APPENDIX 12-3

Background Noise Survey

REPORT

Trinity Consultants

awnconsulting

Background Noise Survey

Project Title: Taurbeg Wind Farm Extension of Operating Life

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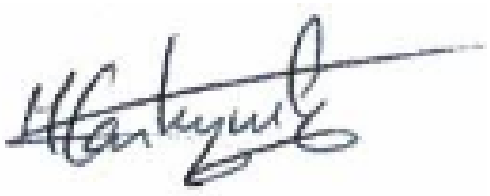
Signature		
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1. INTRODUCTION

AWN Consulting, A trinity Consultants Company, completed a background noise survey at strategic locations surrounding the existing Taurbeg Wind Farm Co. Cork. The noise survey was undertaken as part of the environmental noise impact assessment for the proposed continued operation of the Wind Farm. This note has been prepared to provide details of the background noise levels derived at the relevant Noise Monitoring Locations (NMLs). A description of the assessment methodology is outlined.

2. BACKGROUND NOISE SURVEY

The noise survey and subsequent data analysis was carried out in accordance with best practice following the guidance contained in the Institute of Acoustics publication *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (May 2013), (IOA GPG).

2.1 Selection of Measurement Locations and Methodology

The intent of the survey was to measure background noise at representative locations for typical noise sensitive locations surrounding the development. As the wind farm was operational the survey locations were identified with consideration of the potential turbine noise contribution from the existing Taurbeg turbines assessed using noise prediction modelling and supported by reviewing aerial images and street side images where available on website e.g., Google Earth and Bing Maps. The suitability of any location to be representative of, or a 'proxy' for, other locations, is determined through on-site observations and review of the measured background noise data.

The assessment methodology in the EIAR will be in accordance with the Institute of Acoustics document *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (2013) hereafter referred to as the IOA GPG.

The following text summaries the guidance from the IOA GPG for the selection of background noise survey locations:

- The selection of suitable noise monitoring locations for background noise surveys is not straightforward and only general guidance can be given as it is not possible to be prescriptive.
- Often there are practical constraints on where equipment can be placed, and a considerable degree of experience-based judgement is required when selecting these positions.
- Any contribution to background noise levels of noise from an existing wind farm must be excluded when assigning background noise and setting noise limits for a new development.
- No general guidance can therefore be given on the number of measurement locations as this will be site-specific.

A robust assessment of the noise impacts of the wind farm necessitates a detailed survey of the background noise at houses in the vicinity of the wind farm. As mentioned in section 2.2.2 of the IOA GPG: '*Any contribution to background noise levels of noise from an existing wind farm must be excluded when assigning background noise and setting noise limits for a new development.*' There are a number of ways of achieving this, as described in section 5.2 of IOA GPG:

> *5.2.2 Where a new wind farm is proposed and a receptor is also within the area acoustically affected by an already operational wind farm, then noise from*

the existing wind farm must not be allowed to influence the background noise measurements for the proposed development.

5.2.3 In the presence of an existing wind farm, suitable background noise levels can be derived by one of the following methods:

1. switching off the existing wind farm during the background noise level survey (with associated significant cost implications);
2. accounting for the contribution of the existing wind farm in the measurement data e.g. directional filtering (only including background data when it is not influenced by the existing turbines e.g. upwind of the receptor, but mindful of other extraneous noise sources e.g. motorways) or subtracting a prediction of noise from the existing wind farm from the measured noise levels.
3. utilising an agreed proxy location removed from the area acoustically affected by the existing wind farm/s; or
4. utilising background noise level data as presented within the Environmental Statement/s for the original wind farm/s (the suitability of the background noise level data should be established).

Option 1 will have commercial cost implications and a negative impact on renewable energy production, on that basis it is the least preferred. In this instance, a combination of option 2 (directional filtering and subtracting a prediction of the noise from existing wind turbines, and option 3 selecting locations where that will provide directional wind data upwind of operational turbines.

