atmos CONSULTING

61253

Environmental Impact Assessment Report

Cummeennabuddoge Wind Farm

Technical Appendix 13-3: Background Noise Assessment

Cummeennabuddoge Wind (DAC)

September 2024

Contents

Baseline Noise Assessment

Measurement Locations

The noise survey to determine the existing noise environment at the four measurement locations neighbouring the Proposed Development has followed the guidance within ETSU-R-97. The noise measurement locations (NMLs) are provided at Table 13-3-1, alongside the noise sensitive locations (NSLs) that they represent. The location of all NSLs included in the assessment are detailed at Appendix 13.1.

Table 13-3-1: Noise Measurement Locations

Location	Easting (ITM)	Northing (ITM)	Properties Represented
NML 1	518899	583815	R153
NML 2	517404	583959	R06
NML 3	517145	580425	R76 R93, R129
NML 4	516098	583540	R72

The locations of the NMLs are shown at Figure 13.1, as well as the locations of the Proposed Development turbines. The measurement equipment was installed on 23 June 2021 and was collected on 11 August 2021.

Instrumentation

The background noise measurements were made with four RION model NL-52 Sound Level Meters, fitted with 1/2" microphones and complying with Class 1 in BS EN 61672. The microphones were fitted with 45mm radius foam ball windshields surrounded by 125mm radius secondary windshields of 40mm thickness (based on recommended design specifications within ETSU W/13/00386/REP, Noise Measurements in Windy Conditions) and mounted on tripods at a height of approximately 1.2 to 1.5m height. Pre-calibration was carried out using a Brüel & Kjær acoustic calibrator (s/n 3022368). The calibration of each meter was checked at the end of the monitoring period using a Brüel & Kjær acoustic calibrator (s/n 2218188).

Concurrent onsite wind speed data was provided from a LiDAR unit located at 520493, 583472 (ITM). Pluvimate rain gauges were installed at NML2 and NML3 to monitor occurrences of rainfall during the measurement survey.

Measurement Procedure

The sound level meters were programmed to measure a number of statistical noise indices, including the L_{A90} (the background noise level), together with the maximum and minimum levels and the L_{Aeq} (the average noise level) over consecutive 10-minute intervals. The equipment was synchronised to a Global Positioning System (GPS) time signal and the results were automatically stored at the end of each measurement interval.

Field calibration of the noise measurement equipment was carried out before the monitoring period commenced and was checked at the end. A change of no more than 0.3dB over the period of the survey was noted at any of the measurement locations, which is within normal tolerances.

The LiDAR unit measured the wind speed and direction at a height of 120m directly. These measurements have been used to represent the hub height wind speed of 118m. The measured wind speeds have been corrected to 'standardised' 10m height wind speed using the same methodology as is used by manufacturers to quantify sound power level data as required by IEC 61400-11 and as detailed within the UK Institute of Acoustics Good Practice Guide (GPG) to wind turbine noise assessment, i.e.

$$V_{10} = V_h \left(\frac{\ln\left(\frac{10}{z_0}\right)}{\ln\left(\frac{h_h}{z_0}\right)} \right),$$

where, V_{10} and V_h are the 'standardised' 10m height and hub height (hh) wind speeds respectively, and z_0 is the standardised ground roughness length (of 0.05m). In this way, it is ensured that the comparisons of predicted turbine noise level and background level (including any associated noise limits) are made on a like-for-like basis.

Rainfall data was taken from the rain gauges installed at NML 2 and NML 3, which both logged rainfall in 10-minute intervals, time synchronised to a GPS time signal – this allows for corresponding data, where noise levels may be affected by the presence of rainfall, to be removed from the analysis.

A description of each of the measurement locations and the instrumentation used is provided.

NML1

This property is located north of the Proposed Development. The equipment was installed on a patch of land approximately 250m west of the property due to issues with access. It was positioned here to be as far away from the nearby stream and foliage as possible. Noise sources noted were the stream, sheep, birds, wind in the trees and a helicopter.

NML2

This property is located northwest of the Proposed Development. The equipment was installed within the centre of the back garden, approximately 4m from the house. Noise sources identified at this property were the nearby stream, birds, sheep, and voices.


