Invalid Noise Assessment

Objection to the Proposed Jupiter Wind Farm

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The noise assessment in the EIS is false or misleading in a number of demonstrable and critical ways. It is likely that characteristic applies also to other parts of the noise assessment which are not amenable to being checked by community members.

In fact, ***noise monitoring conducted for this proposal is so flawed, in both the process of measurement and application, that the Department has no choice but to scrap it entirely and rely on a simple 35dbA limit, at all wind speeds, for all properties impacted by the Jupiter proposal.***

As the Department knows from many other submissions, the EIS is riddled with false and misleading statements on a multitude of aspects other than noise assessment. This paper demonstrates the proponent has also proved to be erroneous in a checkable part of the noise assessment. The Department can therefore make no assumption of the validity of the noise modelling component of the assessment.

Consequently, ***the Department has no choice except to reject the noise assessment provided in this EIS, both in relation to Jupiter in isolation and the cumulative noise effect of Jupiter in conjunction with Capital, Capital 2 and Woodlawn wind farms.***

Overview

The noise assessment in the EIS is false or misleading in a number of demonstrable and critical ways. It is likely that characteristic applies also to other parts of the noise assessment which are not amenable to being checked by community members.

According to the EIS[1]:

> "A key element in assessing environmental noise impacts is an understanding of the existing noise environment in the vicinity of the Project receptors. To achieve this, a baseline noise monitoring campaign to quantify existing ambient and background noise levels at locations representative of the closest and/or potentially most affected residential (dwelling) receptors was completed."

Background noise monitoring is used to set compliance limits for each property. If there are problems in the background noise monitoring then there are likely to be problems in the compliance limits set for each property (related to measured wind speed).

Despite the statement that chosen locations are "representative" of the "most affected residential (dwelling) receptors", the EIS provides no evidence to demonstrate that to be so. In fact, data in the EIS and information publicly available shows that in a great many instances they are not representative. So the EIS fails at its own stated requirement.

In addition, there is no basis for restricting data collection to represent only dwellings "closest and/or potentially most affected". Given how intrusive Jupiter is, many other residents may be seriously exposed without being the "most affected". Those individuals are no less deserving of a duty of care by the NSW Government – and the developer needs to provide the information necessary to allow the Government to determine what is necessary in relation to its duty of care to all individual residents.

Note that the revised EARS, issued in March 2016, require the developer to[2]:

> "include monitoring to ensure that there is adequate wind speed/profile data and ambient background noise data that is representative for all sensitive receptors"

Note, unlike the EIS statement, the EARS requirement is to provide representative ambient background noise data "for ***all*** sensitive receptors" – not just for those the developer considers likely to be most affected.

The process of background monitoring for the EIS is flawed in multiple ways that advantage the developer, to the detriment of the local community. They include:

- Inappropriate siting of loggers, leading to misrepresentation of ambient background noise;
- Restricted time of year used for measurement, creating unrepresentative data;
- Insufficient measurement locations;
- Unrepresentative data due to selectivity of locations and other factors;

[1] *Jupiter Wind Farm EIS*, p. 10.7.

[2] *Environmental Assessment Requirements, Jupiter Wind Farm,* 2 March 2016, p. 3.

- High unexplained variance in data, so derived equations have very weak generalisability to other locations;
- Inappropriate use of specific measurement locations to represent particular other dwellings.

Unexplained Variability in Background Noise Levels

The EIS presents plots of noise levels versus wind speed at each of the monitoring sites (Figures 5.1 – 5.13). The R^2 for those plots averages 0.31. That means that ***more than two thirds of the variation in noise levels at any site cannot be explained by wind speed***. Had the monitoring been done over a full year, with the full variety of weather conditions and seasonal variations in other elements, the unexplained variance would have been even larger.

When the ability to explain and predict noise level at a single site, based on the only indicator you are using, is so poor, then the ability to predict noise levels at other sites using that single indicator is substantially worse.