The locations were selected to provide an opportunity to determine the background noise levels through directional filtering in so far as practicable upwind from all operational turbines. The option to subtraction of predicted turbine noise from the total measured noise levels was also considered. Additionally, survey data may be utilised to validate turbine noise levels, particularly in specific locations where turbine noise is expected to be contributing to downwind conditions. The methodology employed to determine background noise levels is this document.

2.2 Measurement Locations

Table 2-1 Coordinates of Noise Monitoring Equipment

Location	Coordinates (ITM)	
	Easting	Northing
NML1 (H040)	523,693	610,287
NML2 (H034)	521,032	612,392
NML3 (H033)	521,477	611,213

Table 2-1 shows the locations of each of the monitoring locations in the context of the surrounding area.

Figure 1 Location of NMLs

Site visits by survey personnel were carried out during morning and afternoon periods; during these visits, primary noise sources contributing to noise build-up were noted. In respect of night-time periods, when noise due to traffic on local roads, agricultural activities and other sources tend to reduce, there was no indication of any significant local night-time sources of background noise at any location. No sources of vibration were noted at any of the survey locations.

In general, the significant noise sources in the area were noted to be local traffic movements, activity in and around the residences, wind generated noise from local foliage and other typical anthropogenic sources typically found in such rural settings.

At some locations noise from the operation of existing wind turbines was noted to be audible to varying degrees during site visits. It should be noted that the level of wind turbine noise is variable, it is dependent on the operational condition of the turbine, wind speed and direction, distance from the turbines, and the levels of background noise at the location.

As previously outlined in this document any noise from the existing wind turbines in the area should not form part of the background noise environment at noise sensitive locations. In contrast, the terms 'baseline noise level' or the 'existing noise levels' environment, incorporate current noise contributions from the operation of the existing turbines.

2.3 Measurement Periods

The periods of noise measurements used in the background noise monitoring assessment are outlined in Table 2-2. The survey was deemed completed when an adequate number of datasets had been measured as recommended in the IOA GPG to determine a suitable representation of the typical background noise.

Table 2-2 Measurement periods of Noise Monitoring Equipment

Location	Start Date	End Date
NML1 (H040)	30 August 2024	20 November 2024
NML2 (H034)	30 August 2024	19 November 2024
NML3 (H033)	30 August 2024	20 November 2024

Before, after and during each survey period, the measurement instrument was checked and calibrated using a Brüel & Kjær type 4231 Sound Level Calibrator. Instruments were calibrated on each interim visit and any drift noted. All calibration drifts were less than ±0.2 dB and within acceptable tolerances outlined in the IOA GPG. Wind data measurements commenced on 4 October 2024.

2.4 Noise Data

Table 2-3 confirms the details of the noise monitoring instrumentation installed at each location.

Table 2-3 Details of Noise Measurement Instrumentation

Location	Equipment Make and Model	Serial Number
NML1 (H040)	Rion NL-52	164426
NML2 (H034)	Rion NL-52	186668
NML3 (H033)	Rion NL-52	998409

Copies of the relevant calibration certificates are included in Appendix 10-2 of the EIAR Chapter.

2.5 Rainfall Data

Rainfall was monitored and logged using two Texas Instruments TR-525 data loggers that were installed at Locations NML1 and NML2 over the duration of the survey.

2.6 Wind Data

Average wind speed and direction data from each turbine in 10-minute intervals was measured at the turbine hubs and provided to AWN. Wind speed measurements were obtained from a Zephir ZX300 Lidar unit installed and operated by MKO. A copy of the Lidar installation report is included in Appenidx 10.7 of the EIAR Chapter.

These wind speeds were then corrected to the 'standardised' 10 m wind speed in accordance with the IOA GPG. The 'standardised' wind speed is the industry standard for referencing wind speeds with respect to wind turbines.

2.6.1 Wind Shear

The measured wind speeds are corrected to the 'standardised' 10 m wind speed in accordance with the IOA GPG. The 'standardised' wind speed is the industry standard for referencing wind speeds with respect to wind turbines.

