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Hon Brad Hazzard, Minister for Planning,
Director General, NSW Department of Planning,
All other individuals responsible for the planning decision with respect to
the COLLECTOR WIND DEVELOPMENT
NSW Department of Planning
Submitted via email

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Dr. Sarah Laurie, BMBS (Flinders)

Board
Tony Hodgson, AM
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The Hon. Clive Tadgell, AO
The Hon. Dr. Michael Wooldridge,
B.Sc. MBMS, MBA

To All Responsible Individuals, including the Planning Minister and the Director General of the NSW Planning Department;

I have been asked by concerned residents of the region surrounding the proposed Collector wind Development in New South Wales to send a submission to you, to enable you to fully consider the potential yet predictable short and long term impact of the proposed Collector Wind Development on the health of the nearby residents, and any visitors including employees.

I have been advised by concerned residents, that there are approximately 500 people living in and around the township of Collector within a 10km radius from the proposed wind development. I am further advised that there is a school, located in the town, which is approximately 3.5km from the turbines. The Primary school has 26 students currently.

I make the following comments having investigated the area of wind turbine noise and its effects on surrounding rural residents for the last two years. I have worked with sick residents and their treating doctors, with national and international acoustic engineers, physiologists, psychologists, epidemiologists and medical practitioners to better understand the problems. We are all concerned about the growing numbers of people seriously adversely affected by these wind developments, when they are located too close to homes and workplaces.

Despite the many reports of serious ill health from residents around the world living near, working and visiting large industrial wind turbines, relating in part to exposure to infrasound and low frequency noise (ILFN) exposure, it is an area of public health which is only comparatively recently starting to be investigated by a rapidly growing number of concerned independent acousticians and clinicians

internationally. Universal denials of the problem by wind developers and public health authorities based on a lack of systematically collected published evidence are reminiscent of the early denials of HIV / AIDS, and tobacco.

Given the numbers of people reporting serious health problems, and the severity of those problems which are resulting in people resorting to abandoning their homes and their farms, the denials of the existence of serious health problems being caused to vulnerable citizens by proximity to operating wind turbines are unacceptable, as is the ongoing refusal of state Health authorities including NSW Health, to investigate those problems.

Identical health problems have been reported to NSW authorities from residents at Uranquinty, near Wagga (gas fired power station ILFN emissions) and from the Upper Hunter region, specifically Wollar and the Cumbo Valley, where numerous residents have also developed the characteristic health problems relating to ILFN exposure from open cut coal mining activities. **In both instances, confidentiality agreements have been used by the respective companies to ensure that the sick residents cannot speak publicly about their ordeal.** This perpetuates the ignorance of the problems amongst health practitioners, which is unhelpful, dishonest, unethical and may have subsequent legal repercussions for those individuals involved in the ongoing cover up.

I have been advised that some senior officers in the NSW Departments of Planning and in the Office of the Environment and Heritage are well aware of these resident's situations, health problems, and confidential property buy outs. The same tactics are used by the wind industry. Some of those sick residents have subsequently been gagged from speaking publicly about their problems, with significant financial penalties should they choose to do so (see <http://www.abc.net.au/news/video/2010/02/19/2825235.htm>) and indeed lawyers (Slater & Gordon) used by sick residents to negotiate with the wind developers (whose turbines have made the residents sick) have admitted that such gag clauses are "industry required" (see <http://www.wind-watch.org/news/2012/05/06/confidentiality-clauses-not-made-at-our-direction/>).

The denials of a problem by public health authorities are global, as are the confidentiality agreements, and the health problems being reported, with only one public health physician having the courage and professional integrity to speak out. Dr Hazel Lynn, from the Grey Bruce Public Health Unit in northern Ontario, is well aware of the seriousness of the health problems being reported at places like Goderich and Ripley, and has recently publicly stated **she believes there are direct adverse health impacts caused by the wind turbines** (see <http://www.windturbinesyndrome.com/2012/medical-officer-acknowledges-wind-turbines-cause-direct-health-effects-ontario/?var=cna>).

Of note also in Ontario is that the Chief Medical Officer, Dr Arline King, has recently been instructed to attend a Court to be questioned in person about her report, which has a similar statement to that of the NHMRC's Rapid Review from 2010 on the same subject, to the effect that there is no evidence of direct pathological effects from wind turbines. Both these reports (from Ontario and the Australian NHMRC) have been used widely by health authorities, other relevant government departments, as well as wind developers to assert that there are no adverse health problems. This has resulted directly in serious harm to an increasing number of rural residents.

Just last week a group of 50 concerned German Physicians formed a group, (see <http://www.windturbinesyndrome.com/2012/doctors-promote-public-awareness-of-wind-turbine-syndrome-germany/?var=cna>) based on their professional concerns because of the wide range of serious pathology they are seeing in their long term wind turbine exposed population in Northern Germany. This pathology includes serious heart valve structural tissue problems, for which the only cure is eventual

expensive cardiac valve surgery with all the risks entailed. The alternative is early death from cardiac failure.

The same pathology now being identified by these physicians in German citizens exposed to operating wind turbines, known as Vibro Acoustic Disease (see <http://www.wind-watch.org/documents/vibroacoustic-disease-biological-effects-of-infrasound-and-low-frequency-noise-explained-by-mechanotransduction-cellular-signalling/>) was reported in 2007 in a 10 year old child exposed in utero and in his early years to an infrasound low frequency noise rich environment in Portugal (<http://www.wind-watch.org/documents/public-health-and-noise-exposure/>), and most recently by another research group in Taiwanese aviation workers exposed to occupational ILFN <http://docs.wind-watch.org/chao.html>.

There are legitimate clinical concerns that large industrial wind turbines, such as those proposed by RATCH Australia for the Collector Wind Development, will directly cause this serious cardiac pathology with long term exposure to the infrasound and low frequency noise these turbines are emitting. These illnesses are preventable, providing the turbines are sited well away from human habitation, and are of particular concern in the case of children being exposed in utero and subsequently throughout their lives, as the effects appear to be progressive with ongoing exposure.

Denial of their knowledge of the range of serious reported health problems from acute and chronic exposure to ILFN, which some acousticians have known about for many years, is unethical behaviour by that group of professionals. Nor is it acceptable to advocate the siting of larger wind turbines such as those greater than 2MW turbines, known to emit even greater proportions of infrasound and low frequency noise, in areas where some of the local population will inevitably be seriously harmed out to greater distances with long term exposure.

Moller and Pedersen's paper confirming that turbine size and power generating capacity increases the proportion of LFN, and therefore what they described as "annoyance" for the neighbours, was published in a peer reviewed journal over a year ago, (see <http://www.wind-watch.org/documents/low-frequency-noise-from-large-wind-turbines-2/>) yet it has been universally ignored, it would seem. This is yet another example of unethical and unacceptable behaviour by those acousticians who have a professional obligation to protect the health and safety of the public, even while they are working for and well remunerated by wind developers.

Wind developers and turbine manufacturers such as VESTAS are well aware of the problems, and in the case of VESTAS have admitted they are not unable to engineer a solution to the problem to reduce the low frequency noise emissions in a letter to the Danish Minister for the Environment (<http://www.wind-watch.org/documents/letter-from-vestas-worried-about-regulation-of-low-frequency-noise/>).

Undoubtedly this is why the local VESTAS representative in Australia was so keen to encourage the NSW Planning department not to measure low frequency noise, in his submission to the NSW Planning department concerning the new draft guidelines (see <http://www.windturbinesyndrome.com/2012/vestas-objects-to-wind-turbine-infrasound-low-frequency-noise-requirements-australia/?var=cna> for more detail). As my colleague Dr Mauri Johansson from Denmark pointed out to the VESTAS Board at their AGM, such behaviour is dishonest and not in accordance with their stated corporate values (see <http://www.windturbinesyndrome.com/2012/gutsy-doc-gives-vestas-hell-denmark/?var=cna>).

Short term exposure to ILFN can result in serious ill health for those population subgroups who are susceptible, including the elderly, the young, and people with a history of motion sickness, migraines and inner ear pathology, as identified by Dr Nina Pierpont, the US Paediatrician who studied reports of what

happened to the members of 10 families exposed to operating wind turbines, and compared that with information prior to exposure and after they had abandoned their homes (as 9 out of the 10 families have done). This resulted in these individuals being their own controls, a design known as a case series cross over, particularly well suited to studying this particular problem and identifying changes in each individual over time with differing exposures. I am told (by Canadian Lawyer Eric Gillespie) Professor Geoffrey Leventhall has at last acknowledged "Dr Nina Pierpont's important contribution to the field of environmental noise" which she undoubtedly has made by identifying these susceptible population subgroups in her study.

Individuals with preexisting clinical conditions such as angina, hypertension, diabetes, anxiety, depression, post traumatic stress disorder, autism, and any other clinical conditions exacerbated by sleep deprivation or severe physiological stress (stimulation of the fight flight response) are also experiencing worsening of their clinical conditions, which then improve when the turbines are off for a length of time, or they are away from the source of the ILFN. This is unsurprising, given the knowledge highlighted by Professor Leventhall in 2003 that exposure to low frequency noise causes a **physiological** stress response (see section 10 of the report for DEFRA, downloadable at the following <http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>). Both chronic stress and severe sleep deprivation or noise sensitivity will worsen the conditions listed above, and both severe stress symptoms and severe chronic sleep deprivation are being regularly reported by residents living near wind developments around the world, and by their treating doctors.

There may well be other population subgroups not yet identified as susceptible, given the limited existing systematic research. Once "sensitized" to the low frequency noise effects, the acousticians have long recognized that the only cure is to remove oneself from exposure or remove the source of the ILFN (see concluding remarks in the following document by Professor Leventhall, downloadable at <http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>).

I have found, both in Australia and in some locations internationally, that over time, people are being so adversely impacted by these wind developments out to distances of at least 10km, that in some instances they are forced to abandon their homes temporarily or permanently, or leave their homes to sleep in cars or elsewhere when their homes are downwind of the turbines. Others are resorting to sleeping in tents outside their homes, as the impact is not as bad as inside their homes. This is generally an intermediate step before they resort to abandoning their homes permanently.

In Australia, near smaller VESTAS turbines (V90's at Waterloo wind Development) there are residents out to 4.5km from the wind turbines who have had to permanently leave their homes, some on medical advice from their treating doctors, who include a cardiologist and family doctors. Acoustic emissions in the very low frequency / infrasound range have been measured at these homes and are occurring at the time these people are developing certain characteristic symptoms. When the acoustic emissions are not measured (eg when the wind is not turning the turbines) these people do not have the characteristic symptoms, nor do they have them when they are away from their homes and away from other sources of infrasound and low frequency noise.

This is an area in which little systematic empirical research data has been collected, however that does not mean there is not a serious and rapidly growing problem. **Nor does it mean that relevant existing evidence and research should be ignored.** Harvard trained US epidemiologist Professor Carl Phillips, who has given evidence in multiple court and planning hearings on this issue, has this to say: (downloadable from <http://www.wind-watch.org/documents/properly-interpreting-the-epidemiologic-evidence-about-the-health-effects-of-industrial-wind-turbines-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. 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. Proponents of turbines have sought to deny these problems by making a collection of contradictory claims including that the evidence does not “count”, the outcomes are not “real” diseases, the outcomes are the victims’ own fault, and that acoustical models cannot explain why there are health problems so the problems must not exist. These claims appeared to have swayed many non-expert observers, though they are easily debunked. Moreover, though the failure of models to explain the observed problems does not deny the problems, it does mean that **we do not know what, other than kilometers of distance, could sufficiently mitigate the effects.** There has been no policy analysis that justifies imposing these effects on local residents. **The attempts to deny the evidence cannot be seen as honest scientific disagreement, and represent either gross incompetence or intentional bias** “

There are a multitude of “reviews” internationally relied on by wind developers and public health advocates of wind energy, which assert that because there is so little peer reviewed published evidence specifically investigating these problems that “there is no problem” or, “there is no evidence” of a problem. However, continued reliance by the planning decision makers on documents such as the outdated and inadequate NHMRC’s (Australian National Health and Medical Research Council) Rapid Review of 2010 would be most unwise, given the extensive criticism it has received from local and international researchers and institutions working in this area (see for example <http://www.wind-watch.org/documents/audit-national-health-and-medical-research-council-public-statement-2010-and-rapid-review-2010/>).