This is particularly the case when many of those sites are kilometres away, in different terrain, subject to a variety of atmospheric and other conditions. This problem is exacerbated because, as discussed below, the developer has chosen to monitor at so few points, during only one month of the year, and has selected monitoring locations guaranteed to have problems.

Inappropriate Logger Siting

EPYC used only 13 sites to monitor a huge area. The placement of those loggers has multiple problems.

- Eleven of the thirteen loggers were placed within 1.5 kms of the nearest turbine. That makes them poor predictors for properties further away.
- There are ten monitoring locations around the northern and central sections of Jupiter. However, four of those locations are along Boro Road. This is not to begrudge the people along Boro Road, since they will be between the northern and central sections. But it didn't leave many to measure the rest of this huge area.
- In addition, 5 of the 10 are close to the Goulburn-Braidwood Road, i.e. the most heavily trafficked road in the area except for the Kings Highway. Two of the locations are 130 metres from the road (J103B, J257), another two are about 250 metres away (J075B, J140) and one is about 450 metres from the road (J020), on a slope to the road with very little other than grass between it and the road.
- While the traffic noise at those sites may be "background" for those particular sites, it is not background for sites further away and application of the results from those sites is invalid elsewhere if at all contaminated with traffic noise.
- At least two of the thirteen monitoring locations (J070 and J141) have small wind turbines in place. Small wind turbines are actually very noisy in the immediate vicinity. That may be part of the ambient noise for the dwelling at the site, but it cannot legitimately be imputed to any other property.

  One of those locations is in Boro Road, the other is one of the three locations used for the southern section of the wind farm. So the misleading impact on imputed background noise is likely to be substantial for a number of properties.

Residents Against Jupiter wind turbines has conducted noise monitoring at a number of sites. One of those locations had also been used by EPYC. The property owner was certain the placement of the measurement equipment at that site had been done by the EPYC project manager, who is known to locals. That raises the question of in how many other cases did the project manager place the equipment and what are his qualifications for that purpose.

The last question is not an idle one. When we started to set up our equipment at the site, the property owner told us it was within a few metres of where EPYC had done so. While we were setting up, we noticed that the home had a heat pump which came on for a number of minutes quite frequently and it was quite noisy where we, and EPYC, had set up the equipment.

Recognising that as extraneous noise, we relocated to the other side of the house, where it was scarcely audible. So we measured without impact of the heat pump, whereas EPYC measured with the heat pump as a regular contributor to the noise it was recording.

One might argue whether that noise is genuine background noise for that property, though the heat pump was sited so that it was not a problem in terms of internal noise. However, once again, that noise is very definitely not background noise for the many other properties to which its results have been imputed.

Generalisability

The problem of generalisability of a noise monitoring location to other properties can be seen in EPYC's own data. Examine the background noise dot plots (Figures 5.1 – 5.13) in the EIS. They differ substantially in a variety of ways, including the dbA levels for wind at 3 m/s and at each subsequent speed up to 15 m/s. They differ in the shape of the plotted curves. They differ in the variance explained by the curve. You can't take one of them and with any accuracy apply its results to another – even when they are near the same section of the wind farm.

That data shows the limits of applying them to other properties.

Incidentally, there appears to be an error in relation to measurement point J197. After the scattergrams (Figures 5.1 – 5.13) there are another set of graphs showing background noise and compliance limit curves for each of the monitoring properties (Figures 5.14 – 5.26).

The background noise lines in those graphs are virtually identical to the curves plotted in the scattergrams, except for property J197. In that case the curves are quite different. Going from 3 m/s to 15 m/s, the scattergram (Figure 5.11) starts at 25 dbA and rises to 38 dbA. The background curve for that same property (Figure 5.24) starts at 35 dbA and rises to 43 dbA. [Note. The curve referred to here is the background noise curve. The compliance limit curve in the same graph is a further 5 dbA higher at all wind speeds.] This is a very substantial difference. It appears to be an error undetected by EPYC, its consultants or the Department. How many such errors have found their way into the modelling?