Wind speed measurements were made at 67 m hub height. The measured hub height wind speeds were then corrected to standardised 10 metre height wind speed.

The Calculated hub height wind speeds have been standardised to 10 m height using the following equation:

Roughness Length Shear Profile: $U1 = U2 \times [(\ln(H1/z))/ (\ln(H2/z))]$

Where:

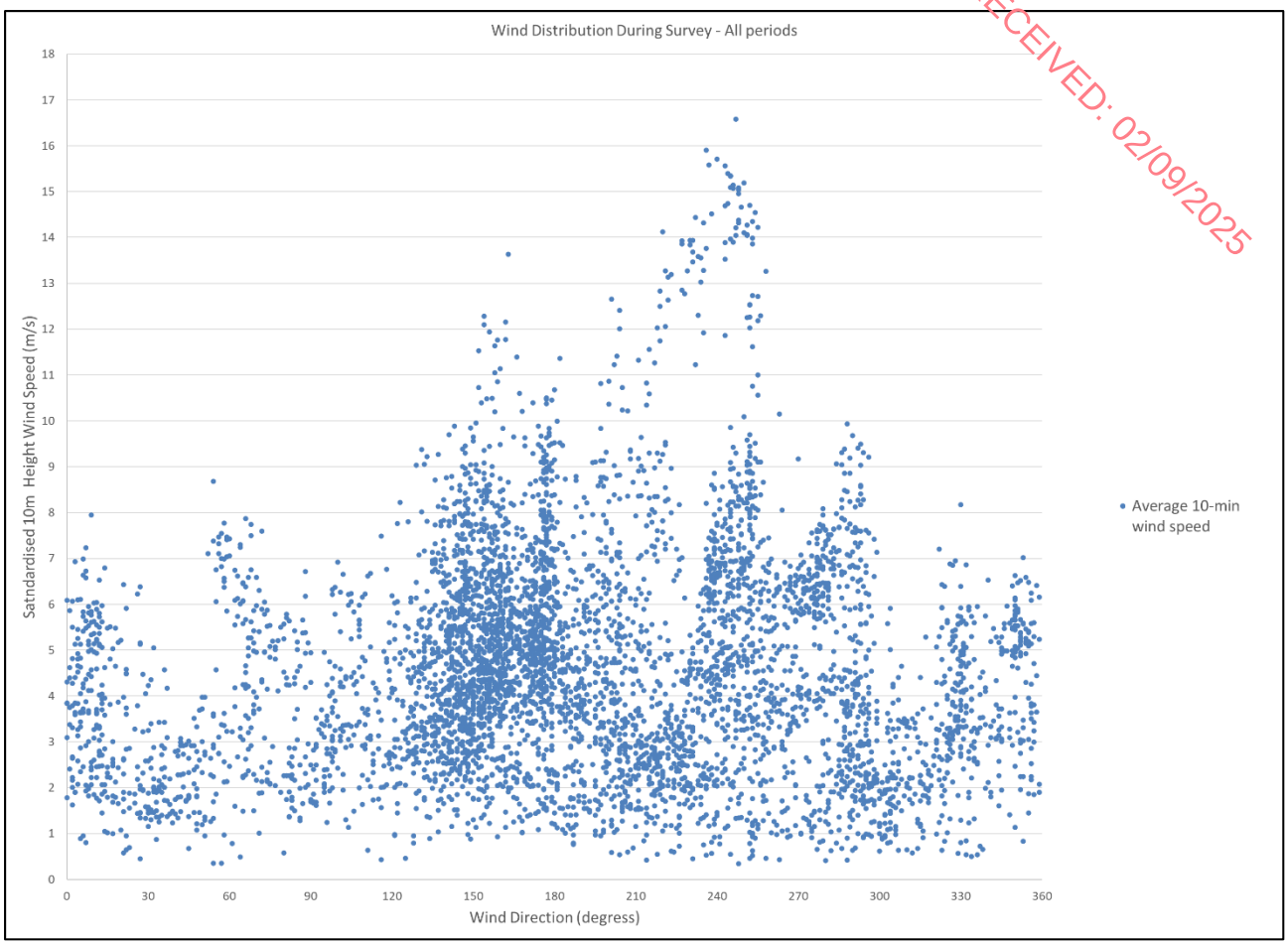
H_1	The height of the wind speed to be calculated (10m)
H_2	The height of the measured or calculated HH wind speed.
U_1	The wind speed to be calculated.
U_2	The measured or calculated HH wind speed.
Z	The roughness length.