NML3

This property is situated southwest of the Proposed Development. The property is, at present, uninhabitable but the measurements carried out here were used to represent three NSLs southwest, as described at **Error! Reference source not found.**1. The equipment was placed to the rear of the property at a distance of approximately 10m. Noise sources identified at this location were wind in foliage, cows and distant road traffic noise.


NML4

This dwelling is northwest of the Proposed Development. The equipment was installed on a disused track approximately 10m from the property itself, which is currently uninhabitable. The measurements are used to represent a neighbouring property as detailed at **Error! Reference source not found.**1. Noise sources noted were a distant stream, birdsong, sheep and farm vehicles.


Results Of Noise Measurements

The measured L_{A90} background noise levels have been plotted against the standardised 10m height wind speeds for a hub height of 120m for each property for night-time and daytime hour's periods separately, as required for the derivation of the WEDG limits. Full time histories of the survey carried out at each property are available on request. A hub height of 120m is suitably representative of the 118-125.5m range of hub heights being considered.

Any 10-minute period where rainfall was recorded at either measurement location has been removed from the derivation of the prevailing background noise levels from the data collected at all the measurement locations.

Where atypical or extraneous noises were noted, these periods have also been excluded from the analysis. These exclusions were applied in cases where the measured 10-minute L_{A90} noise level was substantially higher (> 6dB) than adjacent 10-minute periods without a corresponding increase in wind speed.

Exclusions were made for NML1 and NML2 at periods during which the local water course was producing elevated noise levels due to increased water flow. Exclusions have been made for NML3 where noise levels increased significantly from 04:20 until 07:00. These increased noise levels are due to birdsong and early morning traffic, which are unrepresentative of night-time noise levels.

Further exclusions have been made in order to discount the noise contribution from the nearby operational wind farms. This was done by excluding measurements during which the wind direction was in a 90° downwind arc between any operational turbine and noise measurement location.

Best fit third or second order regression lines have been calculated through the background noise data for each time period at each measurement location to provide the prevailing background noise levels on which the DoEHLG noise limits are based.

Error! Reference source not found.2 and **Error! Reference source not found.**3 the prevailing background noise levels for each NML for the night-time and daytime periods respectively, for wind speeds from 3 to 9m/s.

The baseline noise measurement results used for the derivation of the noise limits is shown graphically at Figure 13-3-1 to Figure 13-3-8. The plots show insufficient background noise data for wind speeds above 9m/s. Therefore, the background noise level for wind speeds above 9m/s have been assigned the value measured for 9m/s.

Table 13-3-2: Night-time Derived Prevailing Background Noise, dB L_{A90}

	Standardised 10 m Height Wind Speed (m/s)						
	3	4	5	6	7	8	>9
NML1	32.8	33.2	33.8	34.4	35.2	36.2	37.5
NML2	37.1	36.8	36.7	36.8	37.3	38.4	40.3
NML3	29.2	28.8	28.2	27.9	28.5	30.5	34.6
NML4	32.9	33.2	33.7	34.4	35.6	37.5	40.3

Table 13-3-3: Daytime Derived Prevailing Background Noise, dB L_{A90}

	Standardised 10 m Height Wind Speed (m/s)						
	3	4	5	6	7	8	>9
NML1	32.3	33.0	34.0	35.2	36.4	37.5	38.2
NML2	36.1	36.3	36.9	37.6	38.4	39.1	39.7
NML3	35.5	36.1	36.5	36.9	37.1	37.3	37.4
NML4	32.5	33.2	34.4	35.9	37.6	39.5	41.3

