17 April 2013

40-1952 SLR Response to Papodopoulos 20130416.docx

Crookwell Development Pty Ltd
Suite 403, 68 York St
Sydney NSW 2000

Attention: Shaq Mohajerani

Dear Shaq

Crookwell 3 Wind Farm
Response to Papadopoulos

SLR Consulting Australia Pty Ltd (SLR Consulting) has reviewed the submission letter and accompanying information leaflet (submission #54400) from George Papadopoulos of Yass in relation the Crookwell 3 Wind Farm.

We have prepared the following response.

Letter - 29 January 2013

Issue 1 Low Frequency Noise and Human Health

The letter raises concerns that wind farms are the cause of widespread infrasound and low frequency noise (ILFN) in the Capital and Southern Tablelands region. The author claims that he and many other people in the district (up to 30-35 km from wind farms), including people located in northern Canberra, are able to hear the same "v8 engine', "diesel engine" noise which is causing severe distress and sleep disturbance, most since Autumn 2011.

Response 1

The National Health and Medical Research Council's (NHMRC) current Public Statement details that despite anecdotal reports of a wide range of effects "*there is no published scientific evidence to support adverse effects of wind turbines on health".*

Numerous acoustic studies of infrasound levels near operating wind farms have been completed both internationally and in Australia.

- *The Measurement of Low frequency Noise at Three UK Wind Farms* by Hayes McKenzie Partnership Ltd for the UK Department of Trade and Industry (DTI) in 2006.
- *Infrasound Measurements from Wind Farms and Other Sources* by Sonus Pty Ltd for Pacific Hydro in November 2010.
- *Infrasound levels near windfarms and in other environments*, by Resonate Acoustics and the SA EPA in January 2013.

A common finding from the studies was that the measured infrasound noise levels were significantly below the recognised threshold of perception for acoustic energy within this frequency range. Furthermore, infrasound noise levels in the vicinity of wind farms were at similar levels or in many cases lower than that in many other common acoustic environments such as rural, coastal, and urban areas.

The most recent of these studies[1] concluded that:

> *"The level of infrasound at houses near the wind turbines assessed is no greater than that experienced in other urban and rural environments, and that the contribution of wind turbines to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment."*

Furthermore,

> *"The most significant difference between the urban and rural locations was that human activity and traffic appeared to be the primary source of infrasound in urban locations, while localised wind conditions appeared to be the primary source of infrasound in rural locations*."

We note that the address given by Mr Papadopoulos is approximately 9-12km from the Sydney-Melbourne Rail corridor and the Hume Highway respectively, both of which carry quite significant traffic volumes including heavy trucks and freight trains which are both significant sources of low frequency noise and infrasound.

During the day period, under normal unstable atmospheric conditions, these sources would be sufficiently far away and well shielded by topography so as to render them inaudible.

However, during the night period under certain atmospheric conditions (eg temperature inversions), when heavy truck traffic volumes are at their highest on this section of the Hume Highway, traffic on the Hume Highway would likely be audible.

Furthermore, given the distance from the highway, during such conditions, a significantly long stretch of the road (~20-30 km) could potentially contribute to noise levels at this property, which given the high traffic volumes implies that a large number of heavy vehicles are potential sources at any one time. Considering the large number of potential sources, the large propagation distance and frequency dependant propagation enhancement, the received character of the noise would likely be a constant low frequency rumble and it would be impossible to determine a specific direction from where the noise came from. I would suggest that this is more likely the source of the 'V8 engine, diesel engine' noise described by the author.

We note the address is approximately 50 km from the proposed Crookwell 3 Wind Farm.

Issue 2 Low Frequency Noise and Human Health

The author claims the symptoms are by and large consistent with individuals sensitive to low frequency noise as described by Dr Leventhall's 2003 DEFRA report[2].

Response 2

Dr Geoff Leventhall is an internationally recognised expert in the field of low frequency noise and infrasound. The comprehensive DEFRA report;

- Details the internationally accepted low frequency hearing thresholds and loudness perception curves.

