

Technical Appendix 10.1: Baseline Noise Measurements

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Appendix 10.1. Baseline Noise Measurements

Introduction

- A10.1.1 This technical appendix describes the baseline noise measurements undertaken to inform the operational noise assessment for Glenouther Wind Farm (the Proposed Development) presented in **Chapter 10: Noise and Vibration** of the EIA Report. This technical appendix relates solely to the Proposed Development (as defined in **Chapter 4: Development Description** of the EIA Report). The Likely Grid Connection Route (as defined in **Chapter 4**) is addressed in **Chapter 10** of the EIA Report.

Methodology

- A10.1.2 Baseline noise measurements were carried out in accordance with the methodology prescribed by ETSU-R-97 *The Assessment and Rating of Noise from Wind Farms* (ETSU-R-97), and the accompanying guidance produced by the Institute of Acoustics (IOA) in their document, *A Good Practice Guide (GPG) to the Application of ETSU-R-97 for the Assessment and Rating of Noise from Wind Turbines*. The Total Noise Assessment Criteria (TNAC) have been derived in line with the *Assessment and Rating of Wind Turbine Noise* (ARWTN), and is compatible with ETSU-R-97 and the IOA GPG in the way that the baseline noise measurements were undertaken.
- A10.1.3 The baseline noise measurement locations were discussed and agreed with East Ayrshire Council (EAC), who were invited to attend the installation of the noise monitoring equipment – see **Chapter 10** for further details.

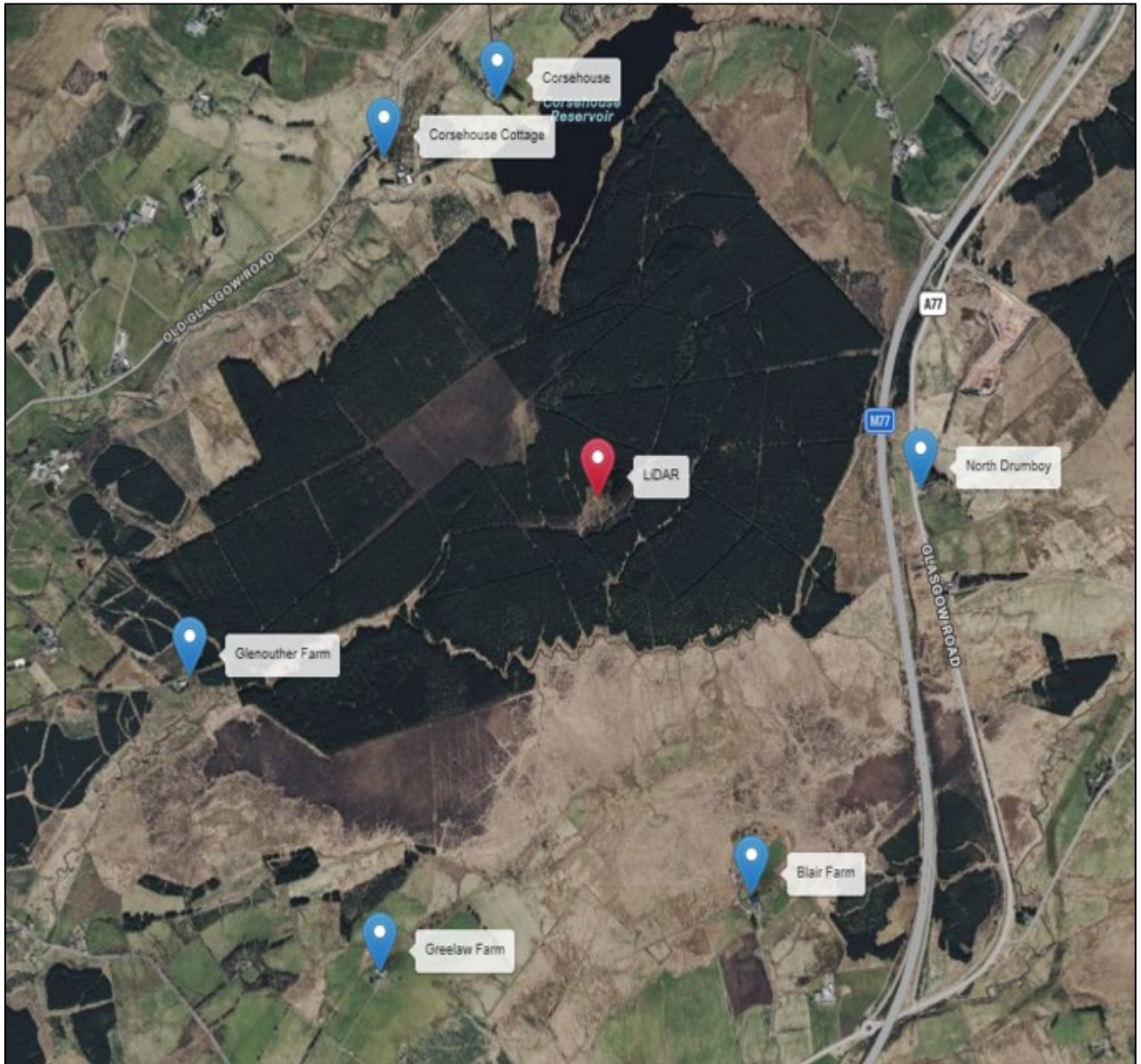
Measurement Locations

- A10.1.4 Baseline noise measurements were carried out at six locations within the vicinity of the Site in order to determine typical background sound levels. The noise measurement locations (NMLs) were selected based on noise predictions for a preliminary turbine layout, and chosen to be representative of the nearest noise sensitive receptors (NSRs) to the turbines of the Proposed Development. The NMLs are shown in **Table A10.1.1** and **Figure A10.1.1** below. **Table A10.1.1** also details the measurement equipment used and the date of last calibration. The calibration certificates can be provided on request.

Table A10.1.1 Baseline noise measurement locations (NMLs)

ID	Noise Measurement Location (NML) Name	Easting	Northing	Measurement Dates	Equipment Reference and Serial Number.	Date of Last Calibration (valid for 2 years)
NML1	Blair Farm	248684	647336	05/12/2025 to 29/12/2025	HMP 64 (s/n 00821100)	31/03/2025
NML2	Corsehouse Cottage	247347	650035	05/12/2025 to 29/12/2025	HMP 37 (s/n 00810320)	10/01/2024
NML3	Corsehouse	247802	650222	12/11/2025 to 29/12/2025	HMP 51 (s/n 01032421)	08/02/2024
NML4	Glenouther Farm	246486	648233	12/11/2025 to 29/12/2025	HMP 62 (s/n 00821098)	24/03/2025
NML5	Greelaw Farm	247208	647171	05/12/2025 to 29/12/2025	HMP 43 (s/n 00420658)	17/02/2025
NML6	North Drumboy	249368	648794	12/11/2025 to 29/12/2025	HMP 55 (s/n 01032451)	19/03/2024

Figure A10.1.1 Baseline Noise Measurement Locations



- A10.1.5 It was originally intended to carry out baseline measurements at property known as Marramead, as initially agreed with EAC; however, it was not possible to install equipment at this location, and measurements were carried out at the adjacent property (North Drumboy) instead. Noise levels recorded at North Drumboy continued to be representative of levels likely to be present at Marramead.

Noise Survey Methodology and Instrumentation

- A10.1.6 Rion NL-52 sound level meters corresponding to the Class 1 standard in BS EN 61672 were used for the noise measurements. The microphones were fitted with double skin windshields based on the recommended design in ETSU W/13/00386/REP and mounted on a tripod at a height of 1.2-1.5 m. wind speeds and noise measurements were averaged for successive 10-minute measurement intervals.
- A10.1.7 Wind speeds were measured at a number of heights between 38 and 229 m using a LiDAR within the Proposed Development Site at the grid reference location, 248128, 648799.

