



13 July 2018

AECOM Ltd
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For the attention of Louise Cowan

Dear Louise

**PROPOSED KAIMAI WIND FARM
FURTHER INFORMATION ASSESSMENT
ACOUSTICAL CONSULTANCY**

Hauraki District Council has asked Acousafe to provide an assessment of the appropriateness of the Acoustics Assessment (**The Assessment**) for the above project. The Assessment is by Chiles Ltd dated 30 May 2018 reference 170201b.

The applications received by Hauraki District Council are for land use consent for the establishment and operation of 24 large scale wind turbines up to 207m high, within sites identified as 771 and 604 Rotokohu Road and 6356 State Highway 26, Paeroa.

The application provides for the construction and operation of the turbines and ancillary structures including a new substation, 18.9km of internal road network 3 component laydown areas and an underground cable network between turbines.

The assessment is undertaken in accordance with NZS 6808:2010 *Acoustics – Wind farm noise*, which we agree is the correct Standard to use. In forming our recommendations, however, we also refer to the UK Institute of Acoustics document “A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise” (**The GPG**). This document was published after NZS 6808:2010 and contains some useful checks on what information should be provided.

We note that the nearest dwellings are some 800 metres from the proposed turbine location, with a significant number between that distance and 1.2km. In our experienced care needs to be taken that the wind farm noise is appropriately managed and controlled at these separation distances.

Figure 2 of the Assessment shows what is *understood* to be the long-term wind rose for monitoring undertaken on the proposed wind farm site. This wind rose shows a clear predominance of wind from the south westerly direction. We recommend that further information is sought regarding:

- the seasonal breakdown of the wind rose, and
- with filtering of the data for Amenity Hours and Night-time hours.

Amenity Hours are defined (in the GDG) as:

18:00 – 23:00 hrs Monday – Sunday;

13:00 – 18:00 Saturday and 07.00 to 18.00 Sunday

Night-time Hours are defined as:

23:00 – 07:00 (weekday and weekend)

Background sound was measured in March 2017. This monitoring was undertaken during summer while cicada sounds were high. While some further analysis has been attempted to identify the influence of cicada noise the results in Appendix A show little or no correlation between wind farm wind speeds and background sound levels.

We recommend that further information is sought regarding:

- the monitoring of background sound levels during the winter months (without cicadas),
- a breakdown into wind direction (if this can be done), and
- a breakdown into background sound levels during the Amenity Hours and Night-time Hours,
- remove the presence of noise sources which are not common to the representative measurement locations and neighbouring noise sensitive properties, using a review of time histories and scatter plots,
- if appropriate remove clear dawn chorus effects from night-time data,
- exclude any data directly affected by rainfall, or when rainfall has resulted in atypical levels, and
- plot the background sound levels against wind speed to determine the prevailing background sound levels at each representative assessment position. The order of regression analysis to use (linear to fourth order) will depend upon the nature of the background environment.

This will demonstrate the seasonal and diurnal variations in background sound level.

The modelling has been undertaken referencing a specific Siemens wind turbine model based on a wind speed of 8m/s at 10 metres AGL. Section 6.1.5 of NZS 6808:2010 states that:

A set of overall levels shall be predicted covering the wind speed range for which sound power level data are available from the manufacturer. As a minimum, the wind speed range shall include the range specified by IEC 61400-11 and the wind speed corresponding to the highest sound level generated by the turbine. All predicted wind farm sound levels shall be calculated at hub-height wind speeds.

The GPG considers that the ISO 9613-2 standard can be applied to obtain realistic predictions of from wind turbines but only provided that the appropriate choice of input parameters and correction factors are made. In particular, the use of “soft-ground” factor should be avoided, and the full theoretical effects of terrain screening will usually not be achieved.

We recommend that further information is sought regarding:

- Predicted data which should cover the range of wind speeds between cut-in and the speed at which maximum sound power level is achieved,

- Use the hub height wind speed (not 10m AGL),
- Identify if wind shear issues affect noise generation or propagation,
- Justify why 106 dB L_{Aeq} sound power level has been selected,
- Justify the spectral adjustment used,
- Provide justification why this data should represent other turbines that may be selected,
- Undertaken predictions with both zero and 0.5 ground absorption,
- Do predictions at a receiver height of 4.0 metres to reduce the potential oversensitivity of the calculation to the receiver region ground factor compared to lower receiver heights, and
- Provide for safety factors and uncertainty including any terrain screening concerns described in the GPG (if no data on uncertainty is provided then a factor of +2dB should be added to WTG noise levels).

Section 7 discusses construction noise. No mention is made of traffic using the internal roading network particularly during Amenity Hours and at Night. This network is likely to be closer to receivers than proposed turbine locations and may involve steep terrain. Would the sound of labouring trucks on steep internal roads be likely to cause an impact on neighbours and should this be controlled at critical times?

Is concrete manufacture proposed on the wind farm site?

Conditions

The current background sound monitoring shows no correlation between wind farm wind speed and background sound level at residential neighbours. This makes it impossible to apply proposed condition 1(b) because there is no method of determining the background sound level. The further information sought above may improve this level of knowledge but if not, then how is NZS 6808 to be applied?

Yours faithfully

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