Note: A roughness length of 0.05m is used to standardise hub height wind speeds to 10m height in the IEC 61400-11:2003 standard, regardless of what the actual roughness length seen on a site may have been. This 'normalisation' procedure was adopted for comparability between test results for different turbines.

Any reference to wind speed in this chapter should be understood to be the standardised 10 m height wind speed reference unless otherwise stated.

Figure 2 presents the distributions of wind speed and wind direction standardised to 10 m height over the survey period.

Figure 2 Distributions of Wind Speeds and Directions Over the Survey Period



3. RESULTS

3.1 Data Analysis

The following sections present a summary of the statistical analysis carried out on the noise monitoring data to derive the background noise curves at each NML.

Background noise data sets can be re-analysed for various scenarios should this be required, for instance, if background noise levels are required to be derived for specific wind direction sectors not identified as part of this assessment.

3.1.1 Assessment Periods

The results presented in the following sections refer to the noise data collated during 'quiet periods' of the day and night as defined in the IOA GPG. These periods are defined in Table 3-1.

Table 3-1 Daytime and Night Periods

Period Description	Period Definition
Daytime (Amenity Hours)	ETSU-R-97 defines the amenity hours as: 18.00 to 23.00 Monday to Friday. 13.00 to 23.00 on Saturdays; and, 07.00 to 23.00 on Sundays.
Night	ETSU-R-97 defines the night-time hours as 23.00 to 07.00 every day.

The data sets have been assessed separately for both daytime and night-time periods as outlined in Table 3 and analysed with respect to the methods outlined in the IOA GPG.

3.1.2 Noise from Existing Turbines

As discussed above in Section 2.1, to derive background noise levels in the presence of exiting turbine noise, the methodology from the IOA GPG has been applied to the assessment. The following table summarises important information relevant to this aspect of the methodology.

Table 3-2 Location-specific methodology details

Location	Nearest turbine to measurement location	Analysis details
NML1 (H040)	T10 – 1,040 m	Directional analysis applied - background noise represented by upwind sectors South and Southwest.
NML2 (H034)	T03 – 1,035 m	Directional analysis applied - background noise represented by upwind sectors North and Northwest.
NML3 (H033)	T08 – 810 m	Estimate of background noise levels obtained by filtering for upwind sectors West Northwest and Southwest and subtracting predicted turbine noise levels as there was some contribution in the filtered wind direction from operational turbines.

3.1.3 Atypical Noise Data

The data sets have been filtered to remove issues such as periods affected by rainfall, dawn chorus and the influence of other atypical noise sources. An example of atypical sources would be short, isolated periods of raised noise levels attributable to local sources, agricultural activity, boiler flues, operation of gardening equipment etc. This approach is in line with the guidance contained in the IOA GPG.

3.2 Derived Background Noise Levels

Appendix B presents the preliminary regression analysis for daytime and night-time periods from each NML from which the background noise levels have been derived. The derived background noise levels dB $L_{A90,10min}$ for daytime and nighttime are presented in Table 3-3 and Table 3-4 respectively. These background noise levels will be used to determine the appropriate turbine noise limits in accordance with the adopted turbine noise criteria and will be set out in the Noise and Vibration Chapter for the Proposed Project.

