REPORT 6
(1215/13/IM)

RATIFICATION OF COMMUNITY BOARD SUBMISSION TO LONG GULLY WINDFARM RESOURCE CONSENT APPLICATION

Officers recommend that the Makara/Ohariu Community Board:

1. *Receives the information.*

2. *Ratifies the Board submission to the Long Gully Windfarm Resource Consent Application.*

Attached is the Board submission to the:
- Long Gully Windfarm Resource Consent Application (Appendix 1)

APPENDIX 1

Submissions of the **Makara Ohariu Community Board**

in the matter of the application by **Windflow Technology Ltd**

to **Wellington City Council**

for resource consents in relation to a windfarm at **Long Gully**.

prepared by Ruth Paul

Chairperson

Makara Ohariu Community Board

c/o Wellington City Council.

The Makara Ohariu Community Board ("MOCB") has restricted its submissions to wind turbine noise.

1. NOISE LIMIT

Objectives and policies in the renewable energy and rural chapters of the District Plan are to be read side by side. Policy 14.2.3.2 (rural area) seeks to "control the adverse effects of noise". Chapter 26 (wind energy rules) prevails over the rules and assessment criteria in Chapter 15 (rural rules). The assessment criteria of 26.3.1 provides for consideration of the "actual and potential noise effects" of the application. No noise limit is set or discussed.

Section 16 of the RMA states that noise limits prescribed in District Plans or in the appropriate NZ Standards may be used as a guide to define what is accepted as 'reasonable' noise.

To that it would be relevant to add the West Wind decision (Environment Court) and Mill Creek decision (WCC/GWRC) as they have given significant consideration to the acceptability of noise from windfarms in Wellington's rural area.

The experience of residents in relation to noise from the operative wind turbines in Makara also needs to be considered.

The approach in NZ so far (based largely on NZS6808) is to set both a lower and upper limit – a lower limit (i,e, 40dBA L95) that the windfarm need never be 'quieter' than, and an upper limit of background +5. Discussions about the levels of acceptability for noise focus mainly on the lower limit, i.e. how much of a pre-existing quiet environment is a resident entitled to?

We include here a statement from Fritz Van Den Berg in the West Wind proceedings that in colloquial terms sums up how the difference between background sound and a new imposed sound can affect the people experiencing it:

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"… from plus five dB above the prevalent level that existed, you might expect complaints, and from 10, I would say the authorities are bound to get complaints, and at 15 dBA people go out into the streets for that, so there is, let's say, some measure of what people are used to in their environment and then if a noise increases that, that gives you a measure of what it would mean to people."

Another approach is simply to set an upper limit, as the French authorities do, with no lower limit but simply a background +5dB limit. Mr Hunt has put forward a possible approach to this with the NPI which might work but has some issues around the 'averaging' of the base level background measurements.

1(a). Rural Rules for noise sources excluding wind turbines.

15.1.1.1 sets the limit for any other noise source at 35dB L10 at night, in recognition of the quiet night-time rural environment. The Board is aware of Mr Hunt's Noise AEE comments as to why L10 should not be used as a measure of windfarm noise. We agree with this, but would comment that where a noise is continuous, the L10 and L95 would be the same thing. It is our view that windfarm noise is not always continuous over a night-time period, although it can be.

If we therefore translate the 35(L10) to (L95) according to the measure in the existing NZ Standard (as opposed to the revised standard) reported to this hearing by Mr Lloyd on behalf of WCC, and we alter it by 5dB – we can read the underlying rural rule as equating to approximately 30(L95). Whichever way you do the math, the limit suggested by Mr Hunt of 40dB (L95) is a louder and less restrictive limit than currently applies for other noise emitting activities in the rural area at night.

As a comment on Mr Lloyds **definition of the L95**, we further explain that the L95 as a measure of windfarm sound over time takes into account all sound in the environment (except maybe the quietest 2-3 percent) then sets the level just above the quietest 5% of that sound environment. It therefore measures the quietest consistent sound in the environment, and by it's nature cannot pick up any special audible characteristics that involve peak to trough impulsiveness (i.e. modulation). It records a measured level that exists when all impulsive or intermittent sounds (such as noise carried by wind gusts) are removed.

1(b). NZS6808.

The New Zealand Standard is currently under review. Mr Lloyd has referred to the public comment draft of the revised Standard, but we submit that this is an indication of the what the Standard might look if published, but was prior to significant public input so must be approached with some reserve.

The existing (old) Standard suggests a limit of 40dBA (L95) and states at 4.4.4 that a Territorial Authority is not prevented from specifying an alternative compliance level on a site by site basis. The public draft Standard suggests a secondary (or 'high amenity') level that sets a lower limit of 35dB(L90) where the property is commonly under 25dB(L90) OR where the District Plan recognizes a quiet environment. There are complex provisions for how this would be applied.