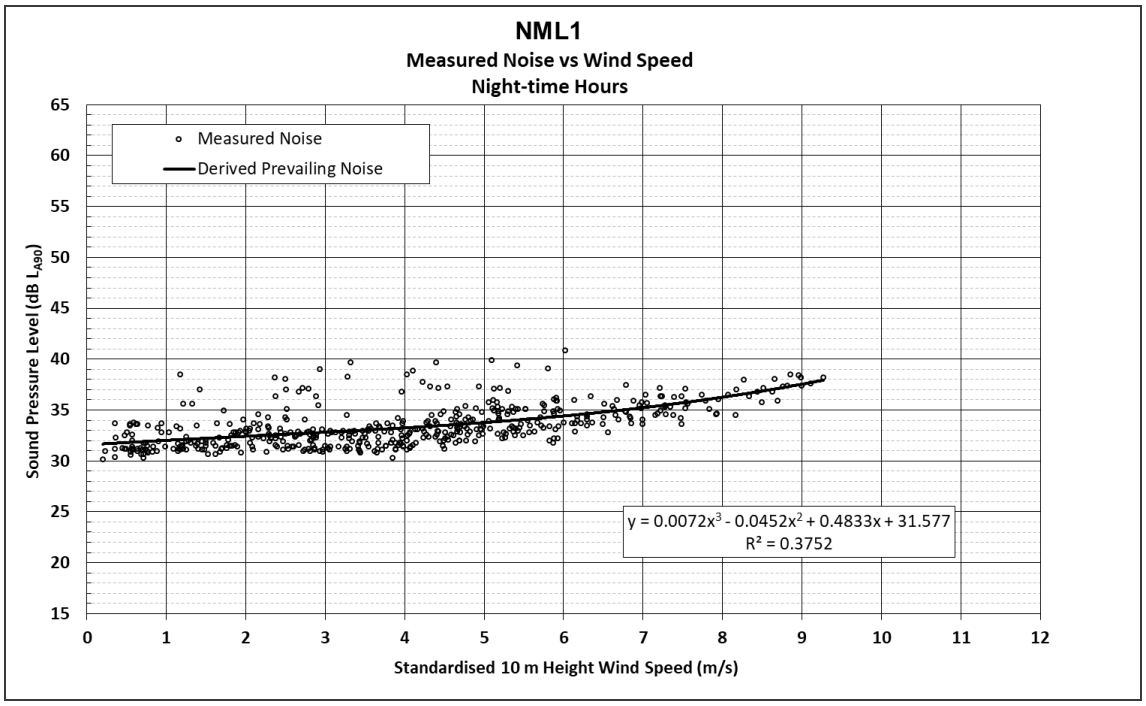

Figure 13-3-1: NML1 Night-time Hours

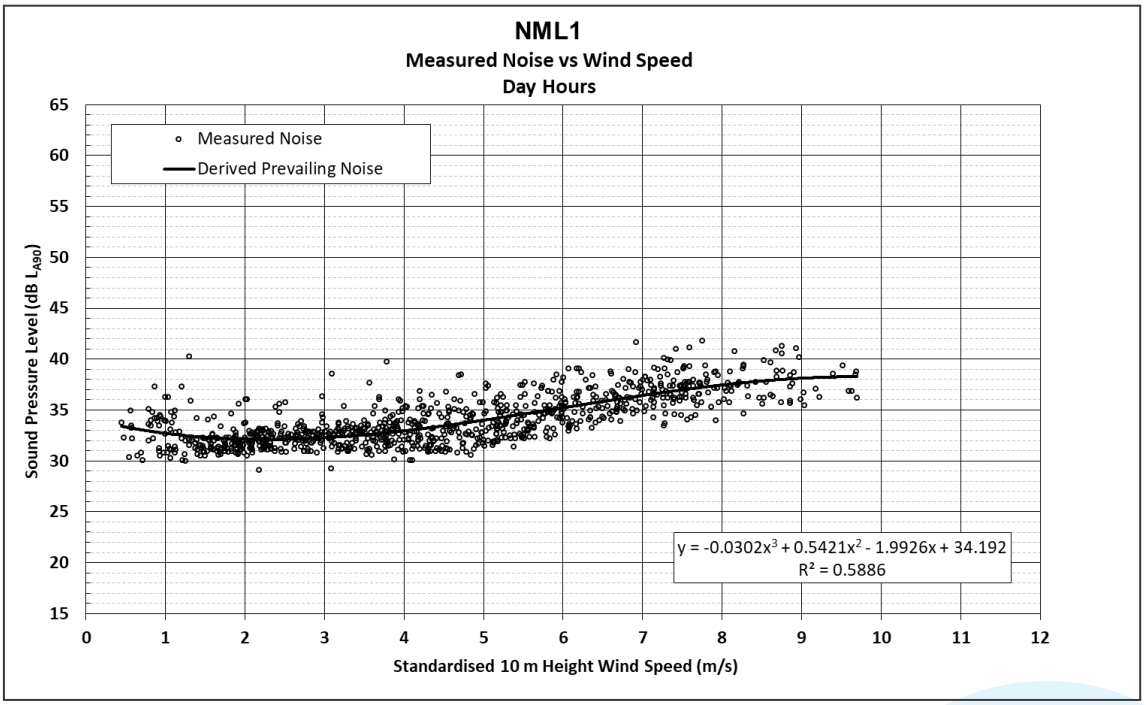

