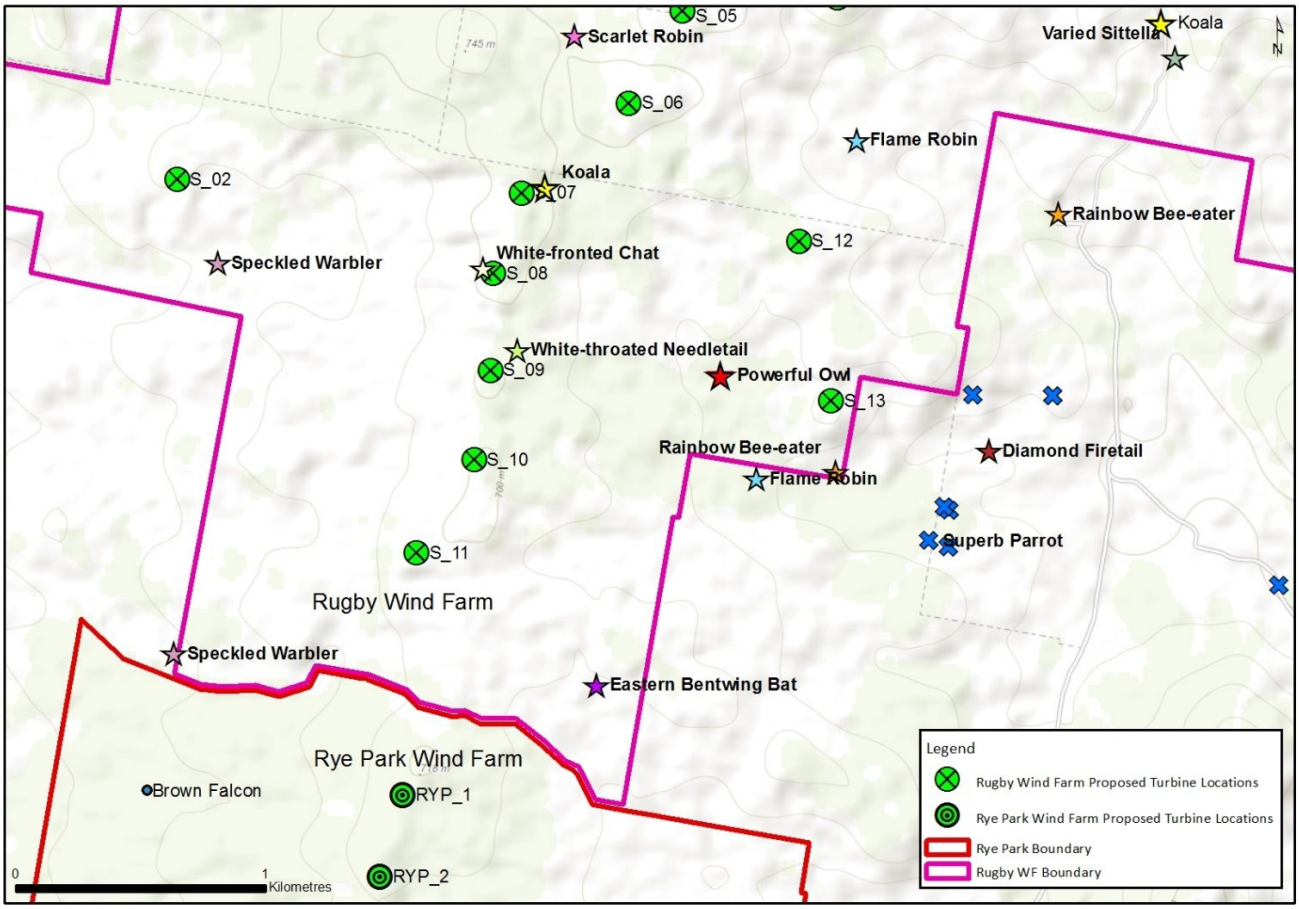
- The 70m infrastructure exclusion buffer at a minimum is implemented in all cases with a recommendation to increase to a radius similar to the turbine height as an appropriate buffer zone.
- Turbines are removed or relocated from areas adjacent to or within high quality habitat or vegetation as per the applied buffer zone.
- In-stream and riparian ecology impacts from works close to waterways and or waterway crossing be considered as per DGRs (in particular with impact to the Southern Pygmy Perch).
- Greater attempts to delineate superb parrot breeding and foraging areas are made.
- Further surveys are conducted for threatened orchids, the Yass Daisy and Superb Parrot flight path surveys across years and within seasons and vantage point surveys conducted at all turbines to increase level of confidence that all species present on site have been identified and the level of impact has been adequately described as required by the DGRs.
- Total vegetation area to be cleared includes areas modified and rehabilitated and hence offset appropriately
- The offset site under consideration is detailed further with particular reference to hollow bearing trees.

Please see attached documentation (Attachment A) for further detail and information of our review.

Yours sincerely,

JkSmits

Jennifer Smits
Research Officer
Australian Wildlife Services



Map 2 Relevant Threatened Species Records in the Rye Park – Rugby Wind Farms area

2. Rye Park Wind Farm – BDLG Flora and Fauna comments

No reference made by developer using the following organisations to obtaining information to complete Biodiversity Report for Rye Park Wind Farm Environmental Assessment report:

- Adrian Manning published several papers on Superb Parrot. He also did his Thesis on the Superb Parrot. He is the scientific expert to the Superb Parrot for the Rye Park region.
- Pat Thompson – Boorowa local expert into the Superb parrot
- Lachlan Catchment Management Authority (CMA)

- Rye Park Landcare group
- Boorowa Landcare group
- Box Gum Grassy Woodlands project – a federal government project
- Greening Australia
- National Park Wildlife Service publication – "The Native Vegetation of Boorowa Shire"
- Charles Sturt University publication – "Boorowa Shire Koala Survey –Implications for SEPP.44"
- Australian National University (ANU) – Sustainable farms project
- Australian National University (ANU)- Ecology Unit
- Boorowa Muesum
- Boorowa Library
- Yass Valley Library
- Boorowa Council – limited contact with developer

Project area includes areas of endangered ecological communities (ECCs). Several species of threatened birds and bats detected during field surveys.

Are these species to be dismissed regarding the Rye Park Wind Farm project? Threatened means threatened. An industrial scale development of 14,000ha is a very allege medium and high conversation area. The endangered ecological communities of this region are to be further threatened with the adjoining Bango and Rugby Wind farm proposals. It is on very big area being put under enormous pressure all in the sake of government reaching a 2020 target at whatever cost to the limited natural environment this region has left since early European settlement. The endangered ecological communities should be left well alone and further encouraged to remain intact for future generation to thrive by regenerating with increasing population numbers of vulnerable, endangered, threatened species of flora and fauna.

CMA listed as catchment area organisation.

The catchment area information provided by developer is incorrect with the current government organisation controlling the area absent from EA information.

Areas in Rye Park are mapped as medium and high conservation value.

Why is a wind farm being proposed to be built in an area of medium to high conversation value? A project such as this that is on an industrial scale is allowed to be approved and built, represents the lack of respect government departments have for the remaining fragile natural environment left in this country. The 2020 targets for renewable energy (green energy) will damage the existing box gum woodlands of the Rye Park region that the federal government are investing millions of dollars with their Box Gum Grassy Woodlands project. The vulnerable, endangered and threatened species of the Rye Park that are documented in published data, are they to be just forgotten about in the sake of green, clean energy for 2020 targets to be met? Just doesn't add up to me. Take away any of the existing natural medium and high conversation value areas of this region are disgraceful. Once they are gone, THEY ARE GONE.

Project area is approximately 14000ha.

This should be an accurate area size, not an approximate.

100m buffer around infrastructure.

EA then further states large buffers required from the follow up surveys. The results 'infrastructure footprint plus an additional 100-200m buffer". The summary by developer should include the larger

areas of buffers required, not a general area be only listed. Due to this project being in a Box gum Woodland area, vital vegetation will be removed by proposal.

The proposal site mostly derived by Box Gum Woodland.

The EA keeps referring to the project as being in open grassland. There is a complete difference to Box Gum Woodland to open grasslands. The developer needs to be clear with the exact project description.

Box Gum Woodland of Rye Park Wind Farm project area.

The recommendations in report would form Statements of commitment. The report considers threatened entities and critical habitat that may occur in the project area and the affect that proposal may have upon them.

Why would this project be even consider, when it is an area that supports the habitat of vulnerable, endangered, threatened species of fauna and flora? I previously mentioned a statement the developer has published in their EA the project area included areas of endangered ecological communities with several endangered species present. Why has the developer made the statement of may occur when they have further published the endangered ecological communities of the area do occur. The whole biodiversity assessment has so many flaws it to me as a person of the general public to read. The affect that proposal may have upon them is catastrophic and reversible.

Matters of national Environmental Significance MNES must be referred to Federal Minister for the Environment for assessment and approval.

The Rye Park Wind farm project should be hand to Federal Environmental Minister due to the significance the amount of diverse amount vulnerable, endangered, threatened species of flora and fauna. The species that I believe to be most threatened by this project is the Superb Parrot. The region of Rye Park is in the location of the only breeding ground of the Superb Parrot. It should be paramount of any State or Federal government minister connected to this project to dismiss this development application. The developer has estimated 1029 hollow bearing trees will be removed due to this development. This is 1029 too many in my opinion as Superb Parrots use hollow bearing trees for nesting. I draw to your attention that estimate by developer can be a higher amount of hollow bearing trees that would be removed. Old timber growth is limited in the Rye park region and takes many decades to a century to occur. Land clearing practices since European settlement have been devastation to the region. The Rye Park Wind Farm proposal is directly adjoining the proposed Rugby

Wind Farm. The Rugby Wind Farm project area is positioned in more heavy timbered ridgelines, where a higher percentage of hollow bearing trees will be removed. As a basic estimate, the 1029 hollow bearing trees be doubled that are to be removed in the two adjoining wind farms, there would be 2058 hollow bearing trees removed. This figure will be greater in reality as I previously mentioned because the adjoining Rugby Wind Farm vegetation level are far greater that will be removed. The basic estimate I have given of 2058 hollow bearing trees is devastating to the Superb Parrot's ONLY breeding ground region. The Superb Parrot , all other bird species and bats will have a 60km wall of turbines to contend with, if the Rye Park & Rugby Wind farms are approved.

The current generation of agricultural land custodians have become aware of the implications from past land custodians. Governments fund projects e.g. Landcare, Greening Australia, Box Gum Grassy Woodland to regenerate degraded land to support future biodiversity within the regions. It will be disappointing to see State or Federal government approve a project such as this when they have full knowledge of the environmental damage this project will have on vulnerable, threatened species of flora and fauna when the developer has issued results from field studies that have been done when nesting occurred for Superb Parrot. The results the developer has applied to this EA are not the indication of ever method utilized on gaining ALL information about the Superb Parrot. No reference has been made using the published papers of Adrian Manning with Hollow bearing trees used by Superb Parrot. Many of the bird surveys for the Superb Parrot have been done outside the project area. Why? Superb Parrots forges and breeds within box gum grassy woodland. This is the project area indicated by developer. Guidelines for bird surveys recommends the methods used for timeline of field observations be done from sunrise to 10am and from 4pm to sunset). Bird survey guidelines also states "Survey efforts will need to be increased outside breeding season. This hasn't been applied by developer as the detailed field surveys for the Superb parrot were done in on a broad scale 26-27 Nov 2011(2 days), then general field studies of flora and fauna done between 31 Oct and 4 Nov 2011(5 days), additional field studies of flora and fauna done between 10-14 April 2012,additional surveys done on 27 may 2013. The Superb parrot has been noted in EA for it's additional surveys done between 4 and 9 Nov 2013. There is no indication by developer in EA of the additional surveys increased outside the breeding season of the Superb Parrot. Being a vulnerable listed species, the developer needs to attempt using every method to obtain ALL information on Superb Parrot. For a State or federal minister who approves this project , will have on the consense the knowledge they have approved a project depleting valuable box gum woodland so many vulnerable, endangered and threatened species of flora and fauna reply on to exist.

Hollow bearing trees located in the Rye Park Wind Farm project area

A large number of assumptions are required- Wind farm biodiversity data monitoring data is not collected in a standard manner and is not generally available to the public, making comparsions difficult.

The developer makes this statement due to their sheer laziness into researching ALL available published works of people who are experts and specialize in the fields of the Rye Park flora and fauna. I noticed in the references section the EA isn't very large. A wind farm project is a large scale development. Every aspect needs to be researched. The reference section of an environmental assessment should be quite large. It is clear the developer hasn't made every attempt to gain data from sources who have already completed and published their data. The internet has provided myself who is a person of the public to gain published works of field data for the Rye Park and Boorowa Shire for free. How come the developer hasn't done the same?

Table 3-4 Wind Speed data.

I will bring to your attention the wind speed data. This data haven't been taken in the field when bird surveys have taken place. They have been taken from the Bureau of Meterology located at Yass generally at 09:00hrs and 15:00hrs. The 8 Dec survey proves no wind speed data reading are recorded when field surveys are under taken. The site 1 Frogmore rd survey site which is outside the project area, is located 60km north of Yass. 60kms is a vast distant for variation in wind speed and temperature. Agricultural spray contractors have portable wind reading devices that they require for recording wind speed information on their spray data paperwork, so why doesn't the field surveyors have the same device to record accurate wind speed data?

Comprised of narrow access tracks.

The narrow assess tracks according to EA are to widened and impacting on surrounding vegetation.

Discrete turbine footing

There is nothing discrete regarding turbine footings.

Biodiversity survey effort per area of impact is high but survey effort in compassion to the development envelope can appear low.

The biodiversity survey effort needs to be at the highest level due to the endangered ecological communities the project area covers.

Koala.