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We draw your attention to the footnote in the opening submissions of Windflow Technology Ltd (p25, para 66) where the legal test for a reasonable level of noise in relation to s16 RMA is discussed. The footnote cites *Mobil Oil NZ Ltd v Taupo DC* A 149/98:

" The Court noted that noise standards tend to be of general application and regard has to be had to the particular circumstances of each case in deciding whether the standards will provide adequate protection for the amenities that the plan seeks to prevent (sic)."

1(c). West Wind and Mill Creek.

In West Wind the Environment Court set a level of 40dB(L95) and a further lower level of 35dB(L95) when the existing background noise at the receiver is less than 25dB(L95) and the windspeed at receiver is less than 1.5 m/s.

Mill Creek improved on this by making the windspeed at the receiver 3m/s, after significant argument about the irrelevance of wind speed at the receiver. We note that windspeed at the receiver is not incorporated at all into the proposed conditions and support that approach. This is also consistent with the approach of the 6808 revision committee.

Background site measurements taken by the consent holder in both of these windfarm applications show significant periods of time where properties (in the 35dB predicted noise contour) fall below 25dB during windspeeds of 3m/s or less.

1(d). Residential experience in Makara with operative turbines.

Over the last few months one large group of turbines nearest residents in the Makara have become operational, the last 5 of these having been commissioned within the lat month. The turbines along South Makara Rd are not yet commissioned.

Meridian and WCC keep a report of all complaints lodged during this period. These logs are available to the Community Liaison Group and would be informative reading for the commissioners. A clear pattern emerges from complaints that residents *downwind* of turbines experience problems in certain meteorological conditions, and it is hoped that a more definitive pattern will emerge from these comaints over time so that specific meteorological conditions can be targeted for remedy.

One significant and possibly irremediable issue is the nature or character of the noise (excluding modulation which we address next). It might be true to say that the noise is no louder than a nearby stream, but it is commonly described as being more like the noise of a nearby motorway or airport. This is a new and unexpected noise for many residents of the rural area and not one that is easily adjusted to as it can be monotonous and single-pitched. At 5dB above background it is already an issue for many residents, let alone at the 10-15dBabove background allowed for by a limit of 40dB(L95).

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Summary of noise limit submission:

MOCB submits that the appropriate limit in the rural environment for windfarm noise in this instance will be 35dBA(L95).

The District Plan provides a more stringent limit of 30dBA(L95) or 35dBA(L10) for other noise sources in the rural area during evening and nighttime. Individual assessment for this site is more appropriate than a generic level set by a NZ Standard. Both West Wind and Mill Creek decisions contain conditions requiring a limit of 35dBA(L95) in low noise situations, at all times. Experience from West Wind operational turbines so far indicate that the character of the sound is causing problems, and a more restrictive level than that proposed by Mr Hunt is precautionary.

Setting a limit of 35dBA(L95) may not particularly inhibit this application. Where exceedence of this limit at a residential property is deemed to effect windfarm design (i.e. turbine placement) then an economic incentive may be offered (see WINDFARMperception paper, University of Groningen, commissioned by the EU where an economic interest was found to lessen annoyance from windfarm noise). Alternatively, an offer of indemnity might be considered.

2. MODULATION

In a 2009 paper enititled "Comparison of Wind Turbine Manufacturers' Noise Data for Use in Wind Farm Assessments" by Sylvia Broneske of Hayes McKenzie Partnership in the UK she states that the issues currently **not** addressed by manufacturer's data, include (p5):

> *"- the minimum separation distance needed between wind turbines so that turbulence intensity does not increase to such an extent that the sound power levels increase significantly - amplitude modulation"*

In particular we are concerned with amplitude modulation. Modulation is a special audible characteristic, and includes both high and low frequency impulsive sound. It is complex to define in scientific terms, but the best discussion of the problem is in a 2008 paper entitled "Amplitude Modulation of Wind Turbine Noise. A Review of the Evidence" by Dick Bowdler, New Acoustics, UK.

In the introduction he states:

"Many of the complaints in the UK relating to wind farm noise appear to be due to the amplitude modulation (AM) of the aerodynamic noise from the blades, sometimes referred to as "swish" or "thump". The mechanism of this noise is not known though various possible reasons have been put forward.

And in conclusion:

"It seems probable that there are two distinct mechanisms in operation to create AM. The first is swish which is a function of the observers position relative to one turbine. The second is thump

which is due to turbine blades passing through uneven air velocities as they rotate. In the second case the uneven air may be due to interaction of other turbines, excessive wind shear or topography. These two mechanisms are entirely separate though it is possible that they interact. If this is the case there is little that can be done about swish but further research into thump would help to avoid excessive AM in future developments."