It is also worth taking careful note of the subsequent comments of the CEO of the NHMRC (Professor Warwick Anderson), who made the following comments nine months after the Rapid Review was released, in his oral testimony to the Australian Federal Senate Inquiry into Rural Wind Farms on 31st March, 2011 (page 86 Hansard):

*“we are very aware that **the high-quality scientific literature in this area is very thin.** That is why we were at pains to point out that we believe that **a precautionary approach should be taken to this,** because, as you would understand, **the absence of evidence does not mean that there might not be evidence in the future**”*

Professor Anderson went on to make the following comment with respect to the value of anecdotes (on page 87):

“Anecdotes are very valuable ways of honing the questions to be asked”

and further on (p 88)

“we do not say that there are no ill effects. We definitely do not say it that way”

The Australian Federal Senate inquiry recommendations issued in June 2011 were very clear – **that urgent research into a number of different areas was required.**

The recent formation of a new Australian NHMRC Panel to examine the relevant material omitted from the first Rapid Review, and subsequent research which has been peer reviewed and published, **is further supportive evidence that our National Federal Health Research body considers this is an issue requiring immediate further attention, which it is currently receiving.** The documents to be found at the following weblink demonstrate that there is now much more information about the effect of wind turbines on surrounding communities than was available by July 2010 when the Rapid Review was released (see <http://www.wind-watch.org/documents/peer-reviewed-articles-regarding-adverse-health-effects-of-industrial-wind-turbines/>).

Some of that information was presented to a court in Ontario in July 2011, in which Professor Carl Phillips was one of many knowledgeable experts who gave evidence, **where the judges found that on the basis of extensive expert evidence led by the wind industry and the appellants that wind turbines can cause harm to health,** but that further research is required. The wording of that part of the judgment is below:

"While the Appellants were not successful in their appeals, the Tribunal notes that their involvement and that of the Respondents, has served to advance the state of the debate about wind turbines and human health. This case has successfully shown that the debate should not be simplified to one about whether wind turbines can cause harm to humans. *The evidence presented to the Tribunal demonstrates that they can, if facilities are placed too close to residents. The debate has now evolved to one of degree.*" (p. 207) (*Emphasis added*)

Environmental Review Tribunal, Case Nos.: 10-121/10-122 Erickson v. Director, Ministry of the Environment, Dated this 18th day of July, 2011 by Jerry V. DeMarco, Panel Chair and Paul Muldoon, Vice-Chair, <http://www.ert.gov.on.ca/english/decisions/index.htm>

The Waubra Foundation have focused most of our attention on the issue of infrasound and low frequency noise, however there may well be other toxic agents involved, which some researchers have identified are present in these environments, including EMF, ground borne vibrations, and rapid fluctuations in barometric pressure, sufficient to explode bats lungs and at times with sufficient energy to perceptibly rock stationary cars even further than a kilometre away from the nearest wind turbine.

Whilst most medical practitioners remain ignorant of the already known links between infrasound and low frequency noise (ILFN) and a range of serious physical and mental health problems, there is information in the public domain which clearly indicates that acousticians have been well aware for some time of the serious health problems which can result from acute and chronic exposure to infrasound and low frequency noise (see <http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>).

Furthermore, Acousticians have a professional obligation to act ethically at all times with respect to the safety of the public, even when that might conflict with the aspirations of those engaging them (see <http://www.acoustics.asn.au/joomla/codeethics.html>). It is becoming increasingly evident that this is not occurring with acousticians who work for wind developers.

There are two literature reviews from 2001 and 2003 which are highly relevant now, because the full spectrum of the acoustic energy is now being measured inside and outside the homes of sick people in Australia and internationally, and both infrasound (0-20Hz) and low frequency noise (20 – 200Hz) is being measured. This is being done by a number of acousticians, (eg Rick James, Rob Rand, Stephen Ambrose, Steven Cooper, Dr Bob Thorne), and it is important to note that actual measurement of the full acoustic spectrum is specifically NOT included in the regulations governing wind turbine noise anywhere in the world which only measure dBA. (which only accurately measures the sound energy above 200Hz).

These acousticians are finding there is infrasound and low frequency noise present, with a distinctive sound signature, which is clearly coming from the wind turbines, and that sick resident's symptoms at times are correlating with its measurement in those homes. In one instance both the acousticians conducting the measurements unexpectedly became sick themselves, with the exact pattern and range of symptoms so well described around the world (see <http://www.wind-watch.org/documents/bruce-mcpherson-infrasound-and-low-frequency-noise-study/>).

Wind Developers and their advocates in the ranks of public health academia and departments are using an unnamed NSW public health academic's critique of this landmark Falmouth acoustic survey to dismiss it. It seems the unnamed but reportedly senior public health academic who authored it is unable to comprehend that it is a detailed acoustic survey, (with the unexpected finding that the acousticians themselves got sick), rather than an epidemiological study. Rand and Ambrose are acousticians, not epidemiologists, so such criticism from this unnamed public health academic would appear to be deliberately avoiding the important issues they raise. Multidisciplinary acoustic surveys and clinical epidemiological studies Rand and Ambrose suggest have not yet been done, and are urgently needed, just as the Australian Federal Senate Inquiry recommended over a year ago.

The first relevant "old" literature review is one by Professor Leventhall for the UK Government's DEFRA in 2003, (downloadable from <http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>) where Professor Leventhall has highlighted a case control study (p49, attached as appendix 1 to this document) identifying symptoms identical to "wind turbine syndrome" which occurred with exposure to low frequency noise (generally sound energy 20 Hz – 200Hz) from another source. Professor Leventhall has publicly confirmed on a number of occasions (including under cross examination in the Ontario court case mentioned above) that the symptoms of "wind turbine syndrome" are well known to him (see <http://www.wind-watch.org/documents/audit-national-health-and-medical-research-council-public-statement-2010-and-rapid-review-2010/>).

Later in the DEFRA document, at section 10, Professor Leventhall lists some of the then known scientific peer reviewed published evidence relating to the **physiological** effects of exposure to low frequency noise. **One important example he gives is that of truck noise inducing a physiological stress response in sleeping children.**

Professor Leventhall now states that the stress is "psychological" and appears to have forgotten the physiological evidence in sleeping children he was well aware of in 2003. The existence of knowledge about physiological stress from low frequency noise is well known, and is discussed in documents such as WHO guidelines for community and night time noise, (see <http://www.wind-watch.org/documents/guidelines-for-community-noise/>).

This issue is critically important, because long term exposure to operating wind turbines is resulting in a myriad of new illnesses and exacerbation of preexisting illnesses, almost all of which are explained in each individual person's case by the well known consequences of chronic cumulative severe physiological and psychological stress which express themselves uniquely in each person. Further detail can be found in <http://www.wind-watch.org/documents/response-to-nsw-planning-department-draft-guidelines-for-wind-developments/> .

There is further evidence of a primary physiological stress response in experimental research data (see the Chen, Qibai and Shi study at <http://www.wind-watch.org/documents/an-investigation-on-the-physiological-and-psychological-effects-of-infrasound-on-persons/>) recently the focus of Dr Malcolm

Swinbank's attention at the recent New York Internoise conference (see <http://www.wind-watch.org/documents/numerical-simulation-of-infrasound-perception/>). There is also evidence in the clinical stories of these residents, especially in their consistent stories of suddenly waking up in a panicked anxious frightened state, night after night, and often a number of times a night.

The history these residents give is characteristic of a **physiological** "fight flight response" and the pattern of sleep disturbance is commonly reported around the world. Dr Daniel Shepherd's paper in the peer reviewed journal Noise and Health September 2011 has confirmed the presence of sleep disturbance in this population exposed to turbines using standardized questionnaires such as the Pittsburgh Sleep Quality Index (see <http://www.wind-watch.org/documents/evaluating-the-impact-of-wind-turbine-noise-on-health-related-quality-of-life/>)

The residents mostly report being unable to hear the turbines at the time they wake. This never happens to them when the turbines are not operating, nor does it happen when they are away from their homes, is worse with certain wind directions and weather conditions, and is being described out to at least 10km in some locations.

Other rare supporting evidence of a primary physiological stress response is the histories of Tako Tsubo heart attacks (Capital Wind development in NSW, Waubra wind development in Victoria, and a cluster in the Cumbo Valley in the Upper Hunter region of NSW) and acute hypertensive crises (Victoria and Ontario) which have occurred in the presence of known ILFN, but without the usual known clinical precipitants of a sudden emotional shock (death of a close relative) or an underlying pheochromocytoma respectively.

The second "old" literature review is from the 2001 US National Institute of Environmental Health Sciences (download from <http://www.wind-watch.org/documents/infrasound-brief-review-of-toxicological-literature/>) and details the physiological and pathological consequences of exposure to infrasound (sound energy 0 – 20Hz). It makes for concerning reading, despite the limited animal and human data. Chronic exposure to infrasound has resulted in focal organ damage from oxidative stress, ischemic myocardial (heart muscle) damage has been observed, as has secretion of adrenaline and cortisol – two of the body's main stress hormones. **This is confirmatory (animal experimental) evidence of a physiological stress effect.** The effects worsen with cumulative exposure, and there is evidence of improvement when exposure to infrasound ceases.

The wind industry and its acousticians and even government regulatory authorities have for a long time stated that there is no infrasound or "there is no infrasound at a well maintained wind farm" (current SA EPA guidelines), however as Dr Malcolm Swinbanks has recently pointed out, there is evidence of infrasound emissions from modern upwind wind turbines since NASA reported on some Hawaiian wind turbines in 1989 (see <http://www.wind-watch.org/documents/infrasound-from-wind-turbines-letter-from-malcolm-swinbanks/> where the original documents showing the infrasound measurements can be downloaded). Steven Cooper in Australia has measured and documented infrasound and low frequency emissions from wind turbines with a characteristic sound signature, (see for example his peer review for Goyder Council of the proposed Stony Gap wind development at <http://www.wind-watch.org/documents/reviews-of-noise-impact-assessments-stony-gap/>).

More recently, having been confronted with the evidence that infrasound IS emitted by turbines with upwind rotors, the wind industry has been stating that 85dBG is a "safe" limit for infrasound. It has been assumed that what you can't hear can't hurt you – the findings in the NIEHS literature review animal experiments would suggest otherwise, as would Professor Alec Salt's work (see <http://www.wind-watch.org/documents/responses-of-the-ear-to-low-frequency-sounds-infrasound-and-wind-turbines/>).

Other recent work by Professor Alec Salt, presented at the Internoise 2012 conference in New York in August has also shown that the inner ear behaves very differently in areas of quiet background noise, and that infrasound stimuli under these circumstances results in a much greater stimulus on the brain (see <http://www.wind-watch.org/documents/perception-based-protection-from-low-frequency-sounds-may-not-be-enough/>) particularly with respect to “alerting mechanisms”. This has been observed out in the field, especially in homes which are very well insulated, resulting in less audible noise transmission from outside to inside the home. This markedly changes the proportions of sound energy present in the room, and perceived by the inner ear. If there is additional resonance within the rooms, as is known to occur, this further changes the proportions of sound energy.

Salt’s clear conclusion from his work is that the inner ear and the brain can perceive sound energy which is not audible, the implication being that the statement that 85dBG is “safe” is not supported by his findings. We do not have enough information to know yet what those “safe” exposure levels are, especially with chronic exposure, and especially with vulnerable populations such as the very old and the very young, or in those people who have been identified to be particularly susceptible to the “wind turbine syndrome” vestibular dysfunction pattern of symptoms (those with a history of migraines, motion sickness and inner ear pathology). Salt has found that a vestibular response can be seen after infrasound exposure at 60 dBG. Such a level (and up to 30dBG) higher is being measured at wind developments in Australia and internationally by acousticians who are independent of the wind industry. It is “lost” in the averaging techniques used, however as Professor John Harrison, physicist from Queens University in Canada has pointed out, as have others “the ear does not hear averages, it hears the peaks”.

With Dr Swinbanks reminding us of the Chen Qibai and Shi 2004 study previously mentioned, which found that young fit subjects developed the characteristic symptoms (nausea, headaches “fretful”) and increased blood pressure within only an hour of exposure to infrasound experimentally at levels which are comparable to those being measured around wind developments, it is clear that this assumption that 85dBG is “safe” and does not directly cause these symptoms is not supported by this longstanding research evidence from Chen et al’s 2004 peer reviewed and published paper either. There is also clear evidence from both animal and human research data that cumulative exposure to ILFN increases these effects over time, until exposure ceases.

