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Review of noise conditions from planning permits recently approved in Victoria Australia

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Abstract

A number of proposed wind farm developments have been granted planning permission in recent years in Victoria, Australia. In each case there are a number of conditions, including conditions for noise emission, associated with the planning permit, which must be satisfied throughout the construction and operational phases of the wind farm. The noise conditions typically require that noise monitoring be carried out at residential properties around the wind farm in order to confirm that emission from the wind farm complies with noise limits determined according to the relevant standard, New Zealand Standard 6808:1998 *Acoustics - The assessment and measurement of sound from wind turbine generators* (NZS6808:1998). Early permit conditions required 10-14 days monitoring to occur once a month for a period of 12 months. More recent permits require two sets of 10-14 days monitoring separated by approximately 10-12 months in some cases with additional filtering for wind direction. As a continuation of earlier work (Delaire, 2007) this paper reviews noise conditions from recent planning permits. In addition, a set of representative data is analysed using the various noise conditions to determine how consistent the outcomes of the various methods are.

INTRODUCTION

When a wind farm development is granted planning permission in Victoria, Australia there are a number of conditions, including conditions for noise emission, which must be satisfied throughout the construction and operational phases of the wind farm. The noise conditions typically require that noise monitoring be carried out at residential properties around the wind farm in order to confirm that emission from the wind farm complies with noise limits determined according to the relevant standard, New Zealand Standard 6808:1998 *Acoustics - The assessment and measurement of sound from wind turbine generators* ([1] NZS6808:1998).

Early permit conditions required 10-14 days monitoring to occur once a month for a period of 12 months. More recent permits require two sets of 10-14 days monitoring separated by approximately 10-12 months in some cases with additional filtering for wind direction. Delaire (2007) **Error! Reference source not found.** supported the adoption of permit conditions which did not require 12 months post-construction noise monitoring. In June 2009, the Lal Lal Wind Farm permit conditions were released. Consistent with the Macarthur Wind Farm permit conditions and the recommendations from Delaire (2007), the Lal Lal Wind farm planning permit conditions involve 2 rounds of monitoring spaced 10-14 months apart, with some discrimination of the data on the basis of wind direction. Since then noise related permit conditions have been issued for seven Victorian wind farms using, in general terms, the approach to post-construction noise monitoring described in the Lal Lal Wind Farm permit conditions.

As a continuation of Delaire (2007) this paper reviews noise conditions from a selection of recent planning permits. In addition, a set of representative data is analysed using the various noise conditions to determine how consistent the outcomes of the various methods are. This paper considers unattended post-construction measurement methods as these have been used most commonly to data in Victoria. Attended or on/off tests are not directly considered.

A REVIEW OF PREVIOUS WORK

A paper presented at the Wind Turbine Noise 2007 Conference, *Review of post-construction noise compliance assessment conditions included in various wind farm planning permits in Victoria, Australia* (Delaire, 2007), reviewed and discussed a number of planning permits issued for wind farms in Victoria, Australia.

As the current paper continues the theme of this analysis, several key items from Delaire (2007) are noted herein.

Planning process

The planning permit conditions for a proposed wind farm in Victoria are currently determined by an independent panel appointed by the State Minister for Planning, when the project's power output exceeds 30MW, or by the local council for smaller projects.

During the panel hearing, the community, local council and technical experts provide submissions to assist the panel in making its decision. The panel members usually consist of lawyers, planners and engineers. During this process planning permit conditions can be proposed by any submitters and the panel will then decide on the final set of conditions to be included in the planning permit. An indicative flowchart of the process is presented in Figure 1.

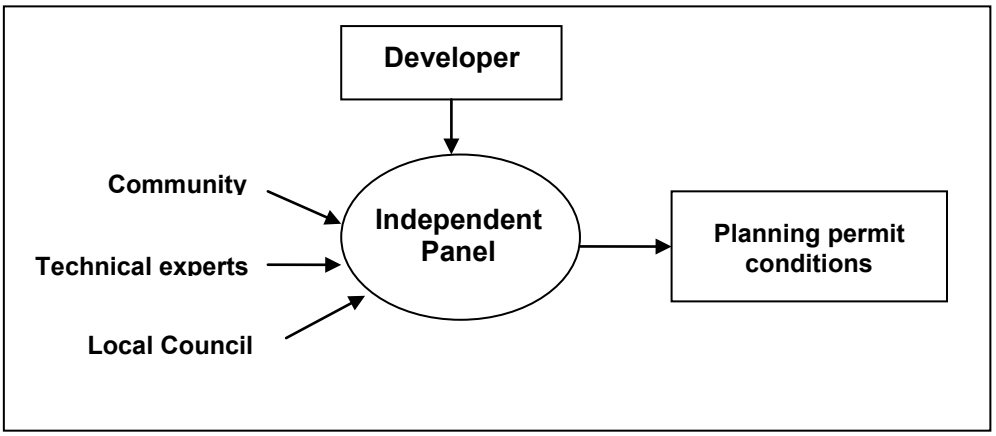

Figure 1: Planning process indicative flow chart

The Independent Panel provides its recommendations to the Minister for Planning through a Panel Report which includes recommended draft permit conditions to fit any specific requirements that may exist for a particular project. The Minister for Planning then issues the final planning permit which may differ significantly from the Independent Panel's recommendation.

Planning permit conditions

A summary of planning permit conditions included in the 2007 study which relate to the post-construction noise assessment for wind farms are presented Table 1.

Table 1: Summary of requirements

Wind Farm	Compliance with NZS6808:1998?	Post-construction noise monitoring program			
		Required?	Commencement	Duration	Comments
Challicum Hills *issued 8/10/2001*	Yes	No	n/a	n/a	To the satisfaction of the responsible authority
Wonthaggi	Yes	Yes	Not specified	Not specified	At any existing dwelling at the time of the application To the satisfaction of the responsible authority
PWEP *issued 04/2003*	Yes	Yes	2 months from the commissioning of the first generator	A minimum of 12 months after the commissioning of the last generator	Monthly results must be forwarded to the Minister for Planning within 30 days of the end of each month
Waubra *issued 26/05/2005*	Yes	Yes	2 months from the commissioning of the first generator	A minimum of 12 months after the commissioning of the last generator	Report summarising the results of the monitoring program must be forwarded to the Minister for Planning within 45 days of the end of the monitoring period
Macarthur *issued 26/10/2006*	Yes	Yes	Initial program: within 2 months of the commissioning of the last turbine (or group of turbines if staged construction) Second program: between 10-12 months of the start of the initial program for the whole site		Monitoring starting date and extent to be agreed between the responsible authority and the facility operator Concurrently monitoring at all dwellings where background noise monitoring was undertaken If compliance was demonstrated by the initial program, a second noise compliance monitoring program is to be undertaken No further noise compliance monitoring program is required if compliance is demonstrated by the second program Further noise compliance monitoring may be required by the responsible authority at any dwelling on the basis of a reasonable belief that the noise limits are exceeded.

2007 recommendations

After reviewing a selection of planning permit conditions related to post-construction noise assessment, the 2007 study found that the level of complexity and detail varied significantly between projects. The New Zealand Standard provided only the methodology for determining compliance while details regarding the way the post-construction noise monitoring program should be undertaken were limited.

It was considered that permit conditions requiring measurements to be performed once the first generator was completed would not prove compliance or otherwise with NZS6808:1998 noise limits as the measurements would not be representative of the whole wind farm and would likely be affected by construction noise. In addition, it was considered that guidance regarding the wind conditions required during the

measurement period should be provided in addition to the duration of the monitoring period.

The following recommendations were proposed for inclusion in future revisions of NZS6808:1998:

- Post-construction noise monitoring should be undertaken during a period of worst case wind when the monitored property is located downwind from the nearest turbines
- Compliance should be demonstrated during two periods of noise monitoring separated by at least ten months and no more than twelve months

An example revised post-construction noise assessment condition was proposed in the 2007 study, which is represented in Appendix A.

THE CURRENT STATE OF PLAY

New and revised standards and guidelines

Recently in Australasia, several standards and guidelines have been either published or revised. The following key new documents are available:

- New Zealand Standard 6808:2010 *Acoustics – Wind farm noise* (NZS6808:2010) [3]
- Australian Standard 4959:2010 *Acoustics – Measurement, prediction and assessment of noise from wind turbine generators* (AS4959:2010) [4]
- South Australia Environment Protection Authority *Wind farms environmental noise guidelines* (SA Guidelines 2009) [5]
- EPHC *National wind farm development guidelines – Draft July 2010* (NWFDG) [6]

Notwithstanding the above, it is still currently NZS6808:1998 which is the guidance document specified by the Victorian State Government for assessment of noise emission from wind farms, just as it was being applied during the work undertaken in 2007.

Only the SA Guidelines 2009, which are not applicable in Victoria, provide a detailed methodology for measuring and analysing post-construction noise monitoring results. They state that compliance assessment should be based on 500 data points associated with the worse case wind direction from the wind farm to the monitored property ±45°.

In late 2010, state elections saw a new government take power in the state. Wind farm noise emission featured in the pre-election policies campaigned by the elected party and it is understood that legislation regarding noise emission is currently being drafted.