- A10.1.8 To monitor rainfall over the duration of the noise measurements, two rain gauges were installed at the North Drumboy and Glenouther Farm baseline noise measurement locations.
- A10.1.9 The sound level meters were calibrated during installation and checked and then recalibrated at each subsequent site visit. The GPG states that a calibration drift of no greater than 0.5 dB during the survey period is within an acceptable tolerance. A maximum calibration drift of 0.1 dB was measured on any of the sound level meters during the survey which is well within the allowable tolerance.
- A10.1.10 A description of the noise environment at each measurement location is provided below.

Blair Farm

- A10.1.11 The sound level meter was installed adjacent to a property that was uninhabited but which is understood to be intended to be refurbished, and was located at least 4 m from the nearest façade. The location was chosen to be shielded from potential noise from plant on the other side of the property.
- A10.1.12 Sounds noted during the site visits included road traffic noise, dog barking, and wind around the buildings.

Figure A10.1.2 Blair Farm site photos



Corsehouse Cottage

- A10.1.13 The sound level meter was installed in the garden of the property which is relatively enclosed and surrounded by trees. The equipment was located more than 4 m from the nearest façade.
- A10.1.14 Sounds noted during the site visits included distant road traffic noise, occasional road traffic on the adjacent road (B769), wind in the trees and foliage, and birdsong.

Figure A10.1.3 Corsehouse Cottage site photos



Corsehouse

- A10.1.15 The sound level meter was installed in the rear amenity area to the south-west of the property at least 18 m from the nearest façade.
- A10.1.16 Sounds noted during the site visits included wind in the trees, distant road traffic noise, scaffolding works during the interim site visit, birdsong, and noise from plant in the yard further along the drive from the property was noted during the collection site visit.
- A10.1.17 At the installation of the equipment the nearby small wind turbine was noted as just audible during lulls in the wind but was not noted as audible during the subsequent site visits.

Figure A10.1.4 Corsehouse site photos



Glenouther Farm

- A10.1.18 The sound level meter was installed on the north side of the property near to a garden bench, and located approximately 8 m from the façade of the property.
- A10.1.19 Sounds noted during the site visits included aircraft over-flight, wind in the trees, some construction activity on the other side of the property, and distant road traffic noise.

Figure A10.1.5 Glenouther Farm site photos



Greelaw Farm

- A10.1.20 The sound level meter was installed on the north-west side of the property in the garden area at approximately 10 m from the building façade.
- A10.1.21 Sounds noted during the site visits included wind in the trees and foliage, birdsong, and distant road traffic noise.

Figure A10.1.6 Greelaw Farm site photos



North Drumboy

- A10.1.22 The sound level meter was installed on the west side of the property which is also the side closest to the M77 motorway. The deployment location was compromised due to requirement for access around the property, but was located away from an air source heat pump installed at the rear of the property which was also enclosed and close to trees and foliage and the farm yard. The installation location was at least 12 m from the nearest façade.
- A10.1.23 Sounds noted during the site visits included road traffic noise from the M77, and horses grazing in the field adjacent to the equipment.

Figure A10.1.7 North Drumboy site photos



Baseline Measurement Results

- A10.1.24 The measured acoustic data has been correlated with the standardised 10 m height wind speed derived from the data measured using the on-site LiDAR in order to determine the prevailing background noise level during the night and quiet daytime periods. The process for this wind speed derivation is described below which follows the recommendations of the IOA GPG. The LiDAR only reports results where the data is reliable, and there are occasional gaps in the wind data under conditions such as rain or fog.
- A10.1.25 The standardised 10 m height wind speed is calculated from hub height wind speeds, which in this case, for the candidate turbine under consideration for the proposed development, is 119 m. The standardised 10 m height wind speed was calculated by correcting the measured 119 m hub height wind speed, assuming a logarithmic wind shear profile as described by the following formula;

$$V_{10} = V_h \left(\frac{\ln\left(\frac{10}{Z_0}\right)}{\ln\left(\frac{h}{Z_0}\right)} \right),$$

Where: V_{10} is the 10 m wind speed, V_h is the wind speed at hub height h , and Z_0 is the reference ground roughness length of 0.05 m.

Data filtering

- A10.1.26 The measured noise data was filtered into the relevant time periods for night-time and quiet daytime hours. Night-time hours according to ETSU-R-97 are 23:00 to 07:00, or whenever the onset of noise producing morning activities (both human and animal) start, whichever is earlier. Quiet daytime hours are 18:00 to 23:00 weekdays, 13:00 to 23:00 Saturdays and 07:00 to 23:00 Sundays, and is aimed to represent times of relaxation with less impact from working activities.
- A10.1.27 Any periods within 30 minutes either side of a 10-minute period where rainfall was measured at either of the rain gauges was excluded from the derivation of the prevailing baseline noise levels at all locations.
- A10.1.28 Periods of adverse weather where the LiDAR is unable to report the measured wind conditions are also excluded from the analysis, which also results in an additional filter of adverse or atypical weather conditions.
- A10.1.29 At Blair Farm, Corsehouse, Corsehouse Cottage, and North Drumboy, early morning periods between 04:00 and 07:00 were excluded from the night-time dataset as increases in noise level not related to wind speed were evident, likely attributable to road traffic noise. Although this data is still representative of early morning baseline noise levels, it has been excluded to ensure a conservative assessment.
- A10.1.30 Some construction noise was noted during the site visits to Corsehouse, and Glenouther Farm during the daytime. It has been assumed that the construction activities would be unlikely to continue into the quiet daytime periods, and no significantly elevated noise levels were observed during the quiet daytime hours likely attributable to construction activities. Therefore, no additional filtering was undertaken for these two properties for potential construction noise.
- A10.1.31 No other manual filtering of the data was carried out.
- A10.1.32 At Corsehouse, it was noted that the nearby small wind turbine was faintly audible during the installation of the noise monitoring equipment during lulls in the wind. Review of the measured data suggested that its contribution to measured background noise levels at the measurement location were not significant relative to typical diurnal variation. During the night hours average background noise levels at low to mid wind speeds were significantly lower than during the quiet daytime hours, and given that the operation of the wind turbine is unlikely to change between daytime and night time, this is a positive indication that it has not significantly affected the quiet daytime measured background noise levels. During the night time, if the ETSU-R-97 lower fixed limit of 43 dB L_{A90} is met then even if there was the potential for existing turbine noise to affect the measured background noise levels, it would not be significant in terms of the limit applied. No additional filtering was carried out to exclude any potential contribution from the nearby small turbine, and the noise limits derived from baseline noise measurements at Corsehouse have not been directly applied to any other assessment location.

Baseline Results

- A10.1.33 The measured background noise level over a range of wind speeds for each measurement location during the quiet day hours and night-time periods, correlated with the standardised 10 m height wind speed are shown in the following figures. A 3rd order polynomial regression line has been plotted through the average measured noise data to derive the typical background sound levels.
- A10.1.34 The results presented for each location also show the measured data that was excluded due to the filtering described above as well as the relevant TNAC.