Despite the reports of sick residents and concerned medical practitioners from wind developments in the UK and Australia since 2003, it is only within the last 6 – 12 months that there has been any independent acoustics information about what the exposures are of these sick residents to both infrasound and low frequency noise emissions from the turbines, INSIDE their homes. As previously stated, the presence of ILFN has been historically denied by the wind industry, and no government noise regulatory authority is measuring the full sound spectrum inside and outside homes, as is now suggested as best practice to overcome the knowledge gap (<http://www.wind-watch.org/documents/wind-turbine-acoustic-pollution-assessment-requirements/>).

The presence of wind turbine infrasound and low frequency noise emitted by wind turbines has been categorically and undeniably confirmed at multiple wind developments in Australia and internationally, by multiple acousticians, as mentioned above. This is in contrast to statements from the wind industry and noise regulatory authorities like the South Australian EPA, who say in their guidelines that there is no infrasound at a “well maintained” wind development. This is then used to justify not measuring the full sound spectrum. There are various excuses used to justify not doing internal home measurements, despite this being recommended for environmental low frequency noise in 2004 by the Queensland EPA, for

example (see <http://www.wind-watch.org/documents/ecoaccess-guideline-for-the-assessment-of-low-frequency-noise/>)

What follows are the crucial questions requiring immediate answers, to enable safe planning of the siting of wind turbines “*What is a safe level for both acute and chronic cumulative exposure to infrasound and low frequency noise from wind turbines*” and “*What is a safe setback distance, for a given turbine, in a specific terrain?*”

Nothing other than a sufficient setback distance is currently available to prevent these adverse health effects occurring both inside and outside homes. Many rural properties are also workplaces, which means there are important Occupational Health and Safety issues for those rural residents who employ people, and there are increasing concerns based on the experiences of their own employees that they cannot guarantee a safe workplace.

We don't yet know the answer to those critical questions, because that research has not yet been done in order to construct adequate dose response curves. **In other words, this technology is being imposed on rural communities without ANY adequate safety data beforehand.**

If this were a therapeutic drug, would it be allowed in the market place before adequate safety testing? And if Adverse Events (like Adverse Drug Reactions) were being reported, would the “drug” be pulled from the market, and further investigated? That is certainly the current practice with pharmaceuticals, and it is a scandal that international and Australian public health authorities have been so slow to investigate, given that wind turbine refugee families now number more than 40. All of these people have been ignored – not one public health unit in Australia is investigating why these people have become so sick, and left their homes.

The first medical practitioner in the world to conduct any research was UK Rural General Dr Amanda Harry, who conducted her case series survey in 2003 shortly before Dr Iser identified the problems in his patients in 2003/4 in Australia, at Toora in South West Gippsland. Dr Harry's work was in Cornwall in the UK (see <http://www.wind-watch.org/documents/wind-turbines-noise-and-health/>). Dr Iser found similar health problems and range of individual experiences, and informed the local Victorian state health authorities by letter in 2004. Unfortunately his prophetic warnings to the Premier, the Health, Planning and Regional development Ministers of the then Bracks Labor Government fell on deaf ears.

There are also clear warning signs that there are major problems emerging with the use of the larger wind turbines such as the VESTAS V90's, which have been used at Waterloo wind development in South Australia, now owned by TRU energy. **As previously mentioned, size does matter** (see <http://www.wind-watch.org/documents/low-frequency-noise-from-large-wind-turbines-2/>) as the larger more powerful turbines emit proportionately more LFN, the adverse effect on the neighbours from this LFN is being reported in the field by those residents out to much greater distances.

Historically this impact has been called “annoyance” by engineers, but all the medical practitioners who have investigated sick people for themselves or have spoken to their treating doctors have formed the opinion that **this “annoyance” includes serious clinical pathology, previously not necessarily recognized by some of the acousticians, who are not trained to diagnose illness. Unfortunately all too few medical practitioners are aware of the already known connections between low frequency sound and vibration energy and health problems, with the exception of some physicians specializing in inner ear and balance disorders, and occupational physicians.**

There is no population health data on the effect of these larger turbines on the surrounding community, but there is some highly relevant information from Waterloo in South Australia, where VESTAS V90's have been installed and operating for over 18 months. There are community surveys, which have recently conducted – the first by an Adelaide University Masters Student in 2011, and the second by a local community member Mary Morris who well knew that residents including turbine hosts were being adversely impacted by the noise and vibration out to 10km. Mary Morris's survey, and the briefing summary of the Adelaide university study can be accessed from the following weblink: <http://www.wind-watch.org/news/2012/07/18/open-letter-to-the-premier-of-south-australia-re-new-survey-at-waterloo-wind-farm/> . A summary of the Adelaide University survey can be found at <http://www.wind-watch.org/documents/evaluation-of-wind-farm-noise-policies-in-south-australia/> .

Of note was that in the Adelaide university survey, of those surveyed (out to 5km) 50% were moderately to severely impacted by the noise. That number included some wind turbine hosts. Mary Morris's survey confirmed that some people were impacted by the noise and vibration and consequent sleep disturbance out to 10km, which confirm what those residents have told others, including the Waubra Foundation.

It was telling that at a recent Goyder Council Development Assessment Panel (DAP) meeting in Burra, South Australia on 1st August 2012, where the proposed TRU energy Stony Gap Wind development was discussed, the lawyer for that proponent would not give a guarantee that there were no adverse health impacts. Other developers in Australia have been publicly asked the same question, but not one developer has provided such a written guarantee.

The members of the Goyder Council planning panel had just heard 6 hours of testimony from sick and concerned residents living nearby at Waterloo, making it clear that the reports of people being badly being affected 8 – 10km away were real. I am personally aware of 5 households in the Waterloo area who have had to semi-permanently abandon their homes, some on medical advice. One is 4.5km away from the nearest wind turbine, and has had to leave a 4th generation family farm home.

Acoustician Steven Cooper's peer review report for the Goyder Council clearly outlined the risks should the neighbouring proposed TRU energy development at Stony Gap be allowed to proceed, and the panel members have acted responsibly in refusing the application. Steven Cooper's peer review report for that development can be located at the following: <http://www.wind-watch.org/documents/reviews-of-noise-impact-assessments-stony-gap/>).

In summary, we know that people's health is being harmed who are living within 10km of these large wind turbines, from the well known clinical consequences severe cumulative sleep disturbance, from acute and chronic cumulative physiological and psychological stress, and from a range of characteristic other symptoms, which are thought to relate primarily to vestibular dysfunction of the inner ear at levels of infrasound and low frequency noise previously assumed to be safe (based on Professor Salt and Dr Nina Pierpont' work).

As previously stated, Dr Pierpont identified in her work that certain groups in the community were at increased risk of developing these vestibular dysfunction symptoms so well known to Professor Leventhall, and they included people with a history of motion sickness, migraines, damage to the inner ear (eg industrial deafness) and those at the extremes of age (the very young, and the elderly). Other researchers such as Dr Bob Thorne have highlighted the plight of those in the community who are particularly noise sensitive (eg children & adults with autism). The Waubra Foundation's field work has confirmed Dr Pierpont's findings of these susceptibilities, with over 100 residents having provided information to us.

Further research work is required, but in the meantime, the adoption of a very conservative precautionary approach to the siting of wind turbines is necessary in order to protect the health of the surrounding population. The consistent observation of the deterioration in health of these residents with chronic exposure to ILFN makes this even more imperative. Such deterioration is consistent with what we know about chronic stress, and with what limited information we have about “sensitization” to low frequency noise. Once sensitized, the only “cure” is to eliminate exposure to the ILFN ie to move, or turn off the source of the ILFN.

Of particular concern is the effect on young children who live in the vicinity of these developments. The effects on children have been little discussed and barely investigated, but the reports from US Paediatrician Dr Pierpont’s study, together with verbal reports from parents and teachers at the Waubra Primary school which they have requested me to keep confidential, and from parents elsewhere in Australia and internationally make me extremely concerned about the consequences for children with respect to both their health and their learning.

Professor Arline Bronzaft is a world authority on the effects of noise on children’s learning, and she has written of her concerns with respect to the effect of inappropriately sited industrial wind turbines on the health and learning of children (see her paper downloadable from the following weblink: <http://www.wind-watch.org/documents/wind-turbine-noise-and-health-special-issue-of-bulletin-of-science-technology-society/>)

Some of the problems identified by Dr Pierpont as newly occurring in younger children with exposure to the wind turbines, **but which resolved when the exposure ceased (ie when these people moved away from their homes near the wind turbines)**, include the following:

- Night terrors, 2-5 times per night
- Delayed onset of sleep, and frightened at night
- Waking saying “I can hear this terrible noise”
- Disrupted speech development
- Oppositional cranky behaviour “a completely different kid for a few months”
- Pulling ears and cranky at the same time as adults got headaches and episodes of tinnitus
- Specific problems with mental arithmetic (observed in adults as well)
- Difficulties maintaining concentration
- Deterioration in interest in reading (previously a very good reader)

Daytime problems reported to me by parents and staff from Waubra School, and parents from Pacific Hydro’s Cape Bridgewater development, include irritable cranky behaviour which is noticeably absent when the turbines have been off for a few days, tired sleepy children, and exhausted parents, in addition to some of the problems listed above, found by Dr Pierpont. And as Professor Arline Bronzaft clearly points out, what adversely affects the parents will also affect the family dynamics and therefore the health and wellbeing of the children.

In addition to the issues with respect to the children, and residents, there are occupational health and safety issues for any businesses or insitutions who employ staff in the vicinity of these operating wind developments. Farmers and other employers from a variety of regions in Australia have highlighted numerous instances where their staff or visiting contractors have had problems and have had to leave their work as a result because they felt too ill and were unable to continue. There are a number of businesses in Collector itself, together with the surrounding farms, where this could well become an issue for the local residents.

In conclusion, if this proposed Collector Wind Development is approved, it is inevitable that it will have a serious cumulative and predictable adverse effect on the physical and mental health of the surrounding population out to at least 10km, and may even drive some families, out of their homes over the life of the project, because of the cumulative effects of chronic exposure to ILFN. There may also be adverse health effects for some people in some locations from EMF, seismic vibrations and rapid fluctuations in barometric pressure.

Sleep disturbance alone is well known to increase the risks of cardiovascular diseases, diabetes, suppress immunity, and result in poor mental health. It also increases the risks of accidents, including driving, and operating farming machinery. Farming is already acknowledged as having high accident rates compared with other occupations, and sleep deprivation is already taking its toll on the health of farmers because of accidents they are reporting, where fatigue is also reported as a contributing factor. All these are being reported at many existing wind developments, in addition to the other well described “wind turbine syndrome” symptoms, well known to some acousticians such as Professor Leventhall for years. The chronic physiological stress effect, which is being observed with prolonged cumulative exposure, adds an additional burden of morbidity onto a group already adversely impacted by sleep disturbance.

The final insult is the psychological damage done to these already sick rural residents, when the responsible authorities (Health and Planning particularly) deny there is a problem, and refuse to investigate, or who just state that such rural residents are “collateral damage” and the wind development is “compliant” with unsafe and unenforced noise regulations, but refuse to conduct truly independent noise monitoring of the full acoustic spectrum inside and outside homes as recommended, let alone ensure that the residents also have access to the full set of raw data for independent analysis and peer review by acousticians who do not work for the wind developers (see <http://www.wind-watch.org/documents/wind-turbine-acoustic-pollution-assessment-requirements/>).

Senator Xenophon’s comments after the Stony Gap decision are worth considering carefully, with respect to the potential individual liabilities for those who approve such developments and who choose to ignore the mounting evidence. His background as a personal injuries litigation lawyer prior to entering Parliament, together with his first hand knowledge of the extent and severity of the problems of the sick residents, make him eminently qualified to comment in this way.

I note that we issued our Explicit Cautionary Notice to Planning authorities on 29th June 2011, now over a year ago. <http://media.crikey.com.au/wp-content/uploads/2011/07/caution.pdf>).

Our advice is unchanged.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Sarah Laurie', written in a cursive style.