Recent Victorian planning permits

In February 2008, during the Crowlands Wind Farm panel hearing, post-construction noise compliance conditions consistent with Delaire (2007) were recommended by the noise expert. These conditions were largely adopted by the panel, as detailed in their report dated June 2008. However the Crowlands Wind Farm panel report was not made publically available until August 2010, after the time of issue of the planning permit. The Crowlands Wind Farm planning permit conditions are consistent with Delaire (2007).

In November 2008, post-construction noise compliance conditions consistent with Delaire (2007) were also presented by the noise expert during the Lal Lal Wind Farm panel hearing. The conditions were again largely adopted by the panel as detailed in their report dated February 2009. However, the post-construction noise compliance conditions included in the planning permit for the wind farm, issued in April 2009, varied significantly from those drafted in the panel report.

In 2010, during the panel hearings for the Berrybank, Mortlake, Ararat, Stockyard Hill, Yaloak South and Moorabool wind farms, the Lal Lal Wind Farm planning permit was a key reference document. In particular, the timings of the various hearings predated the issue of the Crowlands Wind Farm planning permit whereas the Lal Lal Wind Fram planning permit had only recently been issued. The noise related permit conditions for the Berrybank, Mortlake, Ararat, Yaloak South and Moorabool wind farms have effectively shadowed the Lal Lal Wind Farm permit conditions, with some variations from project to project. A summary of the NZS6808:1998 based post-construction noise conditions from selected planning permits issued since Delaire (2007), is provided in Table 2. Extracts of noise related conditions from selected planning permits are presented in Appendix B.

Table 2: Overview of recent Victorian planning permits

Wind farm	Comply with NZ6808:1998	Post-construction noise monitoring program?			Comments
		Required?	Timing	Duration	
Lal Lal [7] *Issued 30/04/2009*	Yes	Yes	Completed within 14 months from commissioning of the last turbine	In accordance with NZS6808:1998, which implies at least 10 days monitoring and 1440 data pairs. A second round of monitoring is to be carried out within 10-14 months of the first round.	Additional data requirements include: + Minimum 500 data points + 1% of data pairs at hub height wind speeds ≥ 8m/s + 1% of data pairs at hub height wind speeds ≤ 4m/s + The number of data pairs in the down wind direction proportional to the expected monthly average* Attended monitoring may be used in lieu.
Crowlands [7] *Issued 18/08/2010*	Yes	Yes	Started within 2 months of commissioning of the last turbine	In accordance with NZS6808:1998, which implies at least 10 days monitoring and 1440 data pairs. A second round of monitoring is to be carried out within 10-12 months of the first round.	Consistent with the recommended permit conditions of Delaire (2007)
Berrybank [9], [10] *issued 24/08/2010* **Mortlake [11]** *issued 07/10/2010* **Ararat [12], [13]** *issued 22/10/2010* **Yaloak South** *issued 26/10/2010* **Moorabool [9]** *issued 29/10/2010*	Yes	Yes	Completed within 14 months from commissioning of the last turbine	In accordance with NZS6808:1998, which implies at least 10 days monitoring and 1440 data pairs. A second round of monitoring is to be carried out within 10-14 months of the first round.	Attended monitoring may be used in lieu.
Stockyard Hill [15] *issued 26/10/2010*	Yes	Yes	As specified by the Noise Compliance Testing Plan, which must be approved by the Minister prior to the wind farm being commissioned, but generally not more than 60 days after commissioning	As specified by the Noise Compliance Testing Plan, which must be approved by the Minister prior to the wind farm being commissioned. Pragmatically, likely to require a minimum of 4000 data points for analysis.	Additional requirements:** + Consideration of time of day (24 hour and night time) + Consideration of wind direction, 90 degree quadrants, without consideration of surrounding noise sources and geographical arrangement of the farm. An alternative attended monitoring program could also be used, which is of shorter duration.

* see below for additional discussion of wind direction related issues.
** See below for additional discussion.

The post-construction noise monitoring requirements detailed in the planning permit for the Stockyard Hill Wind Farm are less explicit than those detailed in other permits. For example, where the Lal Lal Wind Farm permit details the timing and duration of post-construction monitoring, the Stockyard Hill Wind Farm refers these requirements to the Noise Compliance Testing Plan. Requirements for pre-construction noise monitoring, however, are well detailed. For example, information is provided regarding the number of properties to be monitored and minimum number of data points to be collected as are details of analysis of wind direction and time of day. It could be inferred that the post-construction monitoring requirements should mirror the requirements of the pre-construction campaign. However, while it is this approach which has been adopted for the notes in Table 2, there are no specific comments provided in the permit conditions. Of the planning permits detailed in Table 1 and Table 2, three general types or groups of permit may be identified, as detailed in Table 3 below.

Table 3: Planning permit condition groupings

Type		Wind farms	Features	Comments
A		PWEP Waubra	12 rounds of fortnightly monitoring	-
B	1	Macarthur Crowlands	First monitoring campaign to be started within 2 months of commissioning of the last turbine Second monitoring campaign to be undertaken 10-12 months from the first campaign showing compliance	Conditions do not explicitly require consideration of wind direction. However, time of noise monitoring should be agreed with the Relevant authority.
	2	Lal Lal	First monitoring campaign to be started within 2 months of commissioning of the last turbine Second monitoring campaign to be undertaken 10-14 months from the first campaign showing compliance	Conditions require specific wind direction considerations.
	3	Berrybank Mortlake Ararat Yaloak South Moorabool	First monitoring campaign to be completed within 14 months of commissioning of the last turbine Second monitoring campaign to be undertaken 10-14 months from the first campaign showing compliance	Conditions do not explicitly require consideration of wind direction. However, their permit conditions do include a clause describing how to determine the worst case wind direction from which it could be implied that wind direction review is appropriate.
C		Stockyard Hill	As defined in the Noise Compliance Testing Plan. Pragmatically, 4000 data pairs should be collected.	-

For Type B permit conditions, where the noise monitoring is to start 10-14 months of commissioning, it would allow for monitoring to be undertaken during expected worst case wind directions at each of the dwelling. For example, annual wind data could be reviewed to determine the time of year when the wind direction is most commonly downwind from the wind farm to the monitoring location. Repeating the noise monitoring campaign within 10-14 months of the first campaign would typically allow for the same wind conditions to be monitored.

Concurrently, it should be noted that carrying out two rounds of monitoring 10-14 months apart will effectively only capture noise levels during one season of the year. If there is significant seasonal variation in noise levels, this would not be well represented using the monitoring approach of the Type B permit conditions.

A COMMENT REGARDING WIND DIRECTION

Some recent planning permits (Type B1 and B2) require consideration of wind distributions to establish the extent of wind which blows from the wind farm to the monitored property ±22.5°. This approach, while reasonable in principle, can present some difficulties in practice.

It can often be unclear what the downwind or worst case wind direction should be. The SA2009 Guidelines note that a worst case wind direction defined as a "*wind direction spread of 45° either side of the direct line between the nearest WTG and the relevant receiver is considered acceptable*".

However, this type of approach can prove problematic. For example, consider the following simple scenario.

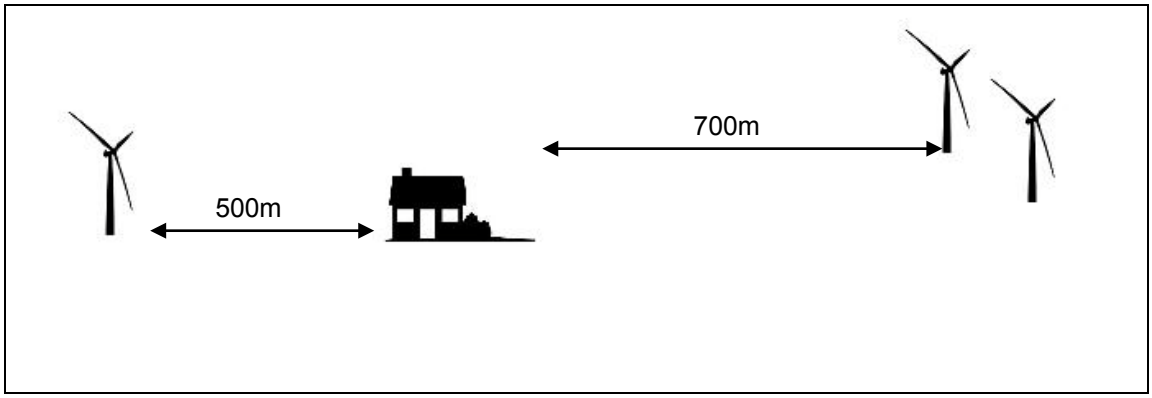

Figure 2: Simple worst case wind direction scenario

The nearest turbine, to the west, is 500m from the dwelling. However, there are two turbines positioned approximately 700m east of the dwelling whose combined noise emission may be similar to the one turbine to the west. In this case, should the worst case wind direction be:

- To the east
- To the west
- A combination of easterly and westerly directions and, if so, what proportion of winds should be in which direction

Even this simple example presents three feasible options for the worst case wind direction. Wind farms will, of course, generally be much more involved than this simple three turbine case, which can result in even less clarity regarding what the worst case wind direction might be.

In such a situation the SA Guidelines 2009 requires a separate analysis for each of the worse case wind directions.