Figure A10.1.8 Baseline results chart; Blair Farm, night

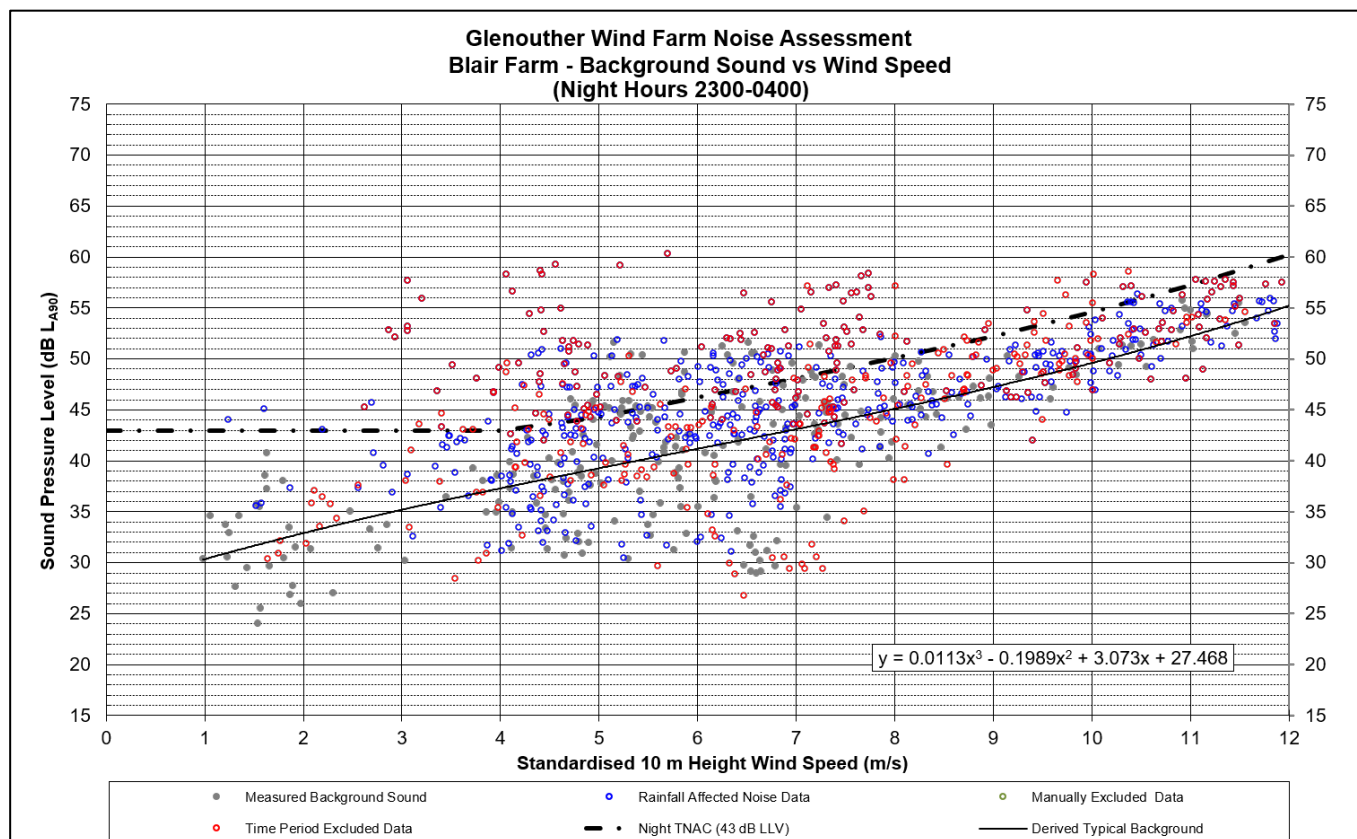


Figure A10.1.9 Baseline results chart; Blair Farm, quiet day

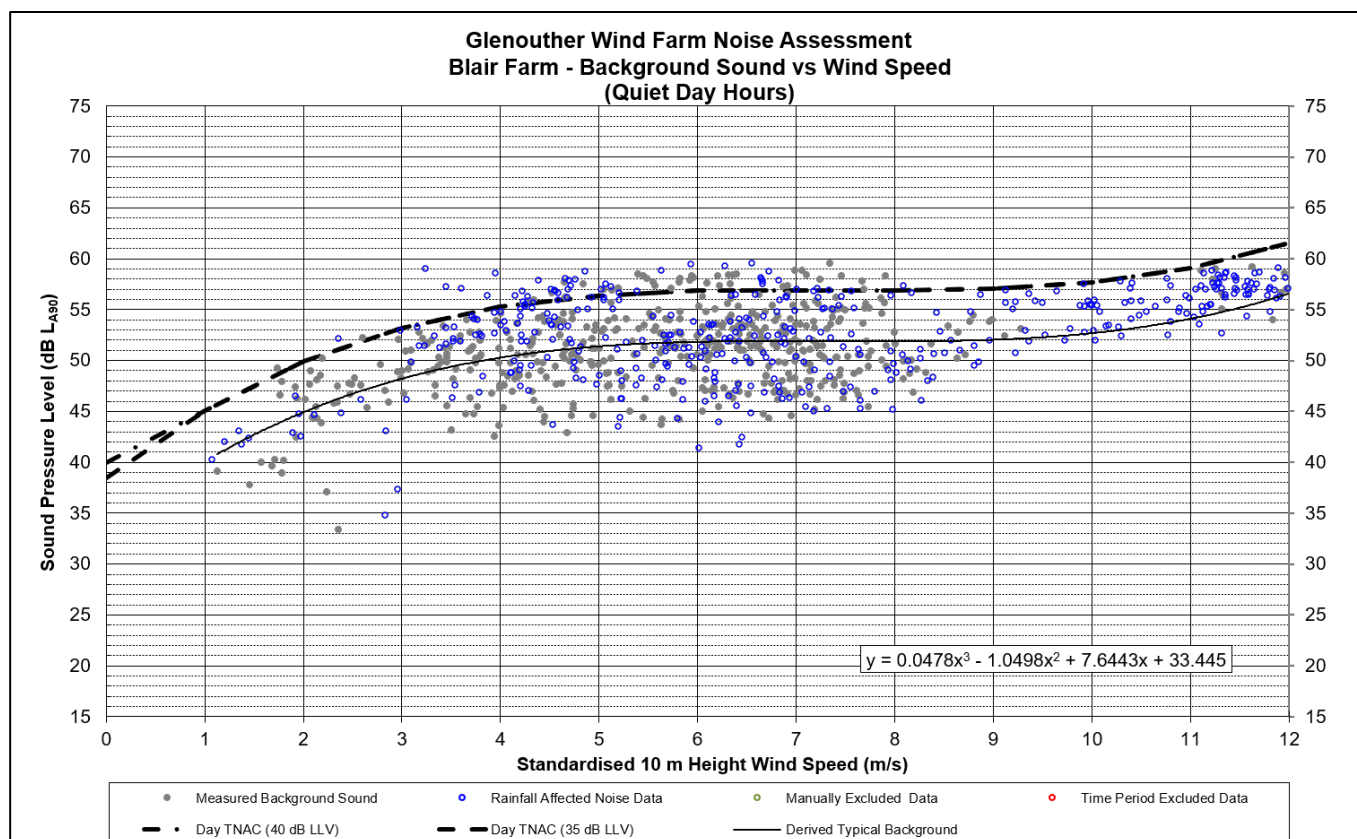


Figure A10.1.10 Baseline results chart; Corsehouse Cottage, night