Dr. Sarah Laurie, CEO

List of appendices

Appendix 1 - **Extract from Leventhall et al 2003 report for the UK Dept of Food and Rural Affairs on the effects of Low Frequency Noise on Human Health**

Appendix 2 - Explicit Cautionary Notice, issued 29th June, 2011

Appendix 3 - Wind Turbine Acoustic Pollution requirements, 11th May, 2012

Appendix 4 - Pre construction health Checklist guidelines for residents and their treating doctors, as at 21st September, 2012 (includes information about Waubra CEO's qualifications and experience in this area)

Appendix 5 – Waubra Foundation submission to the NSW Department of Planning with respect to the proposed guidelines for wind developments, March 2012

Appendix 1 – from National Wind Watch (NWW)

Extract from Leventhall et al 2003 report for the UK Dept of Food and Rural Affairs on the effects of Low Frequency Noise on Human Health

12.2 Effects on health. In an epidemiological survey of low frequency noise from plant and appliances in or near domestic buildings, the focus was on health effects (Mirowska and Mroz, 2000). ...

A control group of dwellings had comparable conditions to the test group, with similar A-weighted levels, except that there was no low frequency noise. There were 27 individuals in the test group and 22 in the control group.

The test group suffered more from their noise than the control group did, particularly in terms of annoyance and sleep disturbance. They were also less happy, less confident and more inclined to depression.

The comparison of the symptoms between the tested group and the control group show clear differences, as in Table 5. [**NWW note:** *The symptoms in this table are the same that were later described by Nina Pierpont as "[wind turbine syndrome](#)".*]

Table 5. Health comparison of exposed and control group.

Symptom	Test group %	Control group %
Chronic fatigue	59	38
Heart ailments anxiety, stitch, beating palpitation	81	54
Chronic insomnia	41	9
Repeated headaches	89	59
Repeated ear pulsation, pains in neck, backache	70	40
Frequent ear vibration, eye ball and other pressure	55	5
Shortness of breath, shallow breathing, chest trembling	58	10
Frequent irritation, nervousness, anxiety	93	59
Frustration, depression, indecision	85	19
Depression	30	5

These results are extremely interesting as an epidemiological survey of an affected and a control group. Table 5 shows very adverse effects from low frequency noise levels which are close to the threshold and which do not exceed A-weighted limits.

Download from <http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>



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EXPLICIT CAUTIONARY NOTICE

TO THOSE RESPONSIBLE FOR WIND TURBINE

SITING DECISIONS

Medical Director
Dr. Sarah Laurie, BMBS (Flinders)

Board
Tony Hodgson, AM
Dr. Sarah Laurie, BMBS
Peter R. Mitchell AM, BChE (Chair)
Kathy Russell, BCom, CA
The Hon. Clive Tadjell, AO
The Hon. Dr. Michael Wooldridge,
B.Sc. MBMS, MBA

Including Specifically Directors of Wind Developers, Publicly Elected Officials from Federal, State and Local Government, and Bureaucrats in Relevant Departments

BE ADVISED that, as a result of information gathered from the Waubra Foundation's own field research, and from the clinical and acoustic research available internationally, ***the following serious medical conditions have been identified in people living, working, or visiting within 10km of operating wind turbine developments.*** The onset of these conditions corresponds directly ***with the operation of wind turbines:***

- chronic severe sleep deprivation;
- acute hypertensive crises;
- new onset hypertension;
- heart attacks (including Tako Tsubo episodes);

- worsening control of preexisting and previously stable medical problems such as angina, hypertension (high blood pressure), diabetes, migraines, tinnitus, depression, and post traumatic stress disorder;
- severe depression, with suicidal ideation;
- development of irreversible memory dysfunction, tinnitus, and hyperacusis.

Other symptoms include those described by Medical Practitioners such as Dr Amanda Harry, and Dr Nina Pierpont in her landmark Case Series Crossover Peer Reviewed Study (submission No 13 to the Australian Federal Senate Inquiry into Rural Wind Farms) and published in Dr Pierpont's book entitled "Wind Turbine Syndrome, A Report on a Natural Experiment", 2009, published by K-Selected Books, Santa Fe.

These serious health problems were also identified by Australian GP Dr David Iser in 2004. Dr Iser formally notified the Victorian Government of the time after his patients became unwell following the start up of the Toora wind project. His warnings were ignored without being properly investigated by the authorities and politicians.

All this and supportive material has been made available to the Boards of the major developers, State Ministers for Health and Planning and senior health bureaucrats. The time for denial, and of using the Clean Energy Council to shoulder the increasingly difficult task of denying the link between adverse health and operating wind turbines, is over.

At the Toora and Waubra wind projects, some seriously ill affected residents have been bought out by the developers; but only after they signed confidentiality agreements specifically prohibiting them from speaking about their health problems. This buy-out activity would support a conclusion that developers are aware of the health problems.

Meanwhile, wind developments have continued, with developers asserting that their projects meet acceptable standards, and thereby implying that they cannot be causing health problems.

The Foundation is also concerned that Vibroacoustic Disease, as recorded and described by Professor Mariana Alves-Pereira's team from Portugal, will develop in people chronically exposed to wind turbines. The disease has already been

identified in the occupants of a house with levels of infrasound and low frequency noise identical to levels the Foundation is recording in the homes of affected residents in Australia.

The Foundation is aware of over 20 families in Australia who have abandoned their homes because of serious ill health experienced since the turbines commenced operating near their homes. Most recently, five households from Waterloo in South Australia have relocated, where the larger 3 MW turbines have had a devastating impact on the health of these residents. Some of these people have walked away from their only financial asset, to live in a shed or a caravan on someone else's land. The Foundation notes the mid-2010 advice from the National Health and Medical Research Council that a ***“precautionary approach”*** be followed. We are not aware that either industry or planning authorities have adopted this exceedingly valuable and important advice.

The Foundation's position, as the most technically informed entity in Australia upon the effects of wind turbines on human health, is this: ***Until the recommended studies are completed, developers and planning authorities will be negligent if human health is damaged as a result of their proceeding with, or allowing to proceed, further construction and approvals of turbines within 10km of homes. It is our advice that proceeding otherwise will result in serious harm to human health.***

We remind those in positions of responsibility for the engineering, investment and planning decisions about project and turbine siting that their primary responsibility is to ensure that developments cause no harm to adjacent residents; and, if there is possibility of any such harm, then the project should be re-engineered or cancelled. To ignore existing evidence by continuing the current practice of siting turbines close to homes is to run the dangerous risk of breaching a fundamental duty of care, thus attracting grave liability.

The Waubra Foundation, 29 June, 2011

Enquiries: Dr Sarah Laurie, Medical Director, 0439 865 914

Email address: sarah@waubrafoundation.com.au



11th May, 2012

WIND TURBINE ACOUSTIC POLLUTION ASSESSMENT REQUIREMENTS

On behalf of the many people around the world, suffering acute and chronic health damage from living near wind turbines, the Waubra Foundation demands that relevant authorities initiate:

- ***full frequency spectrum acoustic monitoring inside and outside the homes and workplaces of people claiming health problems caused by the proximity of operating wind turbines;***
- ***the monitoring must be conducted for sufficient time, under the weather and wind conditions indicated by victims as being contributive to their symptoms;***
- ***measurements must specifically include, infrasound and low frequency noise, (dBZ or dBLin, dBA, dBC, & dBG).***

The noise monitoring must be performed by accredited acousticians demonstrably independent of the wind industry, approved by the sufferers, and in a manner that will avoid any deliberate manipulation of turbine operation to reduce the acoustic emissions during testing. The results (including all the raw data and associated sound files) must be made available to all parties.

The Rationale for These Demands

- Most health practitioners are well aware of the links between chronic severe sleep deprivation¹ chronic stress² and poor physical and mental health. This is exactly what residents living near wind turbines are experiencing,³ together with other specific symptoms directly correlating with acute exposure to this sound energy.^{4,5,6,7}
- Knowledge of the damage to health from exposure to infrasound⁸ and low frequency noise⁹ (ILFN) has been known for many years. Despite this, little is known about the current exposure levels of residents to ILFN emissions from wind turbines inside their homes.
- The link between chronic exposure to low frequency noise and chronic physiological stress, even when asleep, was clearly highlighted by Professor Leventhall et al in 2003.¹⁰
- Most medical practitioners have been unaware of the problems associated with exposure to ILFN. This ignorance has not been helped by acousticians and others calling such problems “annoyance” without accurate clinical diagnoses.¹¹
- These symptoms have been reported to occur specifically with exposure to operating wind turbines by medical practitioners since 2003.^{12,13,14,15,16,17} Symptoms have been reported by acousticians, health practitioners and residents from countries including Denmark, Sweden, Germany, United Kingdom, France, United States, Canada, New Zealand and Australia.
- Symptoms have been reported historically up to 4 km from the nearest wind turbine, and more recently characteristic symptom patterns have been reported at distances up to 10km away from the nearest wind turbine¹⁸. This is described especially with larger wind turbines (eg 3MW), and on occasions even further away, where turbines are sited at altitude¹⁹ or near expanses of water.
- These health problems consistently worsen over time, until the exposure ceases. Families are being advised by their treating doctors to leave their homes in order to regain their health. Many have nowhere else to go, and cannot sell their homes, so they become homeless “wind farm refugees”. Others remain trapped, unable to move²⁰.
- Professors Moller and Pedersen, from the University of Aalborg in Denmark, have confirmed that larger more powerful wind turbines emit more low frequency sound waves as a proportion of their sound emissions²¹. These emissions are known to easily penetrate through the walls, roofs, and windows of homes and workplaces, due to the lower transmission loss of low frequencies.
- Recent acoustic survey work in the USA (Falmouth)²² and Australia (NSW)²³ has confirmed that low frequency noise **and** pulsatile infrasound emitted by wind turbines have been measured inside the homes and workplaces of sick people, and occur when they are experiencing the symptoms of Wind Turbine Syndrome.
- Currently governments around the world do not require measurement of the full sound and vibration spectrum, do not require measurement **inside** homes and workplaces, do not require evaluation of sleep or other disturbances, but instead limit almost all assessment to audible noise (dBA) only, **outside** homes and workplaces.

Summary

The plight of people made ill by wind turbine acoustic pollution has been universally ignored by their respective governments.

The current noise assessment practices and standards are incompetent and unacceptable, and must be changed to include full spectrum acoustic monitoring inside homes and workplaces as a matter of urgency.

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Suggestions for Pre Construction Health Assessments For individuals exposed to operating wind turbines or other sources of infrasound and low frequency noise (ILFN) as at 21st September, 2012

What follows are suggestions for busy rural clinicians confronted with sick patients, and very little easily accessible information. They are based on the current limited collective knowledge about the acute and longer term consequences of exposure to operating wind turbines, and infrasound and low frequency noise (ILFN). Recent measurements of wind turbine ILFN inside and outside the homes of sick people, which are correlating with specific symptoms such as painful ear pressure and episodic sleep disturbance have focused our attention on the existing evidence of harm from this sound energy.

It should be noted from the outset that other pathological agents which have been suggested by various researchers to be potentially implicated in some of the pathology being reported by residents living near industrial wind turbines include ground (seismic) vibration, rapid changes in barometric pressure, and electro magnetic radiation. There is limited information available about each of these in the context of wind turbines, so there has been a focus in this document on the existing evidence with respect to ILFN exposure.

The guidelines will need to be adapted according to individual clinical circumstances and presenting pathology. They have been written with the busy rural clinician in mind, hence the justifications for some of the suggestions may not be immediately obvious. The major sources of information have been listed in the Recommended Reading section, but there is also a wealth of material cited in the Waubra Foundation documents listed at the very end of the appendices. Any specific queries can be directed to me and I will try and answer as quickly as possible. Email is preferable, sarah@waubrafoundation.com.au, but if urgent, my mobile is 0439 865 914.

The information has been compiled from a variety of sources, nationally and internationally, including clinicians at the "front line" seeing these sick people, researchers, acousticians, as well as directly from the experiences of the people affected themselves. There are a limited number of relevant peer reviewed studies, which are cited through the text and in the recommended reading section, which will be of benefit to those seeking further information.

In summary, there is a wide range of reaction to exposure to operating wind turbines, from immediate severe onset of vestibular dysfunction symptoms or migraine ("wind turbine syndrome") to no apparent response in the short term. As the duration of exposure increases more people report a range of other

symptoms generally consistent with the myriad of consequences from chronic severe physiological stress and sleep deprivation. In addition, tissue pathology and symptoms related to Vibroacoustic Disease (VAD) are also being reported, together with focal organ damage also noted in animal studies of chronic infrasound exposure.