The use of a “noise rose” can assist in determining the most suitable range of worse case wind directions. A noise rose is created by calculating or predicting the noise emission levels from noise sources around a given receiver and plotting the noise level according to the direction of the noise source from the receiver.

An example of a “noise rose” for the site used in the case study below is presented in Figure 3. The wind direction resolution for the noise rose in Figure 3 is 10° and noise level iterations are shown as increasing circles. The grey areas in Figure 3 indicate wind directions where noise emission from wind turbines will impact on the selected receiver. Red areas indicate wind directions for which there are no wind turbines.

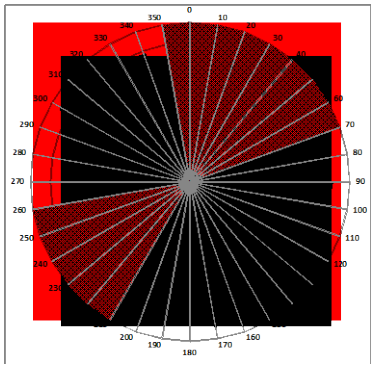

Figure 3: Example noise rose

According to the noise rose presented in Figure 3, there are two significant wind direction ranges for this dwelling, namely: 70-210°, and; 260-350°. Similar to the simple case study considered above, it is again not immediately clear which range of wind directions should be considered the worst case. The maximum predicted noise emission is at 300° in the 260-350° wind direction range whereas the 70-210° range has moderately lower levels of predicted noise emission but over a greater range of wind directions.

Given the relatively uniform distribution of noise emission across the two wind direction ranges, it would likely be most appropriate to incorporate both ranges into the worst case direction range.

In practical terms, it is considered that any given worst case range should not be less than 90°.

CASE STUDY FOR DATA ANALYSIS

A set of representative data is analysed herein according to the various noise conditions described above to determine how the outcomes may vary. In other words, for a given set of data, do the various monitoring and analysis methods from the planning permits considered result in the same level of post-construction wind farm noise emission being derived?

The example data set used in the following analysis comprises more than 20,000 data pairs. For the analysis and comparison purposes, it is inherently assumed that the regression analysis of this rather large data set is generally representative of the actual post-construction noise level/wind speed relationship at the monitored property.

The key wind speed range in the following analysis is approximately 5-10m/s at 10m AGL as below 5m/s wind farm noise emission tends to be dominated by the ambient noise and at higher wind speeds, above about 10m/s, wind generated noise sources closer to the monitoring location tend to dominate the wind farm noise emission.

NZS6808:1998 procedure

Post-construction noise monitoring is addressed in Section 5 of NZS6808:1998. The key features are noted here:

- Monitoring is to be carried out in general accordance with the requirements of the pre-construction monitoring methodology. Specifically, measuring L_{A95} noise levels over continuous 10 minute intervals for a period of 10-14 days.
- Monitored noise levels are to be correlated with wind speeds measured at the wind farm at a height between 10m above ground level (AGL) and hub height.
- A regression analysis should be carried out for the noise level/wind speed data pairs, to determine a regression equation which describes the variation in noise level with changes in wind speed.

It is the regression curve discussed in bullet point three that is the focus of the following analysis. Note that for the current analysis the regression curve represents the average post-construction noise levels at the monitoring location, comprising wind farm noise emission and ambient noise. It would typically be the case that a compliance assessment would include calculations to correct the post-construction noise levels for ambient (background) noise to derive an estimate for the wind farm noise emission. As the focus of the following analysis is comparison this additional step has not been carried out and average post-construction noise levels are used directly.

For this study, all wind speeds have been referenced to hub height. In the charts presented in the following sections, the value presented in brackets beside each item in the legend is the correlation coefficient for that item.

Permit Type A

By consolidating the data collected during the 12 rounds of fortnightly monitoring, the resulting regression analysis generates the curve shown in Figure 4 below. The vertical scale is in iterations of 5dB.

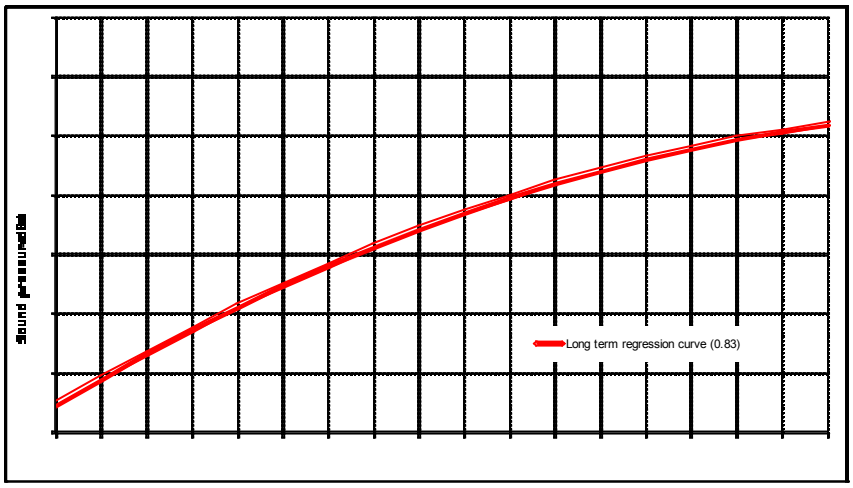

Figure 4: Regression curve from consolidated data set

As noted above, the analysis which follows inherently assumes that this regression curve is generally representative of the actual post-construction noise level/wind speed relationship.

Permit Type B

Permit Type B involves 2 rounds of monitoring, 10-14 months apart.

To determine the range of regression curves that could be encountered from two independent rounds of fortnightly monitoring, we have divided the long term data set into groupings which are approximately a fortnight in duration. The range of regression curves is presented in Figure 5 below.

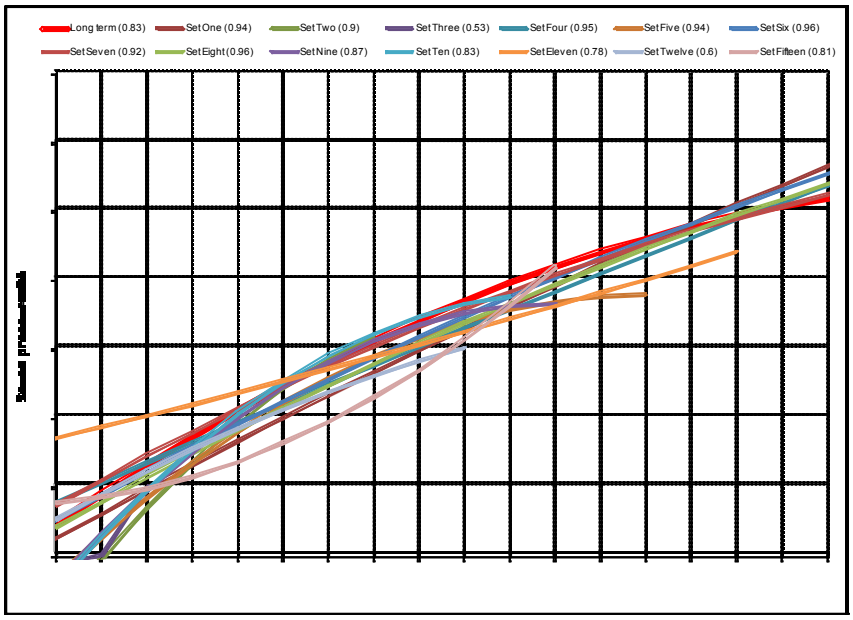

Figure 5: Variation across fortnightly monitoring sets

For the critical wind speed range of 7-13m/s it can be seen that there is variation of up to approximately 5dB across the set of fortnightly regression curves, in comparison to the long term regression curve. The variation is generally more pronounced at lower and higher wind speeds, which are at the edge of the assessment range. Figure 6 presents the positive and negative variation sums from the long term regression curves. For example, for the wind speed 3m/s, the positive variation sum shows the sum of the fortnightly regression curves whose values are greater than the long term regression curve at 3m/s. The negative variation sums are derived analogously.

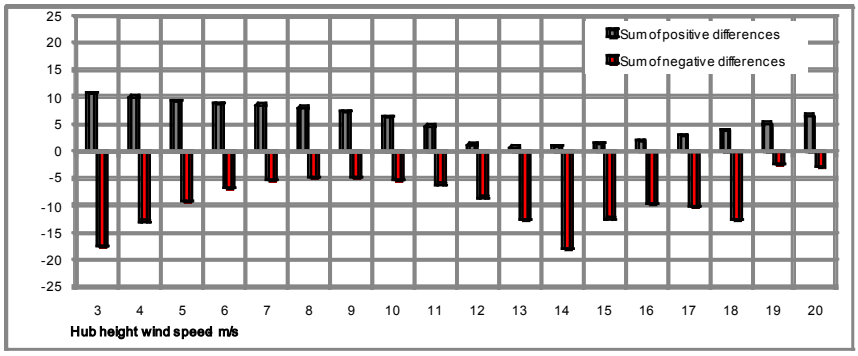

Figure 6: Positive and negative variation sums from the long term regression curve

As an example of the variation in measured noise levels which can occur between rounds of monitoring separated by 10-14 months, Figure 7 below presents monitoring results from data sets One and Two, shown with black and grey curves and data sets Fourteen and Fifteen, shown by blue curves, which were collected 14 months after sets One and Two. In this particular, the variation across the regression curves does not, visually, appear to be especially significant.