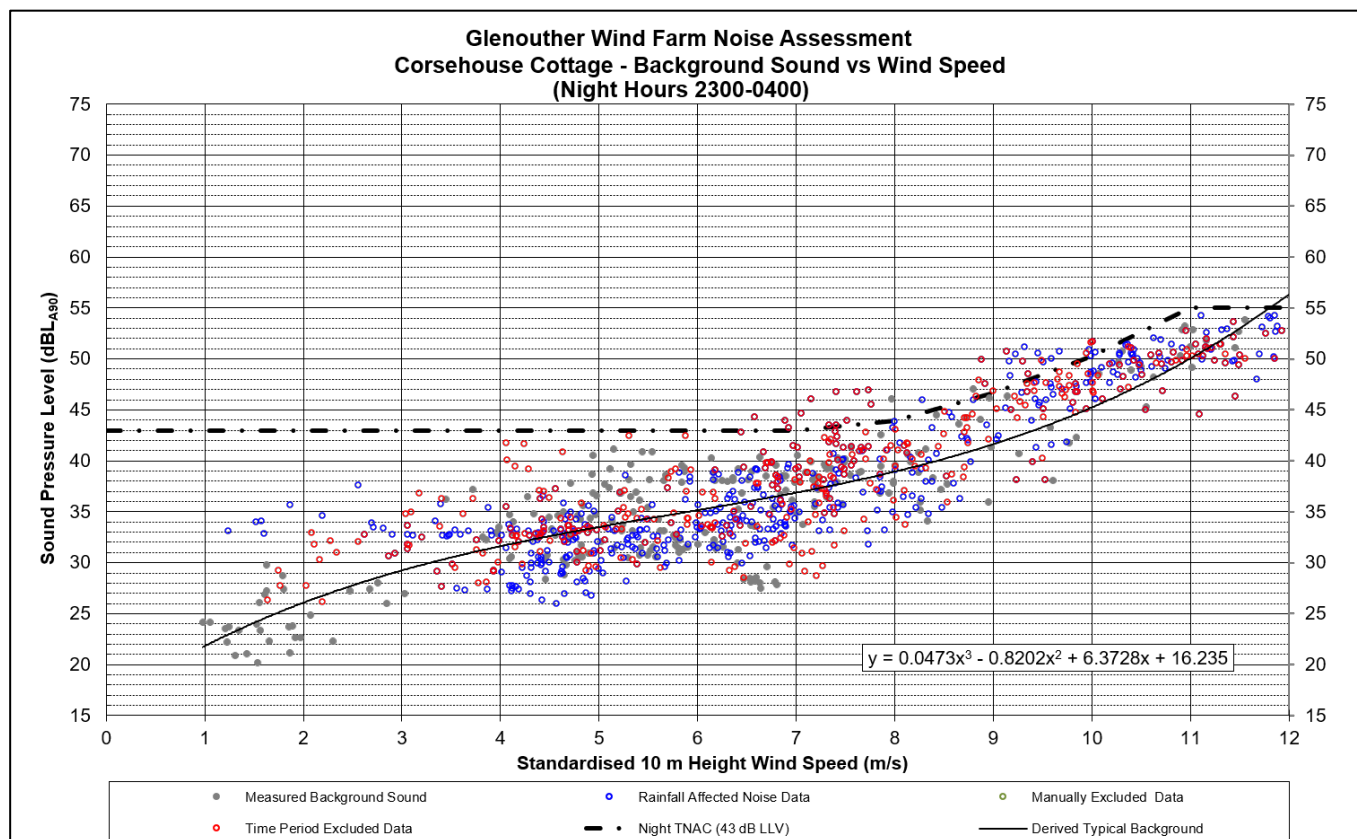


Figure A10.1.11 Baseline results chart; Corsehouse Cottage, quiet day

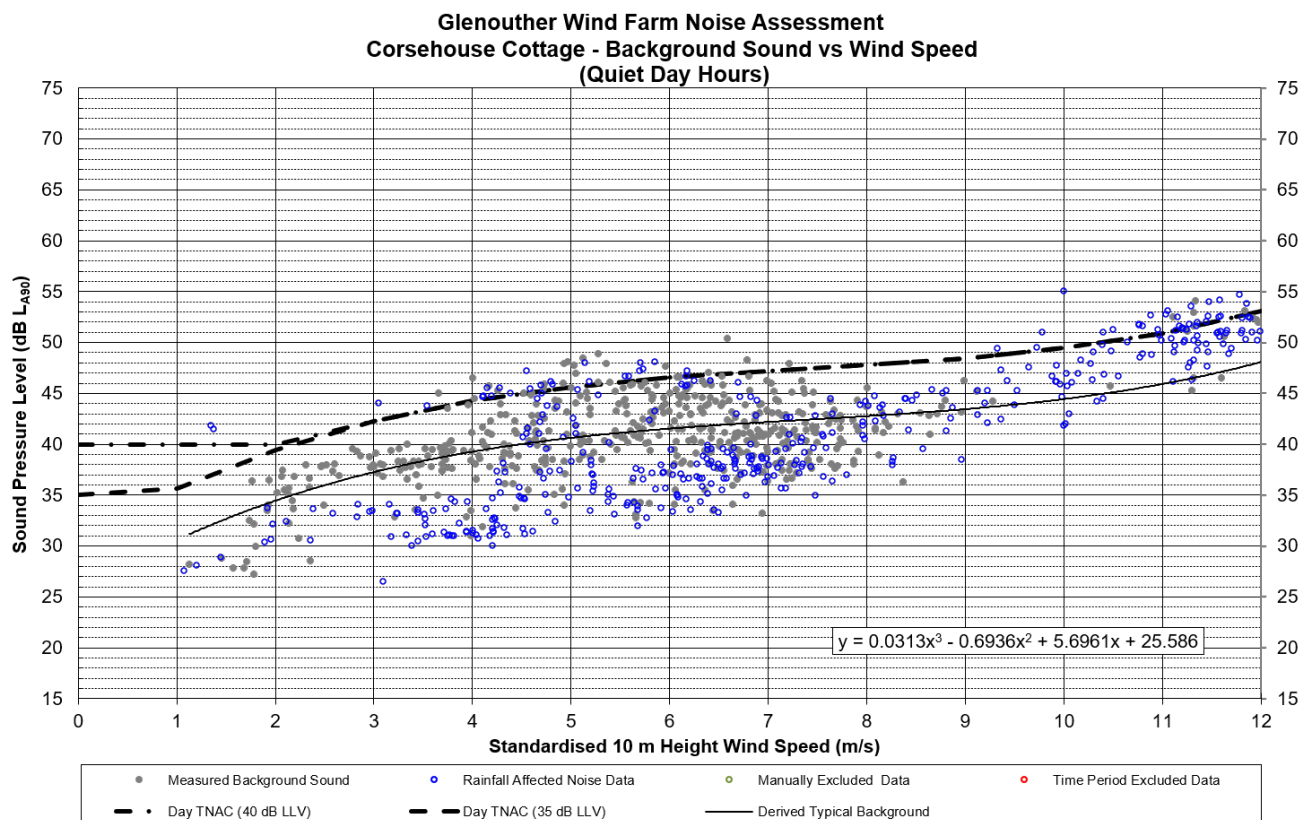


Figure A10.1.12 Baseline results chart; Corsehouse, night