Pre Construction History, Examination and Investigations

a. Clinical History

Useful specific features to record include:

- history of motion sickness, migraines, existing inner ear conditions; as these, together with extremes of age have been linked to increased susceptibility to developing symptoms
- documentation of past noise exposure; pre existing hearing damage, and sensitivity to noise
- documentation of past & current medical and psychiatric conditions, including particularly hypertension, ischemic heart disease, arrhythmias, diabetes, thyroid disorders, inflammatory disorders, epilepsy, autism, Post Traumatic Stress Disorder (PTSD), Anxiety, Depression.

b. Examination:

- blood pressure (even in young fit people significant blood pressure elevation has been documented with exposure to wind turbines; (see also <http://www.wind-watch.org/documents/an-investigation-on-the-physiological-and-psychological-effects-of-infrasound-on-persons/>)
- cognitive assessment (in order to detect subtle changes in cognition and memory which have been observed to occur post exposure); for example either or both those listed below:
 1. **The Montreal Cognitive Assessment Battery:** can identify mild cognitive impairment, <http://www.mocatest.org/>
 2. **The Trailmaking test:** a timed, simple test of spatial and divided attention http://www.granddriver.net/data/media/docs/Ulowa_trailMaking.pdf
- mental health assessment questionnaires (for later comparison with repeat testing), to formally document current mental state with particular reference to validated questionnaires screening for the presence of anxiety, depression, and PTSD.
- Pittsburgh Sleep Quality Index, and Epworth Sleepiness Scale, again, for later comparison with repeat testing. Dr Daniel Shepherd's peer reviewed published study provides clear evidence of an effect on sleep quality, and sleep deprivation is the commonest symptom reported by residents living near wind turbines. Dr Shepherd's paper is available from <http://www.wind-watch.org/documents/evaluating-the-impact-of-wind-turbine-noise-on-health-related-quality-of-life/>

c. Baseline Pre-Exposure Investigations to be Considered:

- **baseline ECG**
(arrhythmias are commonly being reported, and heart attacks and Tako Tsubo episodes are being reported to occur in association with operating wind turbines and others exposed to infrasound and low frequency noise (ILFN) from other sources especially in quiet country environments);
- **baseline routine blood tests including kidney and liver function, complete blood picture, thyroid function including T3 and T4, fasting blood sugar and Hba1c, and cholesterol;** focal organ damage has been noted with chronic exposure to infrasound in animal studies (study number 58 in the following literature review : <http://www.wind-watch.org/documents/infrasound-brief-review-of-toxicological-literature/> , and metabolic abnormalities of blood sugar regulation and thyroid function have been reported by a number of clinicians and have been included in Professor Robert McMurtry's proposed Case Definition (downloadable from <http://www.wind-watch.org/documents/wind-turbine-noise-and-health-special-issue-of-bulletin-of-science-technology-society/>)
- **baseline night time salivary cortisol** (for comparison with post exposure to ILFN). A number of these investigations have been done in Ontario and in the US and have shown marked differences between exposed and non exposed states, (see also section 10 of Leventhall's 2003 DEFRA review, at <http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>)
- **Baseline comprehensive hearing tests by an audiologist and review by ENT specialist** if a history of pre existing inner ear pathology has been noted. People with preexisting inner ear pathology or industrial deafness seem to be more susceptible to developing problems, and numerous residents have developed abnormalities having previously had normal hearing.
- **Baseline comprehensive visual tests**, by an optometrist and/or review by existing ophthalmologist
- **Cardiac Echocardiography**, with particular attention to pericardial thickness and the state of the cardiac valves. Abnormalities of collagen (and other abnormalities) have been reported in association with long term exposure to infrasound and low frequency noise by Professor Mariana Alves Pereira, and have been given the name of VAD or Vibro Acoustic Disease. (see <http://www.wind-watch.org/documents/vibroacoustic-disease-biological-effects-of-infrasound-and-low-frequency-noise-explained-by-mechanotransduction-cellular-signalling/>) Recently abnormalities of mitral and tricuspid valves in German citizens exposed long term (18 years) to much smaller wind turbines have been reported to me by those residents. Concurrently, a Taiwanese research team has just shown abnormalities in echocardiographs of workers with higher ILFN doses (see <http://docs.wind-watch.org/chao.html>).

Professor Alves Pereira has also documented abnormal pericardial thickness and mitral valve abnormality in a child exposed to an ILFN rich environment in utero and post conception for 10 years. (<http://www.wind-watch.org/documents/public-health-and-noise-exposure/>)

Professor Pereira's presentation to the Australian National Health and Medical Research Council workshop in Canberra on June 7th, 2011

<http://www.nhmrc.gov.au/media/events/2011/wind-farms-and-human-health-scientific-forum-7-june-2011>)

What Residents Can Do:

- Visit your doctor and dentist for a thorough health check prior to the turbines commencing operation.
- keep detailed personal health journals contemporaneously; both when exposed to the turbines and when away from home. Note if the turbines have been turning at the time symptoms are experienced, if known; and the more detail that can be given to locate the precise date and time of symptoms, weather and wind conditions at the time will be very useful. See the following: <http://www.windturbinesyndrome.com/2012/wind-turbine-syndrome-chapmans-caution-and-personal-health-journals/?var=cna>
- thoroughly record all symptoms and episodes of illness, no matter how trivial, especially infective, for all family members; and episodes of disturbed sleep;
- closely monitor growth, development, and language and cognitive development in children, with particular focus on language acquisition, mental arithmetic and memory & concentration; especially if there is any regression once turbines have commenced operating.
- also monitor mood changes, disruptive and aggressive behaviour in children; and note any changes in their behaviour and sleep patterns when at home (with turbines operating) compared to when away or when the turbines are off for more than a day.
- liaise closely with school teachers, so parents may be alerted to any learning difficulties at school in a timely fashion; and ensure that teachers are aware of what abnormalities have been reported. The most detailed information comes from Dr Nina Pierpont's study, available in her book, which can be purchased at cost from www.windturbinesyndrome.com . Part of the book including the section written for health professionals and the raw case data containing details of what changes were noted in the children in the study was kindly submitted to the Australian Federal Senate Inquiry, and that submission (number 13) may be accessed via http://www.aph.gov.au/Parliamentary_Business/Committees/Senate_Committees?url=clac_cte/impact_rural_wind_farms/index.htm
- monitor blood pressures (especially with severe headaches) as markedly elevated blood pressures have been noted in many people including young adults, which have reverted completely back to normal or usual baseline when well away from operating wind turbines;
- consider a trial of antioxidants (given their reported benefit to rodents in one experiment with prolonged exposure to infrasound). These might include multivitamins. This is NOT based on peer reviewed published medical research, rather observations in one animal study looking at chronic infrasound exposure, where clear benefits to the group of rats given antioxidants were noted when compared to controls who did not receive this intervention (see study number 58

in the following weblink: <http://www.wind-watch.org/documents/infrasound-brief-review-of-toxicological-literature/>)

- actively try to manage stress, (eg exercise & meditation) and try and organise time away from exposure to operating turbines if needed, and able to do so; especially overnight.
- Have regular check ups with your treating doctors and dentist
- If personal financial resources permit, commission truly independent full spectrum acoustic monitoring, done by trusted acousticians who are independent of the wind industry, and keep a detailed diary of symptoms while the monitoring is being carried out. See <http://www.wind-watch.org/documents/wind-turbine-acoustic-pollution-assessment-requirements/> for more detail.

Post Construction History, Examination and Investigations

As indicated by the clinical context and presenting problems, together with past medical history:

- detailed history of new symptoms with correlation of exposure to operating wind turbines, (well kept personal health journals can help greatly here, as people's short term memory is often impaired, but patterns of symptoms occurring with exposure to operating wind turbines and certain wind directions and weather conditions can be quickly identified);
- detailed health and sleep history especially correlated to turbine operation, climatic conditions, wind direction and estimate of wind speed, and time of day or night, where possible;
- Detailed health history of illnesses or symptoms when **away** from turbine exposure (eg holidays, and turbines off for maintenance);
- In North America, comparative repeat night time salivary cortisol, and more extended serum cortisol testing has been found to be markedly elevated with exposure, but returns to normal when repeated again after cessation of exposure to ILFN (when residents also report feeling "better");
- comparative repeat cognitive, sleep, and mental health questionnaire assessments as indicated – see preconstruction health check list for details.

Other investigations, which may be indicated in specific situations where specific pathology is suspected or has been identified, include:

- 24 hour blood pressure monitoring;
- sleep studies (comparing "in home" and "away from home" if possible);
- specific blood pathology indicated by the clinical picture (kidney, liver, CBP, clotting, thyroid function, blood glucose & Hba1c);

- specific radiological investigation where focal pathology is suspected, including brain MRI where indicated (eg cognitive deficits being reported, suspicion of late onset epilepsy).
- Referral if indicated to sleep, ENT, Endocrine, Cardiac, Ophthalmology, Psychiatric, Psychological, Optometrist, Audiologist and other relevant health professionals.

Recommended Further Reading

Harry, Dr Amanda “Wind turbines, Noise and Health” 2007

<http://www.wind-watch.org/documents/wind-turbines-noise-and-health/>

Leventhall, et al 2003 Literature for DEFRA (UK Department of Food and Rural Affairs)

“Review of Published Research on Low Frequency Noise and Its Effects”, especially page 49, and section 10

<http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>

Pierpont, Dr Nina “Wind Turbine Syndrome, A report on a Natural Experiment”

Published by K Selected Books, Santa Fe NM 2009

Available from www.windturbinesyndrome.com

McMurtry, Professor Robert

“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 2011 31:316

<http://bst.sagepub.com/content/31/4/316>

downloadable from: <http://www.wind-watch.org/documents/wind-turbine-noise-and-health-special-issue-of-bulletin-of-science-technology-society/>

Ambrose, Stephen & Rand, Robert

“Bruce McPherson Infrasound and Low Frequency Noise Study” 2011

<http://www.wind-watch.org/documents/bruce-mcpherson-infrasound-and-low-frequency-noise-study/>

Frey, Barbara and Hadden, Peter

[“Wind Turbines and Proximity to Homes: The Impact of Wind Turbine Noise on Health”](http://www.wind-watch.org/documents/wind-turbines-and-proximity-to-homes/) 2012

<http://www.wind-watch.org/documents/wind-turbines-and-proximity-to-homes/>

Recommended websites (in addition to www.waubrafoundation.com.au)

www.windvigilance.com

The website of the Society for Wind Vigilance, the Canadian based International Group of Physicians, engineers and other professionals who are advocating for research, and who held the first International Symposium in October 2010

www.windturbinesyndrome.com

The website edited by Dr Nina Pierpont’s husband, Dr Calvin Luther Martin, a retired history professor. There is a wealth of material, collected over the last 7 years, not only confined to health issues

www.wind-watch.org

A wealth of news items, videos and documents, with a very useful search function, not confined to health issues.

For further specific information, please do not hesitate to get in touch with me.

Dr Sarah Laurie, CEO Waubra Foundation sarah@waubrafoundation.com.au 0439 865 914

Extract from Leventhall et al 2003 report for the UK Dept of Food and Rural Affairs on the effects of Low Frequency Noise on Human Health

“12.2 Effects on health. In an epidemiological survey of low frequency noise from plant and appliances in or near domestic buildings, the focus was on health effects (Mirowska and Mroz, 2000). ...

A control group of dwellings had comparable conditions to the test group, with similar A-weighted levels, except that there was no low frequency noise. There were 27 individuals in the test group and 22 in the control group.

The test group suffered more from their noise than the control group did, particularly in terms of annoyance and sleep disturbance. They were also less happy, less confident and more inclined to depression.

The comparison of the symptoms between the tested group and the control group show clear differences, as in Table 5. “

The symptoms in this table and pattern of exposure are the same as those later described by Dr Nina Pierpont as "[wind turbine syndrome](#)". Professor Leventhall has now agreed with this publicly on numerous occasions, including while being cross examined in a court case in Ontario (see <http://www.wind-watch.org/documents/audit-national-health-and-medical-research-council-public-statement-2010-and-rapid-review-2010/>).

Table 5. Health comparison of exposed and control group.

