

**DRAFT NSW PLANNING  
GUIDELINES  
WIND FARMS**

**SUBMISSION**

**NSW Department of Planning and  
Infrastructure**

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**12 MARCH 2012**

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## 1. SUMMARY

The “Draft NSW Planning Guidelines – Wind Farms” is a discussion paper only. Its inherent poor quality ensures this.

An examination of this document reveals little rigour, contradictions, omissions and escape clauses which would easily allow circumvention of the embarrassingly absent regulatory authority this document should contain.

Close examination of this document reveals several reoccurring and alarming aspects:

1. The obvious lack of due diligence by parties responsible for the authorship of this document. This ensures criticism of these guidelines by any reasoned analysis.
2. The obvious bias contained to ensure swift success of industrial wind turbine developments.

These Guidelines were developed to overcome the legal deficiencies which became apparent in the SA 2003 Planning Guidelines (used by the NSW Department of Planning and Infrastructure) following the appeal in the SA Supreme Court of the Quinn-AGL matter (see Section 2 (iv) below).

Surprisingly very little has changed.

- There is still insufficient protection for the non-host residents.
- Setback distances are inadequate.
- Health implications are largely ignored or treated very perfunctorily.
- Rights of appeal by objectors to any wind farm proposal are weak and are obscured by layers of bureaucracy.
- Any appeal process that is open to residents and prospective neighbours of proposals are skewed by inequities of finance, power and access to expert witnesses.
- There are too many opportunities for abuse of power, violation of natural justice, attacks on local democracy and citizens’ rights, inequality and bias.

## 2. INTRODUCTION

- (i) **Moratorium and the Precautionary Principle:** Although not within the true gambit of a draft document on wind farm guidelines, the Department of Planning and Infrastructure should have used this opportunity to endorse a **moratorium** on all wind farm developments. The evolving body of evidence demonstrating issues of setback distances, adverse health impacts and the increasing noise (audible and inaudible) from ever enlarging wind turbines has elucidated significant and serious problems with the whole wind turbine industry. Authorities such as the National Health and

Medical Research Council and the 2011 Senate Enquiry into “The Social and Economic Impact of Rural Wind Farms” have called for more research. This must lead to the inevitable application of the **precautionary principle** where, if there is any doubt about the safety of the siting of wind turbines, approval must be denied until better evidence is available. There is no legal or moral defence to the continuation of developments that may cause harm to Australian families. To deny a moratorium in favour of development will and can only be seen as **profits before people**.

The Draft “NSW Planning Guidelines – Wind Farms” regrettably has displayed no duty of care in this regard and has ignored the precautionary principle.

- (ii) **The Environmental Assessment Process:** The Draft NSW Planning Guidelines for Wind Farms (2011) once again presents an opportunity lost. Now is the time to meaningfully control the preparation of an Environmental Assessment (or Environmental Impact Statement) by the proponent. The process whereby the proponent organises and pays for the EA, and selects the environmental consultant to prepare the EA has always led to accusations of undue influence and bias. A case of “he who pays the piper calls the tune” (perceived or otherwise).

The process must be arranged so that the proponent has no influence whatsoever on either the selection of the consultant or the resultant environmental assessment. This can be achieved by the proponent paying an appropriate levy to an independent third party (a Commission or Authority for instance) which then arranges for the EA to be conducted impartially and without the present overwhelming conflict of interest.

The Guidelines have failed to rectify this glaring anomaly.

- (iii) **Conflict of Interest:** A further conflict of interest also exists with the Department of Planning and Infrastructure, and the Environmental Protection Authority both currently promoting energy derived from industrial wind turbines as environmentally desirable. With the EPA now set to develop an as yet unspecified regulatory role it is necessary for it to stand aside from all promotional aspects of the industry and confine itself solely to regulation. The regulator cannot be the operator or promoter.
- (iv) **Due Diligence:** The NSW Department of Planning and Infrastructure has failed to exercise Due Diligence in the preparation of the Draft Guidelines. **No actual data is produced, or referenced,** to support the basis of the assessment process. The proposed noise limits appear to be delineated at random and are not backed by credible scientific research. No due diligence has been conducted on potential adverse health effects of wind turbines on individuals and communities.

There has been insufficient due diligence undertaken regarding legal ramifications. What is the legal standing of the Guidelines? It is noted that it is proposed to strengthen the regulation of noise from wind farms in the POEO Act 1997 to give the EPA a stronger regulatory role. Will this give the EPA authority to institute legal penalties (via PINs, fines, legal procedures within Courts of Law etc)? What penalties are envisaged for non compliance? Will there be financial penalties or fines (of suitable levels)? Will there be alteration of operational conditions of consent? Will EPA close down wind farm operations in the case of continuous non compliance? What are the trigger points?

What legal force will the Guidelines have? Will these be regulations under the POEO Act? Will they have statutory status? Or will they be a simple advisory document having no standing in a Court of Law? If the latter case how will the EPA be able to prosecute them even with a strengthened POEO Act? None of this is clear in the Draft Guidelines.

The NSW Draft Guidelines appear simply to be a re-write of some sections of the South Australian EPA Wind Farm – Environmental Noise Guidelines (2003 and 2009). Due diligence surely should involve some original investigation and research into what would be best for New South Wales. In particular the South Australian guidelines have been successfully shown to **not** adequately protect health (7 November 2011, the Full Court of the Supreme Court of South Australia ([2011] SASCFC 126) in the matter of Quinn & Ors v. Regional Council of Goyder & Anor [2010] SAERDC 63.Quinn – AGL).

To prepare Wind Farm Guidelines in NSW based on what is obviously a legally flawed document not only negates due diligence but it espouses laziness, carelessness and poor regard for the rights and welfare of affected citizens.

- (v) **Bureaucracy:** The layers of bureaucracy advocated within the Draft Guidelines are unworkable and represent unnecessary organisational complexity. For any single proposed wind turbine installation the following organisations will be involved, as a minimum:
- The proponent
  - The Department of Planning & Infrastructure (various sections and various levels)
  - The Environment Protection Authority (presumably)
  - NSW Health (at the discretion of the Director General)
  - The Planning Assessment Commission
  - The Joint Regional Review Panel
  - Local Council (possibly)
  - Community Consultative Committee (with often conflicting opinions)
  - Plus significant others if there is any form of appeals process, legal or otherwise.

- (vi) **Language:** The language used in the Draft Guidelines is weak and open to interpretation, often providing “escape” clauses for proponents and government agencies wishing to obstruct objection, avoid regulation, stultify community consultation and cloud information transfer. The document is full of such phrases as “may”, “will generally need”, “can”, “typically”, “should”, “relies on assumptions”, “recommends” (and many other examples), none of which instil confidence in either the Noise Guidelines or the ability of the Department of Planning and Infrastructure to effectively control or regulate the processes of development and operation.
- (vii) **References:** The references cited demonstrate little original research or investigation in developing these guidelines. There seems to have been little attempt to study original research. References are a catalogue of prior Government publications, some of which are out of date and do not assimilate contemporary data and research, and demonstrate laziness, ineptitude and distain in the Guidelines development process.