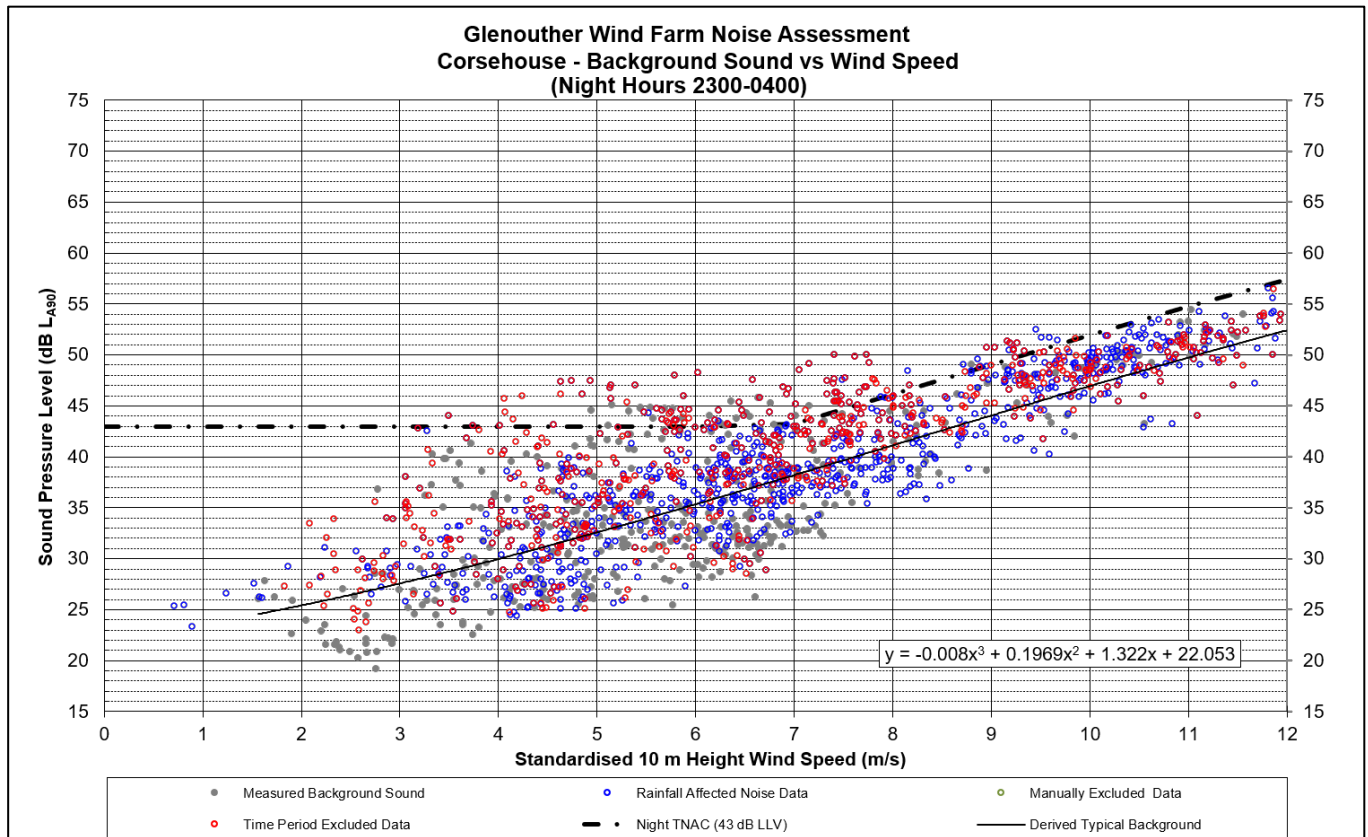


Figure A10.1.13 Baseline results chart; Corsehouse, quiet day

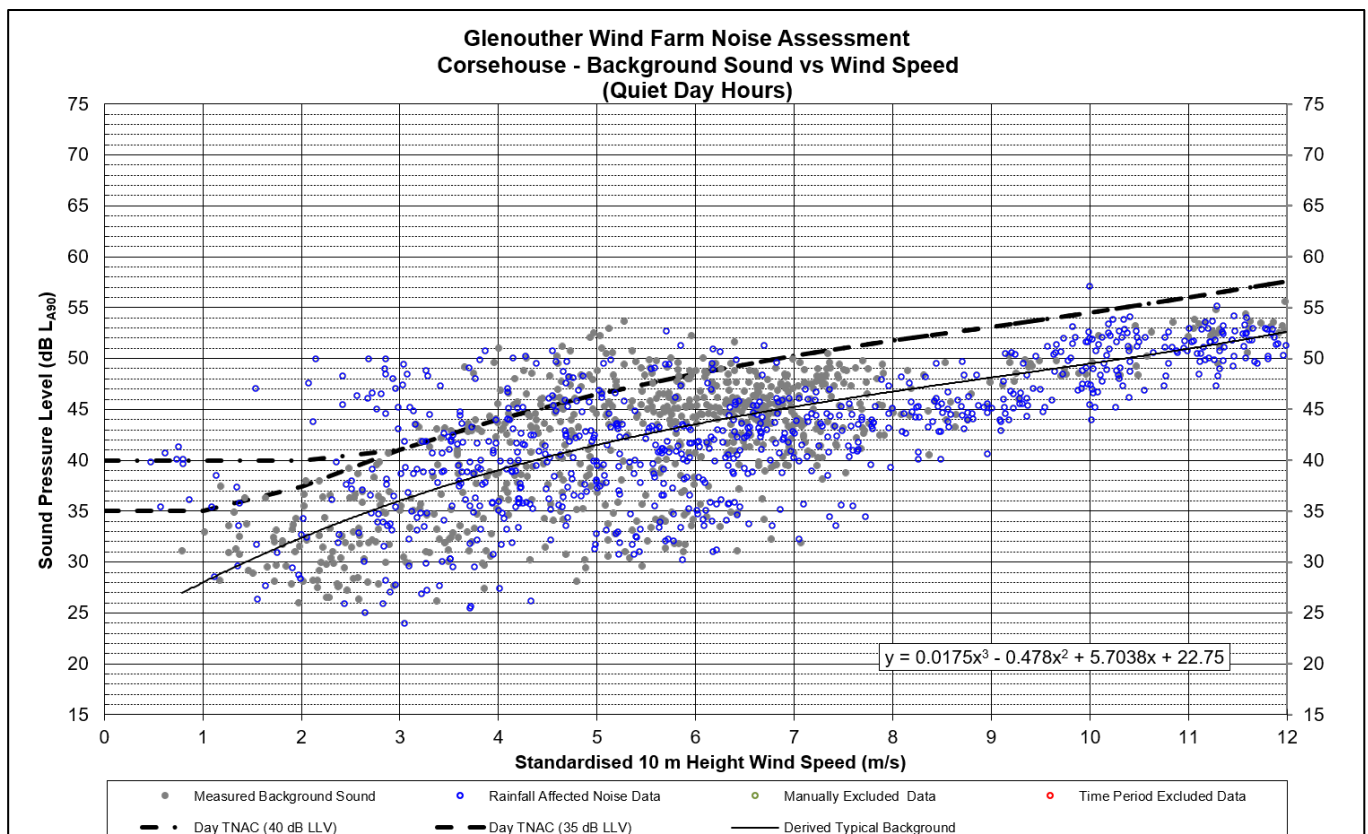


Figure A10.1.14 Baseline results chart; Glenouther Farm, night