Field surveys done between 4 and 9 Nov 2013 and 18 and 22 Nov 2013. The developer discussed with Mike Saxon (OEH) on 10/9/13 potential impacts to the koala. The EA states" ***the extent of clearance is primarily limited to discrete areas, primarily for transmission line corridors. Clearance for wind turbines will be nil to minor as main access tracks and turbine sites are located in cleared or non-forested areas.***

In table 7-2 the developer has indicated 127.5km of new roads are to be constructed with a 8 metre width. There is no mention in this table the radius around any of the proposed 126 turbines of amounts of vegetation to be removed. The developer is assuming the reader of the EA will accept their statements of all 126 turbines are located in non-vegetated locations. The aerial mapping used in EA is not a true indication of vegetation to be removed due to the images not being zoomed in enough for the observer to notice the vegetation types located at turbine sites. How can the developer say the extent of clearance will be minor to nil when they are going to construct 127.5km of new roads and remove using their estimates, 226ha of vegetation. The figures are just no adding up. The transport section of the EA has a reduced figure of the news road that will be constructed. The EA is simply very confusing to the reader. So what are the actual figures of the new roads to be constructed? It will make a total difference to the volume of construction traffic using the local road system. While this is the location of where koalas have been sited within the Boorowa shire, below are documented reports complied for Boorowa Council for the preservation of trees within the shire.

The State Environmental Planning Policy No44 (SEPP 44) gazetted 13/2/1995 applies to Boorowa Shire. Core Koala habitat is defined by SEPP 44 (section 4) as *"an area of land with resident population of koalas, evidenced by attributes such as breeding females (that is young with young)and recent sightings of and historical records of a population."* The Rye Park area has historical records of two koala sightings. The NPWS publication " The Native Vegetation of Boorowa Shire" lists one sighting at Rye Park. The "Boorowa Shire Koala Survey- Implications for SEPP 44" publication was undertaken by 2 students from Charles Sturt University, Bathurst. 289 surveys were posted to residence with 91 returned. Their field surveys consisted of 315 transact sites of 100m x 2m. 157 of these were located in woodland. This is a far greater study for a threatened species which they did compared to the very basic field studies the developer has done. Current koala distribution within the Boorowa Shire listed in the Boorowa Shire Koala Survey were identified as being present in only two patches of woodland, in the Rye park area, from scratch marks and scat presence. Likely koala habitat and core habitat being only identified in a few woodland patches in the shire, their distribution is most like much wider considering the distribution of potential suitable food trees.

Major impact on the koala within the Boorowa Shire threatening their population.

1.Clearing –The identification of koalas in two patches of woodland in the shire clearly highlights the sensitivity of the population to future clearing known or potential koala habitat. Clearing within either of the two identified woodland patches would provide a significant threat to the species will reducing

any remaining available habitat of the species. Clearing of any trees either scattered or woodland would have major effects on the species by reducing the species ability to move between the two patches in Rye park area. Clearing will also impact on the species potential ability to increase in population.

The Koala survey data suggests in the Boorowa Shire, E. Rossii (Western Scribbly Gum), E. Macrorhyncha (Red Stringybark) and E. Goniocaylx (Long Leaved Box) likely koala habitat, and should be conserved as potential koala food trees across the shire where koalas occur or are likely to occur. The koala survey indicates that the area represents "likely" koala habitat within the shire and should be protected at least the area where koala were identified during their study via tree preservation ordinances. The survey has identified two area located at Rye Park in two patches of woodland. Individual Koala Plans of Management need to be lodged concurrently by proponents of Development Applications.

17.25hrs of spotlighting surveys.

Done by foot and vehicle. Is this enough to cover the targeted species that field surveys are to cover?

Swift Parrot

Surveys were done between 9 and 12 July 2013

10 & 11 July data records overcast – misty. Survey results poor due to misty weather. More time required to survey swift parrot.

Tables used in EA don't have wind speed readings.

It became apparent during surveys to west of project area along Rye park Rd, Frogmore Rd and Flakney Creek Rd were regularly used by parrots. These are outside project area.

Why were these areas, sites for bird surveys being done by developer? They are supposed to be studying within the project area boundary. Not outside it.

Superb Parrot – Flight Path mapping

The flight path surveys of Superb Parrot are not a true indication of how they will be affected by turbines. Since an high percentage of the surveys have been done outside the project area boundaries, this data is of no value to informing the Environment Minister the true representation the effect turbine will have on the vulnerable Superb Parrot. The developer has waste their time and misleading the decision makers of approving and this industrial project.

Superb Parrot

There are many papers and other published works on the Superb Parrot. I wish to refer to many of them as the developer hasn't made reference to utilizing these for their biodiversity assessment. Adrian manning from the Australian National University has published many papers and did his Thesis on the Superb Parrot.

The Superb Parrot breeds in two main areas. Scattered white box-Yellow box- Blakely's red gum (E.albens, E. melliodora, E. blakelyi) woodlands of south-west slopes of NSW.

Main threats to Superb Parrot habitat:

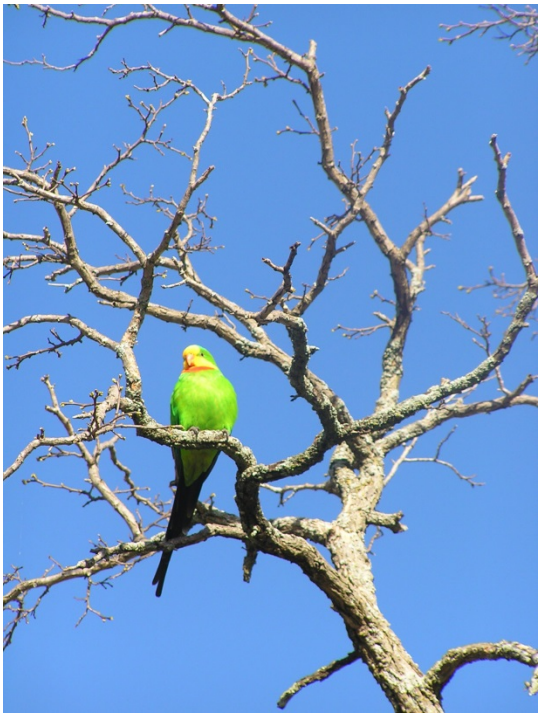
1. Loss of breeding habitat due to clearing and deline of standing trees that provide nesting sites
2. Clearing and modification of feeding grounds.

The study area Manning used of the south-west slopes bound by 33o 25'-35o 18'S latitude and 147o 41 – 149o 24 E longitude. Area searched for nesting trees was 24,740km sq.

The natural vegetation of the south-west slopes is box-gum grassing woodland. These woodlands are

listed under the NSW Threatened Species Conservation Act 1995 as an Endangered Ecological Community.
Superb Parrots lives largely on private owned land.
Dead trees have protection under the NSW Threatened Species Conservation Act 1995 if they are critical habitat for endangered species. Boorowa Council has a tree preservation order for dead trees. The loss of mature trees with suitable hollows or smaller potential nesting trees today cannot be offset in the short term by planting or tree regeneration . A combination of tree protection and regeneration is essential because trees in all age classes can potentially contribute to superb parrot conversation .

The calculated replacement cost in 2000 for trees in temperate agricultural landscapes in Australia by planting was $20 billion. Natural regeneration is considerably cheaper than tree planting.
The Superb parrot is thought to forage up to 10km from nesting areas in the south-west slopes. Manning witnessed tree species located in his field studies of superb parrots during the breeding season. His search areas were conducted of 1 sq. km. he used a diamond shaped transect approximately 2.1km in length. He surveyed 81 sites. 53 sites supported superb parrots. 28 of the 53 sites had superb parrots present at time of his field surveys. A total of 1493 superb parrots were observed by Manning.



Male Superb Parrot

National Parks Wildlife Service

The National Parks Wildlife Service published “The Native Vegetation of Boorowa Shire” June 2002. I will highlight a few items of importance from that publication.
The barking owl species that should occur in the shire, it’s conversation will depend on the retention of large remnants of native vegetation.
Koala- They are most likely to occur in the south-east of the shire.
Golden Sun Moth- In the Boorowa area the moth has been recorded at Wolverhampton Travelling Stock Reserve, Rye park Common, Flakney Creek Travelling Stock Reserve and Tarengo Travelleing

Stock Reserve. It is likely to occur elsewhere in Shire.
Thus out-comes towards the management of threatened species and endangered ecological communities is largely reliant on action from Boorowa Shire Council and local landowners.
The nature of clearing will not affect fragmentation in the landscape.
How can a statement in the EA like this indicate no affect fragmentation in the landscape? It is an industrial scales project, it will have extreme impact on the landscape.
Main assess tracks to potential turbine sites are already cleared with many tracks already 20m wide due to existing agricultural practices.

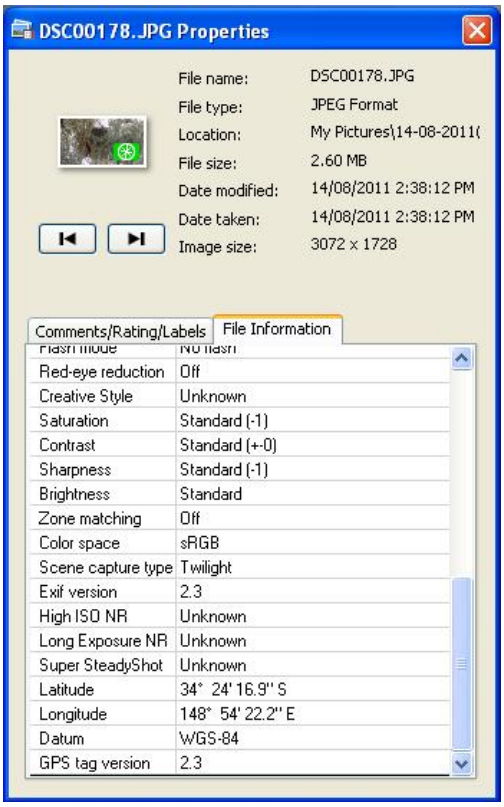
Table 7-2 specifies existing tracks (which EA indicated 40.7km). Why are 127.5km of new tracks being constructed when developer has stated main assess tracks to the potential turbine sites are already cleared? Very confusing to the reader of EA.
Table 3-4 Golden Sun Moth Survey
Wind speed details are not recorded with on-site field surveys. The weather readings again in the EA have been used from the Yass Bureau of Meteorology generally at 09:00hrs and 15:00hrs. Again, the Yass readings are located up to 60km south of the north point of the project area and can be extremely different to the weather readings the developer is using from Yass. Lachlan Catchment Management Authority (now known as Local Land Services) has complied information on the Golden Sun Moth. The references listed in the EA has no mention of referring to any of the CMA reports. Neither has the National Parks Wildlife Services Boorowa vegetation publication been referenced in EA regarding their Golden Sun Moth information. The EA listed 7 of the 10 survey sites having Golden Sun moths present. Being an endangered species, it would be paramount to preserve all the surrounding habitat.

Bird Surveys.
Disappointing to see the developer has only done 11hrs of general bird surveys for November 2011 and April 2012. It wasn't until the OEH issued recommended surveys requirements that further surveys were done. These surveys are still inconsistent given the endangered ecological communities of the Rye Park and are mapped areas of medium to high conservation value. It wasn't until 2013 developer decided to compile surveys slightly more detailed to try and comply with OEH instructions. Web-based databases being consulted first are completely different to field based surveys.
EA indicates additional survey work is planned both prior to approval and prior to construction. Why is this? All assessment work should have been complete and included in the present EA lodged with NSW planning department.
Department of EWHA (now OEH) Survey Guide lines for Australian threatened birds- Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conversation Act 1999. The guidelines assists proponents and assessors with guideline for bird surveys. The guidelines are no manatory but a guide to bird surveyors. Surveys over multiple years may be required when a single years data not enough information to detect certain species.
Weather conditions when field surveys occurred are important to the results. Wind speed, precipitation, temperature, cloud cover,and light intensity are all facts in the detectability of birds species. Poor results will occur when wind speed exceeds 10km/h, rainfall intensity is above a drizzle, conditions are misty or foggy and temperatures well above or well below the seasonal average.
Raptors are common in project area. A pair of wedgetail eagles would usually have two or more nests in their breeding territory. Thus, it is likely another nest occurs within a few kilometres of this

one. All raptors flight patterns are in rotor blade ehight of turbine.

A wedgetail eagle is an endangered species. If the 3 wind farms of the area (Rye Park, Bango and Rugby) are approved, this will reduce the current amount of birds that have a 60km continually length of turbine blades to contend with. Blade strike will be the highest factor of the raptor deaths in the region. Due to the nature of raptors, early morning field bird surveys wouldn't detect high numbers of these species. The large soaring birds are typically easier to detect later in the day when thermals form. The wedgetail nest needs a greater buffer zone of 500 metres.

Wedgetail nest



RYP 17 – However there may be potential impact to woodland birds if they avoid the turbine during operational phase of the project.

The lifespan of the Rye Park Wind Farm is not clear. An estimate of 20-25 years be the lifespan of the turbine for example. How can a creature be re-educated by a human to avoid development that has

encroached on the woodland birds habitat?

Table 7-2

EA lists the project will impact on Box gum Woodland and box Gum Woodland Derived grasslands. The detrimental affect on the area will be heavily impacted. The current Box Gum Grassy Woodland(BGGW) projects of the region funded by federal government seem pointless when a heavily federal government subsidised green energy development in the same region will remove natural Box Gum vegetation decades and centuries old. Allowing a developer to remove wide scale Box Gum environment doesn't sit well with the current landowners under contact with the BGGW project. The woodland and forest patches provide habitat for a large range of fauna including possums, microbats and birds.

Little is known about the effects of operating turbines on bat behaviour, whether bats avoid turbines or not, and the actual number of bat strikes that have been caused by operational wind farms in Australia. Some recent studies overseas have suggested that bats may be impacted by sudden change in localised air pressure created by turbines, after bats had been found with fatal injuries consistent with Barotrauma. Barotrauma is likely to be caused by the sudden air pressure change at turbine blades to which microchiropteran bats are more susceptible than birds.

In terms of blade-strike, Australian species that appear to be most at risk are those that forage above the canopy (ie. In open areas) and move through their environment at high speed. These species are more likely to travel at blade-sweep height and either fail to detect the moving blades, or are less able to quickly manoeuvre around them

There are 3 threatened microbat species recorded within the project area: Eastern Bentwing , Eastern False Pipistrelle and the Yellow-bellied Steathtail. Due to the high number of threatened bat species within this development, without clear studies on the high mortality rate of these bats this proposed development application should be rejected. Further studies need to be applied on the effects wind farms have on bat species in Australia.