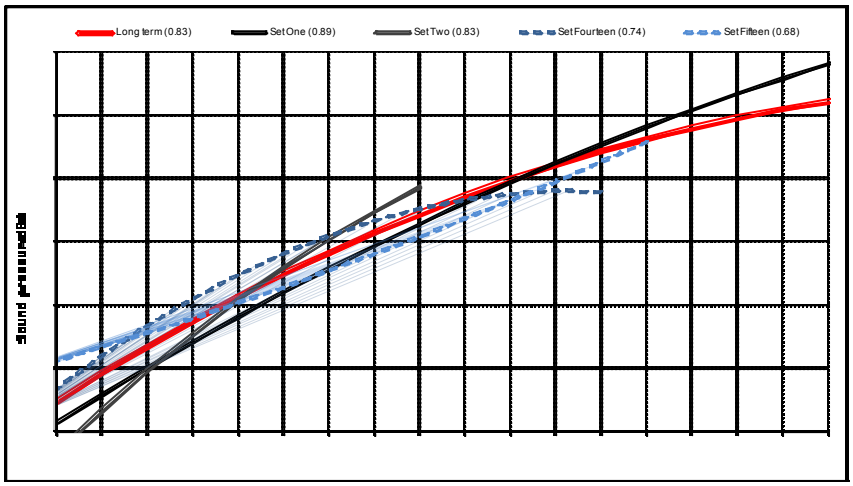

Figure 7: Variation across fortnightly monitoring sets separated by 10-14 months

As noted in Table 3 above, it is not clear whether the monitoring should include consideration of wind directions. The analysis in Figure 5 and Figure 7 above ignores wind direction.

Figure 8 and Figure 9 below repeat the analysis shown in Figure 5 with the additional refinement of selecting only downwind data. For the selected monitored property there are turbines on two sides of the house. As discussed above, this can make the selection of a genuine downwind direction more involved. Figure 8 below presents analysis for downwind conditions relating to turbines on one side of the property while Figure 9 presents analysis for downwind conditions relating to turbines on the other side of the property.

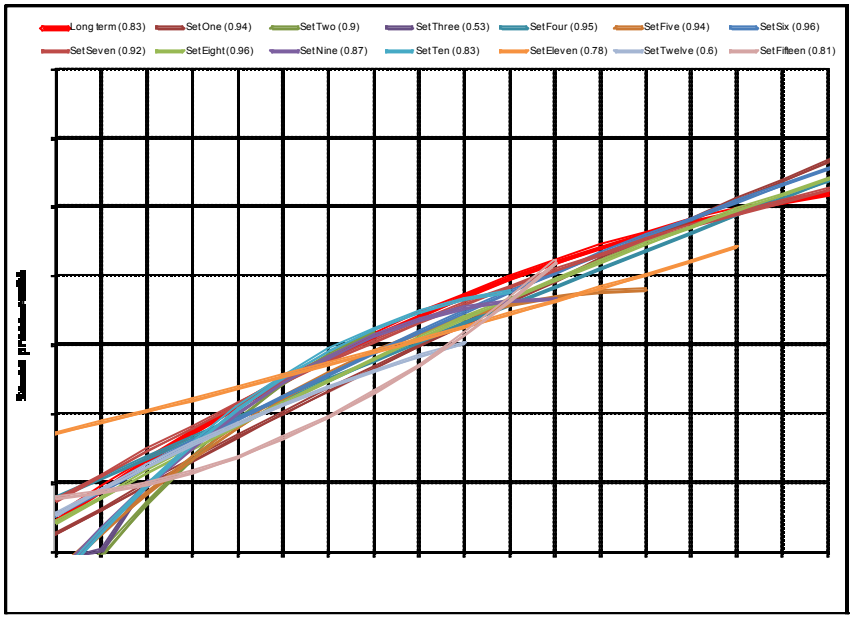

Figure 8: Variation across fortnightly monitoring sets, down wind direction (A)

For the critical wind speed range of 7-13m/s it can be seen that there is variation of up to approximately 5dB across the set of fortnightly regression curves, in comparison to the long term regression curve.

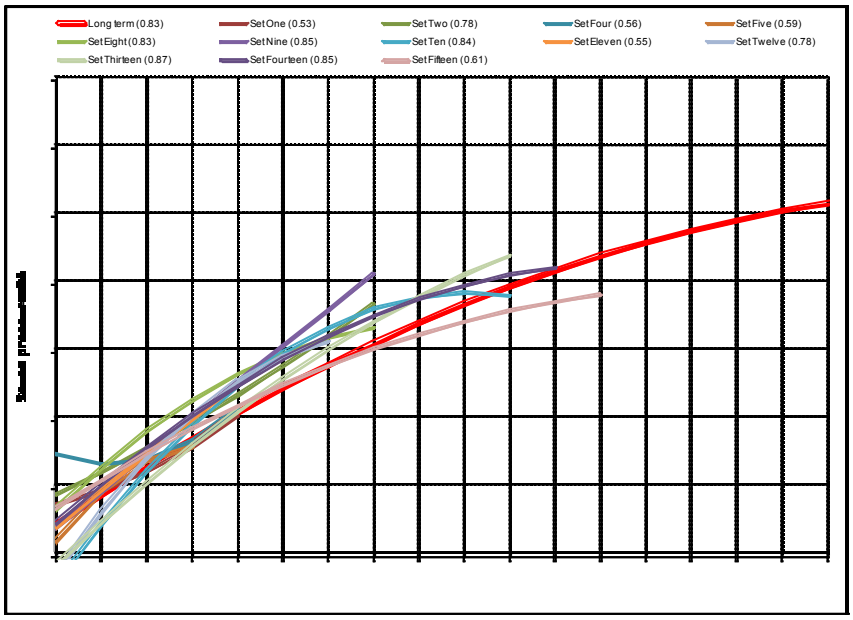

Figure 9: Variation across fortnightly monitoring sets, down wind direction (B)

For the data in this case study it appears that regression curves discriminated for wind direction (B) are generally higher than the long term regression curve and results appear to be more consistent than the case of including all wind directions. Positive and negative variation sums are presented for wind directions (A) and (B) in Figure 10 and Figure 11 respectively.

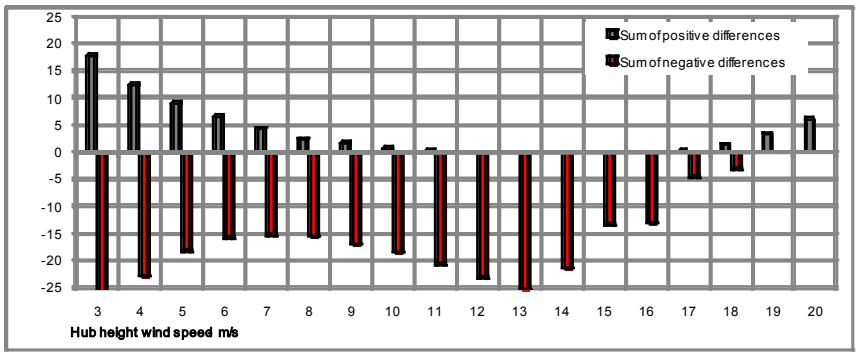

Figure 10: Positive and negative variation sums, down wind direction (A)

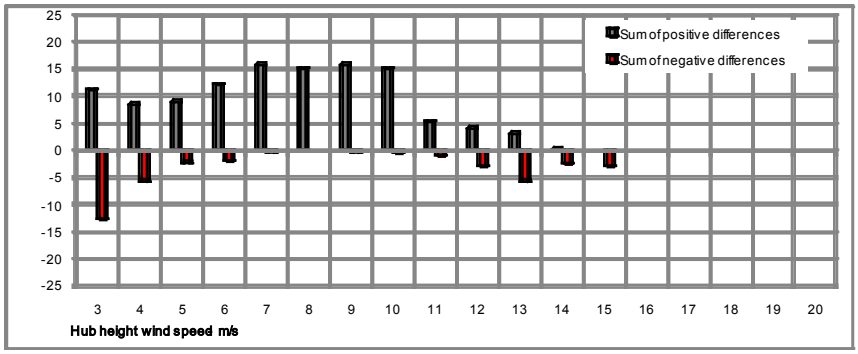

Figure 11: Positive and negative variation sums, down wind direction (B)

As can be seen in Figure 10, variations for wind direction A tend to be negative meaning the fortnightly regression curves tend to lie beneath the long term regression curve. The converse may be said regarding wind direction B in Figure 11.

Permit Type C

As noted in Table 2 above, the post-construction noise monitoring requirements detailed in the planning permit for the Stockyard Hill Wind Farm are less explicit than those detailed in other permits. Requirements for pre-construction noise monitoring, however, are well detailed. For example, information is provided regarding the number of properties to be monitored and minimum number of data points to be collected as are details of analysis of wind direction and time of day. For the analysis which follows is has been inferred that the post-construction monitoring requirements should mirror the requirements of the pre-construction campaign. In particular:

- Each subset of data has 4000 data pairs
- North, east, south and west wind quadrants each have an independent regression analysis.
- 24 hour and night time periods are considered concurrently.