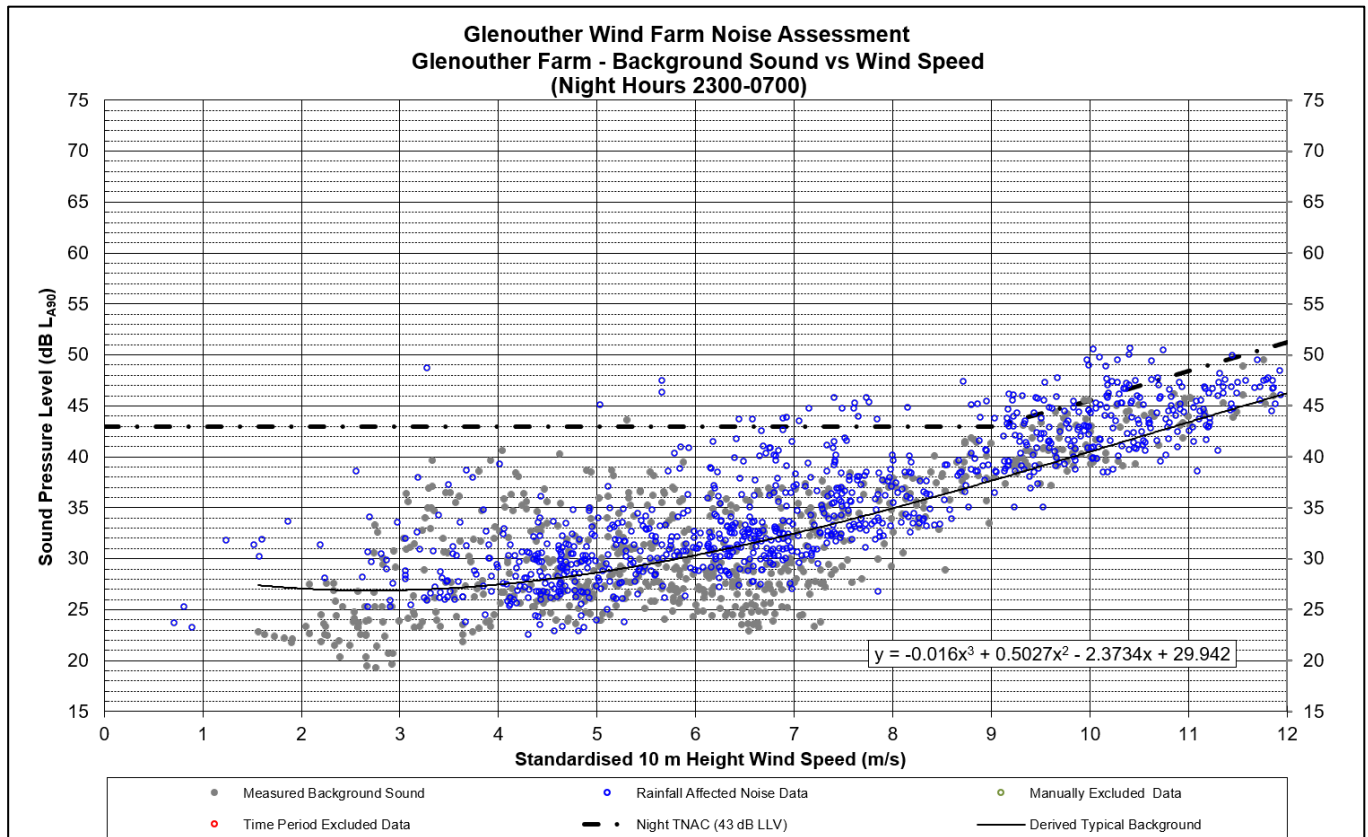


Figure A10.1.15 Baseline results chart; Glenouther Farm, quiet day

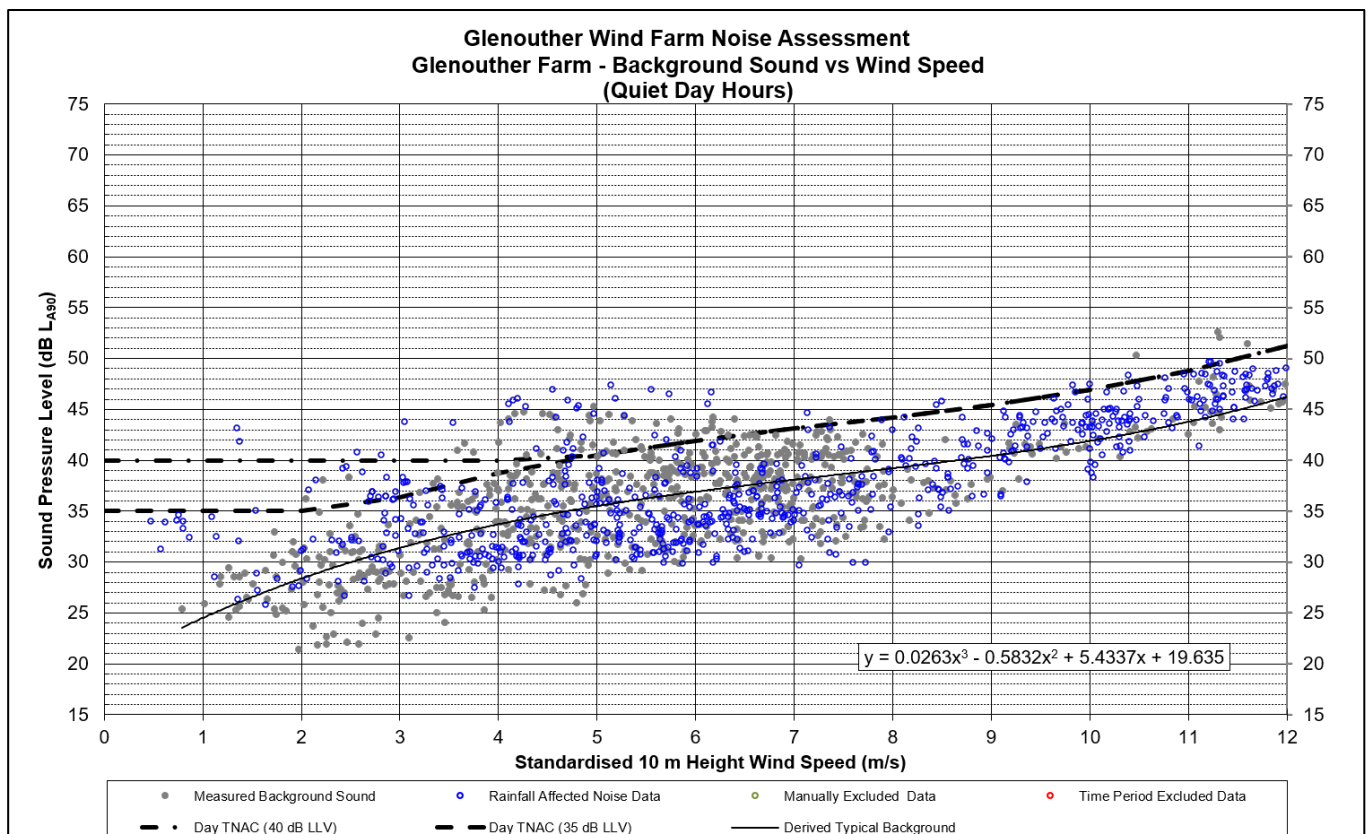


Figure A10.1.16 Baseline results chart; Greelaw, night

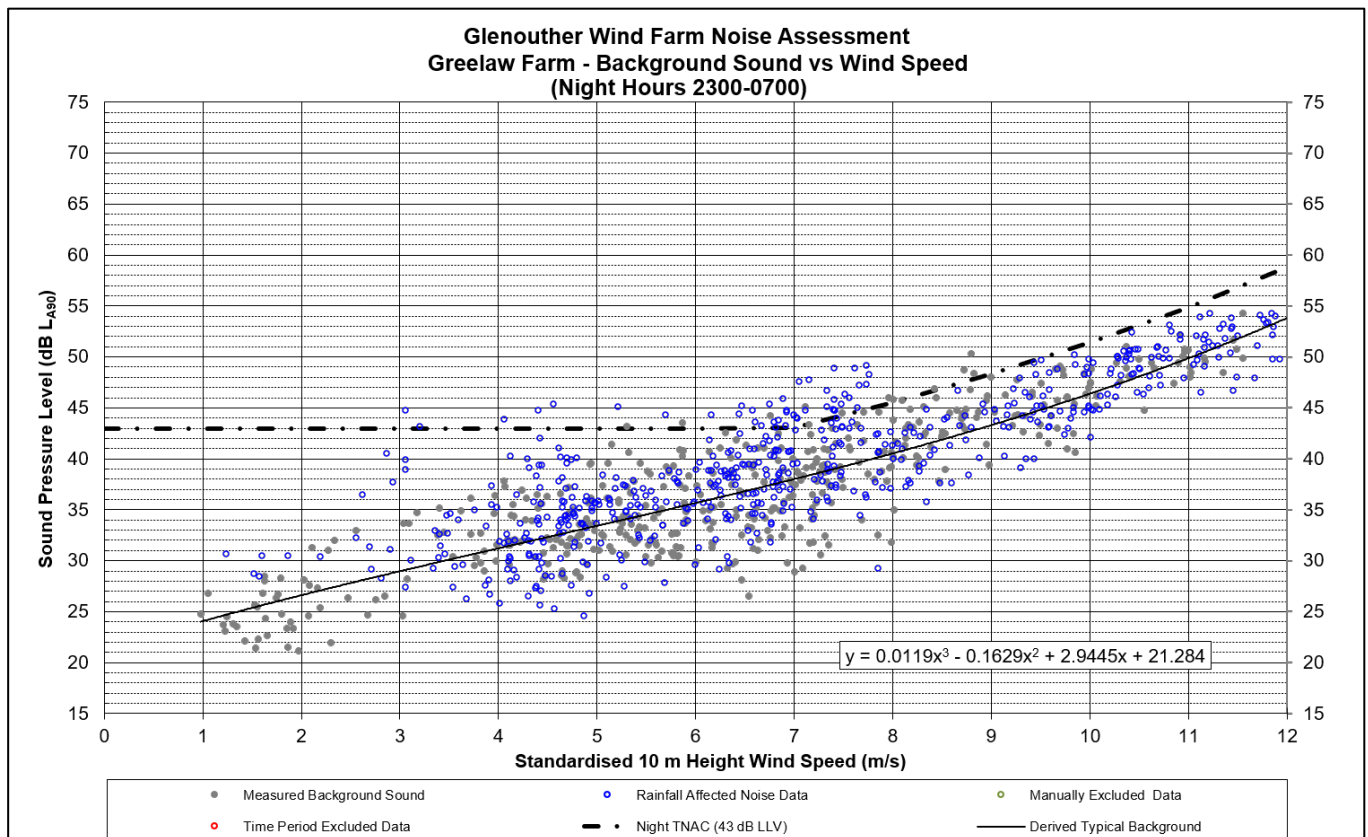