Table 3-3 Derived Background Noise Levels at Assessment Hub Height - Daytime

Locations	Period	Background Noise Levels dB L_{A90} at standardised 10m height wind speed m/s for 67 m Hub Height							
		3	4	5	6	7	8	9	10
NML 1	Day	22.6	25.3	28.0	30.8	33.6	36.4	39.1	41.7
NML 2	Day	26.5	28.3	30.2	32.1	34.0	35.9	37.8	39.6
NML 3	Day	31.1	33.8	34.8	35.2	37.5	40.1	42.3	44.3

Table 3-4 Derived Background Noise Levels at Assessment Hub Height – Night-time

Locations	Period	Background Noise Levels dB L_{A90} at standardised 10m height wind speed m/s for 67 m Hub Height							
		3	4	5	6	7	8	9	10
NML 1	Night	19.9	22.7	25.9	29.4	32.8	36.0	38.7	40.7
NML 2	Night	26.0	27.2	28.6	30.4	32.8	36.0	40.1	-
NML 3	Night	30.5	33.4	34.5	34.6	36.5	38.8	-	-

APPENDIX A
GLOSSARY OF TERMS

Background noise	The noise level rarely fallen below in any given location over any given time period, often classed according to daytime, evening or night-time periods.
dB	Abbreviation for 'decibel'.
dB(A)	Abbreviation for the decibel level of a sound that has been A-weighted.
Dawn Chorus	Noise due to birds which can occur at sunrise.
Decibel	The unit normally employed to measure the magnitude of sound.
Directivity	The property of a sound source that causes more sound to be radiated in one direction than another.
L_{A90}	The noise level exceeded 90% of the time during a measurement period, often used for the measurement of background noise.
Level	The general term used to describe a sound once it has been converted into decibels.
Sound level meter	An instrument for measuring sound pressure level.