7.4.1 Habitat Loss

The results indicate that the trees within Box gum Woodlands take many years to develop large hollows compared to other vegetation tyres and yellow box is particularly important in the immediate area of the proposal. Yellow box trees within the project are selectively used by hollow dependant species for nesting and roost sites. The Offset Strategy in Appendix F in the EA is very limited with information. The EA indicates Epuron have lease agreements will all involved landowners where infrastructure is proposed. These contracts stipulate that land maybe considered for biodiversity offsets. The EA hasn't made it clear they have obtained the area required for offsets. There are no contracts held guaranteeing the required amount of area the offset will be established on.

Table 4.2

Dams and Watercourses generally occur outside the development area. Dams in project area in poor condition.

Depending on when this observation was made, November/December 2013 had little to no rainfall recorded in the area. The year was below average rainfall. Autumn 2012 saw no rainfall for a whole two months. Late 2011 the dam water levels were low due to limited rainfall for spring. The area is covered in third order tied streams, named creeks and numerous farm dam water storages. The

developer is totally misleading making the statement of dams generally outside the project area. The Livestock Land Services (LLS) livestock rates income for the Rye Park area that development area covers , will indicate the carrying capacity of livestock for the area. These livestock depend on dams and watercourses for vital drinking water for survival.

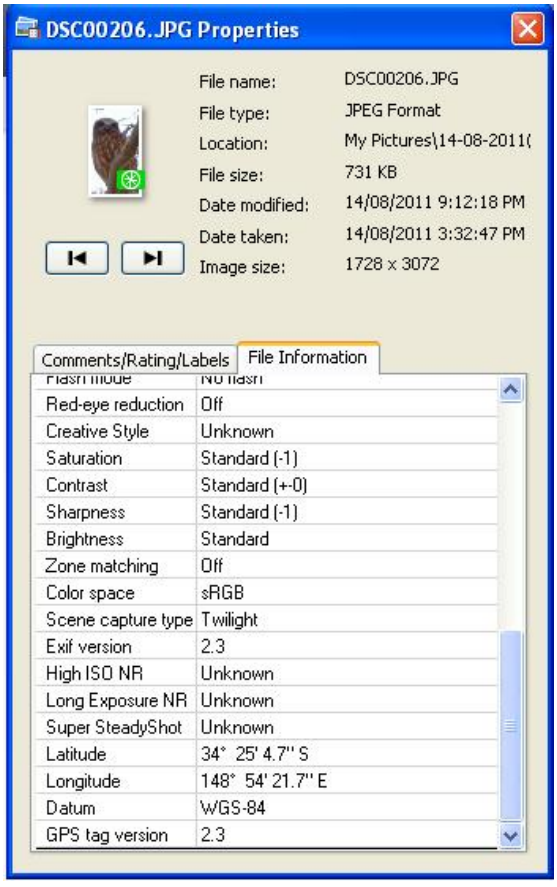
7.2.1 Vegetational Clearance

The supporting infrastructure may require substantial clearing of vegetation.

The amount of vegetation this project is to remove should already been listed in the EA. This vegetation removal will further removed critical habitat for all species located in the Rye Park project area. The developer needs to inform the planning department of the amounts of vegetation that would be removed. They should already know this from field studies of the area, aerial maps and basic community consultation they have clearly avoided to do in their planning process. With clearing comes the impacts including weed spread. Who is to control the weeds after construction phase of the project? 18.2km of 132kv transmission lines will remove 82ha of woodland and forest. This need to be revised and the transmission line relocated to reduce or avoid the removal of any woodland and forest.

Powerful Owl and Barking Owl- The Barking Owl is more likely to forge through the area that the Powerful Owl but no records are known for this species within at least 40km of project area. The proposal is therefore not considered to have a significant impact on these species.

The inserted photo so of an owl ,located on a property 5km from the northern boundary of the Rye Park Wind Farm project. Included in this photo is the GPS location of this photo.



Machinery Hygiene Plan

EA indicates they will establish a machinery hygiene plan to ensure vehicle and machinery is absent of organic matter pre and post site access. That plan should be developed and included in EA. Where are these sites to be established? Are wash down bays to be constructed? Where will the runoff water flow? The project area will have periods of low amounts of water supply available for machinery hygiene. Will this water be trucked in from towb water supplies of either Yass or Boorowa?

8.4 Decommissioning Phase

Who is responsible to develop a flora and fauna management plan for Rye Park Wind Farm as stated in EA. How long will the wind farm operate? There is no time frame of the lifespan of the wind farm in the EA?

Conclusion

Clearly the Biodiversity Assessment produced by ngh environmental for the developer Eupron is misleading, incomplete and flawed. The deception of the information the developer has complied in the whole EA with the level of community consultation has been appalling for the proposed development. This application should be rejected by state or federal government due to the extreme high level of endangered ecological communities of flora and fauna, the region a listed threatened box gum woodland area and the south-west slopes of NSW being the only breeding ground for the vulnerable listed Superb Parrot that this industrial scale development project will permanently affect. This region needs to be preserved for future generations of flora and fauna to flourish and expand their population numbers and decrease the large amount of vulnerable, endangered and threatened species the region currently encounters. Wind farm green energy will destroy current biodiversity of the Rye Park area that is irreplaceable.

SECTION D
TRANSPORT AND TRAFFIC

Transport and Traffic

Rye Park Wind Farm Traffic and Transport Issues
Prepared by: Christopher C Braid BURP, For the BDLG

This submission is in response to Epuron's Rye Park Wind Farm Environmental Assessment and the issues surrounding transport, traffic and impacts that will occur on local roads and to the community.

1. **Primary Routes**

The primary routes as outlined in the EA will pose major obstacles to Epuron, particularly the underpass on Cooks Hill Rd under the Hume Highway for the Northern Section of the proposed development. Given that the bridge has a clearance of 5.3m many if not all of the large turbine and substation components will be forced onto the secondary route of the Lachlan Valley Way through Boorowa. Any over mass loads, nacelle, towers or substation components, would be required to use the secondary route through Boorowa as the rail crossing bridge on Cooks Hill Rd may not be of engineering standard to carry up to 80 tonne.
Should the primary route for the northern section not be able to be used by over size / over mass loads then 104 of the proposed 126 would have to enter through Boorowa as connection between Jerrawa Rd and Rye Park Dalton Rd is not possible.

The end of Cooks Hill Rd and sections of the Rye Park Dalton Rd in the Upper Lachlan LGA are unsealed and must undergo a study in the same manner as Coolalie Rd.
The Rye Park Dalton Rd has a low level crossing over Flakeney Creek and a bridge over Pudman Creek. Both would need to be inspected by engineers prior to over mass loads using this route.

2. **Secondary / Alternate Routes**

The secondary route of the southern section passes through residential areas of Yass. This would mean disruption to local residents particularly for any night oversize deliveries. Coolalie Rd has a bridge over the Hume Highway which could require consultation with engineers if over mass loads are to enter the development via route.

The secondary route for the northern section uses the Lachlan Valley Way between Yass and Boorowa. As advised to Epuron the Boorowa Council has asked that the main street not be used for the transport of over size or over mass loads. Councils preferred route is to use Trucking Yard Rd which becomes Dillon Street then left onto Long Street and right onto the Boorowa Rye Park Rd. All of this passes through residential areas.

The turn from Dillon St into Long St is a sharp left turn with a reasonable incline. This corner would have to be substantially modified to allow over size loads to turn.
On Long St before the intersection with the Boorowa Rye Park Rd there is a steep decent

that would require the use of compression braking by trucks with a residential area. Long St passes to the east of the Boorowa hospital and retirement home.
The Boorowa Rye Park Rd has narrow sections 1.5 to 4km east of the town and 2 bridges over creeks that would require consultation with engineers.

As stated in the EA (page 222) each turbine could consist of 10 sections, 5 tower sections, 1 nacelle, 1 hub and 3 blades. The northern section could have 104 turbines that need access through Boorowa. That would equate to 1040 oversize/ over mass loads passing through the town of Boorowa.

Alternate route through Boorowa would pass through higher density residential areas along Court St or Farm St to Brial St. This would involve passing the Boorowa Central School and Pre School. The Main St of Boorowa is not an option given the roundabout at the corner of Marsden and Pudman St.

3. Construction Material Transport and Traffic.

3.1 Gravel and Road Base

Throughout the EA a number of differing distances are given for the length of road/track construction that will be undertaken for the development. Page 64 Table 3-1 shows access and spur road construction to be 10m in width and 88.9km in length. Page 277 Table 16-6 shows assess track width of 5-6m and 89.13km. Table 7-2 of the Biodiversity Assessment prepared for Epuron by NGH Environmental shows there would be 125.755km of new tracks and 40.705km of widening existing tracks.

Epuron has estimated the total volume of road base (page 277) to be 306,960 m^3. Estimated rock extracted from the 126 foundations is 64,512m^3. This estimate is from the total extraction and includes top soil and non-useable gravel. These estimated will still result in 242,448 m^3 being sources from off site.

A typical gravel truck and dog trailer will carry 16m^3. This equates to 15,153 truck and trailer loads to be carted in from outside sources.

Epuron have used the minimum road width, 5m, to calculate their figures. If you use their figures from the Biodiversity Assessment and allow 8m for formed width of access tracks plus gravel requirements for hardstands and compounds then they will require 414,816m^3. This estimate does not include requirements for connection substation, 2 collection substations, control building or the 2 concrete batch plants as Epuron do not outline these in the EA. Estimated gravel requirements for these structures is 36,000m^3. If the figures from the biodiversity assessment are correct and 166.46km of track are to be constructed or widened then 661,872m^3 of gravel would be required for the construction of roads, compound and hardstands. That equates to 41,367 truck and trailer loads.

If Epuron is able to extract some of the material from foundations, approximately 60% or 38,707m^3, they will still require an additional 412,109m^3 to 493,965m^3 of gravel from off site or 25,757 to 30,873 truck and trailer loads. All of this material will need to be carried over local roads. Should the geology show that the gravel is not up to standard and it all has to be sourced off site then 28,176 to 41,367 truck and trailer loads will be required dependent on which of Epurons road length and width figures are actually correct

3.2 Concrete

Epuron states that foundations will occupy an area of approximately 16m x 16m and 2m deep. This gives a foundation of 512m^3 at ground level. If 750mm is allowed for the height of the foundation above ground level then the concrete materials required are double what Epuron outlines on page 278 of the EA. Epuron has only allowed for a 350m^3 concrete foundation in the EA.

This will equate to 88,200m^3 of concrete required for the turbine foundations. If this is batched off site it will equate to 14,700 concrete truck loads assuming 6m^3 per truck. Even if batched on site all the material will need to be delivered and would equate to approximately the same number of truck movements.

3.3 Water

Epuron has estimated 8.0 ML (megalitres) of water will be required for general construction and 7.6 ML will be required for foundations (page 265). This equates to 15.6 million litres of water. A water truck has a capacity of approximately 16,000 litres so will require 975 truck movements.

The water is to be sourced off site at Yass or Boorowa but more likely at Burrinjuck Dam. These figures do not include requirements for the construction of substations, batching plants, compounds, etc.

The water requirements for the foundations could also double as shown above if foundations are actually 650m^3 to 700m^3 rather than the 350m^3 that Epuron is using for the EA. This would result in 23.2 million litres of water being required for construction. This will not only add to the strain on the local roads but potentially Yass and Boorowa's water supplies should the water be sourced from these towns.

4. Conclusion

This environmental assessment produced by Epuron appears to have been rushed. Many of their figures related to transport and traffic volumes do not correlate throughout the EA. Epuron is either negligent or deceptive in its figures and much, if not all of the traffic and transport sections of the EA must be revised.

The fact that Epuron has not included gravel, concrete or water requirements for the construction of the connection substation, 2 collection substations, control building or the 2 concrete batching plants in the EA shows that Epuron are being deceptive and

these figures must be included in any revision of the EA.

Epuron has failed to outline any of the predicted traffic and transport issues that will arise during the decommissioning and rehabilitation phase of the project. Epuron have failed to outline expected traffic volumes during this period or expected materials required to be carted to the site. ie top soil, gravel etc.

The material requirements for the Rye Park Wind Farm will mean truck movements in excess of 48,000 over local roads. In addition to this would be 1200 plus over size / over mass truck movements of turbine components plus the delivery of equipment i.e. dozers, graders, cranes, etc. This does not take into account vehicle movements for staff during construction, operation, or decommissioning of the wind farm.

The cumulative effect if Bango and Rugby wind farms are approved would be large. With an addition of approximately 180 turbines for the two projects, truck movements would exceed 120,000. The cost to local roads would be at the expense of the communities of Yass, Upper Lachlan and Boorowa. Many of the local roads are not constructed to handle such large volumes of heavy traffic and as such will deteriorate greatly.

Epuron must undertake greater consultation with the local councils in relation to road conditions as large scales road degradation will result from the volume of heavy traffic. An independent review of all roads involved must be undertaken at Epuron's expense and legally binding contracts entered into between Epuron, local and state government so that all roads are returned to a minimum of pre development condition at Epurons expense. If this is not done it will be the local communities and state government that are required to fund all road repairs.

SECTION E
PROPERTY VALUES

Property Values

The Impact of Wind Turbine Developments on Surrounding Rural Land Values in the Southern Tablelands, N.S.W. – Peter Reardon, September 2013.

See full report – Attachment 11

Conclusions:

Contray to published reports to date on the issue of impact of wind turbine developments on land values to adjoining or nearby properties, this report provides clear evidence that this type of development has resulted in a negative impact on marketability and the value of properties to varying degrees. Discounts in value as identified of 33% & 60% in the market place cannot be ignored.

The acknowledgement of this detriment has also been realised by the proponents of the Rugby wind farm proposal near Boorowa N.S.W. We have information indicating that 'Neighbouring Host Agreements' or 'Compensation Deeds' have been agreed to and signed that compensate owners who have a residence within 2 kilometres distance of proposed future wind turbine developments.