### 3. DISCLAIMER

The Disclaimer preceding the text of the Draft Guidelines appears to disclaim any responsibility for the use of the guidelines.

- What are the “relevant statutory requirements” (para 2)? At the very minimum these should be listed and the relevant sections identified.
- There are no rights or obligations attached to the guidelines. In stating that the guidelines are not intended to give rise to any “*rights, claims, benefits, privileges, liabilities or obligations*” all legal or meaningful regulatory authority has been removed, or indeed has never been included. What then is the purpose of the guidelines? If any purpose exists it has not been made clear. It would seem therefore that **adherence to the Guidelines is not mandatory and is not a necessary legal prerequisite to a development approval** (para 3).
- For example, the EPA Industrial Noise Policy (INP) states it is a **non mandatory, non statutory guideline**. However the EPA and/or Local Government and/or the Department of Planning and Infrastructure **can exercise their various authorities to ensure compliance with the INP as a condition of consent**. Somehow this then makes it mandatory.
- There does not seem to be a similar provision included in this disclaimer.
- Within the text of the draft guidelines there is provision for a procedure to be followed. Does this disclaimer make this procedure optional rather than mandatory? If the Conditions of Consent insist on the Guidelines being followed,

does this over-ride the disclaimer and impose “*rights, claims, benefits, privileges, liabilities or obligations*” after all?

- Why should the Department of Planning and Infrastructure *not* take responsibility for its own Guidelines? If not, then who? If not, why not?

#### 4. PLANNING FRAMEWORK FOR WIND FARMS IN NSW

##### (i) Permissible zones for Wind Farms (Section 1.1)

- **Wind turbines are industrial development.** These should therefore be confined to Industrial zones. There is a resulting conflict that devolves to the manner in which Council can charge rates. If land rates are charged on the basis of zoning rather than land use then there is a disconnect. Wind turbines should only be permitted on industrial zoned land and the rates should be similarly based, with the wind energy company entirely responsible for the rates to local Councils rather than the current situation where the rural host is the entity responsible for rates.
- The land use zones RU1 to RU4 are not defined. Presumably they are part of a SEPP but examination of the Environmental and Assessment Act 1979 (No. 203) could not identify them. An easy reference or actual definition is essential here.
- RU2 (Rural landscape) and RU4 (Rural small holdings) in particular are often contested zones where opinions differ concerning the appropriate placement of industrial wind turbines (IWT). **In particular any area zoned as “rural small holdings” should be considered unsuitable for the location of IWTs and be removed from the list of applicable land use zones.** “Rural small holdings” implies that the landscape is *closely settled* thereby ensuring that a significant number of residents will *inevitably be impacted*.
- **Prime agricultural land should be protected** with no industrial development allowed. There is a move within the Australian parliaments to define and protect such land as “strategic” and this should be adhered to. Where there is a conflict of land use Australia’s prime agricultural land should have protection precedence. There have been studies performed where the long term economic benefit of agriculture (both economic and environmental) far outweighs the financial rewards of short term industrial and mining developments which do little to sustain land, communities and local economies. ***The imperative need to protect and preserve the staple necessities of sustainable life on earth, namely food and clean water, must always take precedence over company profits and greed.***

(ii) **Development Assessment Process (Section 1.2)**

- The draft guidelines recommend a minimum public exhibition period of 60 days.
- This is insufficient.
- A proponent for a wind farm proposal often takes years to assemble a development application and an environmental assessment. This inevitably involves environmental consultants, extensive investigations, surveys, research, community consultations (although often token) and other matters pertaining to the proposed project. There is no timeline and the environmental assessment can take a protracted and even leisurely period to complete.
- By contrast, any community member or organisation, or indeed business, corporation, facility (such as school, hospital) etc inevitably will find 60 days too little to study and produce a quality submission (either for or against) the IWT development proposal.
- **This is *inequitable*. At the very least there should be a minimum exhibition period of 120 days or, better still, the same period for exhibition that the proponents took to prepare the submission, whichever is the greater.** This ensures some equality of proposal evaluation by the community especially as developments become larger and more complicated, and regulatory powers are eroded or eliminated. As has been seen by the previous callous excision of wind turbines from the INP and the POEO Act to nullify effective noise monitoring and complaint.
- **Wind monitoring towers should not be an “exempt” development** under Clause 39 and like any other development should require planning approval. Wind monitoring towers are becoming taller as the height of IWTs increases. They have now become significant obstructions to light aircraft (including agricultural air services and aerial fire fighting) and, as such, should have their own planning/development requirements.
- Once a development application is approved a **definite commencement time** must be stipulated and adhered to. There should be **significant constructions** commenced that should include foundations, roads, underground cabling. There should be a requirement that such constructions be finalised within three years of the approval date.
- If no definite commencement has occurred within three years of approval then the approval must lapse and a DA must be resubmitted with costs for approval, if the

proponent wishes to continue with the project. It is noted that the Victorian Government has very recently stipulated that wind turbine projects approved under its old regulations must be commenced by 15/03/2012 or lapse to give greater certainty to residents, particularly in view of the fact that some approvals are up to seven years old.

- Any approval must also **stipulate a completion date**. This important condition is currently not required. Further any completion date must not exceed five years. Certainty is required for both the hosts and non-hosts. Failure to comply or complete construction within this generous time period would obviously incur a financial penalty payable to the local area authority incurring the inconveniences of development delay.

**(iii) Proximity of Industrial Wind Turbines to existing residential dwellings (Section 1.3[a])**

- 2.0 km is an insufficient setback.
- Considerations relating to setback distance include (but are not limited to) noise, blade throw, blade flicker and glint. 2.0 km is considered to be the minimum in some European countries to guard against sequelae from blade throw. As the size of IWT increases this will only increase the setback distance required for safety, noise and visual amenity.
- A minimum 2 km setback is now applied in Victoria, with no “gateway” process. (See Section 4 (iv), this submission). This allows certainty to all parties and eliminates unnecessary application delays as it passes down the protracted bureaucratic process. NSW residents deserve at least to have the same standards as Victorians! This also goes in some way towards the Federal Senate recommendation of June 2011 for Australian National Guidelines.
- **The Guidelines make no provision for increasing IWT size.** Currently IWTs of 5 and even 10 MW size are operational or prototyped respectively. Much expert opinion considers 2 km is an insufficient setback for 2.5 to 3.3 MW size IWTs. It therefore follows it certainly won’t be sufficient for 5-10 MW turbines.
- Noise characteristics from IWTs are also determined by wind speeds and topography. It is not possible to have a fixed standard setback distance when there are so many variables. Ignorance of this critical aspect of incorrect turbine placement has significant health and social consequences.
- The setback distance of 2 km (or greater as argued here) should be calculated from a property boundary rather than a residence.