Seasonality

In this part of the country we have distinct seasons. That affects the weather. It affects wind direction and that can impact noise levels depending on where trees and bushes are relative to

the dwelling and wind direction. It also affects other things that contribute to background noise, such as bird life (most of the birds found in the area are migratory, depending on the seasons), insect noise, the extent of foliage, atmospheric effects on refraction of sound.

Consequently, background noise taken during one month of the year can be quite unrepresentative of other months, and may significantly overstate noise levels at other times.

EPYC has had years to prepare its EIS. It had plenty of time to do full year, accurate, background noise monitoring. After all, it has had expensive wind monitoring towers operating for at least three years, to help in its planning.

Specific Cases

To determine compliance limits for each property examined, the EIS apparently assigns to each of them compliance limits determined for one of the thirteen noise monitoring points. This can be seen from Table 5.3 in the EIS, where each identified property has compliance limits for each nominated wind speed and the set for each property matches the set for one of the monitoring points[3].

It is not difficult with Google Earth to compare the situation of each noise monitoring location with the other properties to which its limits have been assigned. Doing so shows that in many cases the difference in situation are very substantial.

For instance, compare the noise logging location at J103B (742599 E, 6107934 S), almost entirely surrounded by trees and 130 metres from the Goulburn-Braidwood Road, with the situation of properties to which its compliance limits have been imputed, such as J026, J091, J127, J138 and J392).

Some allocations of compliance limits seem even worse than that. Consider the area around Barnet Estate. There is one monitoring location, J020 (742710 E, 6102307 S) actually on the estate. There is another further away to the north along the Goulburn-Braidwood Road, J075B (742307 E, 6104693 S). J075B has higher noise levels and compliance limits than J020, so based on J075B, allowable noise can be louder at dwellings without exceeding the limits.

Dwelling J005 is 540 m from J020 and 2 kms from J075B. It is also, like J020, on largely open grassland on a slope, facing the same way, and with open access to the central part of Jupiter. Despite that similarity and closeness, the compliance limits for J005 are based on the monitoring site J075B, not on that of J020.

It is not the only dwelling in that situation. J116A, J116B and J181 are each 600 – 700 m from J020 and between 2.2 and 2.8 kms from J075B, yet each is assigned limits based on the monitoring site that is much further away.

Things are even stranger at the southern end of Barnet Drive, where J075B compliance limits are assigned. For instance, properties J184 and J185 are both assigned J075B compliance limits, despite J185 being 4 kms from J075B and J184 being 4.6 kms from J075B. Both are

[3] Note. The minimum compliance limit for host is 45 dbA, so in the 4 cases where the monitoring point was on a host property the compliance limit is a flat 45dBA except when it increases above that at higher wind speeds. In those cases the limits for non hosts are given by the compliance curves in EIS Figures 5.14 – 5.26.

much closer to J020, which essentially lies between them and J075B. They are even closer to measuring site J140, which is 2 kms from J184 and 1.6 kms from J185.

Noise compliance limits based on J140 are very similar to those for J020, and in both cases lower than those of J075B from wind speeds of 8 m/s upward. There is no logic behind the assignment of compliance limits to properties in Barnet Estate.

However, the way the assignment has been done raises the compliance limits for those properties and thus makes it easier to claim noise from the wind farm will not exceed compliance limits for those properties. It also means that in subsequent compliance testing, or in the event of complaints to the EPA, the base point for review is inaccurately weighted to benefit the wind farm.

I have not examined every compliance limit assignment in the EIS. Hopefully the Department will actually do so. From the small number examined, it seems likely that there are many other errors.

Conclusion

There are multiple, serious problems in the way noise monitoring has been conducted. Consequently the measurement itself is flawed and the sites and placement are in a number of cases quite inappropriate. In addition there is the inherent problem that measurement was done during less than one month of the year, so cannot be reliably applied to the rest of the year given the multiple factors that change noise levels found during the various seasons in a rural area.