The commentary from key real estate agents who deal in these impacted areas on a daily basis cannot be ignored.

There are a vast array of property types, sizes, topography, aspects, and improvements. In our professional opinion there is no 'blanket rule' as to the percentage of detriment that can be attributed to any particular property impacted by wind turbines. As a generalisation we consider that the greater the distance, and out of sight position of wind turbines to a residence, the lower the reduced marketability and impact upon value to a property will be. Each property therefore needs to be assessed more on a 'case by case' basis rather than an individual 'blanket rule'.

Our initial findings detail that the marketability of certain properties (especially those with lifestyle appeal and/or residential improvements) to be the most severely impacted upon by wind turbine developments. This detriment appears to occur from the initial time that a proposal has been advertised within a locality. The public knowledge of the potential for this type of development appears to create some uncertainty in the market place as to the impact that these potential future developments will have. There is therefore reluctance by purchasers to invest into an area where this uncertainty exists not only from the potential of any future financial loss, but also the blight on many property views and aesthetic appeal, which is a strong consideration by many city based purchasers who acquire properties in the Southern Tablelands.

Given the number of developments existing, under construction and proposed in the

Southern Tablelands, we consider further market evidence will eventuate in the near future.

Further Research and Review Recommended

The strongest potential for future market evidence may come from the 'Gullen Range' wind turbine development to the north west of Goulburn. There are a number of circumstances with this proposed wind farm that have required the wind farm developers to acquire properties at a market rate plus fair compensation. The proponents of this development are proposing to resell these properties after the construction of the wind farm is complete. Taking into account any difference in market conditions between each transaction date, these sales should be able to be analysed in a similar approach to the existing market evidence analysed herein to determine the impact of wind turbine infrastructure.

Larger rural grazing properties nearby or adjoining wind turbine developments, from evidence available are less likely to be impacted upon, if residential improvements are located significant distances away and/ or out of sight and sound from turbines. Future research and consideration needs to be given to larger properties with subdivision approval and/or potential for future subdivision. Many land holders of larger grazing/ farming properties, often view the future subdivision potential of their land to offer a good form of future superannuation when they reach retirement age. Strong consideration and future research needs to be undertaken to determine how this particular type of land holder is impacted upon.

There are also certain rural localities within the Southern Tablelands that have very high (bordering on prestige) land values underpinned by wealthy city based interests. One such example is the
'Roslyn' rural locality to the south east of Crookwell. Many smaller rural residential properties in this locality have present values in excess of $1,000,000, and many large grazing properties in this area have sold for between $2,000,000 - $15,000,000. If wind infrastructure projects are undertaken in or nearby to these localities in our opinion these areas have the potential to show the largest falls in market value. The type of purchaser, who pays a premium for land in this locality are very particular in their requirements. This type of purchaser will not simply accept a discount in value for the negative impacts of such developments, rather they will simply choose not to purchase land in this locality. If such developments proceed in or nearby to these localities, this may cause land
values to revert back to rural grazing rates. Again further research needs to be undertaken in the future to this regard.

Of greater concern is perhaps the overall 'blight' that may occur in certain rural localities due to the the large number of turbine infrastructure developments and high densities.

The significant wind turbine developments that are proposed to be located within a 90 kilometre radius of Goulburn could have a more significant total bearing and blanketing impact upon the entire rural residential and lifestyle market in this northern section of the Southern Tablelands. We consider that a similar situation could arise in the Jugiong, Yass, Rye Park, Boorowa and Rugby localities with a similar high density of turbines proposed in these adjoining regions. Prospective purchasers of rural residential and lifestyle properties could look to other localities outside of the Southern Tablelands for this reason.

Further research outside of neighbouring or nearby property values needs to be undertaken on the economic advantages and disadvantages of this type of development. Further studies are needed on the economic benefit to regions, towns, and city's that go ahead with this type of large scale development. The initial construction stage of a wind turbine development creates employment and economic benefits to communities, however after this initial construction phase, what are the future economic benefits to these stakeholders? There are minimal future capital expenditure requirements by these developments. Only a small number of host farmers/ landholders receive any future income or benefit into the future. Is it therefore worthwhile locking large land areas into this type of long term agreement when perhaps rural residential/ lifestyle development may provide for a larger continual stimulus and growth for the economy in these rural locations.

We would recommend further research be carried out and this report be updated when future market evidence is available regarding the impact of wind turbine developments on property values in this locality given the Southern Tablelands close proximity to major urban centres and large population bases.

SECTION F
DECOMMISSIONING

Decommissioning

The provision by the proponent to estimate the net decommissioning costs 'at least 5 years prior to the terminating date' of the industrial wind turbine facility and subsequent depositing of 20% of estimated costs into anb account set aside solely for the purpose of funding the expenses of decommissioning is inadequate and impractical. It will be very difficult to predict the lifespan and viability of the project, and as a consequence estimating costs 5 years before this very unpredictable date will also be difficult. This undermines all credibility of the proponents suggested decommissioning plan.

Wind developers and some host landholders claim that "scrap value" for turbines will cover or exceed decommissioning costs.

This assumption is **incorrect** and highlights that decommissioning issues are a more recent problem the wind industry and the NSW Government should now be addressing. **Industrial wind energy developers are making exactly these same claims in planning applications that have been approved in NSW without question to date.**

The proponent relies on the savage scrap metal value of the turbines to provide funds to cover decommissioning costs, and this again undermines the practicality, credibility and possibility of the current decommissioning plan to be adequate.

Salvage value for scrap is vulnerable to market price volatility and thus should not be considered a reliable funding source for decommissioning the Project.

A USA study on public record was independently commissioned regarding realistic decommissioning costs for a proposed 124 turbine project in West Virginia. This study, by Energy Ventures Analysis Inc (EVA), found that the wind energy companies engineering decommissioning report stating that costs would be covered by scrap were incorrect. **EVA found that the decommissioning costs for that particular 124 wind turbine development were underestimated by US$10million.** The final decommissioning estimate (**in 2008**) was US$100,000 per turbine, resulting in an up-front bond estimate of US$12+million at the start of the project. It is becoming more likely that future industrial wind energy projects in USA will require an up-front bond, without inclusion of any scrap value due to the fluctuating nature of the scrap metal market. Should such large bonds be required by any future government legislation, these would be an additional financial burden that may halt a project after a lease has been signed, potentially leaving the landholder tied to an onerous long term lease agreement without income. The potential problem should decommissioning not be underwritten is that this financial burden reverts to the landholder and/or the community. **An Australian Bank Guarantee & upfront AAA bond to cover decommissioning costs at the start of the project must be required of the proponents. The government should administer the decommissioning fund.** The establishment of a fund to decommission the Project is necessary in the event the Project does not succeed, or to ensure its timely and permanent removal at the end

of its useful life. The amount placed in the decommissioning fund should represent the full estimated costs of decommissioning without netting out estimated salvage value.

A summary of the USA decommissioning report *"Decommissioning costs and scrap value: Beech Ridge wind energy facility"* by Energy Ventures Analysis (EVA) appears below.
Decommissioning costs and scrap value: Beech Ridge wind energy facility

- Hewson, T & Stamberg, J, (2008), "Beech Ridge Energy LLC Financial Assurance Needs", Energy Ventures Analysis, Inc. Available on line at : http://www.windaction.org/documents/23450
- This document is the full Energy Ventures Analysis (EVA) decommissioning report on the USD$10million underestimate for the 124 turbine Beech Ridge development in the USA. Many NSW developers are claiming that decommissioning is covered by scrap value, this report shows that this is not the case and a serious underestimation of the realities of decommissioning/site restoration. Cost estimates per turbine for decommissioning were US$100,000 at $2008 prices for this particular facility, and ultimately the landholder is potentially liable should funds not be available by the wind energy company.
- Decommissioning costs and scrap value: Beech Ridge wind energy facility October 6, 2008 by Tom Hewson
- Summary:
- Tom Hewson of Energy Ventures Analysis, Inc. ("EVA") was hired by the citizen's group, Mountain Communities for Responsible Energy, to evaluate a Decommissioning Cost Report prepared for the Beech Ridge Energy Project - a 124-turbine project proposed for Greenbrier County, West Virginia. His summary below provides insight into what communities and permitting agencies should be looking for when evaluating decommissioning plans. Mr. Hewson's memo on decommissioning of the Beech Ridge wind facility, which was included in the public record before the West Virginia Public Service Commission on the project, can be accessed by clicking on the link below.
- Tom Hewson of Energy Ventures Analysis, Inc. ("EVA") was hired by the citizen's group, Mountain Communities for Responsible Energy, to evaluate a Decommissioning Cost Report prepared for the Beech Ridge Energy Project - a 124-turbine project proposed for Greenbrier County, West Virginia.
- The project wind developer, Invenergy, had argued that the scrap value of the wind turbines would far exceed the cost to decommission the wind project and thus, bonding only $2,500 per turbine that would slowly escalate to $25,000/turbine by year 16 would be more than adequate.
- The applicant's consultant estimated that its salvage value credit would reach $12.64 million ($101,900/turbine) in their decommissioning fund study based upon application of general scrap factors and prices. This scrap value credit would more than offset their estimated demo costs ($8.68 million: $70,000/turbine).
- EVA completed an independent assessment of the salvage value of the Beech

Ridge Wind turbines by first contacting the major regional scrap yards directly and obtaining current scrap prices for steel, copper and transport. From these data, EVA developed a Beech Ridge project-specific salvage credit estimate of only $2.63 million, i.e., $10.01 million less than the original applicant study. They also uncovered several major flaws in the applicant study methodology and pricing. The developer not only used old scrap prices but failed to take into account costs related to transporting scrap to a yard. In addition, to obtain the posted scrap price, they would need to break down the tower into 3-4 ft length pieces else the quoted price would be significantly less. In addition, the copper materials must also have their insulation stripped and/or copper pieces separated to obtain their posted copper price. If not, their scrap value would be far less than the common posted price. Given the large drop in scrap prices in recent yeard (>40%), EVA found that scrap value would no longer cover decommissioning costs.

- EVA also compared the estimated demolition costs to another decommissioning report for another wind project developer that had contained detailed cost breakdowns. The other study estimated demo costs of $97K/turbine vs. $70K/turbine by Beech Ridge. Using the demolition costs from the other wind turbine project decommissioning study would translate to a Beech Ridge demo cost of $12.03 million, i.e., $3.35 million more the applicant's $8.68 million estimate. (Note: In another very recent project EVA had reviewed, the decommissioning costs were again severely underestimated by more than 50% by not taking into account recent crane rental rates, assuming extremely low earth moving costs, and assuming high productivity rates (6 turbines/wk).)
- The bottom line is that even if the permitting agency allows the salvage credit, the total net cost of decommissioning the Beech Ridge project today would be $10.4 million ($83,900/turbine). EVA's analysis quantified the large scrap price and demo cost escalation risk being assumed by the local community. To protect the community, the permitting agency should require a bond of a minimum $100/K per turbine ($12.4 million) to capture demolition cost escalation risk. If the wind developer can convince the bonding company of the high salvage value, then they should be able to negotiate a lower rate for the bond. If they were right, there would be very little price difference for a larger $12+ million bond. EVA encourages shifting the risk to the bonding company. The developer and bonding company should assume the price risk and not the community.

See attachment 15 Decommissioning Report - Stoops & Neville.

The difficulty and expense highlighted in this document in recycling the blades of the turbines has not been considered by the proponent, and as a consequence, the provisions for decommissioning and recycling of the blades as stated by the proponent are inadequate, unrealistic and impractical.

See attachments 12, 13, 14 & 16 for further information.

SECTION G
HEALTH

Health

AUTHORSHIP

This report has been prepared for FOC (56) by:

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INTRODUCTION

This report will be confined to noise, health and related issues, with the implications for the Collector Wind Farm proposal. Aspects of health information contained in the Marshall Day Acoustics report within the Collector Wind Farm Environmental Assessment will be discussed.

There is now significant national and international research and disquiet indicating that an undeniable health problem exists for people whose residences are sited in close proximity to industrial wind turbines. Undoubtedly there are multifactorial causes, but the most consistently demonstrated association is that of intrusive noise both audible and inaudible. Inaudible noise is both low frequency noise and infrasound.

Infrasound, while not actively "heard" is perceived by the highly sensitive outer hair cells of the vestibular apparatus of the inner ear as a vibration. Human vibration detection is many times more sensitive than that of sound. Infrasound is sound of less than **20 Hertz** and some of the frequencies in this range are associated with synchronisation of brain waves particularly the theta waves with cycles of 5 to 8 cycles per second. The mechanism of ill health is mediated by repeated stimulation during sleep to a wakeful or alerted state resulting in chronic sleep deprivation. As with motion sickness, it appears to affect some members of the community more than others. Human hearing never sleeps, hence the disruptive nature of intrusive sound and why for, example, we use noise emitting smoke alarms at night for warning rather than some other alerting device.

There are known at-risk associations such as age (both the young and people over 50 years) and sufferers of migraine, tinnitus, motion sickness or people with previous middle ear problems, either through disease or degenerative change. Also, adverse health effects seem to worsen with prolonged exposure to infrasound and are thus thought to be ***cumulative*** in effect.

To fully understand the relationship of industrial wind turbines (IWT) and ill health it is necessary to understand the particular characteristics of IWT noise and the physiological effects likely to be produced in human recipients. Background information is provided in the following section within an historical and current context.

INDUSTRIAL WIND TURBINES, SOUND MEASUREMENT AND HUMAN SOUND PERCEPTION

1. Industrial Wind Turbines (IWTs) are significant structures of human engineering. Current models consist of a tower at the top on which are three rotor blades attached by a hub to gears and a generator. These sit in a box (nacelle) at the top of the tower. The tower is anchored to a steel reinforced concrete foundation. A motor turns the nacelle to face into the wind. The blades spin upwind of the tower and blade angles are adjustable. When the rotor spins, it turns a shaft. The shaft spins magnets inside copper coils. This induces a current in the coils. The frequency and voltage of the electricity so generated is modified by circuitry and the current is transferred to the relevant Grid.