- Any property which has subdivision rights will be adversely affected if a subsequent subdivision is placed within the 2 km zones. Unless the 2 km is measured from the boundary any subdivision (actual or potential) will be lost to the land owner.
  - There is an issue of occupational health and safety. A farmer (host or non host), while his residence may be set at 2 km, will inevitably have to work in areas that are less than this distance. He will thus be exposed to health and safety consequences by his necessary and daily occupational proximity to IWTs.
- **It is necessary therefore to increase the setback distance** to cater for the wealth of present and future imponderables: **10 km** (particularly for noise effects) is now considered prudent and frequently cited. This also overcomes potential problems of accurately measuring the setback distance. The draft guidelines do not define how distance is measured for setbacks. Is it line-of-sight or distance-over-ground? 10 km also provides an adequate buffer for unexpected consequences of IWT placement. Once constructed it is very difficult to move or remove an IWT should intractable problems arise.
  - 10 km also automatically alleviates some visual amenity concerns.
  - It should be noted that the new Victorian setback distances include provision for a **5 km** setback from regional populations and from significant landscape areas. There is even room for questioning this type of setback differentiation. Is not the person living in a rural landscape being discriminated against compared to a person living in a regional population centre? Does this not allow an actionable case for discrimination? **A 10 km setback removes all possibility of discrimination.**
  - At what point do the different State noise guidelines for wind farms (which represent different Australian state populations) transgress Federal discrimination law (**Discrimination Act 1991**), when one state legislates obviously superior safeguards for its population when compared to another?
  - While the authors do not advocate IWT placement within National Parks it has to be asked, if they are considered suitable for closely settled rural populations why are they not suitable to be placed in **National Parks**? It also follows, if they do not present **visual amenity problem** what is the objection of placing them in areas of **scenic significance**. An obvious example would be North Head of Sydney Harbour which superbly fulfils many of the wind industry's topographical planning criteria.

(iv) **The Gateway Process**

- **The Gateway process has to be a joke!**
- The introduction of a gateway process eliminates all minimum setback distances. Following an application for a site compatibility certificate, would the JRPP potentially recommend 100 metres? 500 metres? 1 kilometre from a residence? It certainly would have the power to do so. **Thus there is no absolute minimum.**
- Once a setback distance (2 km in the case of these draft guidelines) is deemed appropriate there should be **no reason to reduce it**. A setback distance is **safe or it is not**. This is simply a method for appeasing the Wind Industry and providing a mechanism for it to circumvent the setback distance. **Put simply, this is a licence to affect human harm.**
- If a non-host resident (within the 2 km setback distance) genuinely objects to a wind turbine, the ability of the wind energy proponent to apply for a Site Compatibility Certificate (SCC) renders him powerless. An average landholder may well feel unable to or overwhelmed by the prospect of commenting on the powerful, well funded, legally resourced wind energy company's application for a SCC. The prospect of appearing before a public hearing of the Joint Regional Planning Panel (JRPP) is also likely to discourage participation of some landholders in the process. See also comments in Section vi.
- One supposes that the JRPP is set up to provide an appeal mechanism through an impartial third party for the process of obtaining a SCC. While the possibility of increased community input is welcomed, the process itself lacks rigour and is full of uncertainties and fails to imbue confidence:

*"The department and the JRPP MAY also seek advice from independent experts..."*

*"the JRPP MAY hold a public meeting where there MAY be further opportunity..." page 2*

- What or who determines what MAY or MAY NOT occur? What are the criteria? Who has the final say: the Department? The JRPP? The wind energy proponent? The Landholder? The neighbours? The Community via its representative organisations?
- The claim that the JRPP in having the role of determining the proposal "**ensures**" that there is local representation in the decision making is thus **not true**. The JRPP has the authority to decide **NOT** to have a community meeting.

- **The composition of the JRPP is inappropriate.** The 5 member panel is made up of 3 State nominees (including the Chairman) and 2 local members. This is an **uneven** composition at best. There should be greater provision for more local members rather than State nominees, after all this is a **community based objection**. There is no indication of what qualifications or qualities or experience the members (and indeed the Chairman) should have.
- Where is the role of **Local Government** via the relevant Shire Council? These are after all the elected and responsible first line of government for the Australian citizenry. Council nullification is insulting, undemocratic and eliminates community consultation via their elected representatives.

(v) **Requirements for a Site Compatibility Certificate include the following:**

(Note that the following points also apply to the requirements for an Environmental Assessment)

- A predicted level of noise at any houses within the 2 km zone is required **including low frequency noise**. This will be dealt with in Section 6 but presumably this will be based on background noise data collected down to 20 Hz.
- There appears to be **no intention to measure infrasound** and predict infrasound noise levels when wind turbines are operating. The Department of Planning and Infrastructure is well aware of the potential for infrasound to adversely affect health over and above the noise “annoyance” defined by the World Health Organisation which results from excessive audible noise.
- The Department is also aware of the increasing levels of infrasound and low frequency noise as the size of the wind turbine increases.
- This is therefore an abrogation of Duty of Care by the Department of Planning. **Infrasound needs to be measured as part of any routine monitoring of noise.**
- **Photomontages** notoriously under-demonstrate the visual impact of wind turbines on the landscape. “Photographic tampering” to falsify turbine height has been noted in the past and it is difficult for the viewer to obtain a realistic idea of the scale and size of a wind turbine simply by photography. There is an ambient characteristic which is never captured. It would be more meaningful for the potential host or neighbour to be taken to an operating wind farm and view wind turbines at various points within the 2 km setback distance to obtain a more realistic visual impression. This obviously would be at the proponent’s expense and guided by an impartial third party.

- **Landscape values** are not defined and no financial compensation to affected landholders is mentioned. RU4 Rural Small Holdings is also an important Landscape zone since it has the potential to affect a greater number of residents. Landscape values will be of even greater importance in areas with iconic landscape and these areas are surprisingly not described.
- **Blade glint and shadow flicker** are extremely important consequences of wind turbines placed close to residences. Again these are difficult to visualise and, as with visual impacts above, potential hosts and residents should be allowed to view these impacts (at appropriate times of the day, wind speed, distance etc) at alternate wind farms which are operating.
- **21 days for public comment on a SCC application is insufficient.** Once again the proponent has the ability to take an unlimited time to fulfil the requirements of the SCC application and the public, particularly those most affected, are expected to provide counter argument and information within a short, prescribed time frame. This should be extended to 120 days at least.

**(vi) Agreements between residents and wind energy companies:**

- There is anecdotal and substantiated evidence that wind energy companies will sometimes apply undue persuasion and financial inducements to ensure that contracts are signed between themselves and wind turbine hosts. Too often landholders are not truly aware of the full ramifications of what they are signing, do not seek legal advice and, after signing, realise too late that they have no recourse to reverse the contract.
- With the Gateway process there is also the possibility that non host landholders living within the 2 km set back will be vulnerable to bullying tactics or inducements by wind energy companies to sign away their right of objection.
- The Guidelines must make provision for an “arms length” mechanism, preferably a Department of Planning “Ombudsman”, who acts to both inform and protect landholders in this situation. No contract should be signed before a detailed briefing, with all liabilities and obligations discussed and explained, has taken place. This should include acknowledgement of possible health, economic, aesthetic, environmental and related issues. There should be a standard “cooling off” period as well.
- The Department of Planning and Infrastructure, either through its Guidelines or through its public service requirements, should make provision for this.

- Gag clause are odious and an anathema to democracy and legal transparency. They should be eliminated and democracy reinstated immediately.