Figure A10.1.17 Baseline results chart; Greelaw, quiet day

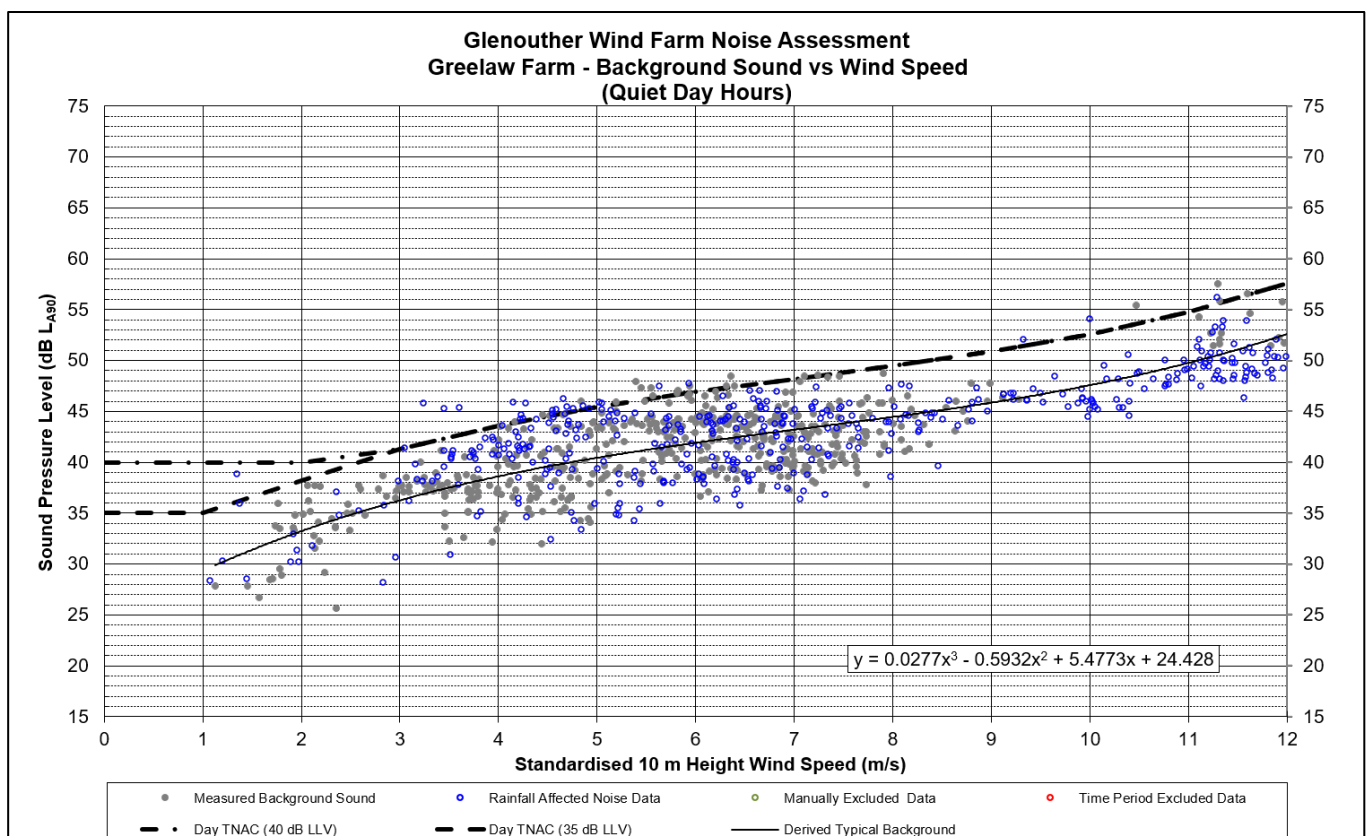


Figure A10.1.18 Baseline results chart; North Drumboy, night

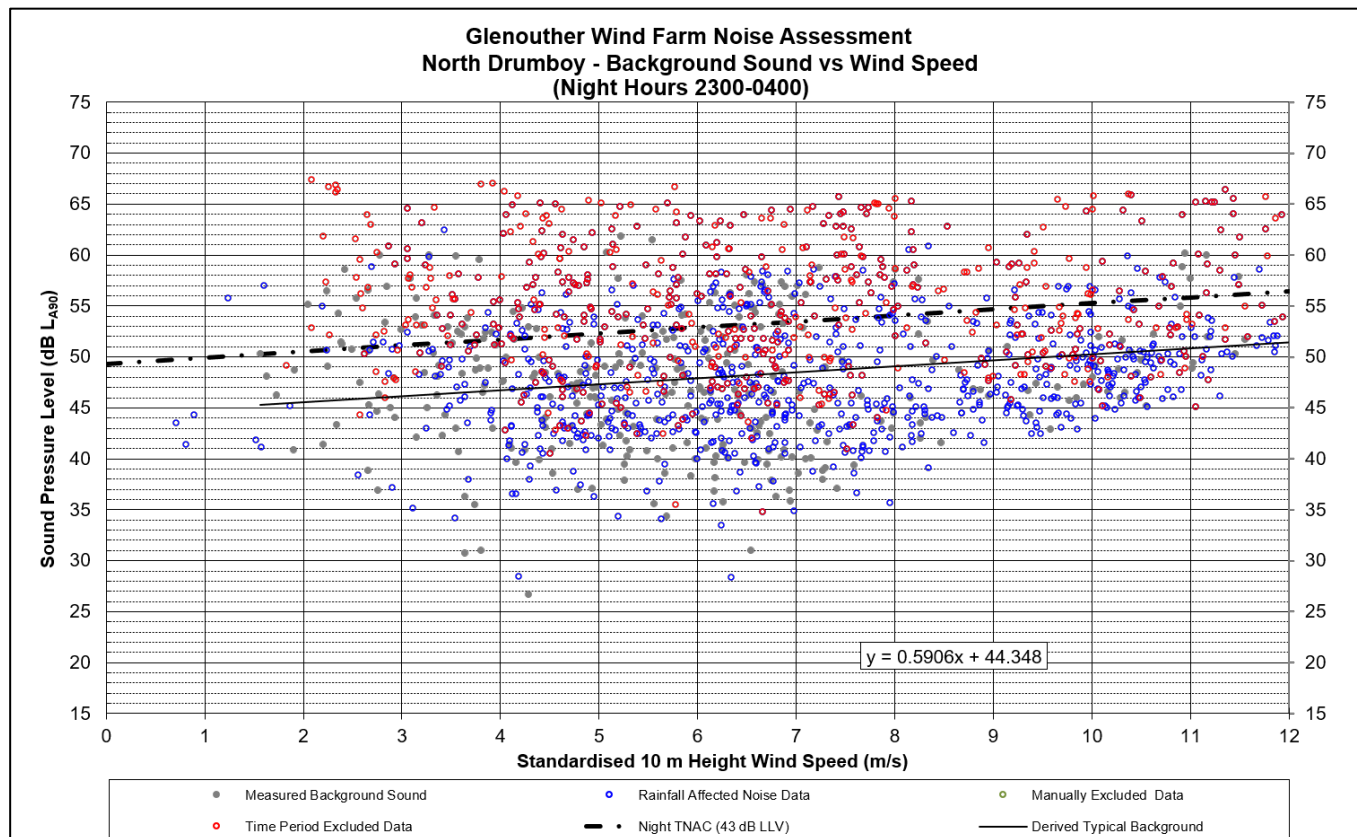
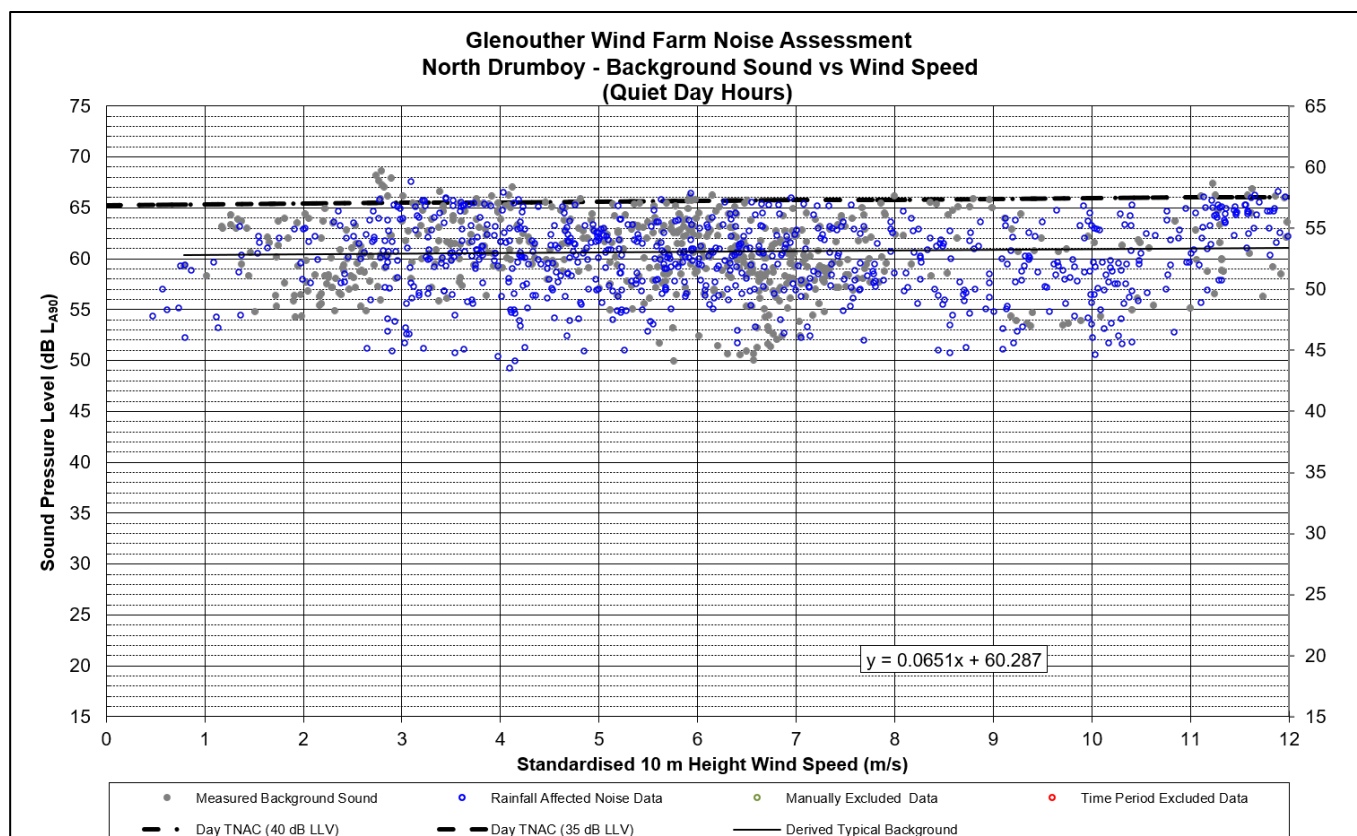