[1] *Infrasound levels near windfarms and in other environments*, by Resonate Acoustics and the SA EPA in January 2013

[2] *A Review of Published Research on Low Frequency Noise and its Effects* by Dr Geoff Leventhall for DEFRA in May 2003

- Discusses possible reasons for 'false perceptions' and 'the hum'.
- Examines the objective effects of infrasound exposure and low frequency noise on behaviour, sleep periods, task performance, and social attitudes.
- Provides a general review of the effects of low frequency noise on health.

The report provides no indication of the claimed symptoms for exposure to infrasonic noise levels measured near wind farms.

Dr Geoff Leventhall has subsequently published a number of papers[3] specific to wind farm noise, and concludes:

- Infrasound from wind turbines is below the audible threshold and of no consequence.
- Infrasound and inaudible noise from wind turbines are not a health problem.
- Low frequency noise is normally not a problem, except under conditions of unusually turbulent inflow air.
- Effects of wind turbine noise on health are mediated through annoyance from audible noise, particularly if aerodynamic fluctuations occur (swish).
- Attitude to a noise source is a large factor in annoyance from the source.

Issue 3 Effects of low frequency noise on bats

The author claims that wind farms producing low frequency noise are having an effect on bats with anecdotal evidence relating to bat population numbers and scarab beetle damage in trees. The author postulates that low frequency noise is interfering with the ability of bats to detect prey.

Response 3

Whilst I am not an ecologist, nor claim to be an expert in bat physiology, I understand that bat's use echolocation in the high to ultrasonic frequency range (14 kHz to 100 kHz+) as opposed to the postulated low frequency and infrasonic emission frequencies from wind farms.

I am also aware that some bat colonies are able to exist quite successfully in large cities where ambient low frequency and infrasound levels would be significantly higher than the environment lived in by the author.

[3] *Infrasound from Wind Turbines – Fact, Fiction or Deception* by Dr Geoff Leventhall in Canadian Acoustics Vol. 34 No.2 (2006)

Information Leaflet

The information leaflet presents a number of assertions and hypothesis, some of which are technically inaccurate or misleading.

Issue 5 Noise that travels through walls and terrain

The author calculates that 6 metre walls are needed to stop 25 Hz noise.

Response 5

The author seems to confuse transmission loss of noise through walls with the absorption of noise in an absorptive material. Standard lightweight wall construction may not be very effective at stopping the transmission of noise at 25 Hz, however, there is no need to have solid construction of over 6 metres thick. Similarly low frequency noise is able to travel around intervening terrain far more effectively than travelling through it.

Issue 6 Noise that travels very long distances

The author misrepresents Distance Spreading Loss

Response 6

The distance spreading loss of low frequency and infrasound noise (referred to as noise dilution over distance by the author) from a point source is 6 dB per doubling of distance from each and every source. The cumulative effect of multiple noise sources will not alter the attenuation of noise over distance from individual sources, however, the acoustic energy received from each source will be additive in the same way as audible noise, which is logarithmic. The logarithmic summation of acoustic energy combined with the spreading loss (whereby the resultant cumulative energy level is dominated by the closest and loudest individual noise source), would mean that infrasound noise levels would not significantly escalate on a regional scale with further wind farm development.

Issue 7 But isn't the noise level within the guidelines?

The author claims there are no current guidelines on low frequency noise - special audible character.

Response 7

The SA EPA Wind Farm Guideline, the Draft NSW Wind Farm Guideline and most typical Director General Requirements applied to wind farm applications include the provision to penalise wind farm noise if it contains excessive amounts of Special Audible Character (SAC). A 5dB penalty would apply to account for the increased annoyance of the noise with that particular character. Subjective evaluation and number of objective tests for tonality, low frequency, modulation etc. are available to test for SAC.

Issue 8 Impact at very large distances

The author provides anecdotal and speculative propositions with regards to wind farm infrasound and low frequency noise being experienced at large distances (30 km to 70 km) and causing extreme distress and health impacts.