## 5. COMMUNITY CONSULTATION (Section 1.3 (b) and Appendix C)

**Please Note:** the Draft Guidelines error in referring to Appendix D. It should be Appendix C.

### (i) The Role of Council

- During the last NSW state elections one year ago the now elected government gave reassurances that decision making would be more decentralised and returned to local communities, via their Councils. These guidelines have invalidated this promise.
- Councils have effectively been removed from the development and approval processes. They have a minor role on the Community Consultative Committees, and may be useful for the proponent energy company as a source of local information. This is an abrogation of election promises that have been quietly ignored.
- Where Councils have a Development Control Plan (DCP) this must be considered and adhered to. DCPs have been constructed to take into account local land uses, land zoning, industrial development, community input, landscape, local businesses (present and future) and any issues pertinent to a particular Local Council and its constituents.
- The Guidelines must require of the proponent and the consenting authority (Department of Planning and Infrastructure or the Planning Assessment Commission) to abide by any restrictions, rules or regulations in the DCP at all times. This represents, as well as any system can, the will of the people. All developments ultimately exist for the good or the use of people and therefore these very same people must be allowed to accept or reject any proposal according to their needs and circumstances.
- Councils should have representatives on the Planning Assessment Commission. At the very minimum there should be a representative appointed by the Local Government Association and one “rolling” appointment where a particular Council with a wind farm proposal being considered will have a representative for that particular assessment only – the position then moving on to another Council where another proposal is being considered.

**(ii) Membership of the Community Consultative Committee.**

- The CCC is to consist of 9 to 12 members. Of these, a substantial majority namely 6 to 8 members will be appointed by the Director General, 1 by the local Council and 2 to 3 by the proponent wind energy company. Obviously this gives the Director General the power to select the majority of the CCC without appropriate local knowledge or input, and indeed the power to weight the CCC in a fashion which is not truly representative of community concerns or indeed the community concerned.
- Local Councils, being the elected local government, should have authority to select community members of the CCC and/or provide a voting system for electing local CCC members.
- Clearly the fact that the proponent can nominate its own representatives on the CCC and the local community cannot is **gross discrimination and bias**.
- Council should have more than one representative on the CCC (Councillors, not Council employees). Council already representing and managing local and community issues are electorally responsible which should make them the logical choice.

**(iii) Functions of the Community Consultative Committee**

- A key responsibility of the CCC is to provide information to the community. Where this is done by public meetings it is essential that the format be that of information sessions followed by well adjudicated Q & A's. Recent experience where participants have been facilitated into small groups has effectively censored and muzzled the opportunity for full meeting relevant Q & A's, especially those directed towards the proponent. This in turn leads to poor information transfer and frustration on the part of participants who, rightly, feel they are being fed sanitised propaganda. Why is transparency, fairness and common sense so lacking from this consultative process?
- What resources will be given the CCC?
- What level of involvement will be expected with the complaints process?
- What audit reports will actually be available to them? For instance recent noise data relating to Capitol Wind Farm has been removed from the Department of Planning's website by the Deputy Director General, Mr. Richard Pearson. It has been reported to several enquirers that this is because of "commercial in

confidence” matters insisted on by Infigen Energy. Disguising data which should be publically available as “commercial in confidence” is outrageous censorship and violation of democratic process.

- What rights therefore will the CCC have to demand and receive current noise collection data? At what point may the proponent request and obtain deletion of public data displayed on the Department’s website because of “commercial in confidence,” when it clearly is not. Who decides on the validity of “commercial in confidence” and what happens when disagreement occurs?
- With little imagination the scenario will develop of greater power for the well resourced, professional and influential wind energy company over the poorly resourced (financially and time), poorly conceived and easily ignored CCC.
- Unless the CCC is a statutory body (as is the case with the PAC and JRPP) it will have no power and will be forever a dissenting party to the bias currently displayed by the Government and the wind energy proponent.

## 6. NOISE (Section 1.3 [d] and Appendix B)

### (i) Noise Criteria

- Table 1 of the draft guidelines (page 5 and page 28) sets out acceptable limits for noise criteria. **These are too high, inadequate and incorrect when applied to rural settings.** Moreover, there is no acknowledgement of the source of this table.
- General references for the Noise Section include WHO: “*Guidelines for Community Noise (1999)*” and “*Night Noise Guidelines for Europe (2009)*”.
- Any reliance on the **WHO night time targets is totally misplaced.** The WHO document identifies traffic noise as the major issue of complaint and considers road, rail and aircraft noise in an **Urban Setting not Rural**. There is no reference to wind farm noise, low frequency noise or rural communities. The WHO documents allows 21 dB(A) attenuation from outside to inside which may be appropriate for road traffic noise but wind farm noise attenuation is much lower.
- Therefore, how do the noise goals of 50 dB(A) in the day and 40 dB(A) at night in any way equate with endeavours to be made “*to retain an acoustic amenity commensurate with the objectives of the surrounding land uses.*” Clearly it

can't, and once again the obvious lack of thought that has gone into these guidelines is obvious.

- Given that surrounding land uses are primarily **rural** (often rural small holdings) how does this relate to the dot point below:
- The guidelines also state that these noise criteria will be either “background + 5 dB(A)” or “35 dB(A)” **whichever is greater**.
- Background noise levels at night in rural areas are generally accepted to be in the range of 20 dB(A), or lower. The criteria allow the proponent to choose the upper noise limit of 35 dB(A). Clearly this is a much higher allowable noise level than background + 5 dB(A) which would normally be, in a rural area, in the order of 25 dB(A), or lower. Many rural inhabitants choose their locality for this very point ie. **a lack of intrusive noise**.
- Under this system a resident could be subjected to night noise levels 10-15 dB(A), or greater, than those the resident would normally be accustomed to, with clear ramifications for annoyance and sleep disturbance.
- **To take a precautionary approach the noise criteria should be “background + 3 dB(A)” or “20 dB(A)” whichever is the LESSER. Only these levels will accurately reflect the true rural night time ambient noise levels.**
- The Guidelines state that the noise criteria have been developed “*to minimise the impact on the amenity of neighbouring properties.*” How will this happen? Neighbouring properties are just as vulnerable to noise as host properties, and will be just as vulnerable to set back distances, turbine noise, visual amenity and the normal array of problems associated with proximity of wind turbines. Once again, the reader is left with the real conclusion that the guidelines have been written by or for the wind industry.
- The Guidelines do not address the issue of **offensive noise**. Offensive noise is defined as “any noise that causes harm to a person and/or interferes with their rest and repose”. In mining and other industries a condition of consent is the prohibition of offensive noise. In **NSW wind turbines are exempt from this requirement**. It is uncertain whether, or if, the strengthening of the regulation of noise from wind farms under the *Protection of the Environment Operations Act (1997)* will address this anomaly and if so, how?
- The Guidelines do not address the issue of **ageing wind turbines**. As they get older there is increasing noise produced as gear boxes, shafts and bearings wear with time.