The results from two 4000 data pair sets are presented below in Figure 12 and Figure 13. For ease of interpreting the figures, the 4 wind direction-dependent regression curves derived from the 24 hour data are all shown in yellow. Similarly the 4 curves derived from the night time data are all shown in grey. For a given wind direction quadrant the 24 hour and night time regression curves appear 'paired' on the figures.

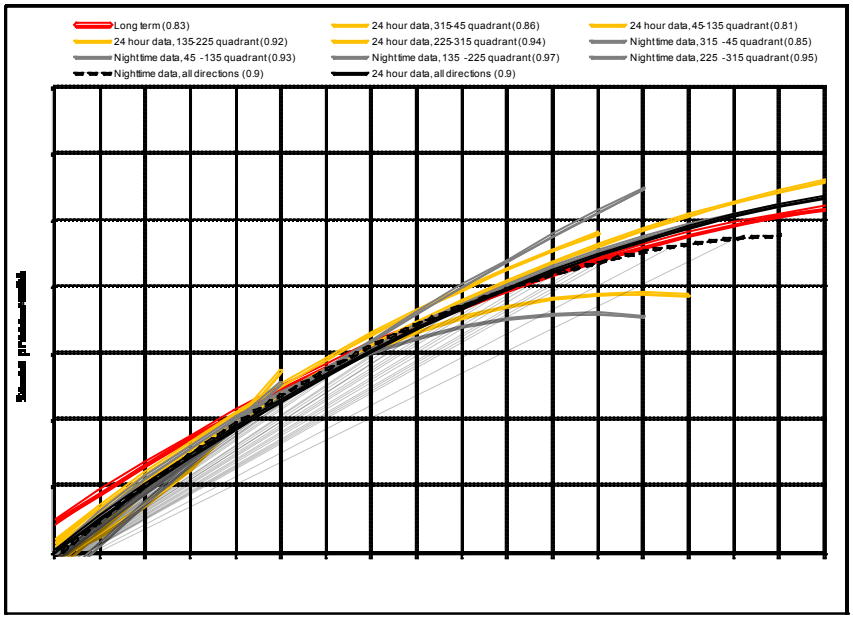

Figure 12: Permit Type C data analysis, example 1

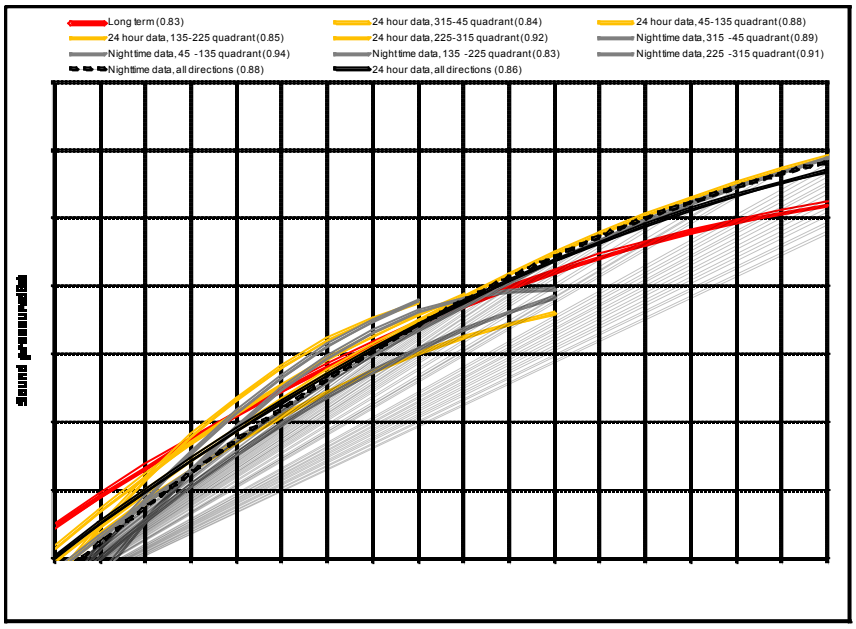

Figure 13: Permit Type C data analysis, example 2

The results shown in Figure 12 and Figure 13 are very similar. For the critical wind speed range of 7-13m/s it can be seen that variation from the long term regression curve of up to approximately 2.5dB is observed depending on the wind quadrant and wind speed.

There is generally a good level of consistency between the 24 hour and night time regression curves for a given wind quadrant. Again the variation is most marked at high wind speeds, towards the upper limit of the assessment range.

Positive and negative variation sums for each example are shown in Figure 14 and Figure 15 below.

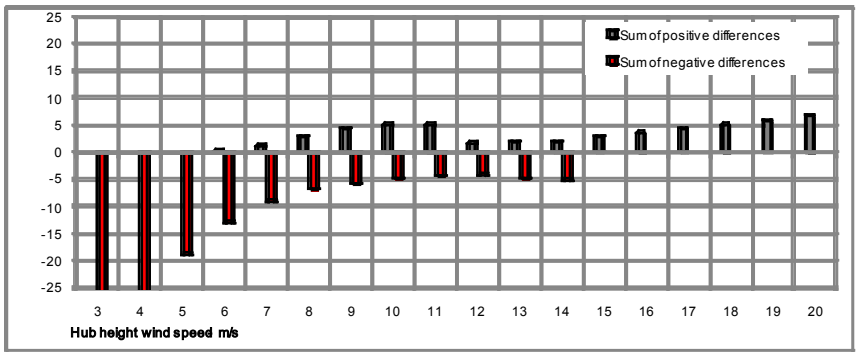

Figure 14: Positive and negative variation sums, Permit Type C data analysis, example 1

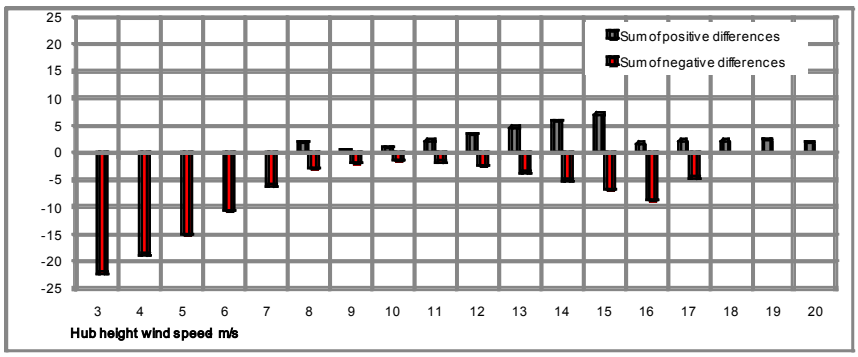

Figure 15: Positive and negative variation sums, Permit Type C data analysis, example 2

CONCLUSION

A range of recent planning permits have been considered and reviewed, highlighting a large degree of commonality in the basic structure of the permits. For example, the majority of permits now required post-construction noise monitoring to be carried out in two rounds, separated by 10-14 months, with some consideration of wind direction, although it can be limited.

The review also identified some very significant differences including variation in the minimum number of data pairs required for analysis, the distribution of that data across the wind speed range and with discrimination of wind direction, and time of day considerations.

A case study has been used to explore the extent of differences in outcome that may result from analysing a common set of data according to the requirements of the various permit conditions. While the case study involved data collected at only one property, such that the results of the study cannot be considered representative of the general case, the results nonetheless suggest that outcomes can vary significantly.

If a greater degree of consistency and equity is preferred by the Victorian regulators who consider wind farm noise emission, it would be advisable to provide planning panels with a planning permit noise condition template. The template could form the basis for the noise relating permit conditions, such that the conditions would be common across many wind farms. Beyond this, the panel could propose amendments or additions to the template, as required for specific cases, to tailor monitoring requirements to a given project.

APPENDIX A

DELAIRE (2007) PROPOSED PERMIT CONDITION

The operation of the wind energy facility must comply with the New Zealand Standard 'Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators' (NZ 6808:1998) (the 'New Zealand Standard'), in relation to any dwelling existing or approved in the vicinity of the wind energy facility at the approval date of this document.

A post-construction noise monitoring and compliance assessment program must be undertaken by the wind energy facility operator. This must be to the satisfaction of the responsible authority with regard to timing, program design, determination of compliance, any necessary remedial action and information dissemination.

The initial compliance noise monitoring program must commence within 2 months of the commissioning of the last turbine in the wind energy facility or, if the facility is constructed in groups of turbines, separate programs within 2 months of the commissioning of each group. The date at which 'commissioning' has been deemed to occur and the extent of the noise compliance monitoring shall be agreed between the responsible authority and the wind energy facility operator.

After the complete wind energy facility is commissioned, noise monitoring shall be carried out at all dwellings used to measure background sound levels, subject to the approval of their owners. The wind turbines shall be operating in their normal mode.

The design of the program and the evaluation of the acoustic data must be undertaken by an independent expert who has had experience in the analysis, interpretation and presentation of acoustic data from wind turbines, and who is preferably a member of a recognised professional association in that field.

Should compliance be demonstrated by the program above the compliance noise monitoring program must be repeated commencing not less than 10 months and not greater than 12 months after the commencement of the initial compliance noise monitoring program for the whole site. Should the further monitoring program demonstrate compliance with the noise criteria no further noise compliance monitoring shall be required at those locations unless otherwise determined by the responsible authority.