Symptom	Test group %	Control group %
Chronic fatigue	59	38
Heart ailments anxiety, stitch, beating palpitation	81	54
Chronic insomnia	41	9
Repeated headaches	89	59
Repeated ear pulsation, pains in neck, backache	70	40
Frequent ear vibration, eye ball and other pressure	55	5
Shortness of breath, shallow breathing, chest trembling	58	10
Frequent irritation, nervousness, anxiety	93	59
Frustration, depression, indecision	85	19
Depression	30	5

“These results are extremely interesting as an epidemiological survey of an affected and a control group. Table 5 shows very adverse effects from low frequency noise levels which are close to the threshold and which do not exceed A-weighted limits.”

Download from <http://www.wind-watch.org/documents/review-of-published-research-on-low-frequency-noise-and-its-effects/>

DR SARAH LAURIE, CHIEF EXECUTIVE OFFICER, WAUBRA FOUNDATION

RELEVANT PROFESSIONAL QUALIFICATIONS AND EXPERIENCE

Qualifications

Bachelor of Medicine, Bachelor of Surgery awarded 1995, Flinders University, South Australia

Fellowship of Royal Australian College of General Practitioners, (RACGP) awarded July 1999

Fellowship of Australian College of Remote and Rural Medicine, (ACRRM) awarded March 2000

Clinical examiner, RACGP 2001

Member of State Council, Australian Medical Association of South Australia, 2001.

Personal

In April 2002, a sudden illness requiring immediate surgery and follow up necessitated Dr. Laurie withdrawing from practice as a rural general practitioner. It was not until 2010 that her own health and other responsibilities made it possible for Dr Laurie to consider returning to practice. During this extended period Dr Laurie did not continue to renew her registration, nor was she able to formally participate in the continuing medical education required to maintain her fellowships in RACGP and ACRRM. Regardless, Dr Laurie remains a qualified medical doctor.

In April 2010, when Dr. Laurie was preparing to re-enter the medical workforce, a wind energy project was announced for the hills near her home. A concerned neighbour drew Dr. Laurie's attention to Dr Amanda Harry's survey from 2003 (see <http://www.wind-watch.org/documents/wind-turbines-noise-and-health/>). This local development proposal has since been withdrawn, however Dr. Laurie's professional concern about the reported adverse health effects from exposure to operating wind turbines, and the lack of proper research continues.

In late July 2010, after voicing her growing professional concerns at a public meeting, Dr. Laurie was approached by Peter Mitchell to join the Waubra Foundation as its inaugural Medical Director, later to become its Chief Executive Officer, both roles being performed on a voluntary basis.

Experience with Wind Turbine/ILFN Health Problems

In the second half of 2010 Dr. Laurie commenced intensive fieldwork, visiting and listening to over 100 sick neighbours of wind projects and other industrial developments with noise pollution issues in South Eastern Australia, liaising with acousticians and concerned medical practitioners in Australia, Western Europe, United Kingdom, and North America.

In October 2010, Dr. Laurie attended the first International Symposium on Adverse Health Effects of Wind Turbines in Ontario, organized by the Society for Wind Vigilance (www.windvigilance.com), and ever since has liaised closely with other professionals and researchers who gave presentations at that symposium.

Dr Laurie's work has included: recommendations about setback distances for new wind projects based upon her gathering of evidence of health impacts at multiple projects; encouraging acoustic measurements by independent acousticians, assisting researchers to connect with sick residents; making submissions to relevant authorities and politicians; educating other medical practitioners; and where invited, educating concerned community groups and affected individuals.

This work has unfortunately and inappropriately attracted unpleasant comments and misleading public statements concerning Dr Laurie's professional qualifications from sections of the wind industry and its vocal, well intentioned but generally ignorant supporters, who are unwilling to accept that there is a very real problem which must be addressed, and who prefer instead to "shoot the clinical messenger".

Legal & Committee Involvement

Shortly after commencing her fieldwork, Dr. Laurie was approached to help give expert evidence in a court case in Adelaide. The academic who ultimately gave evidence for the wind developer agreed that witnesses were "sick" and they were "stressed", but then blamed that on what he called "scaremongering". Unfortunately, the court did not have the benefit of a survey conducted by Dr. David Iser from Toora, Victoria who had gathered clinical evidence of identical serious ill health from his patients living near the Toora wind project as far back as 2004, well before there was any public knowledge of these problems. In this particular case, the judges preferred the "expert" advice of the academic to field evidence from Dr Laurie.

Shortly after this, in July 2011, judges in a similar court in Ontario found that there **are** adverse health effects from wind turbines, and that further research is required. A range of international experts in acoustics and health gave evidence for both developers and the appellants. In that case, Professor Geoffrey Leventhall, one of the acousticians for the Wind Developer, admitted that he knew of the symptoms of "wind turbine syndrome" as they were identical to those occurring from exposure to low frequency noise, known to be emitted by wind turbines as well as other sources. The quote from the Canadian judgment is below:

"This case has successfully shown that the debate should not be simplified to one about whether wind turbines can cause harm to humans. The evidence presented to the Tribunal demonstrates that they can, if facilities are placed too close to residents. The debate has now evolved to one of degree." (p. 207) *(Emphasis added)*

Environmental Review Tribunal, Case Nos.: 10-121/10-122 Erickson v. Director, Ministry of the Environment, Dated this 18th day of July, 2011 by Jerry V. DeMarco, Panel Chair and Paul Muldoon, Vice-Chair,

In June 2011, Dr. Laurie was asked to Chair a Panel at the National Health and Medical Research Council's Workshop, which was re-examining the issue of adverse health effects of wind turbines. (See <http://www.nhmrc.gov.au/your-health/wind-farms-and-human-health>)

In July 2012 Dr. Laurie was asked by the Canadian lawyer for an upcoming case to provide independent expert witness testimony for that case. She has agreed to do so. The name of that case is Haldimand Wind Concerns V Ministry of Environment, ERT case No 12 – 073. The hearings will commence in September 2012.

Dr Laurie's own field work, and extensive knowledge of the field work of others including acoustic and psycho acoustic measurements and physiological research, is widely appreciated. Her help, knowledge and advice is sought by doctors, acousticians and researchers working in this field in Australia and overseas. Her ability to understand the acoustic and human health evidence has contributed considerably to the general community understanding of the existing known pathophysiological pathways which make this condition so devastating to a significant proportion of wind project neighbours.

Important Submissions, Letters and Documents by Dr Laurie

- Federal Senate Inquiry into the Social & Economic Impact of Rural Wind Farms, February 2011 submission number 390 at the following weblink:
http://www.aph.gov.au/Parliamentary_Business/Committees/Senate_Committees?url=clac_ctte/impact_rural_wind_farms/index.htm
also accessible at the following: <http://www.windwatch.org/documents/submission-to-the-australian-federal-senate-inquiry-on-rural-wind-farms/>
- Oral evidence given to Federal Senate Inquiry, given on 29th March 2011
<http://www.wind-watch.org/documents/sarah-laurie-address-to-australian-senate-inquiry/>
- Explicit Cautionary Notice 29th June, 2011
<http://waubrafoundation.com.au/~waubra/Y2NpZD0xJmNhaWQ9MTMmYWlkPSZjcmM9MTQ0OTg1MjMyOA%3D%3D>
- Letter to Prime Minister Gillard 3rd March, 2012
<http://www.wind-watch.org/news/2012/03/09/letter-to-australian-prime-minister-from-dr-sarah-laurie/>
- NSW Planning Department Draft Guidelines March, 2012
<http://www.wind-watch.org/documents/response-to-nsw-planning-department-draft-guidelines-for-wind-developments/>
- Wind Turbine Acoustic Pollution Assessment Requirements, 11th May, 2012
<http://www.wind-watch.org/documents/wind-turbine-acoustic-pollution-assessment-requirements/>
- Opinion piece “ Silent epidemic” 28th May 2012-08-28
<http://www.wind-watch.org/news/2012/05/31/acoustic-pollution-a-silent-epidemic/>
- Submission to NSW Director General of Planning re Mt Bodangora, 8th August 2012
<http://www.wind-watch.org/documents/comments-on-wind-turbine-noise-and-its-health-effects/>



RESPONSE TO NSW PLANNING DEPARTMENT

DRAFT GUIDELINES

FOR WIND DEVELOPMENTS

SUBMITTED MARCH 14, 2012

DR SARAH LAURIE
Bachelor of Medicine,
Bachelor of Surgery
FLINDERS UNIVERSITY, 1995

CHIEF EXECUTIVE OFFICER

SUMMARY OF KEY ISSUES

On the basis of current limited knowledge, these proposed draft guidelines will inevitably result in serious and predictable harm, to the health of current and future rural residents in New South Wales, from the harmful effects of sound and vibration energy generated by industrial wind turbines.

The New South Wales Department of Health's refusal to acknowledge the existence of an emerging serious global public health problem with exposure to operating wind turbines, is a gross dereliction of their responsibilities to protect the health of rural citizens who will inevitably be adversely impacted by these developments.

Rural residents are already significantly disadvantaged with respect to decreased access to health care and related services, and suffer a greater illness burden as a result. The additional burden of ill health, which these turbines will directly cause rural citizens, is entirely preventable, if wind turbines are located appropriately. This is clearly a planning issue.

To proceed with the proposed setbacks outlined in the draft guidelines is deliberately ignoring the warnings of a growing number of clinicians and acousticians internationally,¹ based on limited but compelling empirical data and adverse event reports, from both residents and their treating doctors. Acousticians such as Professor Phillip Dickinson, from New Zealand, who is well aware of the problems experienced there, has suggested that a 5-10km setback² would prevent many of the problems, concurring with our advice.

Urgent independent collaborative multidisciplinary acoustics and clinical research is required to investigate the problems, in order to determine what a safe turbine setback distance is, given a multitude of different variables. The planning requirements need to take into account the "worst case" scenarios for noise impacts, because this is what people will be living with.

The effects of audible and inaudible sound and vibration energy are resulting in frequent sleep disturbance for residents up to 10km away³ from thirty seven 3MW turbines in South Australia at TRU energy's Waterloo Wind Development. As 3MW turbines and larger are planned for multiple sites in NSW, it is inevitable that these adverse effects will be felt out to this distance and beyond. In France, at 4,000 feet above sea level, there are credible reports of people characteristically affected at distances of 12 km - 14 km away⁴ as the crow flies, from six 2MW turbines.

This is of major concern, and highlights the knowledge vacuum we are operating in, and the need for urgent clinical and acoustic data collection globally.

There is a complete lack of knowledge nationally and internationally about the actual dose of sound energy at different frequencies being experienced by people inside their homes and workplaces, and no knowledge of what constitutes a "safe" dose with cumulative exposure. Consistently, people's health relentlessly deteriorates with ongoing exposure, if they are affected.

Siting turbines too close to institutions such as schools, jails, hospitals and nursing homes, with vulnerable and powerless groups, will result in serious harm to those living, and working in those establishments. This will be the inevitable outcome from many of the currently planned and unsafely sited wind developments in NSW, particularly those with larger turbines, placed on hills.

Rural residents in New South Wales are currently being damaged by the sound and vibration pollution emissions from existing wind developments at Capital, Woodlawn, Crookwell, and Cullerin.⁵ NSW Department of Health deny the problem exists, because there is “insufficient credible peer reviewed published evidence” but refuse to investigate the reports of serious health problems occurring in rural residents for themselves, apart from one or two phone calls which have not resulted in follow up, according to the residents.⁶

Nor has there been any proper independent and comprehensive acoustic assessment of the full range of acoustic pollution to which residents are exposed, inside their homes, and in their workplaces, despite numerous complaints being made. Preliminary acoustic data of this type collected by an independent acoustician at residences impacted adversely by Infigen’s Capital and Woodlawn Wind Developments and funded by concerned rural residents suggests that there are indeed problems relating to the infrasound and low frequency sound energy measured inside resident’s homes where those residents are becoming ill.⁷

The current NSW audit of wind turbine noise does not include full spectrum noise assessments, nor does it include inside home measurements. This is ignoring the precise frequencies and locations (inside homes and workplaces) which we suspect are doing the most damage to health.