## (ii) Measurement and Modelling of Noise

- The Guidelines use different criteria when measuring noise. It is important to have **consistency**. For instance, predicted noise levels **prior** to construction are to use  $L_{eq}$ , 10 minute measurements (page 27) whereas **after** construction when testing for compliance  $L_{90}$  is to be used. This will result in a situation where compliance testing cannot be assessed properly against predicted noise. **Where is the sense in that? Why would anyone ever adopt two different standards to measure the same thing, ie IWT noise, unless they were determined to confuse the monitoring process to ensure a lack of compliance impossible to prove? This inconsistency must be fixed immediately.**
- There is an erroneous assumption that as the noise of wind increases so too will the noise of the turbines running at a higher speed will be masked. Wind speed at turbines often does not correlate with wind speed at residents' homes. For instance, a home located down a valley and away from the wind turbine may experience very little wind at times when the wind turbine on a ridge will experience much greater wind speeds producing greater noise.
- This needs to be built into predictions and modelling of noise at residents' homes. At the moment it is not. ***This must be fixed immediately.***
- **It is axiomatic that instruments (loggers) used to monitor noise must be able to measure the full range of noise, especially when collecting background data.**
- According to the Guidelines loggers need only measure down to 20 dB(A).
- Clearly any background noise below 20 dB(A) will not be measured, and yet it is demonstrable that background noise in a rural setting (particularly at night) can drop down below this level. To obtain true background readings loggers must be able to record noise well below this level. If **average noise levels are being calculated the exclusion of below 20 dB(A) readings will skew the results to produce an erroneously high average.**
- Any data collection that guarantees to demonstrate higher background noise than is actually present will favour developers and disadvantage residents. ***This must be fixed immediately.***
- This inherent inaccuracy in the calculation of ambient background noise also affects the **accuracy of any modelling** of predicted noise of the operating wind farm. This then affects the limits imposed in the conditions of consent.

- Flyers Creek Wind Turbine Awareness Group recently provided the Department of Planning with a submission concerning Infigen Energy’s proposed Flyers Creek Wind Farm. Acoustic work reported in the submission readily demonstrated the **inadequacies of the logging instrumentation** used to record background noise and the modelling used to predict the noise from the proposed wind farm.
- The assumptions made when modelling predicted noise levels are often wrong. Any modelling done that assumes flat terrain and a single noise source **cannot** translate to situations where terrain is hilly (with variable and turbulent wind characteristics) or where there is a cumulative effect from several or more turbines. ***This must be fixed immediately.***
- Modelling that does not account for the many likely variables will inevitably **under predict** the noise from the wind turbines. The Flyers Creek Wind Turbine Awareness Group’s submission clearly showed that acoustic modelling for the operational Capital Wind Farm was **incorrect** as the wind turbines there are producing audible noise significantly above predicted levels and also above the allowable levels in the conditions of consent.
- The Guidelines make no real allowance for **temperature inversion**. It is mentioned on page 51 where “*noise monitoring during period(s) commensurate with ‘worst case’ operation and meteorological factors*” MAY be required as part of a Noise Compliance Report which MAY be required within the first 12 months. Temperature inversion occurs particularly in winter with colder night time temperatures as found commonly on higher (ie. Tablelands and ridges) terrain – a landscape typical of the areas proposed for wind turbine installation in NSW.

### (iii) Low Frequency Noise (LFN) and Infrasound

- Despite assertions within the Guidelines that LFN is not typically present, peer reviewed literature is increasingly citing its presence, as well as the presence of infrasound. LFN is generally accepted to be 20-400 Hz, while infrasound is <20 Hz.
- This is an increasing problem as it has also been demonstrated that LFN and infrasound increase as the size of the wind turbines increase (despite assertions by the wind industry to the contrary). As described previously the Guidelines should take into account the fact that wind turbines of between 5-10 MW may become the norm, thus requiring more stringent regulation. ***This must be fixed immediately.***

- **Both LFN and infrasound should be assessed INSIDE and OUTSIDE residences.**
- LFN levels of 65 dB(C) during the day and 60 dB(C) at night are considered acceptable. On what basis? One assumes that these are outside noise levels? What is an acceptable indoor level **where people sleep**?
- **In fact the indoor level for LFN should not exceed 45 dB (C) otherwise noise annoyances and sleep disturbance invariability will result.**
- **Infrasound** MUST also be measured and an upper limit set. Recent literature suggests that it should be considerably lower than the 60dB(C) often quoted. Moreover infrasound is more accurately calculated as dB(G) and this should be mandated for use in this instance.
- The Australian Federal Senate held an enquiry into The Social and Economic Impact of Rural Wind Farms releasing its report in June 2011. Recommendation 6 states: *“The Committee recommends that the National Acoustics Laboratories conduct a study and assessment of noise impacts of wind farms including the impacts of infrasound.”*
- Therefore there should be provision in the Guidelines to adjust maximum allowable noise limits (audible, LFN and infrasound) as emerging research dictates. ***This must be introduced immediately.***
- An upgrade of suitable instrumentation is required. The present Category 2 loggers obviously are not adequate to measure noise at low frequencies. There appears to be inadequacies also with Category 1 without modification. Instruments must be able to measure noise as dB(A), dB(C) and dB(G) as a minimum. Cost of better instrumentation and/or lack of proficiency in consultant acousticians and/or objections by developers should be no excuse to fail to undertake these noise measurements. ***This must be introduced immediately.***

#### (iv) **Tonality and Amplitude Modulation**

- The statement (page 33) that *“tonal characteristics typically do not occur in well designed and well maintained wind turbines”* is false. Waterloo Wind Farm in South Australia recently demonstrated tonality and it is regularly demonstrated internationally despite false and misleading statements to the contrary by the wind turbine industry because it is not in their financial interest to do so. Further, tonality incurs a noise penalty of 5dB(A) and is therefore of great concern to IWT developments.

- On page 34 the Guidelines state that “*an absence of tone measured at an intermediate location is sufficient proof that the tone at the receiver is not associated with the wind farm’s operation.*” This is false and illogical and “Intermediate location” is not defined. Residents (or receivers) can very easily experience tonality at a residence when there may be none demonstrated at an “intermediate location”. Differences in topography, landscape, wind speed, direction and number and placement of turbines can all exert an influence on tonality. Importantly, and to further refute this assertion, it has been demonstrated that there are significant differences in tonality between inside and outside dwellings.
- Similarly the argument is mounted for amplitude modulation. The Guidelines state that “*Absence of excessive modulation in noise emissions at an intermediate location is sufficient proof that the modulation is not a feature of the wind farm.*”
- The assumptions here likewise cannot be validated and these statements should be removed from the Guidelines.
- A further criticism is that the tonal assessment is inappropriate for narrow band tones; again this is totally disregarded and conspicuously absent.
- The description of amplitude modulation is poorly worded and requires clarification.

(v) **Issues of Compliance**

- A protocol for compliance testing must include the full range of sound, both audible and inaudible (LFN and infrasound) because it is at the very heart of the ongoing health concerns. The protocol must be comprehensive and measure noise as dB(A), dB(C) and dB(G). To safeguard sleep the protocol must include measurements both **inside** and **outside** affected residences within a minimum of 5 km.
- Compliance testing must occur within 12 months of the commencement of operation of a wind farm. The Guidelines are quite ambiguous here. On page 7 and page 36 it is stated that compliance testing will be compulsory within the first 12 months. However Appendix E (page 51) states that “*Conditions of consent MAY require the applicant to prepare and submit a Noise Compliance Report.*”
- From this it is assumed that, as the Director General actually issues the eventual Conditions of Consent, the DG can determine **whether** or **not** compliance

testing within the first 12 months (or ever!) is even required. This lack of rigour again reflects the poor quality of this document.