Figure A10.1.19 Baseline results chart; North Drumboy, quiet day



A10.1.35 The resulting derived typical background sound levels at each NML are summarised in **Table A10.1.2**.

Table A10.1.2 Derived Typical Background Sound Levels (dB L_{A90})

Location	Time Period	Standardised 10 m Height Wind Speed (m/s)									
		3	4	5	6	7	8	9	10	11	12
Blair Farm	Night	35.2	37.3	39.3	41.2	43.1	45.1	47.2	49.6	52.2	55.2
	Quiet Day	48.2	50.3	51.4	51.8	51.9	51.9	52.0	52.7	54.1	56.6
Corsehouse Cottage	Night	29.2	31.6	33.5	35.2	36.9	38.9	41.6	45.2	50.0	50.0
	Quiet Day	37.3	39.3	40.6	41.5	42.2	42.8	43.5	44.4	45.9	48.1
Corsehouse	Night	27.6	30.0	32.6	35.3	38.2	41.1	44.1	46.9	49.7	52.4
	Quiet Day	36.0	39.0	41.5	43.5	45.3	46.8	48.1	49.5	51.0	52.6
Glenouther Farm	Night	26.9	27.5	28.6	30.3	32.5	34.9	37.7	40.5	43.4	46.2
	Quiet Day	31.4	33.7	35.5	36.9	38.1	39.2	40.4	41.9	43.8	46.2
Greelaw Farm	Night	29.0	31.2	33.4	35.7	38.0	40.5	43.3	46.4	49.9	53.8
	Quiet Day	36.3	38.6	40.4	41.9	43.2	44.5	45.9	47.6	49.8	52.6
North Drumboy	Night	46.1	46.7	47.3	47.9	48.5	49.1	49.7	50.3	50.8	51.4
	Quiet Day	60.5	60.5	60.6	60.7	60.7	60.8	60.9	60.9	61.0	61.1

A10.1.36 The TNAC were derived by setting the limits at 5 dB above the average background noise level at each integer wind speed, subject to the application of LLVs of 43 dB L_{A90} at night and 35 and 40 dB L_{A90} during the daytime, representing the minimum and maximum day LLVs respectively. The minimum and maximum day TNAC are presented as the lower day and upper day TNAC in the following table. The derived noise limits are shown at **Table A10.1.3 below**. In line with ARWTN, the TNAC are presented up to a standardised wind speed of 10 m/s.

Table A10.1.3 Derived TNAC

Location	Time Period	Standardised 10 m Height Wind Speed (m/s)							
		3	4	5	6	7	8	9	10
Blair Farm	Night	43.0	43.0	44.3	46.2	48.1	50.1	52.2	54.6
	Lower day	53.2	55.3	56.4	56.8	56.9	56.9	57.0	57.7
	Upper day	53.2	55.3	56.4	56.8	56.9	56.9	57.0	57.7
Corsehouse Cottage	Night	43.0	43.0	43.0	43.0	43.0	43.9	46.6	50.2
	Lower day	42.3	44.3	45.6	46.5	47.2	47.8	48.5	49.4
	Upper day	42.3	44.3	45.6	46.5	47.2	47.8	48.5	49.4
Corsehouse	Night	43.0	43.0	43.0	43.0	43.2	46.1	49.1	51.9
	Lower day	41.0	44.0	46.5	48.5	50.3	51.8	53.1	54.5
	Upper day	41.0	44.0	46.5	48.5	50.3	51.8	53.1	54.5

Location	Time Period	Standardised 10 m Height Wind Speed (m/s)							
		3	4	5	6	7	8	9	10
Glenouther Farm	Night	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.5
	Lower day	36.4	38.7	40.5	41.9	43.1	44.2	45.4	46.9
	Upper day	40.0	40.0	40.5	41.9	43.1	44.2	45.4	46.9
Greelaw Farm	Night	43.0	43.0	43.0	43.0	43.0	45.5	48.3	51.4
	Lower day	41.3	43.6	45.4	46.9	48.2	49.5	50.9	52.6
	Upper day	41.3	43.6	45.4	46.9	48.2	49.5	50.9	52.6
North Drumboy	Night	51.1	51.7	52.3	52.9	53.5	54.1	54.7	55.3
	Lower day	65.5	65.5	65.6	65.7	65.7	65.8	65.9	65.9
	Upper day	65.5	65.5	65.6	65.7	65.7	65.8	65.9	65.9