APPENDIX B
INSTALLATION PHOTOGRAPHS

Figure 3 NML 1 Installation Photo

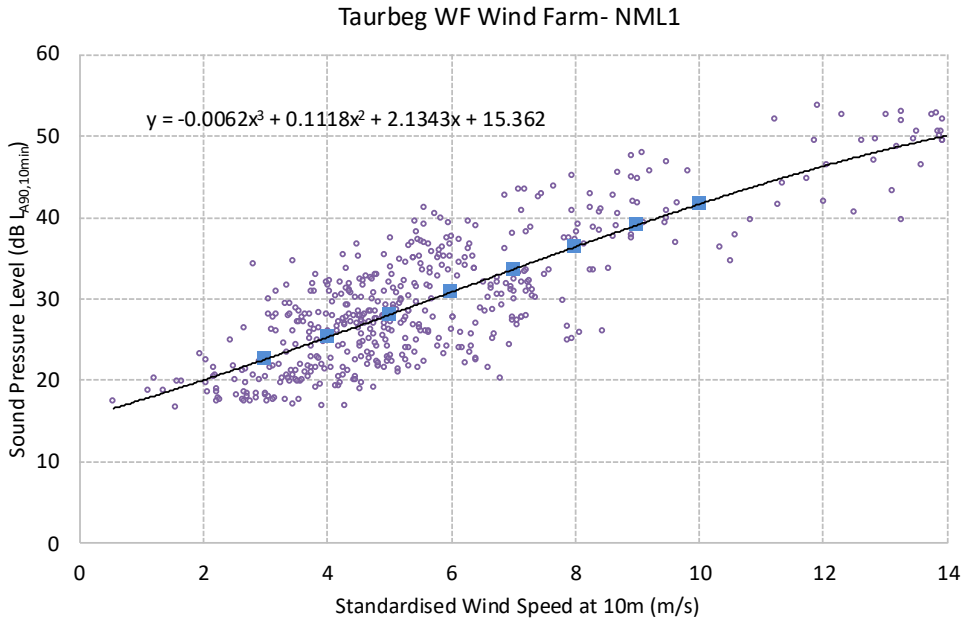
Figure 4 NML 2 Installation Photo

Figure 5 NML 3 Installation Photo

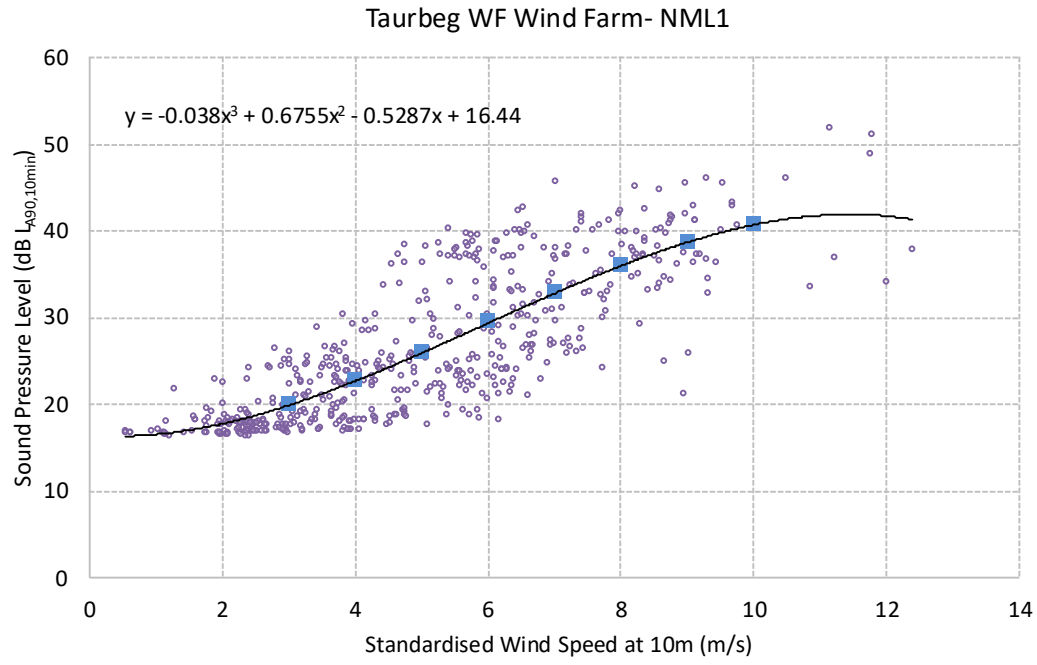
APPENDIX C
REGRESSION ANALYSIS ON DATA SETS

The following graphs present the 'upwind' data sets for each location. In each case, the daytime data is presented first and the night-time data below.

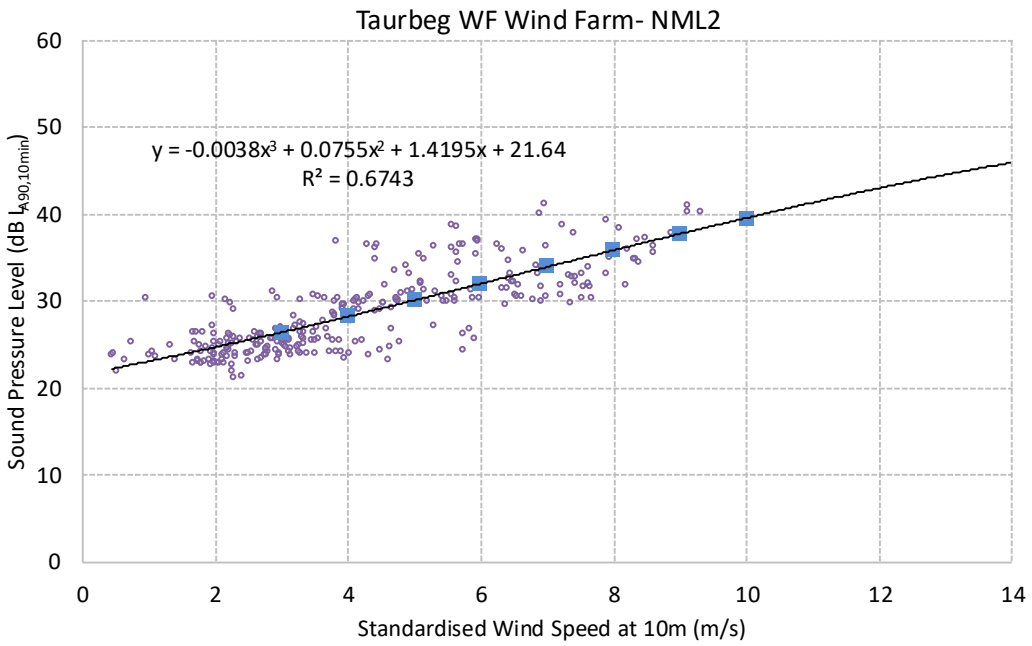
NML 1 Daytime - Upwind South and Southwest