2. There has been a significant increase in the height and size of turbines since original construction. Initial tower heights were about 15 metres in the 1980's with a power output of about 50 kW. By 1990, towers were up to 40 metres, doubling to 80 metres by 2000. Power output had increased to 2000 kW. The turbines presently proposed in most developments in NSW are approximately 162 metres in overall height with tower heights of up to 100 metres and blade lengths of over 60 metres. Prototype turbines are now 193 metres in height. As the wind industry has developed with government renewable energy targets and subsidies, the variety of terrains into which the turbines have been located has extended.

3. The **human body** however, is a vastly more complex piece of engineering than an IWT. The capacity of the human organism to function depends on its capacity to react to its external and internal environment. We possess refined sensory receptors – our skin, our ears, our eyes, our motion and balance senses amongst others – which allow us to do this. These receptors transmit detailed information via our neural pathways to our brains which in turn process this information and co-ordinate our bodies' responses to it. As would be expected for survival, many of these responses occur automatically, without conscious control. Each night, we sleep and the cognitive processes of the brain are consolidated. It is not surprising, indeed it is completely predictable, that if our sensory input or our sleep is disturbed in a prolonged manner, we may, and will, become sick. Our capacity to hear persists even during sleep as opposed to other sensory modalities.

4. Operating IWTs emit sound energy which is transmitted as waves. The science of sound and its associated physics is far from simple but an understanding of the physical principles of sound and its effect on human health arising from IWT projects is central to this document.

The spectrum of sound waves is continuous but is commonly divided into the classifications of **infrasound**, **low frequency sound**, **mid-frequency sound** and **high**

frequency sound. Although variable classifications exist the one used here is after Dr Robert Thorne and consists of:

Infrasound 20 Hz and below Low Frequencies 20 Hz to 250 Hz Mid frequencies 250 Hz to 2000 Hz
High frequencies 2000 Hz to 20,000 Hz38

5. The Hertz measurement refers to the cycles per second at which the wave is travelling. Lower frequencies have **longer** wave lengths than higher frequencies. The **force** of the wave (referred to as sound pressure level - **SPL**) is measured in **decibels (dB).**

6. There are a number of scales available to measure sound energy. Some of these scales give weight (i.e. give preference or filter) to particular frequencies in their measurements. The sounds of all frequencies are not heard equally well by humans.

The **A scale** was developed to deal with **human hearing**. Most studies of community noise have accordingly used the A weighted scale. This scale weights the contributions of sound waves in the 1,000 Hz to 6,000 Hz range. It progressively **reduces** contributions from about 500 Hz down and 7,500 Hz up31,35. Pierpont20 states that the effect of the weighting is to reduce sound measured by about 30 dB at 100 Hz, and about 40 dB at 31 Hz. So the A weighted scale **does not give**, or purport to give, a pure measure of frequencies outside the range of hearing of the human ear and ***increasingly*** **distorts** the contribution of lower frequencies as it moves down the spectrum34.

7. The **C scale** captures sound equally (i.e. without weighting) over most of the audible range down to 31 Hz. After this, it has a decreasing response. The **Z scale** is an unweighted scale (sometimes called **"Lin"** or **"Flat"**) which gives an equal response to sounds between 10 Hz and 20,000 Hz in acoustical standards. The **G weighted scale** measures infrasound frequencies. Some researchers prefer the G scale for infrasound measurement although Dr Thorne uses the **Z scale** in conjunction with the C weighted scale. The following figure effectively demonstrates how the use of dBA units fails to measure infrasound frequencies.

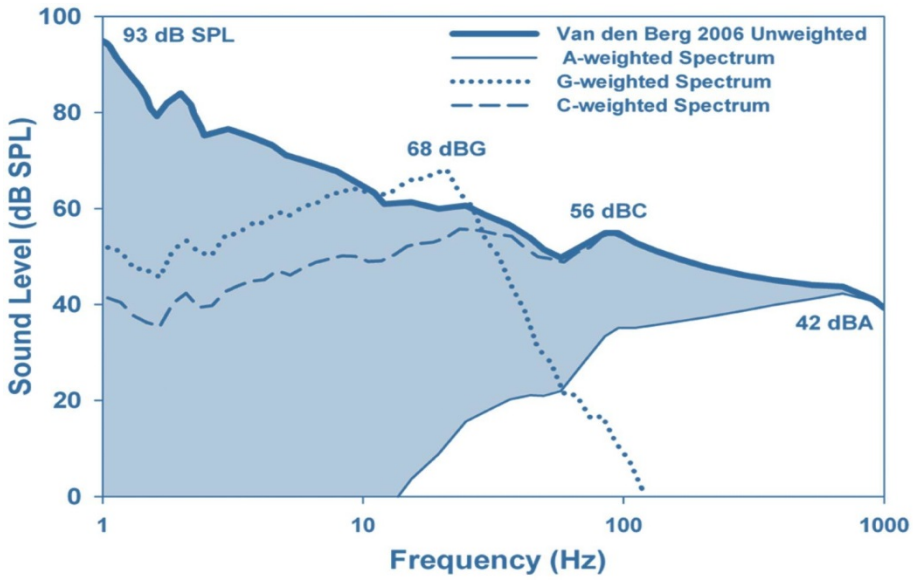

Figure 1: from Salt and Kaltenbach27: Low-frequency components of wind turbine sound spectrum (below 1 kHz) before and after A-weighting. The original spectrum was taken from Van den Berg (2006)54. The shaded area represents the degree of alteration of the spectrum by A-weighting. A weighting (i.e., adjusting the spectrum according to the sensitivity of human hearing) has the effect of ignoring the fact that low-frequency sounds can stimulate the OHC (outer hair cells) at levels that are not heard.

Representing this sound as 42 dBA, based on the peak of the spectrum ignores the possibility that low-frequency components down to frequencies as low as 5Hz are stimulating the OHC. Also shown are the spectra after G-weighting (dotted) and C-weighting (dashed) for comparison.

8. The relationship between our perception of sound and the measurement of sound is interesting. If we can hear sound, we do not necessarily hear in accordance with what is measured.

9. *Firstly*, it is usual for sound measurements to be ***averaged*** over time. If the time period over which sound is measured is short, unique noise events will be captured. But over a longer period, unique events are averaged away22. As it is often said, the human organism does not perceive averages.

10. *Secondly*, sound is perceived against a background of other sounds. The relevance of background noise in determining the perception of noise is well recognized18. Sound may, in some circumstances, be masked by other sounds and we do not perceive it notwithstanding its presence. Conversely, it is widely accepted that sound is likely to be perceived more loudly if it is heard against a quieter background. ***A difference of 10 dB is perceived by human hearing as twice as loud.***

11. Sounds are not constant. Just as we may perceive a contrasting sound as louder than measured, we perceive increases in sound from a single sound source as **greater**

than the actual change in decibels37. Again a 10 dB increase from a single sound source is likely to be perceived as twice as loud as the original sound.

12. Leaving aside audibility, sound waves in the **low frequency** and **infrasound frequency** ranges share characteristics which differ from sound in the **mid to higher frequencies** and which are pertinent to the IWT/adverse health debate. In particular, infrasound and low frequency sound waves **attenuate** at slower rates. They **travel further** and **fall away less quickly**. At distance, when sound emanates from a broadband source, the lower frequency components will **dominate**. Lower frequencies are less easily masked by noise in the mid to high frequency ranges40. Low frequency waves, with their

longer wavelengths, are **not effectively filtered by buildings44.** Nor is hearing protection effective34. The following table demonstrates the length of infrasound wavelengths.

Table 1: Infrasound Frequency and Wavelength in Metres.

Frequency	Wavelength	Frequency	Wavelength
20	17.20	3	114.60
15	22.93	2	172.00
10	34.40	1	344.00
5	68.80	0.1	3,400.00
4	86.00	0.001	344,000.00

13. In relation to the human perception of lower frequencies, low frequency sound may be audible. Older people's hearing is proportionally more acute at low frequency ranges than mid to higher frequencies34. Infrasound is generally regarded as **inaudible** but research has established that there is in fact a **threshold for audibility**. The World Health Organization states that noise with low frequency components requires **lower guideline values** in view of health effects being **more severe** than for community noises in general32.

14. Audible or not, the ear is **sensitive to infrasound**. Recent American studies have confirmed that the ear of higher mammals responds to infrasound waves below audible levels23,24,25,26,27,28,29. The research suggests that this may occur in a number of ways – by stimulation of the Outer Hair Cells of the Cochlea (the Inner Hair Cells respond to sound which we hear), by affecting the ear's response to higher frequency sounds, by stimulation of the vestibular hair cells or by influencing the volume of the fluid in the inner ear (the endolymph). This research highlights that the ear is both the organ of **hearing** and the organ of **balance**. Any effect on the vestibular system

will impact on the body's balance and equilibrium.

15. Note also, that sound waves are **energy waves**. In addition to allowing humans to hear when they impact on the ear, they may cause vibrations in other organs as well as in external structures. Just as low frequency noise can cause vibrations of walls or windows, the bones, organs and tissues of the body are capable of vibration and resonance also. Various organs and tissues will resonate at different frequencies.

INDUSTRIAL WIND TURBINES OPERATING CHARACTERISTICS

1. What happens to sound waves and vibrations when IWTs are anchored into place in varying numbers in different locations and are "turned on"? The immediate answer is "we don't know" with any real specificity or accuracy.

The adequacy of wind industry modelling and pre-construction predictions has been criticized in peer reviewed literature. Wind farm compliance measures are carried out by the wind industry to the **minimum extent necessary to comply** with development conditions. This means the extent of comprehensive and detailed independent studies is usually very limited.

2. When turbine blades rotate, they produce soundwaves through the broadband spectrum ranging from infrasound, through the lower frequencies and the mid and high frequencies. As the blades rotate through the air, the **pressure (amplitude)** of the waves so created **fluctuates** or changes. This is referred to as **amplitude modulation**. With audible waves we hear the modulation often described as louder/softer, louder/softer or swish/swish/swish. Some evidence indicates that this variation is heard when the blades pass from the horizontal position going down. When the blade comes up, it is passing through varying degrees of air turbulence and the change in frequency is audible as a thump or a beat23,24,25,26,27,28,29. The fluctuations in the sound waves are occurring across all frequencies but it is common for people living near wind farms to describe an audible "swish/thump", "swish/ thump" with variations in the "thump."

3. In relation to frequencies that are audible, **amplitude modulated** noise is more **easily perceived and more annoying** than a constant level of noise37. Swedish researchers have shown that audible noise from IWTs is more annoying than other kinds of industrial/transportation noise levels for this very reason3. Residents have been shown to be highly annoyed by wind turbine noise at 38 dBA while aircraft noise has to reach 57 dBA, and road traffic noise, 70 dBA *to produce similar annoyance*. Audible wind turbine sound waves vary in amplitude within relatively short spaces of time, and without cessation, even at night. They are likely to be far more intrusive to the central nervous system than a pure amplitude measurement would suggest.

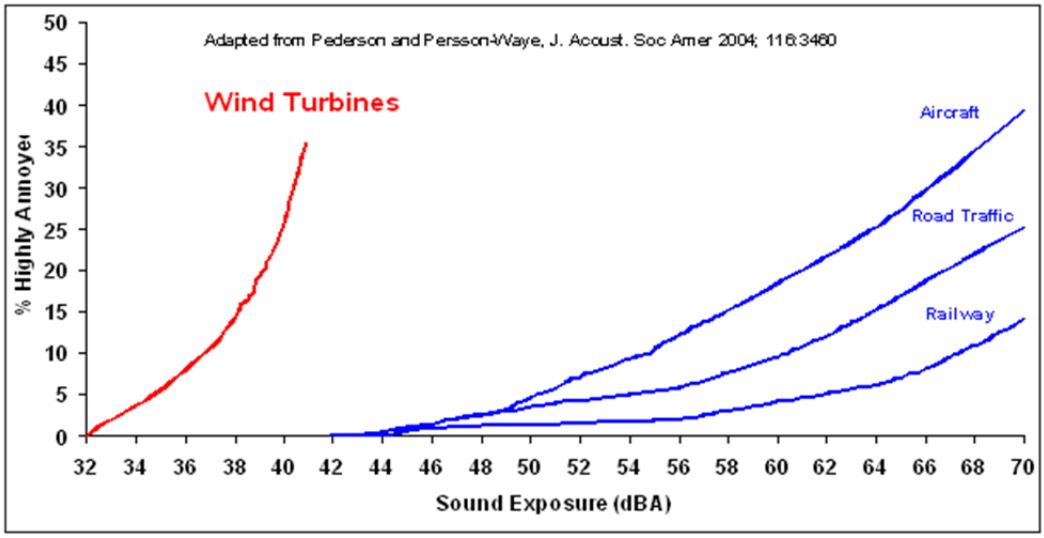

Figure 2 from Pederson and Persson-Waye55. The relationship between annoyance and different noise sources.

It is clear that wind turbine noise is clearly "different" from other types of noise. Compared with aircraft, automobile or rail traffic wind turbine noise at about 30 dB lower levels (40 dBA rather than 68 dB A or higher) annoys
30 % of people. There are attempts to justify the increased annoyance by other (e.g. visual) factors but the possibility remains that the noise itself could be more annoying, due to the **infrasound that is present in the noise but which is excluded from the A-weighted measurement.**

4. When multiple turbines are placed together and are operating, what is occurring to the energy waves? Dr Robert Thorne suggests that with two or more turbines in phase together and a light breeze, there can be a variation (i.e. an increase) of 6 – 7 dBA arising from the synchronicity of the blades. Recall that a 10 dBA change in a sound source is likely to be perceived as twice as loud. Alternatively, if the blades are not operating in synchronicity or there is turbulence with different wind velocities and directions (a common occurrence with ridgeline wind turbines), the "thump" produced by the upward blade movement is exacerbated. The blades cannot be continuously and sufficiently adjusted to cope with the turbulence.