The responsible authority may require noise compliance monitoring at a dwelling or dwellings other than the reference dwellings on the basis of a reasonable belief that noise criteria may not be being complied with.

APPENDIX B

EXTRACTS FROM RELEVANT PERMIT CONDITIONS

B.1 CROWLANDS WIND FARM

NOISE

26. Except as provided as below in this condition the operation of the wind energy facility must comply with the noise criteria specified in NZS 6808:1998 'Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators' at any non-participating stakeholder dwelling existing in the vicinity of the wind energy facility at 20 June 2007 when measured by the method in that standard. In determining compliance the following shall apply;

    a) The sound level from the operating wind energy facility when measured outdoors within 10 metres of such dwelling shall not exceed the background sound level (L95) by more than 5 dBA or a level of 40 dBA L95, whichever is greater. Compliance shall be assessed separately for all-time data and for night-time data. Night time is defined as 10 pm to 7 am; and

    b) If the sound has a special audible characteristic the measured sound level shall have a penalty of 5 dB applied.

    This condition does not apply at any dwelling existing on land on which one or more turbines of the wind energy facility is located ie. a dwelling on participating landowner's land, or at an existing dwelling of a nonparticipating landowner for which an agreement has been reached by which that landowner accepts the noise levels in outdoor areas of the dwelling may exceed the standard. In those cases the operator under the permit must into an agreement with Minister for Planning as the responsible authority and the registered proprietor of the subject land pursuant to Section 173 of the Planning and Environment Act 1987.

27. Before the development commences a detailed proposal must be prepared the satisfaction of the Minister for Planning to obtain robust background noise measurements at a selection of non participating landowner dwellings in the vicinity of the proposed wind farm. If this proposal requires background noise measurements before construction commences those measurements shall be made, and if successful, those results will provide the background noise measurements which shall be submitted to the Minister for Planning for approval.

28. If background noise measurements can only be obtained post construction that shall be done as soon as possible after commissioning, and if successful, those results will provide the background noise measurements which shall be submitted to the Minister for Planning for approval.

29. If robust background measurements are obtained the acceptable noise limit curve derived from those background noise curves shall provide the references at the relevant dwellings for post-construction compliance testing. If reliable background noise curves cannot be obtained, and in the interim until such measurements are made,

    and acceptable noise limit of 40 dBA L95 as a presumptive criterion shall apply across the range of operating wind speeds.

30. A post-construction noise monitoring and compliance assessment program must be undertaken by the operator under the permit. The initial compliance noise monitoring program must commence within two months of the commissioning of the last turbine in the wind energy facility or, if the facility if constructed and commissioned in groups of turbines, separate programs at the dwellings in the vicinity of each group within two months of the commissioning of each group. The monitoring must be carried out in accordance with a method in NZS 6808:1998. Should one or more wind turbines in the facility not be operating at the time of measurement the

operator under the permit shall demonstrate to the satisfaction of the Minister for Planning that that would have an immeasurably small effect on the measured result.

The noise monitoring must be carried out by an independent expert with relevant wind turbine noise experience and, as far as possible the monitoring organisation should be NATA (National Association of Testing Authorities) accredited and the monitoring instruments calibrated by a NATA accredited organisation.

31. The results of the post-construction noise monitoring program (s) of condition 27 and statement of compliance or otherwise must be provided to the Minister for Planning within 45 days of the end of each monitoring program.

32. Should the results show non-compliance the holder of this permit must submit to the Minister for Planning a detailed program to bring the facility into compliance. On approval, that program shall be implemented and on its completion noise monitoring shall be repeated to demonstrate compliance and the results provided to the Minister for Planning within 45 days of the completion program.

33. Noise monitoring shall be repeated commencing not less than 10 months and not greater than 12 months after the commencement after the program in Conditions 30 or 32 as applicable. Should that further noise monitoring program demonstrate compliance with the noise criteria no further monitoring shall be required unless otherwise determined by the Minister for Planning.

34. Before the use begins the operator under the permit must prepare a detailed noise complaint evaluation and response plan generally in accordance with the draft Noise Complaint and Evaluation Procedure in Volume 1 Part B Section 10 of the Crowlands Wind Farm planning application to the satisfaction of the Minister for Planning.

B.2 LAL LAL WIND FARM

NOISE LIMITS

22. Construction of the wind energy facility must comply with noise criteria specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria,* N3/89 at any dwelling existing on land in the vicinity of the proposed wind energy facility as at the date of the issue of this permit to the satisfaction of the Minister for Planning.

23. Except as provided below in this condition, the operation of the wind energy facility must comply with the noise criteria specified in *NZ6808:1998 'Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators'* at any dwelling existing on land in the vicinity of the proposed wind energy facility as at the date of the issue of this permit, to the satisfaction of the Minister for Planning.

    In determining compliance the following requirements apply:

    a) The sound level from the wind energy facility within 20 metres of any dwelling must not exceed a level of 40dBA (L_{95}) or where the relationship between background noise levels and wind speed has been determined by the method specified in Condition 24 of this permit, the background noise level by more than 5dBA, or a level of 40dBA L_{95}, whichever is the greater

    b) Compliance must be assessed separately for all-time and night time. For the purpose of this requirement, night time is defined as 10.00pm to 7.00am, and

    c) If the noise has a special audible characteristic and measured sound level must have a penalty of 5dBA applied.

    Any dwelling on the subject land may be exempt from this condition. This exemption will be given effect through an agreement with the landowner that must apply to any occupant of the dwelling and must be registered on title. Such dwellings will be known as host dwellings.

NOISE COMPLIANCE TESTING

24. Before the development starts a noise compliance testing plan must be prepared by a suitably qualified acoustics expert to the satisfaction of Minister for Planning.

    When approved, the noise compliance testing plan will be endorsed be the Minister for Planning and will then form part of this permit.

    The use must be carried out in accordance with the noise compliance testing plan to the satisfaction of the Minister for Planning.

    The noise compliance testing plan must include:

    a) A determination of the noise limits to be applied during construction using the methodology prescribed in the *Interim Guidelines for the Control of Noise from Industry in Country Victoria,* N3/89

    b) a program of compliance testing to be implemented during the construction of the wind energy facility that:

        (i) Is designed by a suitably qualified acoustic expert, and

        (ii) Utilises the methodology prescribed in *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade)* No. N-1, to demonstrate compliance with the limits determined in (a) above.

    c) A prediction, by a suitable qualified acoustic expert, of the area within which the noise level from the wind energy facility during full operation will be 35dB(A) or greater

d) Identification of all dwellings, excluding host dwellings, within the area predicted in (c) above and a statement as to whether consent from the owner of each of the identified dwellings for compliance testing has been obtained or refused

e) A method or methods of testing compliance with noise limits prescribed in Condition 23 of this permit for each dwellings identified in (d) above for which consent for the conduct of compliance testing has been obtained.

The compliance testing method must be either:

(i) The method described in NZS6808:1998 '*Acoustics – the Assessment and Measurement of Sound from Wind Turbine Generators' with the following criteria being met:*

- The regression curves required must be derived from a data set:
  - Of at least 500 noise level/wind speed data pairs
  - Including wind speed measurements made at turbine hub height
  - Including at least 10 data pairs or 1% of the total number of data pairs whichever is the greater at wind speeds greater than 8 m/s
  - including at least 10 data pairs or 1% of the total number of data pairs whichever is the greater at wind speeds less than 4 m/s, and
  - with the percentage of data pairs that are the results of measurements made with the wind in the direction from the wind energy facility to the dwelling being equal or greater than values determined in (f) below, and
- the coefficient of determination for the regression curves will be 0.5 or great, or

(ii) a method, designed by a suitably qualified acoustics expert, in which measurements of operating and background noise levels are measured with:

- Background noise levels being measured with all turbines that, when operating, influence the noise level at the dwelling, shut down, and
- Then wind in the direction from the wind energy facility to the dwelling for at least 50% of the measurement period.

f) For each dwelling at which compliance testing is to be performed, determination of the maximum monthly proportions of the wind direction distribution that is from the wind energy facility to the dwelling, plus or minus 22.5 degrees

g) A schedule for compliance testing under which compliance testing at all identified dwelling for which consent for such testing has been obtained is performed in the 14 months following the commissioning of the last turbine in a section of the wind energy facility or a stage of the wind energy facility, if the development is in stages, and repeated between 10 and 14 months after the first compliance test

h) A procedure for the assessment, by a suitably qualified acoustics expert, of the characteristics of the noise from the wind energy facility to determine if that noise has any special audible characteristics that require the addition of 5dB (A) to the measured operating noise levels as shown in Condition 23 of this permit

i) A procedure under which all results of compliance testing conducted in any month are reported to the Minister for Planning by the 15th day of the following month and to the owners and occupiers of particular dwellings as soon as results relating to that particular dwelling are available, and

j) A procedure under which the implementation of the noise compliance testing plan is directed and supervised by a suitable qualified acoustic expert to the satisfaction of the Minister for Planning.