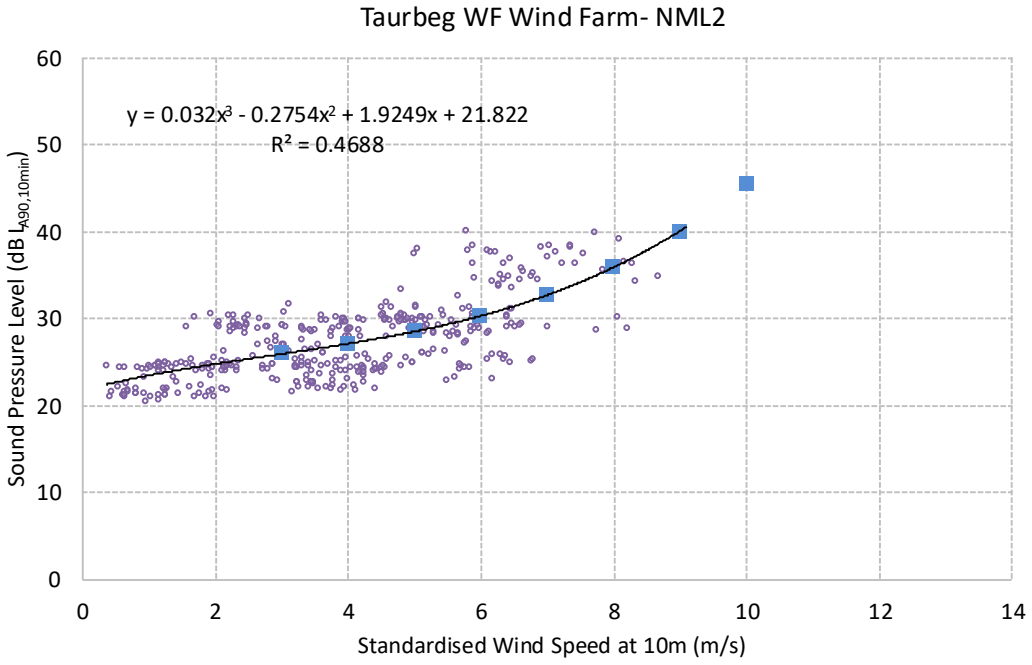
NML 1 Night - Upwind South and Southwest