Further, the data reported in the EIS itself shows each monitoring site has weak generalisability to the other monitoring sites, even though they appear to have mainly been chosen for similarity (e.g. near stands of trees). Consequently they have even less basis for generalising to other properties.

Examination of properties using Google Earth shows that the situation of those used for noise monitoring is frequently quite dissimilar to those to which their compliance limits are applied.

In addition, examination of a small part of the total properties for which compliance limits are claimed to be established shows that in many cases the developer and their consultants have unjustifiably applied limits from a more distant, noisier, monitoring site rather than from closer ones which would give lower limits. Where this has been done it advantages the developer and disadvantages members of the local community.

Noise monitoring conducted for this proposal is so flawed, in both the process of measurement and application, that the Department has no choice but to scrap it entirely and rely on a simple 35dbA limit, at all wind speeds, for all properties impacted by the Jupiter proposal.

It is not possible for the Department to reliably "make adjustments" to achieve accuracy. Any attempt to do so would involve connivance by the Department at applying false or misleading information and claims from the developer.

When so many errors are found, after a brief review, the reasonable assumption is that there are very likely to be more. At the very least it is incumbent on the developer to **PROVE** (not have its consultants assert) there are no more.

The part of the noise impact assessment which I have reviewed is relatively accessible, e.g. it is possible to identify with publicly available tools the exact location of noise monitoring sites and properties to which their noise results have been applied. It is also possible to visually inspect the noise monitoring sites and other properties and see how similar or different are their situations.

The actual noise modelling for the assessment is a wholly different matter which is not in any way reasonably accessible to the public to check. There is no reason to expect that part of the assessment to be any less erroneous and misleading than the parts that are accessible to inspection.

In an *Information Paper*[4] reviewing possible health effects of wind farms, the NHMRC stated:

> "Wind farm noise is complex and highly variable in character (e.g. tonality, frequency content and impulsivity). These characteristics and the duration of exposure influence the way in which wind farm noise is perceived. Perception is also influenced by characteristics of the person perceiving the noise — people who detect and recognise wind farm noise more easily may find it more annoying and people living in quiet environments may be more sensitive to low-frequency noise."

and

> "The occurrence of amplitude modulation depends on a complex range of factors, including local atmospheric conditions, topography, turbine blade design and the way in which they are controlled. A particular turbine type may exhibit the effect in one site but not in another. The effect varies greatly with distance, wind direction and over time, including whether it is day or night time (it may be more common in the evening or night).
>
> When multiple wind turbines are producing sound, the total sound pressure level at a particular location is affected by the sequence of the arrival of the sound (referred to as coherence). For example, if each of the turbines' blades are turning at the same time and are the same distance from the location, the sound from all the turbines would arrive at the same time, increasing the "loudness" of the sound. Amplitude modulation may be enhanced when this coherence effect occurs. However, if some turbines are further away or located at 180 degrees, there will be "cancellation" of some of the sound. These effects also vary depending on meteorological conditions, distance and location."

and

> "It is not yet possible to predict the complex and highly variable characteristics of wind farm noise (e.g. amplitude modulation)."

Note that last quote: ***"It is not yet possible to predict the complex and highly variable characteristics of wind farm noise (e.g. amplitude modulation)."***

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4 *Information Paper, Evidence on Wind Farms and Human Health*, NHMRC, February 2015, pp. 15-16.

If it is impossible to predict "the complex and highly variable characteristics of wind farm noise" then it is logically impossible to model them. Therefore, according to the NHMRC, the modelling for this proposal cannot be relied upon. That reliability reasonably becomes even more doubtful when the proponent has, through either error or intent, proved to be erroneous in other parts of what they have produced.

Note. Aside from the errors identified in relation to noise monitoring and its application, there have been many other objections lodged against the Jupiter proposal which illustrate numerous instances of false and misleading information and claims in the EIS. The Department has all those examples at hand.

Consequently, the Department has no choice except to reject the noise assessment provided in this EIS, both in relation to Jupiter in isolation and the cumulative noise effect of Jupiter in conjunction with Capital, Capital 2 and Woodlawn wind farms.