Figure 13-3-2: NML1 Daytime Hours

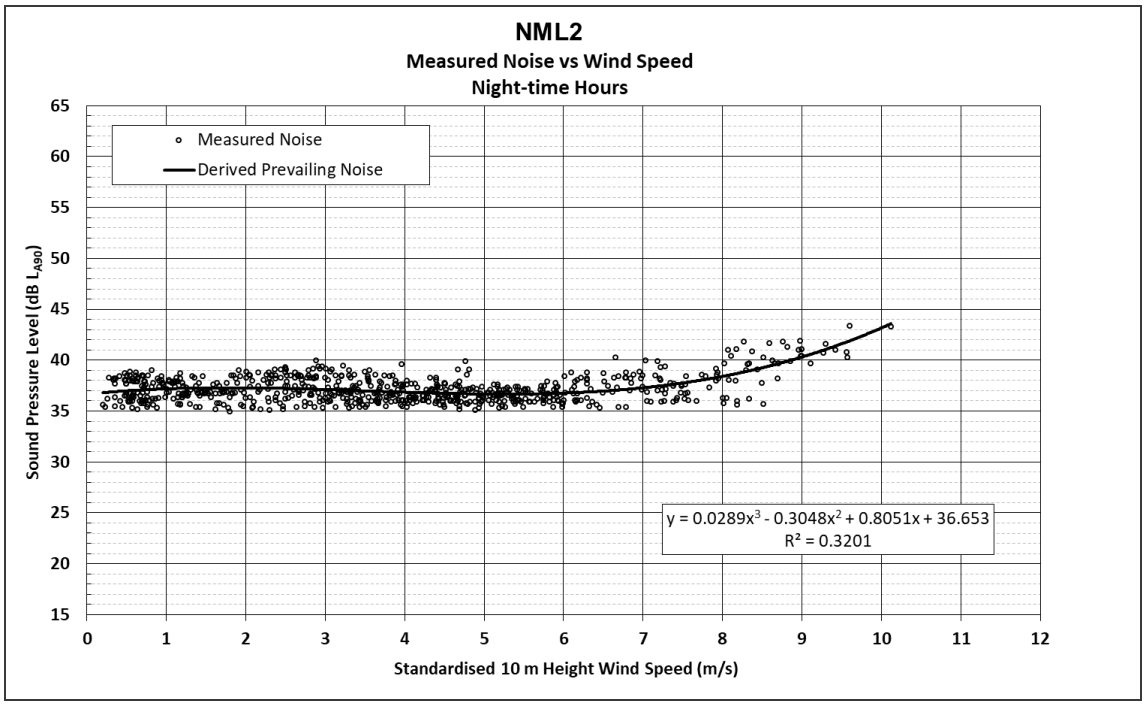

Figure 13-3-3: NML2 Night-time Hours