NOISE COMPLIANCE ENFORCEMENT

25. If an exceedance of the noise limits prescribed in Condition 23 of this permit is detect the wind energy facility operator must:

    a) Within 5 days of the detection of the exceedance, take sufficient actions to reduce the wind energy facility noise level at the subject dwelling as predicted using the prediction methodology contained in NS6808:1998 *'Acoustics – the Assessment and measurement of Sound from Wind Turbine Generators'* by an amount equal to or greater than the amount of exceedance

    b) Within 7 days for the detection of the exceedance, provide the responsible authority and the owner,/occupier of the dwelling with:

        (i) The results of the compliance testing measurements including the magnitude of the detected exceedance

        (ii) Details of the actions taken to reduce the wind energy facility noise emissions, and

        (iii) Evidence that the actions taken will produce a decrease in the wind energy facility noise level at the dwelling by an amount equal to the magnitude of the exceedance based on a prediction using the methodology of NZS6808:1998 ' *Acoustics – the Assessment and Measurement of Sound from Wind Turbine Generators'.*

    c) Continue to operate the wind energy facility with the implemented actions until approval for a different mode of operation is given by the responsible authority under the provision of (d) below

    d) Within 60 days of the detection of an exceedance provide the responsible authority and owner/occupier of the dwelling with either:

        (i) The result of compliance testing using the procedures prescribed in Condition 24 of this permit that demonstrate compliance, or

        (ii) A program for the development and evacuation of an alternative mode of wind energy facility operation that can be reasonably be expected to result in continuing compliance with noise levels as allowed in Condition 23 of this permit.

        The program will:

        - Be developed and implemented under the supervision of a suitably qualified acoustics expert
        - Include detailed descriptions of proposed actions
        - Include predictions of wind energy facility noise levels at the dwelling at each stage of the program
        - Not include any actions or combination of actions that are predicted to result in non-compliance
        - Include compliance testing using the procedures prescribed in Condition 24 of this permit both as the final step in the program and with that compliance testing being repeated after between 10 and 14 month, and
        - Include a program schedule that specifies the timing of each stage of the program

        to the satisfaction of the responsible authority.

        Within 10 days of receipt of the program the responsible authority will either:

    a) Approve the implementation of the program, or

    b) Advise the wind energy facility operator of modifications to the program that are required before approval will be granted.

If the responsible authority requires the program to be modified, the wind energy facility operator may either submit a modified program or immediately withdraw the program and conduct compliance testing using the procedures prescribed in Condition 24 of this permit.

Following implementation of the program, the wind energy facility operator may provide the responsible authority and the owner/occupier with a detailed description of an alternative mode of operation of the wind energy facility together with evidence that under that mode of operation compliance can be expected, to the satisfaction of the responsible authority. Given such information and evidence the responsible authority may approve the operation of the wind energy facility in the alternative mode and such approval will be unreasonably withheld.

B.3 MOORABOOL WIND FARM

PRE-DEVELOPMENT NOISE ASSESSMENTS

36. Before the development starts a pre-development noise assessment of the wind energy facility must be completed to the satisfaction of the Minister for Planning.

    The pre-development noise assessment must be completed in accordance with the noise criteria specified in the noise standard referenced in the "Policy and planning guidelines for development of wind energy facilities in Victoria".

    All aspects of the assessment must be conducted by a suitably qualified and experienced acoustic expert.

NOISE STANDARD

37. Except as provided below in this condition, the operation of the wind energy facility must comply with the noise criteria specified in the noise standard referenced in the "Policy and planning guidelines for development of wind energy facilities in Victoria" at any dwelling existing on land in the vicinity of the proposed wind energy facility as at the date of the issue of this permit, to the satisfaction of the responsible authority. In determining compliance with the standard, the following requirements apply:

    - The sound level from the wind energy facility within 20 metres of any dwelling must not exceed a level of 40dBA (L95 or where the relation between background noise levels and wind speed has been determined by the method specified in Condition 36 of this permit, the background noise level by more than 5dBA or a level of 40dBA (L95), whichever is the greater
    - Compliance must be separately assessed for all time and night time. For the purpose of the requirement, night time is defined as 10.00 pm to 7.00 am, and
    - If the noise has a special audible characteristic the measured sound level must have a penalty of 5dBA applied
    - Any dwelling on the subject land may be exempt from this condition. This exemption will be given effect through an agreement with the landowner that must apply to any occupant of the dwelling and must be registered on title. Such dwellings will be known as 'host dwellings'.

NOISE COMPLIANCE ASSESSMENT

38. Before the development starts a noise compliance testing plan must be prepared by a suitably qualified acoustics expert to the satisfaction of the Minister for Planning.

    When approved, the noise compliance testing plan will be endorsed by the Minister for Planning and will then form part of this permit.

    The use must be carried out in accordance with the noise compliance testing plan to the satisfaction of the responsible authority.

    The noise compliance testing plan must include:

    a) A determination of the noise limits to be applied during construction using the methodology prescribed in the Interim Guidelines for the Control of Noise from Industry in Country Victoria, N3/89

b) A program of compliance testing to be implemented during the construction of the wind energy facility that

- Is designed by a suitably qualified acoustic expert, and
- Utilises the methodology prescribed in State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No n-1, to demonstrate compliance with the limits determined (a) above

c) A method or methods of testing compliance with the noise limits prescribed in Condition 37 of this permit for all non-stakeholder dwellings at or above the noise level of 35dBA predicted from Condition 36 above.

Compliance testing will be carried out according to:

(i) The method described in NZS6808:1998 'Acoustics – the Assessment and measurement of Sound from Wind Turbine Generators'' or

(ii) A method, designed by a suitably qualified acoustics expert, in which measurements of operating and background noise levels are measured with:

- Background noise levels being measured with all turbines shut down that, when operating, influence the noise level at the dwelling, and
- The wind in the direction from the wind energy facility to the dwelling for at least 50% of the measurement period

d) For each dwelling at which compliance testing is to be performed, determination of the maximum monthly proportions of the wind direction distribution that is from the wind energy facility to the dwelling, plus or minus 22.5 degrees;

e) A schedule for compliance testing under which compliance testing at all identified dwellings for which consent for such testing has been obtained is performed in the 14 months following the commissioning of the last turbine in a section of the wind energy facility or a stage of the wind energy facility, if the development is in stages, and repeated between 10 and 14 months after the first compliance test;

f) A procedure for the assessment, by a suitably qualified acoustics expert, of the characteristics of the noise from the wind energy facility to determine if that noise has any special audible characteristics that require the addition of 5dBA to the measured operating noise levels as shown in Condition 38© of this permit

g) A procedure under which all results of compliance testing conducted in any month reported to the Moorabool Shire Council and Minister for Planning every six months

NOISE COMPLIANCE ENFORCEMENT

39. Before the use begins the proponent must prepare a detailed noise compliant evaluation and response plan in consultation with the Environment Protection Authority and the Moorabool Shire Council and to the satisfaction of the Minister for Planning.

This plan must include the following elements:

a) a toll free noise complaint telephone service

b) the erection of a sign on site advising of the complaints telephone number

c) minimum recording requirements for noise complaints (that is, date, time, noise description and weather conditions at the receptor)

d) a process for determining whether the noise complaint identifies a breach of permit conditions

e) a response protocol for confirmed breached including, but not limited to:

(iii) determination of the meteorological circumstances at the time of the breach and operational status of the turbine(s) at that time

(iv) noise optimization of the relevant wind turbine(s) under the same meteorological circumstances as occurred at the time of the breach

(v) in the event of a further breach the selective shut down of the relevant wind turbine(s) or turbines in the same meteorological circumstances

(vi) where under the same meteorological conditions subsequent confirmed noise breaches occur, the decommissioning of the relevant turbine(s)

f) a register of complaints, responses and rectifications which may be inspected by the Minister for Planning and the Moorabool Shire Council, and

g) provision for review of the complaint, any necessary improvement and an evaluation process 12 months after commencement of the operation of the wind energy facility.

B.4 STOCKYARD HILL WIND FARM

NOISE LIMITS

18. Except as provided below in this condition, the operation of the wind energy facility must comply with the noise criteria recommended in NZs6808:1998 *Acoustics – 'The assessment and measurement of sound from wind turbine generators'* at any dwelling existing on land on or in the vicinity of the proposed wind energy facility as at the date of issue of this permit. In determining compliance the following requirements apply:
    a) Noise from construction of the wind energy facility must comply with the requirements of the Interim Guidelines for *Control of Noise from Industry in Country Victoria, N3/89 (EPA Vic, 1989)*
    b) The noise of the wind energy facility only at any non-stakeholder dwelling after the wind energy facility has commenced operation must not exceed the background noise level by more than 5dBA, or a level of 40dBA, l_{95}, whichever is the greater
    c) The noise of the wind energy facility only at any participating landowner's dwelling after the wind energy facility has commenced operation must not exceed the background noise level by more than 5dBA, or a level of 45dBA L_{95}, whoever is the greater. This condition does not apply to any dwellings under option to the permit holder
    d) Compliance must be assessed separately for 24 hour and night time and for each of those time periods for wind direction sectors of ± 45° of 0°, 90°, 180°, and 270°. For this requirement, night time is defined as 10.00 pm to 7.00 am; and
    e) If the noise has a special audible characteristic the measured sound level must have a penalty up to maximum 5dB applied.