5. Further, Dr Thorne and others have shown that downwind from a cluster of turbines, vortices interact and sound is enhanced. Thorne describes these areas where sound is amplified as **Heightened Noise Zones (HNZ)**. There can be significant variations in residences reasonably close to each other if one falls within a Heightened Noise Zone, receiving higher amplitude of waves temporarily, and the other does not. As wind directions change, so do the Heightened Noise Zones. The same residence may be in a HNZ at some times and not at others.

6. The audible amplitude can also be markedly affected by terrain. The most productive land based wind sources can be along ridge lines with houses nestled in adjacent valleys. It is along ridgelines that **noise enhancement** also occurs. Partly, this can be as simple as the fact that a house is built in an area protected from the usual wind in the area. The masking effect which the wind might otherwise have on the audible turbine noise is absent. Remember that noise perceived depends partially on background and masking noise. More importantly, wind turbine noise is enhanced by the atmospheric conditions which frequently occur in ridges and valleys. Warm air rises. At night, the air stabilizes. With a light wind blowing at turbine height, sound levels at homes 800 to 3200 metres away in the valley have been measured at 5 – 15 dBA higher than the models would otherwise suggest12. These conditions are likely to occur at night when families are asleep and can be prolonged with foggy, still weather or an inversion (van den Berg effect).

7. All of these factors suggest that audible noise produced by IWTs can and will be **far greater** than manufacturer's specifications suggest and **compliance monitoring detects**. This fact is well known. Dr M Swinbanks, an applied mathematician with extensive experience in the theory and practice of aerodynamic sound generation, states that this was well known to NASA by 199033. NASA and their subcontractors calculated sound levels generated by ideal turbine blades operating in clean airflow and identified how, inevitably, turbulence resulted in unsteady blade loadings, thus increasing sound levels. They then extended the work to consider the effect of wind gradient (i.e. wind velocity varying with height across the face of a turbine). This generated substantially higher noise levels. Finally, they subjected people to impulsive wind turbine noise under laboratory conditions and showed that the hearing threshold could be almost 20 dB lower than the conventionally accepted noise threshold. Swinbanks has stated:

"During this period *i.e.1980-1990], NASA and NASA sub- contractors identified almost all of the specific issues relating to wind-turbine noise, that now is being re-learned the hard way, by bitter experience" 34

8. It seems probable that the wind industry itself is aware of this issue. In his presentation in May 2010, Erik Sloth stated "Current modelling techniques were developed when turbine projects consisted of one or two turbines."31 He went on to comment that in relation to new projects requiring detailed noise study including **wind speed**, **wind direction** and **directional transmission paths**, "*No modelling tools are at present available to do this kind of modelling, but tools are probably on the way*."32

9. The Finnish acoustics engineer, Denis Siponen has suggested that as **turbines get larger**, so will the complexities of amplitude modulation31. Because the blade length of modern wind turbines can be more than 60 metres, the difference in wind speed at different blade positions can be several metres per second. Growing the size of the turbines and the diameter of the blades is likely to yield increasing problems with

amplitude modulation and tonality: "As wind turbines are still getting larger and their rated power higher, the number of complaints of wind turbine noise is also quite likely to be increased." 31 **Blade tip speed is now in excess of 400 km. per hour and *increasing*.**

10. Concerning infrasound and low frequency sound, the picture is even more interesting. Because infrasound and low frequency sound waves attenuate at slower rates than higher frequencies, it is predictable that they **will predominate** in the sound waves produced by IWTs **at distance** – for example at 2-3 kilometres c.f. 500 metres. It is predictable that residences located at distances from operating IWTs are being exposed to low frequency sound and infrasound. We know that these waves can travel through buildings and cause walls, windows and people to vibrate. Resonations can be set up. What then are the levels of infrasound and low frequency waves actually generated by operational IWTs? **We do not know**. The wind industry measures sound on the useless **A weighted scale only.** This is consistent with current development requirements which are **now totally inadequate** and **do not safeguard public health.**

11. Available recent studies strongly indicate that low frequency and infrasound generated by IWTs are greater than previously acknowledged and likely to be greater still with increases in the height and size of turbines. Robert Thorne38,37 uses the C weighted scale in conjunction with the Z scale.; Pedersen and colleagues17,18 use the G scale. These studies show that the lower frequency sound waves generated by IWTs indeed **predominate at distance**. They are modulated and are present at very significant levels. By way of example, measurements taken inside a residence at Waubra, Victoria by Dr Thorne reveal that there are infrasound waves occurring in Australian residences near wind farms in the 50 to 70 dB(Z) range. There are also high levels of amplitude modulated low frequency waves which may be **audible** (as well as felt) to some individuals.

12. In his presentation to the 4th International Meeting on Wind Turbine Noise at Rome in April 2011, Dr Swinbanks presented evidence indicating that conventional techniques of assessing low frequency and infrasound waves have underestimated their impact and that typical wind turbine infrasonic and low frequency noise can be "readily audible at very much lower levels that has hitherto been acknowledged."33 He again points out that these results are consistent with the extensive work carried out by NASA in the decade between 1980 and 1990. NASA identified and reported increases in low frequency impulsive sound patterns from modern upwind rotor configuration turbines in 1989. NASA attributed the increase to wind-gradients and shadowing effects. At the same meeting, Denis Siponen noted that the increase in the low frequency noise component with large turbines is higher than the increase in the A weighted sound levels31. **Larger wind turbines emit higher noise levels at low frequencies and this would seem where the future of industrial wind turbines lies.**

HEALTH AND AUDIBLE SOUND

Audible Sound: It is an indictment of the wind energy industry that it continues with health impacts denial when there is a rapidly growing body of more recent, independent material published by respected academic researchers and medical practitioners which strongly indicates the opposite view. These health impacts are more pronounced as wind turbines become taller and more powerful with larger rotor diameters and hence sound propagation.

As stated above: In relation to frequencies that are audible, **amplitude modulated** noise is more **easily perceived and more annoying** than a constant level of noise37. Swedish researchers have shown that audible noise from IWTs is more annoying than other kinds of industrial/transportation noise levels for this very reason3. To reiterate, residents have been shown to be highly annoyed by wind turbine noise at 38 dBA while aircraft noise has to reach 57 dBA, and road traffic noise 70 dBA to produce similar annoyance. Audible wind turbine sound waves vary in amplitude within relatively short spaces of time, and without cessation, even at night. They are likely to be far more intrusive to the central nervous system than a pure amplitude measurement would suggest.

In discussing audible sound attenuation from outside a building to inside a building this is usually modelled as a reduction of 15 dB(A). Huson8 has found that in Australia in a typical farm house it is more likely in the range of 3-5 dB (A). Cooper8 in his measurement of noise inside and outside several houses at the NSW Capital Wind Farm found minimal differences in noise readings in a house very typical of Australian farm houses. It must be remembered that an increase of 10 dB(A) leads to a doubling in perceived noise. This has important ramifications for the accuracy in predicting noise inside residences.

Significant research has been performed on the adverse health effects of wind turbine noise.21,20,17,15,11,33,34,16,19,10,13,9 The issue of the extremely adverse wind turbine noise impact on children's mental and physical health is dealt with in some detail by Bronzaft4. She discusses the "many studies *which+ have demonstrated that intrusive noises such as those from passing road traffic, nearby rail systems, and overhead aircraft can adversely affect children's cardiovascular system, memory, language development, and learning acquisition." On the basis of this research into the adverse health effects of transportation noise she argues the need for research into the potential adverse health effects of industrial wind turbines on children's health, and on the health of their parents.

Noise is sometimes described as "annoyance" but physiological effects are concerning and include: headaches, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia (rapid heart rate), hypertension, cardiovascular disease (including Tako Tsubo episodes with 3-6% mortality), irritability, confusion, reduced concentration and

memory problems, panic episodes with severe depression and worsening control of pre-existing and previously stable medical conditions such as angina, diabetes.

Cappuccio et al (2011) summed up the health impacts from excessive noise5. One of the most significance consequences is that of sleep deprivation with physiological and psychological sequelae, including depression. A lack of sleep results in "detectable changes in metabolic, endocrine and immune pathways. Too little sleep …*is+ associated with adverse health outcomes, including total mortality, type 2 diabetes, hypertension and respiratory disorders, obesity in both children and adults, and poor self-rated health. Both short and long duration sleep are predictors, or markers, of cardiovascular outcomes." It is also postulated, and with some early clinical observations, that chronic sleep deprivation may result in a clinical circumstance similar to if not identical to Post Traumatic Stress Disorder (PTSD).

Phillips51 states in his study looking at epidemiologic evidence about the health effects of IWTs on nearby residents: "There is overwhelming evidence that wind turbines cause serious health problems in nearby residents, usually stress- disorder-type diseases, at a nontrivial rate." And further "The bulk of the evidence takes the form of thousands of adverse event reports. There is also a small amount of systematically gathered data. The adverse event reports provide compelling evidence of the seriousness of the problems and of causation in this case because of their volume, the ease of observing exposure and outcome incidence, and case-crossover data."

This is corroborated by McMurtry13 in Canada: "Internationally, there are reports of adverse health effects (AHE) in the environs of industrial wind turbines .... The symptoms being reported are consistent internationally and are characterized by crossover findings or a predictable appearance of signs and symptoms present with exposure to IWT [industrial wind turbines] sound energy and amelioration when the exposure ceases. There is also a revealed preference of victims to seek restoration away from their homes."

A detailed examination of the references listed in this section, and indeed others not cited here, provides accumulating evidence that IWT noise does and will result in adverse health effects. Two conclusions are obvious:

1. Environmental assessments are usually not required to discuss health impacts and therefore this issue is not addressed, or is addressed poorly by any wind farm proponent. This is definitely the case with the **Collector Wind Farm environmental assessment** where most of the discussion on health revolves around denying there are any issues and quoting reports which support this position, usually authored by those wishing to espouse the opposing view.

2. There is an obvious need for both a **moratorium** and **increased research**. People are being harmed by IWTs. To deny this is to remove people's rights to health and safety. It

is apparent that, with the construction of IWTs adjacent to residences (and now it is being shown out to 10 kilometres) people are being knowingly exposed to health risks. Research into the degree and the mechanisms is urgent and it is the responsibility of government to ensure that this occurs.

Seismic Activity: Although not necessarily directly related to audible sound seismic activity is also a source of concern.

Marshall Day Acoustic's discussion on page 35 of its report is interesting in its quotation from Professor Styles denying any possibility of seismic activity that would affect people. Yet the Styles et al study44 unequivocally concludes that there is a clear seismic vibration issue out to distances of **greater than 18km** coming from relatively small turbines that have a generating capacity of 660kW. Further the research found that vibration is proportional to power generating capacity. Therefore a single 2.5 to 3.0MW turbine will produce a significant seismic vibration. A number of turbines combined will have a very significant impact out to a great distance, and the long term effects of chronic exposure to this vibration are unknown.

It has been reported that in Australia: "Some sites where residents are reporting this vibration overnight have become ill very quickly (Waterloo, Glenthompson, Cape Bridgewater and Capital). Note that this urgently required scientific research with large turbines is yet to be instigated" (http://www.wind-watch.org/documents/evidence-of-the-adverse-health-impacts-of-industrial- wind-turbines/).

HEALTH AND INFRASOUND

Infrasound is also termed Non-Audible Sound and refers to that sound that cannot always be heard, but can be felt, and is usually considered to be less than 20 Hertz frequency.

There are two critical issues to consider:

1. Do industrial wind turbines produce infrasound?

2. If they do, does infrasound from wind turbines have an adverse health impact?

1. Do Industrial Wind Turbines produce infrasound?

Despite wind energy company denial there is now a considerable and growing body of work that has found that **wind turbines do produce infrasound**. Low frequency sound is likely produced by wind turbines with the displacement of air by the blades and the turbulence around the blade surface; and as the turbines grow larger the potential to produce infrasound increases.27,28,12,36,2 In fact results confirm the hypothesis that

the spectrum of wind turbine noise **moves down in frequency with increasing turbine size14**. Compared to medium and high frequencies, **low frequency levels decay slowly with distance**, are **less attenuated by conventionally designed structures (such as homes), cause certain building materials to vibrate** and can sometimes **resonate with rooms**, thereby undergoing **amplification.**30 Thus infrasound is more likely to be an **indoor problem rather than an outdoor**. Recent work in Europe has found that infrasound and seismic activity can be measured out to **8-11 kilometres.**24,6 **This has significant implications for the determination of a *setback* distance of residences from wind turbines**.

2. Does Infrasound from Wind Turbines have an adverse Health Impact?

Infrasound, like audible sound, will affect people in different ways, both as to susceptibility (about 15-25% of the population exhibit increased noise sensitivity) and symptoms (type and degree). The difference between audible sound and infrasound is that infrasound is felt rather than heard.

Lower frequencies correspond to resonating frequencies of our body organs and in their presence encourage them to vibrate. Shepherd30 notes that the head resonates at 20-30 Hertz and the abdomen at 4-8 Hertz. The following table illustrates the effects of chronic low frequency vibration and subsequent physiological consequences30.

The health impacts stemming from infrasound often mirror those health impacts associated with audible sound (see above section). Sleep deprivation and annoyance are certainly consequences of infrasound and will result in predictable health sequelae.

Table 2: Psychological and physiological sequelae resulting from low frequency vibrations

Frequency of vibration	Symptoms
4 – 9 Hz	Feeling of discomfort
5 – 7 Hz	Chest pains
10 – 18 Hz	Urge to urinate
13 – 20 Hz	Head aches

Infrasound however can add another dimension because of the element of body vibration. The symptoms associated with infrasound from IWTs are numerous because people react differently. The following lists some, but not all, of these symptoms which are basically associated with infrasound:

- Chronic fatigue, tiredness and malaise
- Heart ailments, palpitations, hypertension
- Chronic insomnia
- Repeated headaches
- Repeated ear pulsations, tinnitus, sensations of fullness and pressure
- Back and neck pain
- Shortness of breath, shallow breathing, chest trembling
- Frequent irritation, nervousness, anxiety
- Frustration, depression, indecision

There has been considerable research published in recent years confirming the health impacts of infrasound from wind turbines.30,4,37,35,36,14,21,23 For instance **Chen and Narins**52 examine studies that have found that inaudible infrasound can affect the human hearing system. They also considered surveys by acousticians which have correlated annoyance levels with different kinds of industrial noise. They cite a case where a family exposed to infrasound at 10 Hz of only 35 dB SPL (sound pressure level) complained of bodily pains, increased annoyance, and difficulties sleeping. They cite the well-known study of Jung and Cheung, which found that wind turbine infrasound below 20 Hz, could reach levels between 60 and 100 dB SPL.