- **Compliance testing must be mandatory. *This must be introduced immediately.***
- **Compliance testing must be carried out by an independent acoustician. *This likewise must be introduced immediately.***
- Any protocol for compliance testing must also include periodic (and unannounced) testing by an independent acoustician over the years of operation. As previously mentioned ageing wind turbines can emit increasing noise. **Ongoing surveillance must be mandatory. *This must be introduced immediately as an obvious regulatory requirement.***
- **All noise monitoring data must be available to the public and placed on the Department of Planning’s website.** There must be no future fictitious issues of “commercial in confidence”. This infringes democratic rights of citizens affected by noise issues.
- It should also be mandatory that the DG order an **independent** review of a wind farm’s operation if a landholder so requests. The draft guidelines merely allows the DG to order such a review if he/she considers it warranted. This provides no guarantees for the landholder and does not allow for a fair, practical or legal framework for complaint resolution and compliance assessment. Moreover the landholder rights to natural justice are obviously jeopardised. What possible good could this serve?
- The Guidelines state that the proponent (wind energy developer) will commission an expert to carry out any review. This self-regulation is **totally unacceptable**. An independent expert must be appointed by an independent and relevant professional organisation. ***This must be introduced immediately.***
- Most importantly, **there is no indication within the Guidelines of the consequences of non compliance. Wind turbines must cease operation if there is evidence of non compliance and remain so until compliance can be achieved.** This occurs with other industries. Industrial wind turbines must not be exempted and this must be legislated (with the inclusion of fines as well as closure). The EPA, as the newly proposed regulatory body, must have sufficient powers to enforce such legislation. ***This must be introduced immediately.***

- Legislation must also provide for compensation to landholders in the event of distress caused by wind turbines remaining operational when non-compliant. *This must be introduced immediately.*

## 7. HEALTH

- The health effects of noise from wind turbines are becoming increasingly important as the expanding body of research (national and international) demonstrates. Considering this, the brief paragraphs given to this topic in the Guidelines (pages 7 and 21) are inadequate and only draw attention to the deficiency of this topic in this document.
- It is inappropriate to only confine consideration of impacts to within 2 km of any proposed wind turbine. As mentioned previously the evidence now is that this distance should be 10 km until we have research to indicate otherwise.
- The recommendations from the Senate enquiry into The Social and Economic Impact of Rural Wind Farms have been totally ignored. For instance (in Recommendation 4) it is stated that there should be “*as a matter of priority thorough, adequately resourced epidemiological and laboratory studies on the possible effects of wind farms on human health.*” Why do the taxpayers of this country tolerate wasteful enquiries which are (sadly) ignored?
- Evolving research into health effects is likely to continuously change the parameters of what is acceptable when considering noise emissions from wind turbines. Any Guidelines must be flexible enough to incorporate this.
- The NSW Department of Health is listed as the authority for health effects in NSW such that “*The Department of Planning and Infrastructure may refer applications to the NSW Department of Health as part of the assessment.*” Given that the Department of Health has not conducted any assessment of the health impacts itself how can it consult with the Department of Planning on this matter with any authority? The Department of Health must regain its role in the protection of public health and initiate immediate research into these health effects, otherwise it will continue to be judged as an organisation which has placed itself into a position of irrelevancy in the current debate. The continued Department of Health dogma that the rural population should carry the responsibility for the entire population’s renewable feel good moment is unacceptable, as is the abrogation of its duty of care to the citizens it is assigned to protect.
- There are only THREE references on health cited in the literature reference list. Two are from the National Health and Medical Research Council (NHMRC)

from 2010 which, on the NHMRC's own admission are now outdated and which are due to be updated later this year. The other is from the Victorian Government although it is not made clear where this is used.

- It is obvious that this very important issue has been ignored with token platitudinous statements which in no way protect any landholders who may suffer from adverse health sequelae from industrial wind turbines. This represents a health disgrace by any measure.

## **8. ENVIRONMENTAL CONSIDERATIONS**

- Once a wind farm proponent submits an application to the Department of Planning there should be a mandatory lapse time of 18 months before the proponent's Environmental Assessment is submitted to the Department. This is necessary to enable district residents to assess the impacts on their community and environment, and to carry out such environmental (and other) assessments they consider necessary. It is often necessary to study impacts over a 12 month period to allow for significant seasonal variations in fauna movements, flora life cycles, and weather, rainfall and wind patterns. This time frame is particularly necessary in view of the mere 60 days proposed for the public exhibition of the proponent's Environmental Assessment.
- The Guidelines are virtually silent on water quality and erosion. There is significant land disruption during construction particularly. Clearly wind farms are usually sited on ridgelines and hilly country which means that access is also across country that will be vulnerable to erosion. This has significant implications for water erosion particularly near water courses and dams.
- Therefore, no turbines should be erected within 1 km of a watercourse, 2 km of a lake of more than 5 hectares and no closer than 1 km from a road or highway. This is particularly important in catchments of water storages which are being used for potable water.
- Habitats of threatened and vulnerable species (as defined by either the relevant State or Federal Acts) must be protected and there should be no disruption of habitats either during construction or operation. This must include height restrictions near the breeding grounds or migratory flight paths of endangered birds or bats.
- The Rural Fire Service defines fire-prone areas. No wind turbines should be built in these areas because of the difficulty of fighting fires that massive wind turbines present. There are no-fly zones generally of 1 km from a wind turbine

where it is not safe for aircraft to traverse. This puts obvious obstructions to managing uncontrolled bush fires which in turn further endangers human life. ***This must be introduced immediately.***

- Any wind turbine that is nevertheless built in a fire prone area must not operate in extreme or catastrophic fire conditions and should be removed at the earliest opportunity in the interest of human safety.
- In addition, when considering wind turbines as a source of fire themselves, all wind turbines must compulsorily be fitted with fire suppressors.