There may well be additional health effects from Electromagnetic field effects for some residents, in some locations, which similarly remain uninvestigated.⁸

These serious health problems are entirely preventable, by adopting a truly precautionary approach, based on existing relevant information including field observations, until more definitive independent multidisciplinary acoustic and medical longitudinal research is conducted. This is precisely what the Waubra Foundation’s Explicit Cautionary notice⁹ suggested, in **June 2011**, and it was based on the best field observations and limited research literature available at that time. Subsequent information is revealing that even this distance may be inadequate to protect the health of surrounding neighbours in some locations.¹⁰

Two research proposals by suitably qualified and experienced independent acousticians, Dr Bob Thorne and Professor Colin Hansen, were first suggested to the NSW government Health Department representatives at an En Health meeting in **November 2010**. Subsequent proposals have been submitted directly to the NSW government by Acoustics researchers since that time.

Research was also recommended by the Australian Federal Senate inquiry into Rural Wind Farms in **June, 2011**.¹¹

In the meantime, the suggestion by the NHMRC to “adopt a precautionary approach”¹² is being ignored by developers and bureaucrats from planning and health departments alike. The justification given is that “there is no evidence” or “there is no credible peer reviewed published scientific evidence”.

Yet people’s health is being seriously damaged, and has been for years in Europe, the UK, North America, New Zealand, and in Australia. The voices of the sick residents, their clinicians, and their advocates, have been universally ignored by these bureaucrats, and the politicians they advise.

This lack of relevant research, despite the longstanding reported problems, is a global public health disgrace. So are the attempts of the wind industry to deny the problems, despite being well aware of them, as the letter from the Vestas CEO to the then Minister for the Environment in Denmark shows. Clearly corporate profits are being put ahead of the health of rural residents, the world over.¹³

THEREFORE: to proceed with these inadequate guidelines, and without investigation into the current problems at existing developments, is reckless and irresponsible in the extreme.

What is urgently needed is:

1. Full sound spectrum acoustic monitoring at all the homes of impacted residents in New South Wales, by acousticians who do not rely on the wind developers for their income, including inside and outside measurements concurrently. Data required by the acousticians from the developers to properly determine their results must be handed over.
2. Thorough clinical assessment of impacted residents, paying particular attention to the commonly reported health problems experienced by residents elsewhere.
3. Concurrent sleep and acoustic studies at the homes of people reporting regularly disturbed sleep, to assist with determining the cause of their sleep disturbance.
4. Other broader epidemiological studies will be dependent on available funding, but as a minimum there should be an assessment which includes the population within 10km of existing developments, and suitable controls not exposed to low frequency noise for comparison. There must also be longitudinal data collected, as it is widely observed that symptoms deteriorate over time, with increasing exposure.

Relevant Excerpts from the proposed DRAFT Guidelines are reproduced below:

Page 7:

(e) Health

The approach to health issues in these guidelines have been developed in consultation with the NSW Ministry of Health. The guidelines adopt a precautionary approach for the consideration of health issues. This includes requiring proponents to explicitly consider health issues as well as comply with stringent operational performance criteria including stringent noise criteria. Applications may also be referred to the Ministry of Health as part of the assessment process.

AND page 21 of Appendix A

Health issues

The potential for the proposed wind farm to impact on human health should be considered, focusing on neighbours' houses within 2 km of any proposed wind turbine. This may be undertaken with reference to the following:

_ up to date evidence-based research

_ statements from relevant health bodies, such as the National Health and Medical Research Council's (2010) Public Statement: Wind Turbines and Health.

_ the predicted level of impact from the wind farms including impacts from noise, shadow flicker, blade glint, night lighting, electric and magnetic fields

_ consultation undertaken regarding health issues and concerns

The Department of Planning and Infrastructure may refer applications to the NSW Department of Health (NSW Health) as part of the assessment.

As the following discussion makes clear, these draft guidelines have clearly not adopted an adequate precautionary approach, nor are they informed by the latest evidence and information.

International knowledge in this field is rapidly increasing, and waiting for the National Health and Medical Research Council (NHMRC) to issue updated statements inevitably means the information is not the most recent and up to date, if that is all that is relied on.

At the time the proposed NSW guidelines were issued, the NHMRC had not issued their report of the June 2011 workshop, which they released in early January.¹⁴ The NHMRC have reported that they are in the process of constructing a panel of suitably qualified and experienced experts, and are in the process of updating the original Rapid Review with a subsequent literature review. It is hoped that this subsequent review will include material omitted in that initial Rapid Review of July 2010, as well as relevant information and peer reviewed research, which has been subsequently published.

In the meantime, the Australian Research Council have awarded Professor Colin Hansen's team from Adelaide University a grant to investigate wind turbine noise at existing developments. Information about the true sound energy exposure levels at different frequencies, which residents are living with, and are being so adversely impacted by, will be of international relevance.

Given the current well known attitude of the NSW Health department to this issue, I see little benefit from the proposed guidelines suggesting that it would be useful to refer projects to the NSW Department of Health, unless there is a serious change in attitude by departmental employees, or a change of staff.

Finally, the noise guidelines can be the "toughest in the world", but if they do not mandate measuring the very sound energy which is thought to be making people sick, inside their homes, and if they do not mandate independent ongoing noise monitoring and ensure that the relevant work is done by independent acousticians who are approved by the affected residents and who have sufficient expertise and the right equipment, the guidelines are of absolutely no practical use or protection for the residents.

Transparent continuous full spectrum noise monitoring, available on line for the whole world to see, and properly recorded so that the data can be analysed properly, would go some way towards restoring faith in the existing wind turbine noise compliance systems and procedures, which are currently considered to be completely useless (and too open to manipulation by wind developers) by the residents who have to live with the effects of this audible and inaudible sound energy pollution.

WHAT IS CURRENTLY KNOWN, and WHO has KNOWN WHAT WHEN?

A significant recent development in conceptual understanding

Wind turbines emit infrasound (0-20Hz), low frequency sound (20-200Hz) and audible sound. Many sound frequencies can cause damage to health if they are at a high enough sound pressure level, for a long enough time, particularly in susceptible individuals. Protection of the health of individuals and of manmade structures is the rationale for much of the work of acousticians.

The recent pioneering acoustic survey by Rand & Ambrose¹⁵ in a house in Falmouth, USA has measured exactly what acoustic energy is being experienced **inside** one home where the resident has become seriously unwell with the characteristic symptoms now reported widely around the world, which have been called "wind turbine syndrome". Just one turbine has been enough to do the damage to this resident's health.

The sound energy inside this home had markedly different proportions to the sound energy outside the home, and it is this change in proportion of sound energy, and the amplification of that sound energy inside the home, which acousticians and medical clinicians think may help explain the problems now being consistently reported by some turbine neighbours including hosts and their families.

Some hosts and former residents living near wind turbines in Australia have advised myself and others that they cannot speak publicly about the health problems they and their families have developed, because of binding confidentiality clauses in their sale contracts if they were bought out by the developers,¹⁶ or because of broad clauses which prohibit them as turbine hosts from saying anything which might portray the wind development in a negative light. I have also been advised of these clauses by some of the lawyers these people have consulted, who have confirmed the existence of these clauses. I have also been told by international researchers and residents this practice is global.

This data from Falmouth is the only publicly available data anywhere in the world on the precise exposures of sound energy including infrasound and low frequency INSIDE the home of an affected resident. This sort of acoustic assessment is clearly urgently needed at the homes of impacted people, in order to determine precisely what ‘dose’ of sound energy and which frequencies they are being exposed to and which correlate with their symptoms.

Unexpectedly for Rand and Ambrose, they too developed the characteristic symptoms, which correlated with wind turbine operation, and specifically correlated with the sound energy down in the lowest part of the frequency spectrum, ie the infrasound low frequency range (ILFN) of 0 – 200 Hz. This is clearly not an epidemiological study, but it is a crucial breakthrough in our understanding of what “dose” and frequencies of sound energy might be directly causing the problems, which so many people report.

Historical Background

Many frequencies of sound and vibration energy can cause serious illness if the sound pressure levels are high enough, exposure occurs for long enough, or occurs in specific frequencies. Acousticians have known for some time that infrasound and low frequency noise can directly cause many of these characteristic symptoms and health problems.

Abstracts of studies relating specifically to **infrasound** and its effects on animals and humans have been listed in a very useful Literature review¹⁷ compiled in 2001 by researchers at the National Institute of Environmental Health Sciences, in the USA, and there are a few other studies in the public domain since this review was published.

Professor Geoffrey Leventhall and his colleagues wrote a very useful literature review of the effects of **low frequency noise** in a report for DEFRA¹⁸ in the UK, in 2003, which lists many of the symptoms now being reported to occur in residents exposed to wind turbine noise. Professor Leventhall’s article clearly demonstrates that **this knowledge is out in the public domain of acousticians, and has been for some time, and that the symptoms are directly caused by exposure to certain frequencies of sound energy.**

Indeed, Professor Leventhall publicly stated during his lecture at the National Health and Medical Research Council Workshop on 7th June, 2011 **that he had known about the symptoms of “wind turbine syndrome” for years.**¹⁹ Indeed he has. Professor Leventhall has conducted research, which has directly confirmed the deleterious effects of exposure to low frequency noise on work performance published in a peer reviewed journal in 1997, for example. In that particular study, he noted that the symptoms worsen with cumulative exposure, just as we are observing with exposure to operating wind turbines.²⁰

Historically, these health problems occurring in relation to low frequency noise exposure from any source have been referred to by Acousticians as “annoyance”, and medical clinicians working in this area believe it is this terminology which has led to the current situation of widespread clinical ignorance of these issues

amongst our colleagues, and a concurrent lack of collaborative multidisciplinary research involving both clinicians and acousticians, despite the problems being reported globally for many years.

Clinicians have simply not realized there is a problem with wind turbine noise, unless, like Dr Amanda Harry in Cornwall in 2003, or Dr David Iser in Toora, Victoria, Australia in 2004, they have suddenly been confronted with their longstanding patients developing an unfamiliar pattern of serious clinical illnesses, which had not previously been described in the English language medical literature which is most accessible to clinicians in Australia, for example.

The presentation of these illnesses in both those rural locations in the UK and in Australia over 8 years ago, coincided with the start up of a new wind development in the vicinity of their rural practices. Both doctors decided to investigate further, and reported their symptoms at the time to their respective health authorities, and were ignored.^{21,22}

Every other medical practitioner since who has become aware of the problems by talking directly to affected residents, and publicized their concerns, has been consistently either ignored or vilified, often by the very Health Departments who themselves refuse to investigate the resident's complaints, because there is "no evidence" of a problem.

However, as Professor Warwick Anderson, current CEO of the National Health and Medical Research Council made abundantly clear in his oral evidence to the Australian Federal Senate Inquiry into Rural wind farms on 31st March, 2011, "**we do not say there are no ill effects**".²³ Professor Anderson and his staff are well aware that developers, bureaucrats, and ideological and financial supporters of the wind industry have misused the summary statement of the Rapid Review to infer that wind turbines are completely safe.²⁴ Professor Anderson went on to point out later on in his oral evidence that an absence of (peer reviewed published) evidence does not mean there is no problem, particularly where there has been so little research into this specific area of wind turbine noise and its effect on health.²⁵

It is hardly surprising that there are endless literature reviews saying there is "no" or "little" evidence of a problem in the peer reviewed literature, given the lack of research, but what is surprising is that not even the most basic of epidemiological studies has ever been done, which have involved medical clinicians as part of the team. Nor has there been any attempt to work out the actual acoustic energy exposures of people, especially inside their own homes. Consequently this practice of using "annoyance" to describe what are in fact "serious health problems" has perpetuated the collective medical ignorance of the problems.

There are larger acoustic population surveys from Europe which certainly confirm the existence of "annoyance" with respect to wind turbine noise, and one from 2004²⁶ which makes it clear that wind turbine noise is "highly annoying" at much lower sound pressure levels of audible noise than other forms of industrial noise such as road, rail and air traffic noise. It is now thought by acousticians who do not rely on the wind industry for their income that this difference in the "annoyance" in that study relates to the low frequency component of wind turbine noise, which is acknowledged to be more annoying.

As Acousticians are generally engineers, and not medical practitioners, they have not had the specific education and training to understand the complexity of the pathophysiological processes which might underlie these symptoms, and their progression over time. Nor do sociologists have the requisite specific clinical or acoustics education and professional training, even if they do become Professors of Public Health at prestigious universities.