They summarise their position by stating:

“High levels of infrasound and low frequency sounds generated by wind turbines pose a potentially serious threat to communities near wind farms. .... With wind turbines generating substantial levels of infrasound and low frequency sound, modifications and regulations to wind farm engineering plans and geographical placements are necessary to minimize community exposure and potential human health risks.”

Within Australia several wind farm operators are having difficulty meeting their compliance conditions, and engineering is providing reliable modifications. AGL at Hallett 2 in South Australia have had to switch off 16 out of 32 wind turbines at night because of noise problems. Infigen at Capital Wind Farm in NSW has been shown to be operating outside its noise compliance conditions8. While the relevant sound measurements at Hallett 2 dealt with only with sound in the audible range, measurements at Capital also demonstrated the presence of significant infrasound, thereby putting lie to the claim of the wind industry that modern upwind IWTs do not produce infrasound.

Many of the symptoms attributed to IWTs are well known sequelae from sleep deprivation or **raised cortisol and adrenaline levels** due to stress6. Sleep deprivation can be caused by both conscious and unconscious arousal.
The physiological pathways that are affected by both audible and inaudible noise are well elucidated by Salt and others23,24,25,26,27,28,48.

Ambrose and Rand 21 investigated the presence or otherwise of infrasound and low frequency noise (ILFN) in a home adjacent to an IWT in Massachusetts. They confirmed there were dynamically modulated low frequency acoustic amplitudes and tones produced by the nearby wind turbine. Dynamic amplitude modulations below 10 Hz were stronger indoors than outdoors. They also found that there were demonstrable adverse health effects from the ILFN. Interestingly the dB(A) and dB(C) levels and modulations did not correlate to the health effects. However the strength and modulation of the un-weighted and dB(G)- weighted levels increased indoors consistent with the worsened health effects experienced indoors. They write:

"The dB(G)-weighted level appeared to be controlled by in-flow turbulence and exceeded physiological thresholds for response to low- frequency and infrasonic acoustic energy as theorised by Salt. The wind turbine tone at 22.9 Hz was not audible yet the modulated amplitudes regularly exceeded vestibular detection thresholds. The 22.9 Hz tone lies in the brain's "high Beta" wave range (15 – 40 cycles per second) and is associated with our alert state, anxiety, and "fight or flight" stress reactions. The brain's frequency following response (FFR) could be involved in maintaining an alert state during sleeping hours, which could lead to health effects. Sleep was disturbed during the study when the wind turbine operated with hub height wind speeds above 10 m/s. "

Professor A.N. Salt from the Department of Otolaryngology at Washington University School of Medicine23 poses several physiological pathways whereby the effects of infrasound are likely to manifest within the human body via the sensory cells of the ear (as discussed elsewhere in this document). Several of the possible mechanisms are not speculation but are based on published data. He concludes:

"…the effects of wind turbine noise on humans are largely unexplored and more research is needed. We believe that the infrasound levels generated by some large wind turbines are unusual in the environment and that there have been no systematic long-term studies of prolonged exposure to such sounds on humans or other animals".

This reinforces the Australian experience where those suffering the attendant consequences of IWT, are calling for proper and appropriate research as well as a moratorium on IWT construction. Until there are adequate answers to the many questions being raised any population residing close to IWTs is simply being used as unwitting "laboratory guinea pigs". There is great scope for further research to tease out the details of the very real effects of infrasound on noise recipients. This is a great opportunity for Government instrumentalities (Health and Planning) to be proactive in

this field. There is considerable cause for concern that they are slow to take up the challenge. Further they are abrogating their responsibility to safeguard their citizens and their duty of care.

Interestingly, and as a portent of action by other institutions internationally, in Massachussetts (as a result of studies such as that of Ambrose & Rand which took place in that state, and because of the continuing complaints by residents close to IWTs) The Massachusetts Clean Energy Center in partnership with the Massachusetts Department of Environmental Protection is currently seeking proposals from qualified acoustic consultants that can assist these departments in conducting a Research Study on Wind Turbine Acoustics.

Through the Research Study on Wind Turbine Acoustics, they seek to measure the level and quality of sound emissions from a variety of operating wind turbines in Massachusetts. The Study will help inform state agencies, local decision-makers, project developers, researchers, and the public about acoustic characteristics of wind turbines.

It seems that it is possible for some governments, or instrumentalities, to finally respond to the plea for urgent research to attempt to elucidate the problems associated with IWT noise and recognised adverse health effects. While the current Wind Farm Audit in NSW, measuring the noise output of three operating wind farm, is seen by some as an attempt to settle the noise issue once and for all, the fact that there is no attempt to measure infrasound because the measurements will only be in units of dB(A) render this audit useless by planned failure. NSW Department of Planning and Infrastructure has again missed a real opportunity to take part in a meaningful debate and one has to wonder why. The possibility of finding uncomfortable results has the potential to put in question the whole IWT development process. Any diminution of the roll out of wind farms would jeopardise the perceived possibility of the government (both Federal and State) achieving 20% renewable energy by 2020, and of reducing carbon dioxide emissions by 20% over the 1990 level. This would be politically unacceptable and therefore it is apparent that people living in proximity to IWTs will indeed be the "sacrificial lambs" to ill-informed energy policy.

REGARDING THE COLLECTOR WIND FARM PROJECT

Both the APP Corporation in the main body of the Environmental Assessment and Marshall Day Acoustics in its report in Appendix F discuss infrasound and health. Both, either dismiss the proposition that industrial wind turbines produce infrasound or sufficient infrasound to cause any problems (health or otherwise). Both discuss and dismiss literature reporting health problems resulting from exposure to any level of noise, be it noise in the audible spectrum, low frequency noise or infrasound. The universal argument is that modern wind turbines do not produce sufficient noise at any part of the noise spectrum that is above regulated limits. It therefore follows that there are no problems with noise and, ipso facto, there can be no health sequelae.

The consequence of this argument is that Collector Wind Farm will have no noise problems and that there is therefore no basis for objection to the wind farm being constructed. We find the arguments put forward in trivialising the contention that there will be no problems with noise unsubstantiated, without merit and biased.

Consistently reported problems associated with noise and infrasound from wind farms in Australia and overseas will result in a portion of the local population experiencing health problems. While noise received will vary depending on weather, wind direction, speed and topography etc. it will be inevitable that some residents, living further out than 2 kilometres will be at risk. Two kilometres is the arbitrary setback distance now stipulated by the Victorian government and presented as the preferred setback distance in the NSW Draft Wind Farm Guidelines. The Victorian government has regulated that wind turbines should not be sited closer than **5 km** to a regional centre. It is obvious the Victorian Government has doubts about siting wind turbines at 2 kilometres but is prepared to abandon the "precautionary principle" and sacrifice rural families in more sparsely populated areas while clearly having concerns about concentrations of the population in towns. More people which may represent not only more damage to health but more law suits.

However, there is evidence that health problems may be experienced at distances greater than 2 km. The village of Collector is about 3.5 kilometres from IWT's and may be affected from time to time. Collector has a primary school with children who, as discussed, are especially vulnerable. It will also have a significant sector of its population aged greater than 50 years. This group is also considered especially vulnerable.

REGARDING THE COLLECTOR WIND FARM:

APP CORPORATION ENVIRONMENTAL ASSESSMENT, AND MARSHALL DAY ACCOUSTICS REPORT.

1. World Health Organisation (WHO)

Marshall Day Acoustics on page 36 of their report selectively quotes a 1995 WHO document stating "*There is no reliable evidence that infrasound below the hearing threshold produce physiological or psychological effects".*

Whereas a more recent and relevant 2000 WHO document by Bergland et al3 states:

"….a large proportion of low-frequency components in noise may increase the adverse effects on health…. It should be noted that the low frequency noise, for example, from ventilation systems, can disturb rest and sleep even at low sound pressure level…**Special attention should be given to: noise sources in an environment with low**

background sound levels; combinations of noise and vibrations; and to noise sources with low-frequency components."

And further:

"**The evidence on low frequency noise is sufficiently strong to warrant immediate concern…Health effects due to low frequency components in noise is estimated to be more severe than for community noises in general**".

Marshall Day Acoustics on page 33 of its report states:

"Notwithstanding the above, and in common with many other sources of noise, wind turbines emit infrasound, low frequency sound and ground vibrations. However, what is often overlooked is that these types of sound and vibration are a feature of the everyday environment in which we live and arise from a wide range of natural sources such as the wind and the ocean to man-made sources such as domestic appliances, transportation and agricultural equipment."

What is again **selectively excluded** is that the **repetitive nature** of the "swish/thump" noise of IWTs and the **amplitude modulation** and **tonality** that are frequently present puts the noise (both audible and low frequency noise) in a class of its own. Most natural sources are intermittent in nature and are better tolerated by noise recipients. Infrasound has been detected at Capital Wind Farm in NSW which, while not exhibiting tonality outside residences, did so within homes8. The preliminary testing at the time demonstrated both infrasound and low frequency noise at levels and fluctuations likely to have increased impact on residents inside their homes.

To omit from their report the essential factors of a **quiet rural setting**, **a series of massive 150 meter towers** and **topographica**l and **climatic factors** is deceitful. And to liken this circumstance to wind rustling leaves and domestic appliances is insulting and infantile.

2. Infrasound and Professor Leventhall

Marshall Day place great significance in **Professor G. Leventhall's** apparent recanting of his position that there is a problem with infrasound (page 34 of the report). Leventhall wrote a significant review paper in 2003 in which he discussed (and referenced other work) the issues of health and infrasound – both physiological and psychological. However, in 2009 Leventhall also wrote in regard to significant issues concerning low frequency noise which cannot be detected using A weighting:

"Although we know a great deal about low frequency noise, there are aspects which we cannot yet explain. We know about how people hear low frequency noise and that some have a low tolerance to it. We believe that low frequency noise may, in general, be more

annoying than higher frequency noise, but do not know why this is so. We do not know why some people complain of a low frequency noise which cannot be measured separately from the background noise.
It is also possible that there are subtle effects of low frequency noise on the body, which we do not yet understand"42.

Leventhall expresses very well the fact that there are many unknown factors, often undefined and unexamined, that are contributing to the health effects that are being reported both nationally and internationally.

The overall Environmental Assessment produced by AAP Corporation Section

11.4.1) states that Collector Wind Farm is being assessed against the South Australian Wind Guidelines, although reference will be made to the NSW Draft Wind Farm Guidelines. Both guidelines state that problems with infrasound are not anticipated with the modern IWT, viz:

***SA**: "Infrasound was a characteristic of some wind turbine models that has been attributed to early designs in which turbine blades were downwind of the main tower. The effect was generated as the blades cut through the turbulence generated around the downwind side of the tower. Modern designs generally have the blades upwind of the tower. Wind conditions around the blades and improved blade design minimise the generation of the effect. The EPA has completed an extensive literature search but is not aware of infrasound being present at any modern wind farm site."*

***NSW**: "Analysis of wind turbine spectra shows that low frequency noise is typically not a significant feature of modern wind turbine noise and is generally less than that of other industrial and environmental sources."*

In a **contrary view** Professor Salt23 observes: "Large wind turbines generate very low frequency sounds and infrasound (below 20 Hz) when the wind driving them is turbulent. The amount of infrasound depends on many factors, including the turbine manufacturer, wind speed, power output, local topography, and the presence of nearby turbines (increasing when the wake from one turbine enters the blades of another)."

The finding of infrasound produced from wind turbines of the more modern upwind design is confirmed by Bakker and Rapley2, Leventhall12, Cooper8 and Thorne36. Also confirmed is the hypothesis that has been outlined above, that is, results indicate that the spectrum of wind turbine noise **moves down in frequency with increasing turbine size14**. Compared to medium and high frequencies, **low frequency levels decay more slowly with distance**, are **less attenuated by conventionally designed structures (such as homes), cause certain building material to vibrate** and can sometimes **resonate with rooms**, thereby undergoing **amplification.**30 Thus infrasound is more likely to be an **indoor problem rather than an outdoor**. Disappointingly, Marshall Day

make no attempt to model noise (either audible or infrasound) attenuation from outside to inside residences.

3. Threshold levels for Infrasound

APP Corporation's EA (11.4.1) quotes Sonus43 as stating:

"the threshold of perception for infrasound in humans is 85dB(G) or greater. Human perception of infrasound below the hearing threshold, as vibrations in the body, is not possible and only occurs at noise levels well above the hearing threshold"; and "measurement of infrasound from modern wind turbines indicates that noise levels are 25dB below the hearing threshold of 85dB(G) at a distance of 200m".

The threshold of 85dB(G) is now being challenged as being too high. Swinbanks (2012)47 found evidence of effects of infrasound at significantly lower levels than has hitherto been acknowledged. His contention is that conventional techniques of assessing low frequency and infrasound waves underestimate their impact. He discussed this in detail at the Internoise Conference in New York in August 2012 47. Additionally he has stated with reference to research he performed at a wind farm in Michigan where he found:

"The maximum power spectral levels for the discrete frequencies associated with the harmonics of the impulses was 64dB SPL (Sound Pressure Level). But the overall **rms** (root mean square) sound power level was 77dB SPL, and the peak of the time waveforms of the impulses was 88-90dB.

"This indicates one of the major errors that has consistently been made in assessing infrasound from wind-turbines. Examining rms power spectrum peaks shows only 64dB, while comparing time domain impulsive peak levels shows 88-90dB. This represents ~25dB difference in the assessment of the infrasonic intensity." (http://www.wind---watch.org/documents/numerical---simulation---of---infrasound---perception/)

It is apparent therefore that infrasound is detected at a much lower dB than has previously been assumed. Hence correct and appropriate measurement of infrasound is critical in establishing meaningful correlation with infrasound and health. It is also apparent that measuring infrasound as dB(A) is pointless and in fact allows for the dismissal of infrasound as significant in the health effects reported by people living in the proximity of wind turbines. To persist with this monitoring approach is dishonest.