## 9. REAL ESTATE VALUES

- The Draft Guidelines addresses this aspect with obvious minimal interest.
- Numerous studies both nationally and internationally show that land values around an industrial wind turbine development decrease. Figures range from 25 to 50% depending on how close a property is to wind turbines.
- Although the Guidelines specify that issues regarding land values “should be considered” within the 2 km band this is not restrictive. Proponents will often consider land values out to 10 km which will obviously bring in a dilution factor. That is, more properties will be in the 5-10 km band than say the 2-5 km and particularly the 0-2 km bands. Land values will be less affected at 10 km than say 2 km, but this will not be demonstrated and importantly will be reflected in inaccurate average prices.
- The results are likely to be further skewed by the demonstrable fact that properties close to wind turbines do not sell readily and/or are unsalable. If a property cannot be sold this will not be reflected in statistics.
- In many instances the wind developer will buy up a property at a price which does not reflect the true market value.
- It has also been shown, and is the authors’ experience, that the mere prospect of a wind developer submitting a development application is sufficient to significantly reduce marketability of adjacent property at least out to the 5 km limit.
- The guidelines do not allow for compensation or mention voluntary or involuntary acquisition. Fair real estate values must form part of the development process. ***This must be introduced immediately.***

## 10. ISSUES WITH DECOMMISSIONING

- This is a very important aspect of industrial wind turbine installations. It must be mandatory that decommissioning is dealt with openly and clearly in the contracts between the proponent and the host. In NSW, in the event of the proponent defaulting, it is the responsibility of the land holder to decommission any wind turbines on his land. This is often not spelt out clearly in any contract.
- The Guidelines state on page 26 “*a condition of consent MAY be imposed requiring the proponent to pay a decommissioning bond in the event the Development Application is approved.*” **This MUST be mandatory and must be introduced immediately.**
- The current argument propounded by the wind industry proponents that the scrap value of the wind turbines would always cover the cost of decommissioning does not stand up to scrutiny and must not ever be given any legitimacy. This trite statement again is not representative of the truth and has never taken into account the increasingly cost of labour to effect the turbine removal, the economies of scale that were available to the proponent when the turbines were actually constructed and the doubtful availability of recycling facilities for the specialised turbine components (currently not available in Australia and who knows what the situation will be in 20 years time!).
- Bonds (AAA rated) must be paid for the entire calculated cost of decommissioning prior to the commencement of construction. The bonds should be administered by an independent, statutory body.
- Over and above the payment of a bond the proponent should present the Department of Planning, as part of its development application, a full decommissioning schedule and associated costs including deconstruction, transport, and recycling of components. This schedule must include the methods of recycling or safe disposal of toxic IWT products. This report should be independently verified. Given the unknown circumstances that may be in place in 15-25 years there must be a “margin of safety” of, say, + 10% in these costings. This figure must be indexed to provide the safety necessary to safeguard the Australian taxpayer.

**11. SUBMISSION TO THE DEPARTMENT OF PLANNING AND INFRASTRUCTURE.**

The above submission is presented to the Department of Planning and Infrastructure for consideration.

We retain the right to further add to this submission beyond the 14<sup>th</sup> March, 2012 should we wish to present further information, facts and material pertinent to the Planning Guidelines – Wind Farms

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12 March, 2011

## 12. REFERENCES

1. Aerial Agricultural Association of Australia. (March 2011) *Windfarm Policy*. <http://www.aerialag.com.au> (viewed November 2011).
2. Alves-Pereira, M., Branco, C., (2007), *Public Health and Noise Exposure: the Importance of low frequency noise*. Proceedings the InterNoise Conference, Istanbul, Turkey. 3-20.
3. Ambrose, S.E. and Rand, R.W. (2011). *The Bruce McPherson Infrasound and Low Frequency Noise Study: Adverse Health Effects Produced by Large Industrial Wind Turbines Confirmed*.
4. Australian Senate Enquiry. (June 2011). *The Social and Economic Impacts of Rural Wind Farms*. Community Affairs References Committee. Canberra, ACT, Australia.
5. Bakker, H. and Rapley, B. (2010). *Sound Characteristics of Multiple Wind Turbines*. In Rapley, B. and Bakker, H. (Eds) (2010). *Sound, Noise, Flicker and the Human Perception of Wind Farm Activity*. p.233-258.
6. Berglund, B., Lindval, T., and Schwela, D. (Eds) (2000). *Guidelines for community noise*. World Health Organization, Geneva, Switzerland.
7. Bronzaft, A.L. (2011). *The Noise from Wind Turbines: Potential Adverse Impacts on Children's Well-Being*. Bulletin of Science, Technology and Society. (Aug 2011). 291-295.
8. Burraston, D. (2011). *Wind Farm Decommissioning*. Paper
9. Cappuccio, F.P., Cooper, D., D'Elia, L., Strazzullo, P. and Miller, M.A. (2011). *Sleep duration predicts cardiovascular outcomes: A Systematic review and meta-analysis of prospective studies*. European Heart Journal doi:10.1093/eurheartj/ehr007
10. Ceranna, L., Hartmann, G. and Henger, M. (2005). *The Inaudible Noise of Wind Turbines*. Infrasound Workshop Nov 28-Dec 02, 2005, Tahiti. (Federal Institute for Geosciences and Natural Resources (BGR), Scetion B3.11, Stilleweg 2, 30655, Hannover, Germany)

11. Clayton Utz. (2006). *Good decision-making for government. Duty of Care.* [www.claytonutz.com](http://www.claytonutz.com)
12. Commonwealth of Australia (1999). *Environment Protection and Biodiversity Conservation Act 1999.* Commonwealth Government, Canberra.
13. FCWTAG (2011), Flyers Creek Wind Turbine Awareness Group Inc, *Submission MP08\_0252 Flyers Creek Wind Farm Proposal.*
14. Hanning, C. (2010). *Wind Turbine Noise, Sleep and Health.* Sleep Disturbance and Wind Turbine Noise. November 2010.
15. Hanning, C. and Evans, A. (2012). *Wind Turbine Noise: Seems to affect human health adversely and an independent review of evidence is needed.* British Medical Journal. **344**: e1527. pp 2.
16. Harding, G., Harding P., Wilkins, A. (2008). *Wind turbines, flicker and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them.* Epilepsia **49**: 1095-1098.
17. Harrison, J.P. (2011). *Wind Turbine Noise.* Bulletin of Science, Technology and Society (Aug 2011). 256-261.
18. Harry, A. (2007). *Wind turbines, Noise and Health.* View: [http://www.flatgroup.co.uk/pdf/wtnoise\\_health\\_2007\\_a\\_barry.pdf](http://www.flatgroup.co.uk/pdf/wtnoise_health_2007_a_barry.pdf)
19. Leventhall, G., Pelmeur, P. and Benton, S. (2003). *A review of published research on low frequency noise and its effects.* Department of the Environment, Food and Rural Affairs, Defra Publications, London, England.
20. Leventhall, H.G. (2006). *Infrasound from Wind Turbines – Fact, Fiction or Deception.* Canadian Acoustics, Special Issue, **34(2)**, 29-36.
21. McCann, M.S. (2011). *Property Value Impact & Zoning Evaluation, Cape & Vineyard Electric Cooperative, Brewster, Massachusetts.* McCann Appraisals, LLC. 500 North Michigan Avenue, Chicago, Illinois, USA.
22. McMurtry, R.Y. (2011). *Evidence of Known Adverse Health Effects related to Industrial Wind Turbines. Appendix C.* Submitted to the Appeal for Renewable Energy Approval Issued to Kent Breeze Corp. and MacLeod Windmill Project Inc., January 2011.