This is the province of trained medical clinicians and researchers with backgrounds in varied fields of general practice, paediatrics, physiology, neurology, endocrinology, cardiology, otolaryngology, psychiatry and no doubt others, as our understanding of this essentially “new illness” to medicine is further explored. Until now, medical practitioners and researchers have been generally unaware of the health problems associated with sound and vibration energy, unless they were practicing in occupational medicine, or specializing in treatment of disorders of the inner ear and vestibular system.

In 2009, an American Paediatrician, Dr Nina Pierpont, published her study²⁷ which investigated the range of symptoms of all the members of 10 families exposed to operating wind turbines, where some of the family members had developed the characteristic health problems. What Dr Pierpont sought to do was establish if there were some characteristics about these people who became affected within those households which made them more likely to develop the symptoms she called “wind turbine syndrome”.

Dr Pierpont found that people who have a history of migraines, motion sickness and inner ear pathology seem to be more susceptible to the effects of the wind turbine noise. She also found that children and the elderly seem to be particularly vulnerable. She recommended urgent further research, including epidemiological studies, to further define the problem.

Why then, has Dr Nina Pierpont’s work which investigated the susceptibilities of certain population groups to develop “wind turbine syndrome” been so widely dismissed by acousticians, such as Professor Leventhall, who admit that the symptoms exist, and occur with exposure to low frequency noise, which wind turbines are known to emit? And why has it also been dismissed by Public Health experts, who often do not appear to have read it, and who have not then done their own due diligence, either by investigating the complaints made by residents in their own regions, or by talking to the treating medical practitioners who are trying to look after them?

Acousticians and sociologists are not qualified to speak on the clinical aspects of Dr Pierpont’s work. Her clinical findings have been replicated by work done in Ontario,²⁸ and have been confirmed by my own field observations gathered from affected residents and their treating doctors in Australia.²⁹ Similar resident reports are emerging from many countries which have installed wind turbines near homes, including many in Europe, the UK, and North America.

One of the hallmarks of credible research is if the findings can be replicated. Dr Pierpont’s clinical descriptions and findings of susceptible populations have been subsequently reported by residents and sometimes their treating doctors, around the world.

There has been widespread misinformation spread by advocates of the wind industry, including some in positions of power and authority in public health circles, about Dr Pierpont’s qualifications. Dr Pierpont is a trained and practicing **Paediatrician**, a former assistant Clinical Professor at Columbia University, and has a PhD in ornithology.

Similarly there have been comments made about Dr Pierpont’s work not being “peer reviewed”. This is a lie. Dr Pierpont’s work has been extensively peer reviewed, and copies of those peer reviews, and the executive summary of her book are attached, together with her study and the raw data. The fact that it has not been published in a medical journal does not mean the work is not credible, despite the assertions of some who might wish this to be so. PhD’s are accepted as credible pieces of original work, and they are not published in peer reviewed journals, but as standalone documents, just as Dr Pierpont’s study has been.

The importance of Sleep

Severely disturbed sleep is being reported by many residents, at current wind developments across Australia and internationally, out to distances of at least 10km in some circumstances, especially with larger turbines, or where the turbines are at higher altitudes.

The audible noise is certainly a problem for some people, however by far the majority report a characteristic pattern of waking suddenly in a panicked state, wide awake, hyperalert, sweaty palms, racing heart, with all the hallmarks of intense arousal of their sympathetic nervous system. They often report that they cannot hear the turbines at the time, inside their homes. Nor can they see them when they are asleep, as is commonly suggested as a reason for them waking by wind turbine proponents, who say residents are waking up because the residents “don’t like the look of them”. The residents report that this does not happen on nights when the wind turbines are not turning, and does not happen with certain weather and wind conditions. Nor does it happen when they are away from their homes. It can be repetitive, occurring on multiple occasions within the same night, and may occur night after night.

The Falmouth acoustics survey by Rand and Ambrose³⁰ has shown that this pattern appears to be caused directly by sound energy penetrating into the home in the lowest frequencies. What is now required is the concurrent acoustic and sleep studies, to further examine exactly what the brain waves are doing at the time of the acoustic stimulus and immediately afterwards.

The clinical history these people give is the same, all over the world. Many of these people do not have access to the internet, and nor do they report knowing anything about the reported effects of the turbines on sleep and health. Many are initially supportive of wind energy, until they find that their health is severely damaged, and they cannot sleep. Then their attitudes change.³¹

There is now peer reviewed published research, which confirms that sleep disturbance is occurring in these populations, from a recent study conducted in New Zealand by Dr Daniel Shepherd.³² Dr Shepherd is an experienced Psychoacoustician who has worked in this area for some years, provided expert evidence at a number of tribunals. More recently he provided independent expert evidence in the Ontario court case where the judges found on the basis of expert evidence presented in that case, that there ARE adverse health effects from wind turbines, and that further research is required.³³

Severe chronic sleep deprivation is well known to have a multitude of serious adverse health sequelae,³⁴ including hypertension, atherosclerosis, immune suppression, mental health disorders, diabetes. It is therefore clear that if severe chronic sleep deprivation is occurring, as reported, and now confirmed by Dr Shepherd’s work, that the clinical sequelae are clear, well known, and extremely damaging. The timely recent editorial in the British Medical Journal by two well respected Sleep Physicians³⁵ from the UK and Ireland illustrates the rationale for serious concern about this issue clearly.

Yet again, two experienced and eminent clinicians are calling for research.

The role of Cortisol

A number of clinicians have been concerned more recently about the role of cortisol in the pathophysiological processes which are being observed.

Professor Gary Wittert, the paid medical expert for Acciona in the Paltridge vs Acciona & District Council of Grant court case in the South Australian ERD court in January 2011 admitted during his evidence that the

people described in the court material submitted by me were sick, and that they were stressed. On those points we concur.

Professor Wittert then went on to assert that in his opinion, despite never having listened to these sick residents himself, nor to their concerned treating medical practitioners, that these people were sick because of scaremongering by trained clinicians such as myself, who are publicizing the reported health problems, and urging authorities to immediately fund and facilitate properly conducted, independent research.

Unfortunately, Professor Wittert's assertions do not withstand careful scrutiny. People at Waubra, Cape Bridgewater, Toora, Capital, Cullerin, Waterloo and Mt Bryan in South Australia all have documented formal complaints to the wind developers, to health authorities, to their GP's, and in some instances in the media,³⁶ **well before I was even aware there was a problem.** I was first convinced there was a serious problem, which had been ignored for too long, in July 2010.

There is no doubt that there is anxiety in the communities where wind turbines are planned, and proposed, however these residents get their information from a variety of sources, and many of them go and do their own "homework" by contacting and visiting residents in other areas who are already living with wind turbines, in order to make up their own minds. They soon find that unfortunately what I have been publicizing is all too true. They then become anxious because of fear about what they know is coming, and know that neither the health nor the planning authorities will help them protect their own and their family's health and well being.

In addition to the stress and anxiety created by being abandoned by their governments, there is growing concern amongst clinicians globally about the role which chronic elevation of cortisol might be playing in the development of a range of chronic conditions, which are emerging in populations chronically exposed to operating wind turbines. Professor Robert McMurtry and Dr Noel Kerin have been exploring this avenue of investigation in Ontario.

There are human pathology results, limited but compelling, from the US and from Canada, which support this concern. Results such as abnormally high levels of night time salivary cortisol when exposed to operating turbines compared to normal levels when residents have not been exposed for a few weeks and are starting to feel better, are focusing our attention back to the limited animal studies which are in the public domain, particularly those reported in the NIEHS Toxicology of Infrasound Literature review from 2001.

There are a couple of studies referenced in that review or in the articles themselves, which refer to both adrenaline and cortisol secretion occurring after exposure to infrasound.³⁷ The clinical descriptions of adrenaline related conditions such as Tako Tsubo Heart attacks and acute hypertensive crises which are occurring in residents exposed to infrasound and low frequency noise from wind turbines and from open cut coal mining activities in the Upper Hunter region of NSW (Tako Tsubo events) would appear to be highly relevant, especially given that the usual causes for these unusual conditions were reported to be absent, and no other reason could be found for their occurrence.

There are other studies in mammals, which clearly show that chronic exposure to infrasound can cause focal damage to various organs including the heart, liver, kidneys and adrenals.³⁸ One study identifies oxidative stress directly caused by exposure to infrasound as the pathological process causing focal organ damage, and found that rodents who were given a trial of antioxidants did not show the degree of damage seen with controls.

The knowledge from the Rand and Ambrose data at Falmouth that infrasound and low frequency noise energy exposure may be significantly higher inside homes than first thought is adding to that clinical concern.

Additionally, the wide range of pathology which is being reported by residents who have been chronically exposed, some of which Teresa Simonetti, a medical student from Sydney University has compiled with Professor Simon Chapman,³⁹ could well be explained by abnormally high cortisol levels which will adversely affect a myriad of different body systems and organs.

In 1998 Bruce McEwen, an Australian researcher working at the Rockefeller Institute in New York, had a paper published in the New England Journal of Medicine, where he discussed the concept of allostatic load with chronic stress.⁴⁰

Since that time, work in areas such as the neurobiology of depression has revealed the connections between elevated cortisol, brain derived neurotrophic factor and a shrinking hippocampus being implicated in depressive illnesses,⁴¹ particularly in recurrent depression if clinical intervention is not rapid, timely, and effective.

Chronically elevated cortisol is extraordinarily damaging for long term health and well being, and this is exactly what appears to be happening to many residents who are chronically exposed to wind turbine noise.

In addition to humans, there are credible reports of domestic pets and livestock being diagnosed by veterinary or agricultural officials with mysterious wasting diseases consistent with chronic stress, or farmers are doing their own autopsies on dead livestock and finding haemorrhaging of the adrenal glands in newborn calves, for example.⁴² These are all signals that further research into this specific area is urgently required.

CONCLUSIONS

- The proposed NSW Wind Farm Planning guidelines are completely inadequate to protect health, on the basis of existing limited knowledge
- Investigation into the noise pollution and adverse health problems at existing wind developments needs to be urgently and thoroughly carried out by acoustics and clinical professionals who are objective in their approach, and who are not either driven by ideology or influenced by wind developers
- Independent multidisciplinary acoustic and clinical research needs to be urgently conducted on a national basis at a variety of wind developments, in order to remedy the knowledge vacuum, to enable the safe siting of wind developments in future
- We continue to advocate for adoption of a truly precautionary approach to the siting of any new wind developments, and our current recommendations are that no wind turbine should be constructed within 10km of a home or a workplace until the appropriate independent research is conducted.

- We further advocate that existing wind developments must be retrofitted with continuous noise monitoring systems, which are available 24/7 online, available for all to see, and that wind turbines which breach the evidence based noise guidelines are switched off if they are breaching appropriate noise guidelines, which include the measurement of internal infrasound and low frequency noise.
- In the interim, residents at impacted houses must be able to engage acousticians of their choice, at the developer's expense, in order to independently measure the full sound and vibration energy they are exposed to, over representative periods of weather and wind conditions which correlate with the worst case scenario

ATTACHMENTS & INCLUSIONS

Waubra foundation DVD Link: <http://www.youtube.com/user/WaubraFoundation>

Video citations

Recommendations from the Federal Senate Inquiry

Waubra Foundation Explicit Cautionary Notice

Waubra Foundation submission to the Federal Senate Inquiry

Dr Nina Pierpont's Executive Summary and Peer Reviews, as part of her submission to the Australian Federal Senate Inquiry

Dr Amanda Harry's Study

Professor Carl Phillips's article

Dr Daniel Shepherd's Study in Noise & Health, 2011

Dr Chris Hanning & Dr Alun Evans BMJ Editorial March 2012

Professor Phillip Dickinson's article

Barbara Frey and Peter Hadden's 2012 Review

Carmen Krogh and Brett Horner's update from Ontario

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Dr Chris Hanning (Sleep Physician),

Professor Henrik Moller (Danish Acoustician),

Dr Mauri Johansson (Occupational Physician, Denmark),

Dr Henning Theorell, (Physician, Sweden),

Professor Alec Salt (Physiologist, Washington State University),

Professor John Harrison, (Physicist, Queen's University),

Professor Robert McMurtry, (former Dean of the Medical & Dental School of Western Ontario),

Professor Arline Bronzaft (Psychologist & international expert on the effects of Noise on children),

Dr Amanda Harry, (UK Rural GP),

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