Response 8

It should be noted that infrasound levels from a wind turbine located 35 km to 70 km away would be at least 40-60 dB lower than the typical levels measured in some of the studies quoted earlier at the closer distance of 85 metres to 360 metres. This represents infrasound noise levels which are many orders of

magnitude lower than levels that have already been established as being significantly below even the most conservative estimate for threshold of perception.

Regarding the reports of mystery noises in Warnambool, there is no evidence that a wind farm is the cause of this annoyance. Just as with examples given in the Southern Tablelands and Canberra there would be many other more significant sources of low frequency and/or infrasound in the area much closer than the wind farms being attributed the blame.

Were wind farm low frequency and infrasound emissions able to cause the debilitating symptoms at the distances described by the author then we would expect that in other regions of the world (eg in Northern Europe, where wind energy development and population density is considerably greater than in Australia) there would have already been an epidemic.

Issue 9 Where is the evidence? - ground borne vibration

The author claims that military provides evidence of how much audible and ILFN and ground vibration is produced by wind farms.

Response 9

Ground borne vibration levels attenuate with distance with varying amounts dependant upon such variables as frequency and geotechnical parameters. There are a few documented research reports with regards to wind farm generated ground vibration.

The Snow Report[4] describes measurements taken at a wind farm consisting of eleven 450 kW WTG's, where noise and vibration measurements were taken at increasingly distant points up to 1 kilometre. Low frequency vibration was determined down to 0.1 Hz with varying wind speeds and on/off operation. The research found that the absolute level of vibration signals measured at any frequency at 100 metres from the nearest WTG were significantly below the most stringent criteria given by BS 6472:1992 *Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).* Furthermore vibration in the 0.5Hz to 1Hz range remained at similar levels when the wind farm was not operating, suggesting that the vibration measured may have been due to other (ambient) sources.

A proposed wind farm development near the Eskdalemuir Seismic Array (EKA) was initially restricted due to concerns about wind farms interfering with the station's ability to detect nuclear explosions. Situated in the southern uplands of Scotland, the EKA is sited on a very quiet magnetic and seismic environment with twin 9 km long lines of seismometer instrumentation which are sensitive enough to pick up nuclear explosions from up to 15,000 km away. Detailed as part of a comprehensive report [5].

It should be noted that the objective of the study was to measure vibration levels many orders of magnitude lower than typical project criteria.

The Eskdalemuir report details results taken from St Breock Downs Wind Farm (possibly the same measurements taken in the Snow Report). From the documented seismic vibration measurements taken at 25 metres from a single WTG a peak particle velocity (PPV) of approximately **$8x10^{-5}$ mm/s** has been calculated. This is approximately 2500 orders of magnitude lower than typical project criteria.

Comparison between the level of human perception to a seismic detection facility is not realistic; just as high quality photo sensors used in telescopes are not to be compared to human sight.

[4] *Low Frequency Noise & Vibration Measurements at a Modern Wind Farm, D J Snow, 1997, ETSU W/13/01392/REP*
[5] *Microseismic and Infrasound Monitoring of Low Frequency Noise and Vibrations from Wind Farms* Applied and Environmental Geophysics Group of Keele University

Further Comments – The "nocebo effect"

Recent studies[6] have shown that symptoms from complainants living near wind farms may be spread by the *nocebo effect* and are often well linked to pre-existing negative opinions about wind farms and that health problems arising are "communicated diseases". "Labelling" of an illness is one of the key features associated with spread of mass psychogenic illness, along with community and media interest.

If you require any further information about this review, please feel free to contact us at any time.

Yours sincerely,

GUSTAF REUTERSWARD B.E. MECH. (HONS.) M.A.A.S.

MELBOURNE OFFICE MANAGER

[6] *Spatio-temporal differences in the history of health and noise complaints about Australian wind farms: evidence for the psychogenic, "communicated disease" hypothesis.* - Simon Chapman PhD FASSA, Alexis St George MSc PhD, Karen Waller BSc - Sydney School of Public Health, University of Sydney - Revised March 27 2013