Perhaps the best way to describe modulation is in laymans terms. These words are taken from one night 's worth of complaints to the Project West Wind 0800 number call log (21/22 July 2009) from 20 different households in Makara (and these from different individuals in differing households):

"rhythmic thunder/thumping"
"drumming"
"whooshing"
"whumping"
"washing machine"
"constant thumping"
"loud dryer"
"heavy beating pulse"
"loud thumping"
"swooshing"
""'ka-thunk" type noise"
"swishing"
"loud throbbing"

At 53.6 and 53.7 Mr Hunt addresses the 'swish-swish-swish' noise and 'impulse sound' which are both forms of modulation as discussed above, and we respectfully suggest that both his references have been superceded by more recent consideration of the subject, although we agree that no formal or successful method of predicting or measuring amplitude modulation in the field have so far been successfully put forward.

As Mr Borich of WCC has informed the committee, modulation has been measured and recorded in the broadband spectrum at a property in Makara by WCC officers, resulting in a request from WCC to the consent holder to investigate and remedy the problem under the 'reasonableness' criteria of section 16 RMA.

As a result, MOCB would strenuously disagree with the assertion by Mr Hunt that modulation is only associated with 'downwind' older model turbines, and note that his statement that there are *"…no impulsive type sounds from the W500 machine that I am aware of*" is a qualified statement and depends on whether the manufacturer has provided any data relating to modulation. MOCB submits that whether modulation from the W500 exists or otherwise may only be known when they are operative in the field, and that precaution needs to be taken when consenting these turbines.

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2(a). Special Audible Characteristic Conditions

MOCB note the proposed condition requiring penalty to the measured (L95) level of up to +6dB.This appears to be commonly interpreted as a maximum penalty of +5dB.

We submit, however, that at or below the limit set for windfarm noise at the receiver, these penalties are ineffective. For example, in a situation where the limit is 40dBA(L95), and the measured level including windfarm noise with modulation occuring is 35dBA(L95), perhaps peaking at around 40-41dBA, the penalty will take that L95 measured level up to 40-41dBA(L95), in other words, it will be compliant. The modulation will still be present.

This is a precise example taken from West Wind, where the residences in prevailing conditions are shielded from the wind and the characteristic 'thumping' shows up more clearly against the quiet background. In other words, modulation is quite likely to occur in conditions in which it will be deemed to be compliant with the limit set, and as a result the only course of action open to address the 'unreasonable' characteristic of the noise is an investigation of it's removal under s16 of the RMA.

The public comment draft of 6808 states at 5.4.4:

> *"No appropriate objective test for audible modulation has been standardised. If a wind farm is deemed subjectively to create sound with a clearly audible modulation an adjustment of +5 dB shall be applied to the wind farm sound level for the wind conditions under which the modulation occurs."*

MOCB agrees with this assertion and approach. Condition 20 needs to be expanded to acknowledge, as above, that no appropriate objective test for amplitude modulation has been standardised. Many different approaches seem to be being proffered at present but these are in no way agreed upon, nor is the level of modulation variance required to be 'unreasonable' agreed upon. The requirements of condition 20 as currently proposed give too much scope for the matter to be drawn out in lengthy processes as different parties determine what a 'regularly varying basis' means, or whether 'measured peak to trough levels' exceeding 5dBA is the right assessment. As no agreed test has been standardised, MOCB suggests that the wording of the public draft, as copied above, be adopted in condition 20.

In addition, there must be a presumption that special audible characteristics shall not be audible at the receiver. MOCB submits that this be inserted as the first sentence of condition 19:

> *"Wind farms shall be designed and operated to avoid special audible characteristics at the notional boundary of a dwelling."*

Also, reference should be made to section 16 RMA, that where special audible characteristics occur and are unaltered by the application of a penalty, an investigation into conditions, with a goal of removing of those characteristics, be undertaken.

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3. ON/OFF TESTING

Where dispute arises over the validity or accuracy of background noise measurements, MOCB submits that an on/off testing condition can be inserted in or around WCC's proposed condition 24 to assist with compliance monitoring where necessary.

The public comment draft of NZS6808 proposes:

7.6.3

If the background levels were not measured prior to installation (7.4), it may be necessary to obtain background sound level measurements for limited periods at critical wind speeds to satisfy 5.2 and 5.3 (for example, if post-installation sound levels exceed 40 dBA L90). These measurements may be for a limited range of wind speeds and directions, while the wind turbine(s) are not operating. This is commonly referred to as 'on/off' testing.

C7.6.3

Where on/off testing is to be used to show compliance, it is not necessary to turn the complete wind farm off. The contribution from individual turbines to the sound at a measurement location can be determined and those turbines which collectively are 10 dB lower than the highest contributor may remain on for the purposes of on/off testing. The duration of the off time needs only to be sufficient to get a number of representative 10-minute samples. Generally two or three samples should be sufficient.

A mediation agreement concerning on/off testing was reached between WCC and Meridian in an enforcement order taken by the Makara Guardians (WN 18/09, 28 May 09) which may also be informative.

MOCB does not propose specific wording for such a clause but would request that the matter be considered by the Hearings committee and appropriate experts.