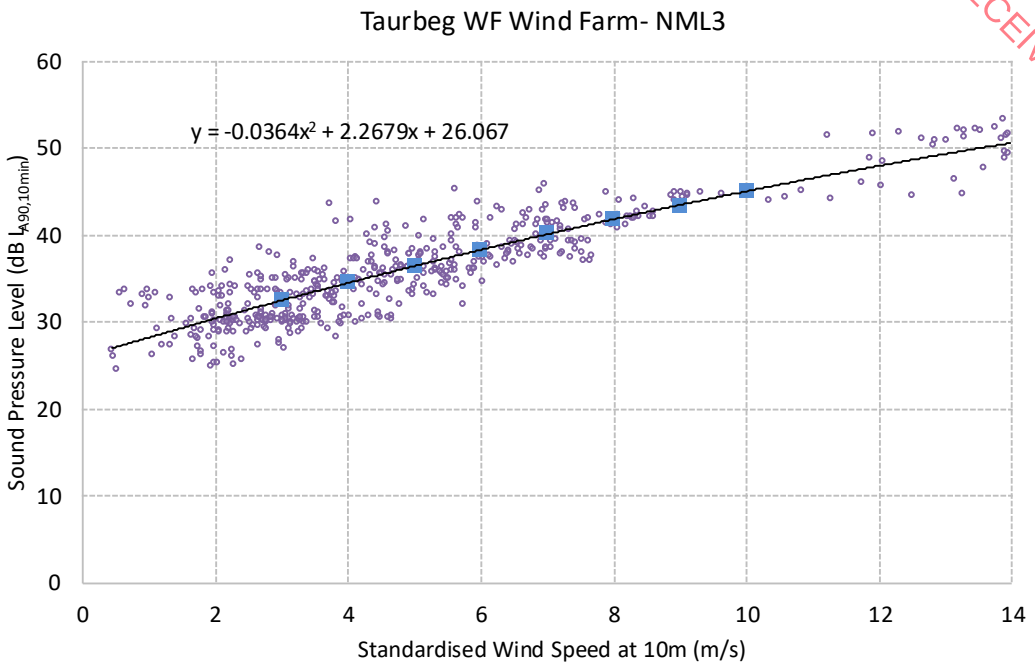
NML 2 Day - Upwind West and Northwest



NML 2 Night - Upwind West, Northwest, North and Northeast

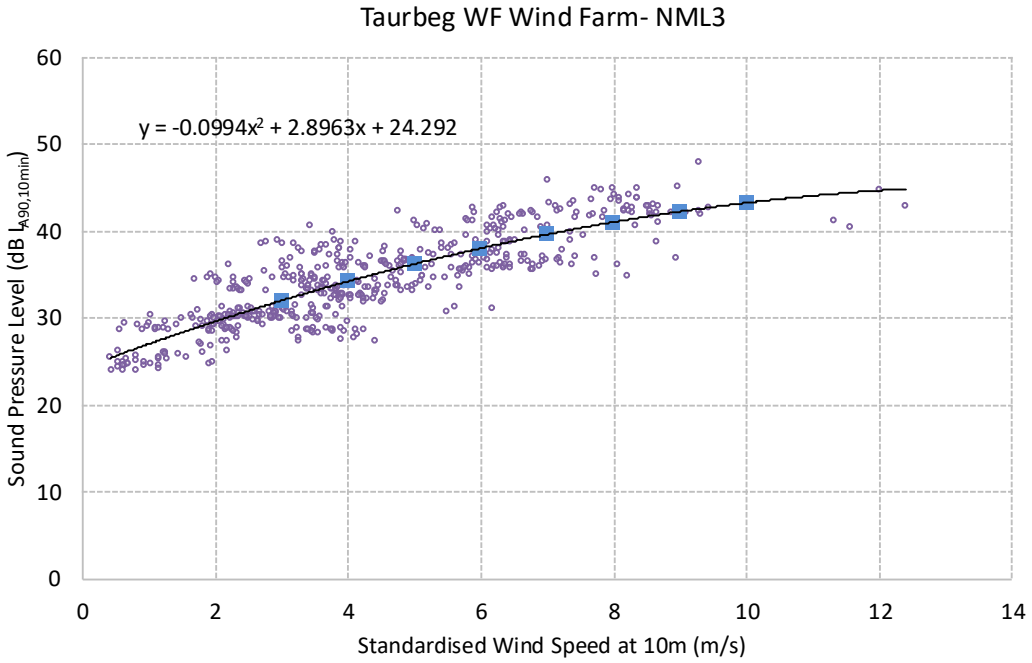


NML 3 Day – Upwind West, Northwest and Southwest



Predicted turbine noise level has been subtracted from the regression analysis data sets for NML3 to determine the background noise levels.

NML 3 Night – Upwind West, Northwest and Southwest



Predicted turbine noise level has been subtracted from the regression analysis data sets for NML3 to determine the background noise levels.