23. McMurtry, R.Y. (2011). *Toward a Case Definition of Adverse Health Effects in the Environs of Industrial Wind Turbines: Facilitating a Clinical Diagnosis*. Bulletin of Science, Technology and Society. (Aug 2011). 316-320.
24. Miskelly, A. and Quirk, T. (2009). *Wind Farming in South East Australia*. Energy & Environment. **21.1**
25. Miskelly, P (2011). Personal communication – Examination of electrical generation performance of total wind farms connected to the eastern Australian electricity grid, with installed capacity ~ 2000 MW.
26. Moller, H., and Pedersen, C.S. (2004). *Hearing at low and infrasonic frequencies*. Noise Health **6**: 37-57.
27. Muller, H. and Pedersen, C.S. (2011) *Low-frequency Wind-turbine Noise*. J. Acoustical Society of America. **129(6)**. 3725-3743.
28. National Health & Medical Research Council. (2009). *Wind Turbines and Health: A Rapid Review of the Evidence*. Canberra, ACT, Australia.
29. New South Wales (1995). *Threatened Species Conservation Act 1995*. NSW Government, Sydney.
30. Niemann, H. and Maschke, C., (2004). *WHO Lares: Report on noise effects and morbidity*. World Health Organization, Geneva,
31. Nissenbaum, M. (2010). *Wind turbines, Health, Ridgelines and Valleys*. View: <http://www.wind-watch.org/documents/wind-turbines-health-ridgelines-and-valleys/>
32. Pedersen, E. and Persson Waye, K. (2004). *Perception and annoyance due to wind turbine noise: a dose response relationship*. *Journal of Acoustical Society of America*. **116(6)**: 3460-3470.
33. Pederson, E. and Persson Waye, K. (2007). *Wind turbine noise, annoyance and self-reported health and wellbeing in different living conditions*. *Occupational Environmental Medicine*. **64**. 480 – 486.
34. Persson, W., Bengtsson, J., Rylander, R., Hucklebridge, F., Evans, P. and Chow, A. (2002). *Low Frequency noise enhances cortisol among noise sensitive subjects*. *Life Sciences*. **70**. 745-758.

35. Phillips, C.V. (2011). *Properly Interpreting the Epidemiologic Evidence about the Health Effects of Industrial Wind Turbines on Nearby Residences*. Bull. Of Science Technology and Society (Aug 2011). 303-315
  
36. Pierpont, N. (2009). *Wind Turbine syndrome: A Report on a natural experiment*. K-Selected Books, Santa Fe, New Mexico, USA.
  
37. Punch J, James R. and Pabst D (2010). Wind-Turbine Noise, What Audiologists Should Know *Audiology Today*, July/August 2010.
  
38. R v Pacino: *Extending the Limits of Criminal Negligence?* p4. <http://www.murdoch.edu.au/elaw/issues/v5n1/macfar51.html> (viewed December 2011)
  
39. Saccorotti, G., Piccinini, D., Cauchie, L., and Fiori, I. (2011). *Seismic Noise by Wind Farms: A Case Study from the VIGO Gravitational Wave Observatory, Italy*. Bulletin of the Seismological Society of America. **101** (2): 568-578.
  
40. Salt, A.N. *Wind Turbines are Hazardous to Human Health*. posted at the website of the Cochlear Fluids Research Laboratory, Washington University, St. Louis. View: [www.otot2.wustl.edu/cochlea/wind.html](http://www.otot2.wustl.edu/cochlea/wind.html)
  
41. Salt, A.N. (2010). *Infrasound: Your ears "hear" it but they don't tell your brain*. Paper presented at the First International Symposium on Adverse Health Effects of Industrial Wind Turbines, Picton, Ontario, October 29-31, 2010.
  
42. Salt, A.N. and Hullar, T.E. (2010). *Responses of the ear to low frequency sounds, infrasound and wind turbines*. Hearing Research. **268**: 12-21.
  
43. Salt, A.N. and Kaltenbach, J.A. (2011). *Infrasound from Wind Turbines Could Affect Humans*. Bulletin of Science, Technology and Science. (Aug 2011). 296-302.
  
44. Salt, A.N. and Lichtenhan, J.T. (2011). *Responses of the Inner Ear to Infrasound*. Fourth International Meeting on Wind Turbine Noise, Rome Italy, 12-14 April 2011.
  
45. Schust M (2004) *Effects of low frequency noise up to 100 Hz*, Noise & Health (2004) **6** (23): 73 –85.

46. Shepherd, D. (2010). *Wind Turbine Noise and Health in the New Zealand Context*. In Rapley, B. and Bakker, H. (Eds) (2010). *Sound, Noise, Flicker and the Human Perception of Wind Farm Activity*. p.15-68.
47. Sinkaus, B. (2011). *Examining the Effects of Wind Turbine Industrial Development on Rural Areas.* Australian National Internships Program. Prepared for Alby Schultz, MP. Parliament of Australia.
48. Siponen D, *The Assessment of Low Frequency Noise and Amplitude Modulation of Wind Turbines*, 4<sup>th</sup> International Meeting on Wind Turbine Noise, Rome, Italy, 12-14 April 2011-07-06
49. Sloth E. (2010) Parameters influencing wind turbine noise. Presented to the Clean Energy Council Conference, May 2010 Sydney, Australia
50. [The] Sonus Report for the Clean Energy Council 2010 p.9
51. Swinbanks MA (2011). The Audibility of Low Frequency Wind Turbine Noise. Paper presented to the 4<sup>th</sup> International Meeting on Wind Turbine Noise, Rome Conference 12-14 April 2011
52. The Acoustic Group (2011) Peer Review of Acoustic Assessment - Flyers Creek Wind Farm, *FCWTAG Submission MP 08\_0252 Flyers Creek Wind Farm Proposal*.
53. Thorne, R., (2010a) *Wind Farms: The Potential for Annoyance*. In Rapley, B. and Bakker, H. (Eds). *Sound, Noise, Flicker and the Human Perception of Wind Farm Activity*. p.127 -136.
54. Thorne, R., (2010b) *Noise from Wind Turbines*. In Rapley, B. and Bakker, H. (Eds). *Sound, Noise, Flicker and the Human Perception of Wind Farm Activity*. p.217 - 224
55. Thorne, R., (2011a) *The problems with "Noise Numbers" for Wind Farm Noise Assessment*. Bulletin of Science, Technology and Society. 262 - 290.
56. Thorne, R., (2011b) *Wind Farm Noise Guidelines 2011*. Noise Management Services Pty. Ltd.
57. Van den Berg, G.P. (2004a). *Do wind turbines produce significant low frequency sound levels?* Eleventh Meeting on Low Frequency Noise and Vibration and its Control. Aug 30 – Sept 1, Maastricht, Holland.

58. Van den Berg GP (2004b) Effects of the wind profile at night on wind turbine sound, *Journal of Sound & Vibration* (2004) 277 (4-5): 955-970.
59. Van den Berg GP (2006) The sounds of High Winds: the effect of atmospheric stability on wind turbine sound and microphone noise. PhD diss., University of Groningen, Netherlands, 177 pp., posted at [www.wind-watch.org/documents/authors](http://www.wind-watch.org/documents/authors).
60. Van den berg GP, Pedersen E, Bouma J and Bakker R (2008) Project WINDFARMperception. Visual and acoustic impact of wind turbine farms on residents. Final Report, June 3 2008. 63 pp. Summary at [www.windaction.org/documents/16255](http://www.windaction.org/documents/16255). Entire report at <http://dspace.hh.se/dspace/bitstream/2082/2176/1/WFp-final.pdf>
61. WHO (1999). *Guidelines for Community Noise*. World Health Organization 1999.