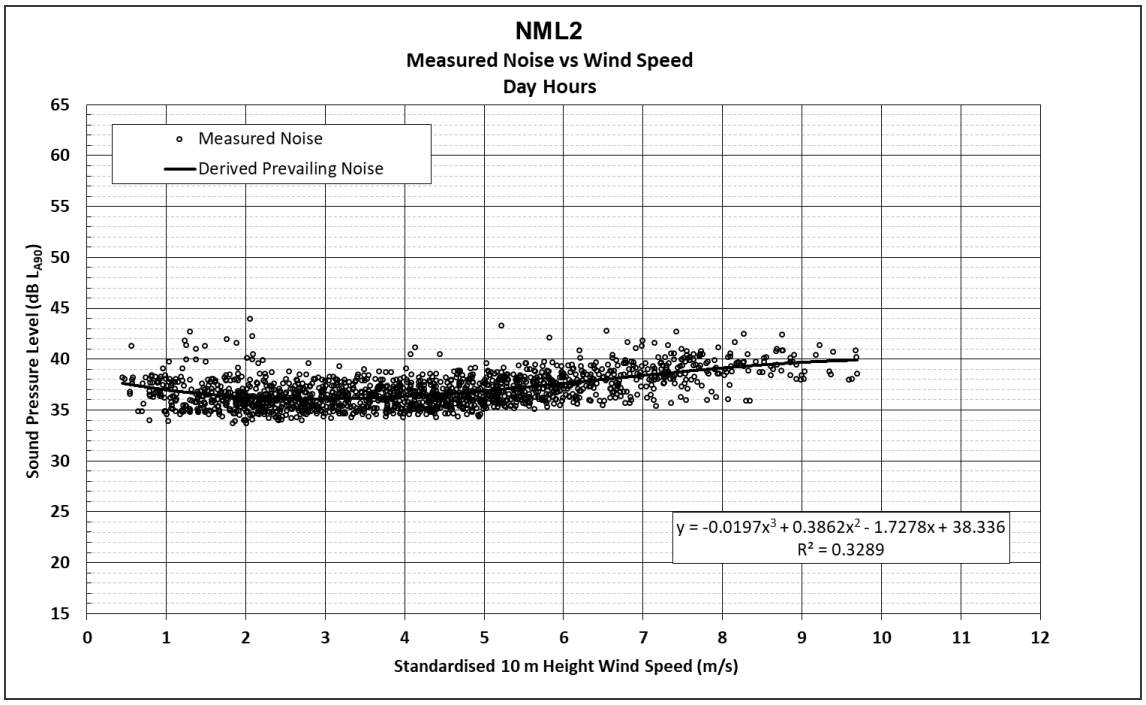

Figure 13-3-4: NML2 Daytime Hours

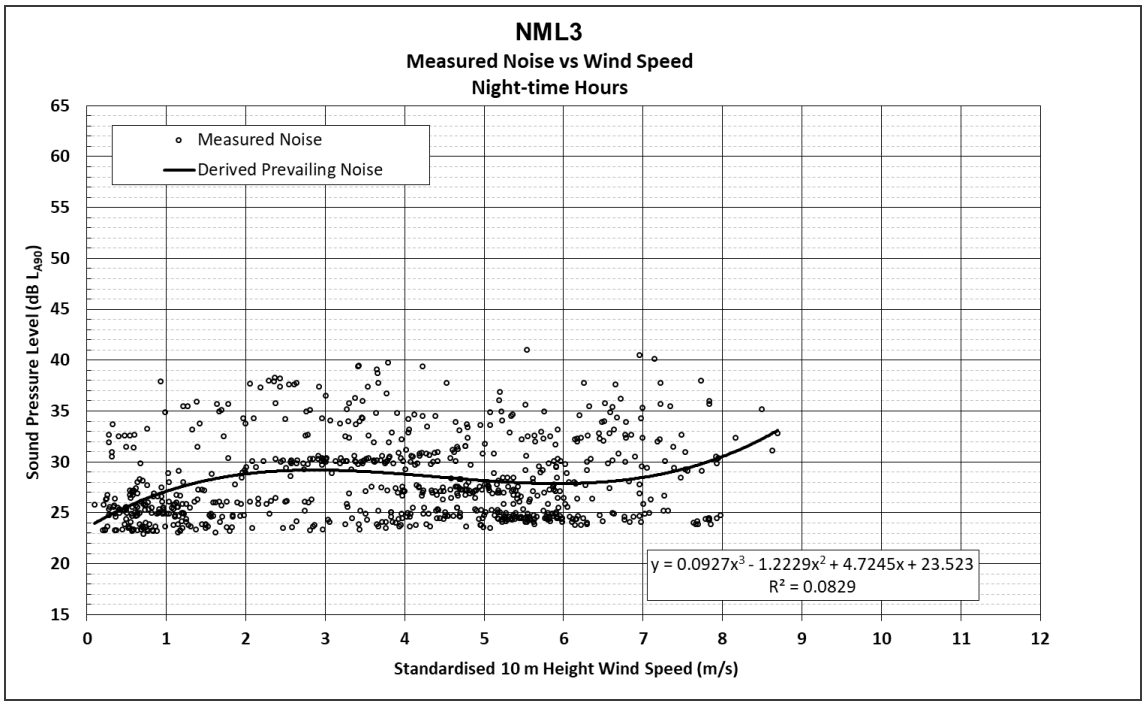

Figure 13-3-5: NML3 Night-time Hours