The conclusion must be that the 85 dB(G) limit is not safe. APP's table 28 on page

138, reports measurements of low frequency sound of between 61-76 dB(G) at or around Clements Gap WF, Bridgewater WF, a gas-fired power station and the Adelaide

CBD. At these levels therefore IWTs **are actually likely to seriously affect the health and wellbeing of noise recipients close by. This simply reinforces the symptoms being reported by residents living in proximity to IWTs – symptoms that are being reported with great regularity both nationally and internationally.**

What is not explained is the forced farm acquisition at Uranquinty due to gas turbine noise.

The requirements for appropriate noise measurement are completely inadequate both in developing an environmental assessment or undertaking compliance monitoring once an IWT wind farm is operational. **This also applies to the Environmental Assessment prepared for the Collector Wind Farm.**

Salt and Lichtenhan48 (2012) also found evidence that the effects of infrasound could be significant at lower dB(A) levels particularly when there was reduced presence of mid to high frequency sound. This correlates very well with the contention (described above) that infrasound attenuates more slowly, and is felt at a greater distance, than noise of higher frequencies. Salt and Lichtenhan48 describe their findings thus:

"The sensitivity of the apical regions of the cochlea to low-frequency sounds, and the suppressive influence of higher frequency sounds on this response, is confirmed by this study. We have demonstrated that A- weighted noise levels of as low as 45 dB A can stimulate apical regions to the same degree as wide band noise of much higher levels, as high as 90 dB A. This study shows that it cannot be assumed that noise levels as low as 40 dB A are benign and do not cause strong stimulation of the ear. Low-frequency noise around 40 dB A undoubtedly affects the ear. If the noise consists of predominantly low frequencies, then it will induce greater stimulation of the ear than has hitherto been appreciated. The observation that responses to primarily low-frequency noise stimulation are larger and do not saturate to the degree seen when higher-frequency components are present (Figure 6) is in complete agreement to the behaviour previously seen with tonal stimuli. The input/output functions of cochlear responses saturated at progressively higher levels for 500 Hz, 50 Hz and 5 Hz tonal stimuli presented in quiet. This means that the largest electrical responses in the apical regions of the cochlea will occur specifically when very low-frequency sound dominates the stimulus and mid-frequency components (200 – 2000 Hz) are absent."

The situation that emerges is that the wind industry's contention that 85 dB(G) is a safe limit is now in **doubt**. There is not enough information available to define a truly safe level and the precautionary principle must be applied here. Of particular concern is **chronic exposure** to infrasound of those members of the population (the young and the elderly) who are most vulnerable and at risk. There is clinical evidence showing that infrasound effects are **cumulative** in humans.

4. Pierpont and the Wind Turbine Syndrome

The APP Corporation's report (section 11.4.1) has criticised the work in the field of the *Wind Turbine Syndrome* performed by Pierpont in 200920 using an anonymously prepared report by NSW Health produced in 2011. Hanning45, an Honorary Consultant in Sleep Disorders Medicine to the University Hospitals of Leicester NHS Trust, has a **contrary view:**

"Pierpont (2009 and personal communication) has recently completed a very detailed, peer-reviewed case-control study of 10 families around the world who have been so affected by wind turbine noise that they have had to leave their homes, nine of them permanently. The turbines ranged from
1.5 to 3MW capacity at distances between 305 to 1500m. The group comprised 21 adults, 7 teenagers and 10 children of whom 23 were interviewed. While this is a highly selected group, the ability to examine symptoms before, during and after exposure to turbine noise gives it a strength rarely found in similar case-control studies. The subjects described the symptoms of wind turbine syndrome outlined above and confirmed that they were not present before the turbines started operation and resolved once exposure ceased.

"There was a clear relationship between the symptoms, even in children, and the noise exposure. She reports also that all adult subjects reported *"feeling jittery inside"* or *"internal quivering"*, often accompanied by anxiety, fearfulness, sleep disturbance and irritability. Pierpont offers compelling evidence that these symptoms are related to low frequency sound and suggests very plausible physiological mechanisms to explain the link between turbine exposure and the symptoms.

"Of particular concern were the observed effects on children, include toddlers and school and college aged children. Changes in sleep pattern, behaviour and academic performance were noted. 7 of 10 children had a decline in their school performance while exposed to wind turbine noise which recovered after exposure ceased. In total, 20 of 34 study subjects reported problems with concentration or memory.

"Pierpont's study mostly addresses the mechanism for the health problems associated with exposure to wind turbine noise rather than the likelihood of an individual developing symptoms. Nevertheless, it convincingly shows that **wind turbine noise does cause the symptoms of wind turbine syndrome**, including sleep disturbance. She concludes by calling for further research, particularly in children, and a 2km setback distance".

5. NSW Health

In relation to the above discussion of Pierpont's work it is worth repeating the NSW Health's assertion that "*such evidence can be regarded as hypotheses generating and not*

as hypotheses proving. In other words, they raise a question, but do not provide an answer". Indeed! If a hypothesis is generated then the indication is that it should be researched so that an answer can be provided. This is what those concerned about the health implications of IWTs have been asking for, a request that has been continuously ignored by those Government institutions which should be most concerned with public health.

NSW Health has a contrary attitude to noise problems. While dismissing refereed publications which find that infrasound is a problem for IWTs, it does have strong opinion and guidelines for audible sound. Since audible sound is also considered a problem of IWTs what the NSW Health has to say about this is relevant. For instance in its submission to the Department of Planning and Infrastructure about the proposed Coalpac Consolidation Project at Cullen Bullen50 it expressed particular concern about the noise levels within a school classroom:

"The recommended LAeq Noise Levels from Industrial Noise Sources [in the NSW Industrial Noise Policy – the INP] suggests that acceptable noise levels in a school classroom (internal) at the noisiest time of day should not exceed 35 dBA LAeq (I hour) with a recommended maximum of 40 dBA LAeq (I hour)."

It is understood that both the NSW Industrial Noise Policy **(INP)** and the NSW Protection of the Environment Operations Act **(POEO Act)** have excised consideration of noise from IWTs. Yet, from a health perspective this is surely irresponsible. It must be within the province of NSW Health to be **concerned about noise and health from whatever source**, whether regulated, legislated or otherwise. There will always be the risk that **Collector School**, even at 3.5 km distant, will be affected by noise, particularly as is argued in this submission that there is risk of adverse health effects from infrasound. As has also been stated here it is known that infrasound will attenuate more slowly over longer distances and will develop characteristics of amplitude modulation and tonality within buildings (i.e. within class rooms).

NSW Health50 goes on to state:

"There is increasing evidence internationally that environmental noise exposure may cause risk to public health, and is recognised by international bodies such as World Health Organisation (WHO) and the US Centre for Disease Control (CDC). There is some suggestion of the long-term effects of environmental exposure to noise on annoyance, sleep disturbance, children's performance at school, hypertension and ischaemic heart disease."

NSW Health is obviously aware of the health risks of excess noise. By concentrating on the effects of audible sound, and ignoring the effects of low frequency sound and infrasound it is obfuscating its duty of care to the public which is at risk.

6. Senate Enquiry into The Social and Economic Impacts of Rural Australia

In fact the Federal Senate's Enquiry into The Social and Economic Impacts of Rural Australia46 recommended just that, viz:

Recommendation 5: The Committee recommends that the National Acoustics Laboratories conduct a study and assessment of noise impacts of wind farms, including the impacts of infrasound.

There are **seven recommendations** in total in the Senate's report which emphasise the need for research and the application of the precautionary principle. This was an extensive Senate Committee investigation with many erudite submissions and evidential interviews. Its conclusions, because they do not equate to the Government push for more IWT developments, are currently being either ignored or trivialised by Governments in Australia. They do so at their own peril since many of the submissions are recorded histories of those people suffering adverse health effects, and to ignore their plight is for the Government to abandon its duty of care.

7. Doctors for the Environment Australia (DEA) and Climate and Health

Alliance (CAHA)

The APP Corporation report (section 11-4-1) enthusiastically quote both the Doctors for the Environment Australia (DEA) and the Climate and Health Alliance (CAHA) as being pro-wind energy mainly because they are anti-coal. This is a philosophical trap. It is illogical to argue that one thing is good (wind energy) because the alternative (coal) is bad. In fact wind energy, in addition to the issues of noise and health and the fact that it is economically, environmentally, visually anathema, ***cannot replace coal because wind does not provide base load energy***. To date in Australia not one coal fired power station has closed because of wind power replacing it.

Coal continues to be burnt while it is in standby mode (at least at 90% capacity) and coal consumption at power stations, according to industry figures, has not decreased53. Gas fired power stations are not much better and, although gas is not as carbon intense as coal, it is still burning fossil fuel and producing carbon dioxide. Instead, it would make better sense to spend the tax payers' money that is currently propping up the wind industry's subsidies to develop ***the only renewable base load energy available, that is, geothermal energy.***

8. National Health and Medical Research Council (NHMRC)

The National Health and Medical Research Council's 2010 rapid review49 has been criticised both nationally and internationally as being careless, superficial and inadequate. The authors are unaware of any other NHMRC document that has been so

vehemently criticised or biasedly misquoted as this review. While this rapid literature review represents a sad indictment on the reputation of this organisation, there seems very little regret expressed by the NHMRC executive. The NHMRC's CEO, Professor Warwick Anderson, qualified the review at the Federal Senate Enquiry46 when he admitted that "high quality scientific literature in this area is very thin." As a consequence the **NHMRC advocated that a precautionary principle should be followed** because "the absence of evidence does not mean that there might not be evidence in the future".

Professor Anderson also clarified the position of the anecdotal evidence which is worldwide at the present time: "Anecdotes are very valuable ways of honing the questions to be asked." And added: "We do not say that there are no ill effects. We definitely do not say it that way."

The NHMRC has been forced to revisit its position and is again looking at the literature, both peer reviewed and "grey", and will be releasing an updated Review in 2013. In the three years since its last review there has been more peer reviewed research and literature published and it is hoped that this time the NHMRC will be able to make a more measured assessment of the current state of noise and health with respect to industrial wind turbines.

A large section of the scientific world believes that any review or research of the possible adverse health effects of industrial wind turbines must logically include patient interviews and examination. Further there must be correlated research on infrasound levels and frequencies within homes of affected residents.

This research must include simultaneous Electroencephalograms (EEG) monitoring of the occupants as well as resident cortisol levels.

Monitoring times must include a full range of climatic and seasonal conditions to demonstrate maximal turbine activity as well as periods when there is no wind turbine generating taking place. The climatic conditions must ensure the van den Berg effect is fully explored as well.

CONCLUSION

As with many project assessments and noise modelling of wind farms there are many deficiencies in the reports produced.

Consultants conducting noise monitoring and assessments will only do the minimum required to fall within the parameters of current inadequate government guidelines. This circumstance will never deliver to the people of Australia a rational or honest appraisal of these developments but rather entrenched institutional dishonesty which is now common place where greed, ignorance and unbridled subsidy

take precedence over honesty, caution and a duty of care based on true moral judgement.

The construction of wind farm projects involving large capital, massive and intrusive industrial wind turbines into the landscape and the ill-advised haste with which governments are building them, means that the health and wellbeing of residents and neighbours to wind farms are being completely ignored. In New South Wales where we are debating the issues with government these people are often referred to as "road kill" and "collateral damage". We have been told by Public Health officials who through fear will not speak openly that "we are the known and justifiable price of renewable energy". The Department of Planning and Infrastructure must take its duty of care seriously and apply a precautionary approach to the approval of wind farm projects. The minimum they must demand is more study, and better, more complete ongoing monitoring as well as an educated and informed consideration of the specific proposed wind farm in question.

The current "cut and paste" mentality used to prepare these industrial wind developers' proposals must cease. This represents a callous cost saving exercise and totally disregards the welfare and best interests of those rural families; families who are contracted to live with these feckless structures for up to 3 generations or 75 years.

Host contracts are onerous, designed to deceive and forbid free speech or complaint when in place. Gag clauses are anathema to freedom and must always be viewed with suspicion in any democracy.

As with all developments there must be a partnership which is guided by an appropriate code of conduct. Developers must exercise their own duty of care, corporate responsibility and bring decency to their corporate citizenship.

See attachments 8 & 9, for further information:

- 8 - Cherry Tree VCAT Statement, Dr Sarah Laurie
- 9 - Explicit Warning Notice, Waubra Foundation

SECTION H
REFERENCES

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Flora and Fauna

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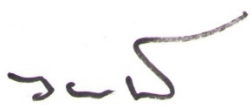
Attachments:

1. Acoustic Review, Rye Park Wind Farm, Dr Steven Cooper
2. Submission to NHMRH, Mary Morris
3. Comments on SA EPA Waterloo Noise Study and Noise Guidelines, Mary Morris
4. Affidavit, Mary Morris – 1.5.14
5. Affidavit, Mary Morris – 7.5.14
6. Waterloo Case Series Preliminary Report, Mary Morris
7. Comments on SA EPA Waterloo Wind Farm Environmental Noise Study 2013
8. Cherry Tree VCAT Statement, Dr Sarah Laurie
9. Explicit Warning Notice, Waubra Foundation
10. Comments on Rye Park Wind Farm EA, Australian Wildlife Services
11. Impact of Wind Farm Development in Southern Tablelands on Surrounding Rural Land Values
12. Crudine Ridge Decommissioning Report
13. FCWF Decommissioning Report
14. Decommissioning Report, Stoops and Neville
15. Bodangora Decommissioning Report
16. Centre of Waste Management Decommissioning Report

BOOROWA DISTRICT LANDSCAPE GUARDIANS RESERVES THE RIGHT TO SUBMITT FURTHER INFORMATION.

Charlie Arnott



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Chair, Boorowa District Landscape Guardians