BACKGROUND AND ACCEPTABLE NOISE LEVELS

19. Before the development starts, background noise monitoring must be undertaken to the satisfaction of the Minister for Planning complying with the following requirements:
    a) A background noise monitoring plan, or plans, must be prepared by a suitably qualified and experienced acoustics expert.;
    b) If the wind energy facility is to be constructed in stages, the background noise monitoring plan may be prepared for each stage before the development of that stage begins and those plans may be submitted successively to the Minister for Planning for approval, provided that where a dwelling might be affected by noise from more than one stage that is accounted for
    c) The plan, or plans, must include the number and location of background noise monitoring sites and the justification for the selection of those sites, the methodology to be used for the noise monitoring and the development of the background noise curves, and a statement of how the uncertainty of those results will be estimated;
    d) The plan must include background noise monitoring at a minimum of 20 representative non-stakeholder dwellings for the whole wind energy facility, subject to access being granted, or a lesser number per stage if the wind energy facility is to be so constructed, as approved by the Minister for Planning. These monitoring sites must be within the modeled 35dBA L95 noise contour for noise from the wind energy facility only, as determined in Condition 19 c);
    e) The plan must include background noise monitoring at a minimum of 10 representative stakeholder dwellings, other than dwellings under option to the permit holder, for the whole wind energy facility, or a lesser number per stage if the wind energy facility is to be so constructed, as approved by the Minister of Planning. These monitoring sites shall be within the modeled 40dBa L95 noise contour for noise from the wind energy facility only as determined in Condition 19 c); and

    f) When approved by the Minster for Planning the noise monitoring plan, or each plan (if the wind energy facility is to be developed in stage), must be made publicly available.

20. After the noise monitoring plan is approved, the background noise testing at each dwelling must be carried out in accordance with that plan and in accordance with NZS 6808:1998 *Acoustics – 'The assessment and measurement of sound from wind turbine generators'* subject to the following:

a) Unless with the consent of the Minister for Planning, the equipment used for measuring noise, wind speed and wind direction must be calibrated by a NATA accredited testing organization and the background noise measurement and assessment carried out by a NATA approved signatory;

b) Unless with the consent of the Minister for Planning, the noise monitor used at each site must be a Type 1 noise logger calibrated with a Type 1 calibrator;

c) The anemometer used for the correlation of background noise against wind speed must:
- be situated at hub height on the nearest meteorological mast to the noise monitoring site;
- remain in place after commissioning of the wind energy facility of that stage of it, and
- be unaffected by wind turbine turbulence.

d) A minimum of 4000 ten minute data pairs are to be collected for each site;

e) The data pairs must be correlated by 24 hour and night (10 pm to 7 am) time periods and for each time sector for wind direction of ± 45° of 0°, 90°, 180°, and 270° using the regression technique of NZS 6808:1998 or 'bin analysis', as appropriate

f) For each noise monitoring site, the same correlation technique must be used for this pre construction background noise monitoring as this will be used for the post construction compliance monitoring, including the same order regression equation; and

g) An estimate must be made of the uncertainty of the background noise curves.

21. For each of the above background noise curves the derived acceptable noise limit curves for the wind energy facility at each dwelling for specified time periods and wind direction sectors must then be prepared as described in NZS 6808:1998 *Acoustics – ' the assessment and measurement of sound from wind turbine generators'.*

22. The background noise curves and the derived acceptable noise limit curves for each background noise monitoring site for the specified time periods and wind direction sectors must be provided to the Minister for Planning for approval as having been carried out in accordance with these conditions; and when approved by the Minister for Planning the background noise curves and the acceptable noise limit curves must be made publicly available.

NOISE MODELLING

23. Before the development starts a noise modeling plan must be prepared to the satisfaction of the Minister for Planning meeting the following requirements:

h) Noise modeling must be undertaken by a suitably qualified and experienced acoustics expert;

i) If the wind energy facility is to be constructed in stages noise modeling may by carry out for each stage before the development of that stage commences and those results submitted successively to the Minster for Planning for approval provided that where a dwelling might be affected by noise from more than one stage that is accounted for;

j) The modeling must include;
(i) The wind energy facility noise contours;
(ii) Modeling of the wind energy facility only noise at those dwellings for which acceptable noise limit curves have been prepared; and
(iii) An estimate of the uncertainty of the modeled results;

24. The results of the noise modeling for ach dwelling must:
- Be overlaid on the acceptable noise limit curve for that dwelling;
- Together with the comparison against the acceptable noise limit, be submitted to the Minister for Planning for approval as having demonstrated that noise compliance can be expected; and
- When approved by the Minister for Planning, be made available publicly.

25. Should the modeling required above not be done with the turbine finally selected for the wind energy facility that modeling must be repeated once the final turbine type is selected and resubmitted to the Minister for approval.

NOISE COMPLIANCE TESTING

26. Before the wind energy facility is commissioned, a noise compliance testing plan must be prepared to the satisfaction of the Minister for Planning meeting the following requirements:
    a) The noise compliance testing plan must be prepared by a suitably qualified and experienced acoustics expert;
    b) The noise compliance testing plan must include a plan for noise monitoring to assess noise levels after construction of the wind energy facility and a plan for concurrent assessment of the presence or otherwise of special audible characteristics;
    c) The noise compliance testing plan must include advice on timing of the assessment including defining when commissioning of the wind energy facility, or an identified stage of it, will occur, and when the compliance noise monitoring results will be provided to the Minister for Planning. That time must not be more than 60 days after commissioning unless with the further consent of the Minister for Planning;
    d) If the Wind Energy Facility is to be constructed in stages a nose compliance testing plan may be prepared for each stage before the development of that stage commences and those plans submitted to the Minister for Planning for approval provided that where a dwelling might be affected by noise from more than one stage that is accounted for;
    e) The noise compliance testing must be carried out at those dwellings at which background noise curves were determined as identified in Conditions 19 d)-e).

27. After approval of the testing plan by the Minster for Planning the noise compliance testing shall be carried out by a suitably qualified and experienced acoustics expert:
    - Generally in accordance with NZS 6808:1998 *Acoustics - 'The assessment and measurement of sound from wind turbine generators '* with the variations described in this permit; or
    - Subject to approval by the Minister for Planning by an 'on/off' or 'shutdown' method as referred to in sections 7.12 and 7.7.1 or NZS 6808:2010-*Acoustics-Wind farm noise.* If this method is used, it must have been earlier approved by the Minister for Planning as a part of the noise compliance testing plan and must be designed by a suitably qualified and experienced acoustics expert;

    The presence or otherwise of special audible characteristics must be assessed concurrently at all the subject dwellings over a range of operational and meteorological conditions.

28. The results of the noise compliance testing for each dwelling, adjusted for any penalty for special acoustic characteristics, must:
    - Be compared with the acceptable noise limit curve for that dwelling to identify whether or not compliance has been achieved;
    - Whether with an accompanying statement of compliance or otherwise, be submitted within the time specified in Condition 26 c) to the Minister for Planning; and
    - Be made available publicly and provided to the owner or occupier of the dwellings(s) involved

NOISE COMPLIANCE ENFORCEMENT

29. If a breach of the noise limits prescribed in Condition 18 is detected by the procedure in Condition 27:
    a) The permit holder must take immediate action to vary the operation of the Wind Energy Facility such that, based on professional advice, it can be expected to be brought into compliance;
    b) When the breach of noise limits is notified to the Minister for Planning as required by Condition 28 the permit holder must advise of the immediate response in Condition 29 a) and the actions to be taken to bring the wind energy facility into compliance and to demonstrate that compliance;
    c) Within 180 days of the commissioning of the wind energy facility it must be brought into compliance to the satisfaction of the responsible authority. That compliance must be demonstrated by testing as described in Condition 26 having been completed;

d) The wind energy facility must continue to be operated in that noise compliant mode unless a plan for varied operation is submitted to and approved by the Minister for Planning;
e) Should such a variation as foreshadowed by Condition 29b) be sought and approved that must be made available publicity.
f) Between 10 and 14 months after commissioning of the wind energy facility noise compliance testing as required by Condition 28 must be repeated to demonstrate continuing compliance of the facility and submitted to the Minister for Planning; and
g) When approved by the Minister for Planning the noise compliance testing results required by Condition 28 must be made available publicly.

NOISE COMPLAINTS

30. Any complaint about noise from the construction or operation of the wind energy facility must be dealt with in accordance with the complaints management section of the Environmental Management Plan in Condition 6 above, or in accordance with Condition 29 above, as appropriate to the receipt of the complaint.

ACTIVE NOISE MANAGEMENT SYSTEM

31. Before the development starts, an active noise management system plan must be prepared and submitted to the Minister for Planning for approval. It must meet the following requirements:
    a) The plan must indicate that an active noise management system for the wind energy facility as to be prepared by a suitably qualified and experienced acoustics expert;
    b) The plan must indicate that the active noise management system will be supplementary to the design of the proposed wind energy facility to meet the noise standards required by these conditions and hence will be designed to respond to any non-compliance with noise standards and to assist with the resolution of any justified noise complaints whilst having regards to operational efficiency; and
    c) The active noise management system plan must describe the methodology and timing for the design of the system, its testing, refinement and implementation.

32. When approved by the Minister for Planning, the active noise management system plan will form part of this permit and must be made available publicly. Thereafter, the operation of the wind energy facility must comply with the active noise management system.

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