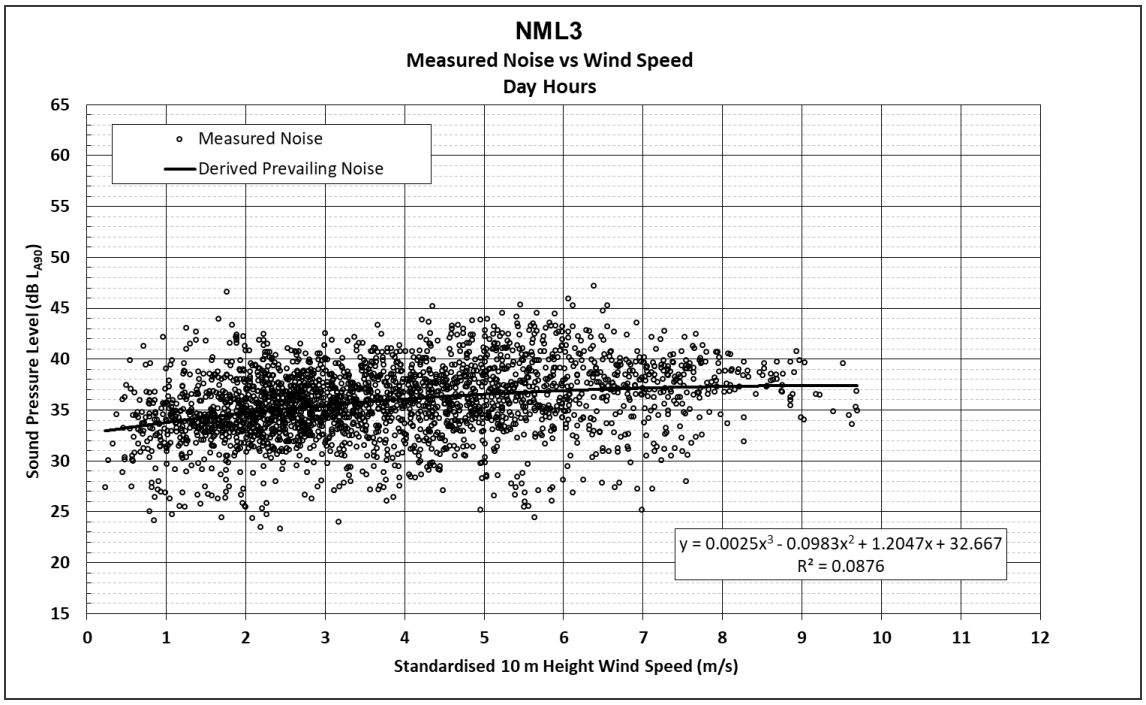

Figure 13-3-6: NML3 Daytime Hours

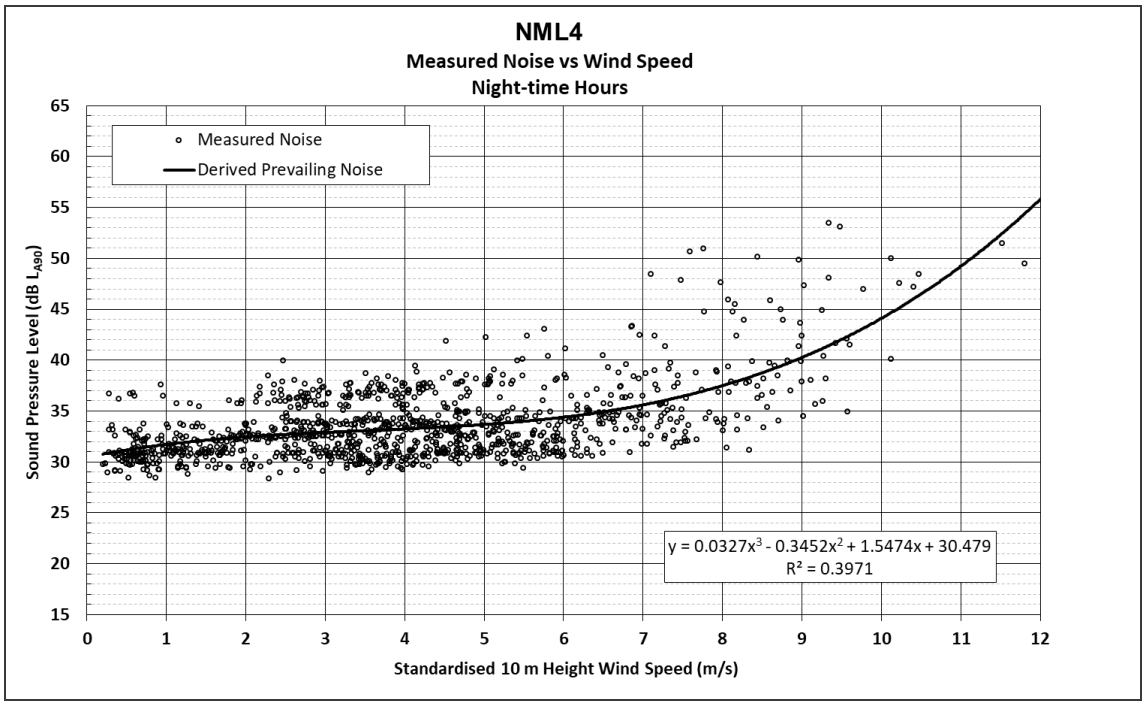

Figure 13-3-7: NML4 Night-time Hours

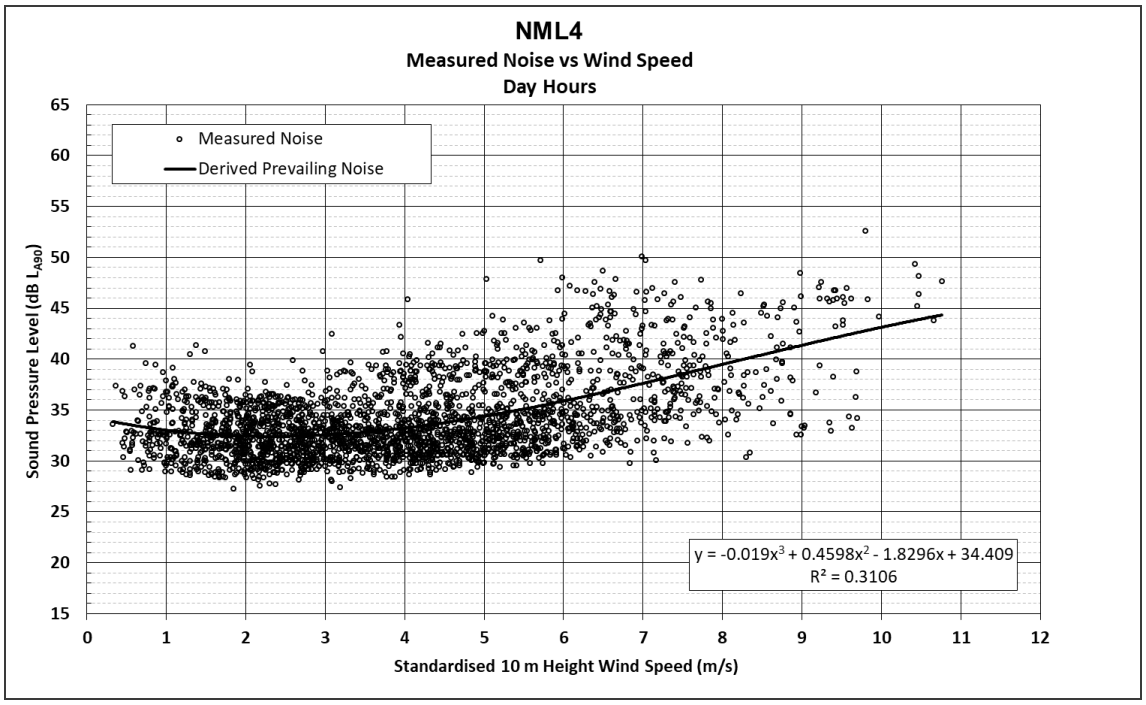

Figure 13-3-8: NML4 Daytime Hours