

Heckington Fen Solar Park

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Appendix 12.1: Background Noise Survey

Applicant: Ecotricity (Heck Fen Solar) Limited

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APPENDIX 12.1: BACKGROUND NOISE SURVEY

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Heckington Fen Energy Park.

Appendix 12.1: Background Noise Survey.

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1. Introduction

1.1.1 Hoare Lea has undertaken a background noise survey in 2022 at noise sensitive receptors around the Proposed Development. This technical Appendix sets out the existing noise climate and sets out the results of the survey undertaken as well as additional and summarising the results of historical survey data. Prevailing background noise levels have been determined at the closest noise-sensitive receptors, in line with the methodology within BS 4142:2014, to assist with setting suitable plant noise limits.

2. Site Context

2.1.1 The Site boundary extends north of East Heckington and the A17 and is bordered by the B1395 to the west, approximately 4 km east of Heckington, Sleaford. The cable route corridor is also considered along with the extension of National Grid Bicker Fen Substation. The Proposed Development boundary is presented in **Figure 12.1- Noise Survey Locations** (document reference 6.2.12). This figure also sets out the attended and unattended measurement locations for the 2022 survey.

3. British Standard 4142

3.1.1 Current Government advice to local planning authorities in England makes reference to BS 4142:2014-A1 2019 (BS 4142) (BSI, 2019) as being the appropriate guidance for assessing noise from commercial

operations and plant noise such as that from building services or other similar sources. The standard provides an objective method for rating the significance of impact from industrial and commercial operations. It describes a means of determining sound levels from fixed plant installations and determining the background sound levels that prevail on a site. This method is only applicable for external noise levels.

- 3.1.2 The assessment of the impacts is based on the subtraction of the pre-existing background sound level ($L_{A90,T}$) from the rating level ($L_{A,r,Tr}$).
- 3.1.3 The standard does not give a definitive method for determining the background sound level but instead, as a commentary, states that “*the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*”.
- 3.1.4 Clause 8.1.4 of the standard, which discusses the monitoring duration, states “there is no “single” background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed.” As a note to this clause the following commentary is given on obtaining a representative background sound level:
- 3.1.5 “To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value.”
- 3.1.6 The rating level is defined objectively as the specific source noise level in question (either measured or predicted) with graduated corrections for tonality (up to +6 decibels (dB) A-weighted sound level (A)), impulsivity (up to +9 dB(A)), intermittency (+3 dB(A)) and other sound characteristics (+3 dB(A)) which may be determined either subjectively or objectively, if necessary.
- 3.1.7 The background sound level is subtracted from the rating level. The following is considered to evaluate the likelihood of complaint:
- A difference of around +10 dB is likely to be an indication of a significant adverse impact, depending on context;
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context; and
 - A difference of +0 dB or less is an indication of the specific sound source having a low impact, depending on the context.
- 3.1.8 The “context” in the above statements refers to a fundamental requirement of BS 4142: this requires consideration not only of the difference between rated levels of background but also of several contextual factors. These include consideration of:
- the absolute level of the noise, particularly at night. This was done through the consideration of a lower cut-off of 35 dB (see Table 12.2 in **Chapter 12**, document reference 6.1.12);
 - the character and level of the sound compared to the baseline noise environment: in this case, the potential character of noise (and how it may differ from the baseline) is accounted for in the assessment by addition of a character correction;
 - The sensitivity of the receptor and whether these include mitigation measures which provide protection from the noise source: in this case, it was assumed that residential receptors did not have specific localised mitigation for the proposed noise sources.

4. New Background Noise Survey.

- 4.1.1 A new series of acoustic measurements have been undertaken in 2022 at the Proposed Development to quantify the existing background noise climate in the area. Locations of the background noise measurements are shown in Figures 12.1.1 and 12.1.2. Resultant background noise levels are presented in Table 12.1.1 (Unattended logger measurements) and Table 12.1.2 (Attended measurements).

4.2 Methodology.

- 4.2.1 The acoustic survey included two unattended and 10 attended measurements, at locations spatially distributed across the site area, representative of the existing noise environment at nearby residential receptors. Unattended background noise measurements were undertaken from 25/02/2022 to 01/03/2022. The attended measurements, used to supplement the unattended measurement data, were undertaken during the day on the 25/02/2022 and 01/03/2022. Both sets of unattended measurements captured background noise levels over weekday and weekend, during daytime and night-time periods.
- 4.2.2 Measurements were made under free-field conditions and the weather conditions were generally suitable for majority of the survey period, except rainfall on the mornings of 28/02/2022 and 01/03/2022, which were excluded from the analysis using rain gauge data on site. Dry conditions and low to moderate winds persisted for the remainder of the unattended survey period. No severe Covid-19 restrictions were in place during the survey period. It was therefore expected that the pandemic would have had either no substantial influence on human activity and road traffic levels and therefore background noise, or that levels would only be marginally lower than normal therefore resulting in a more conservative assessment.
- 4.2.3 The local noise climate is typical of a rural location, with a varying influence of road traffic noise from the A17. The noise sources observed on visits to site at the various measurement positions consisted of road traffic noise, vegetation noise and occasional bird noise. These sources were present, depending on location, however varied in dominance of the local noise climate. Closer to the Bicker Fen Wind Farm, noise from the turbines was sometimes audible, depending on the conditions.
- 4.2.4 All survey equipment was field calibrated at the start and end of each set of measurements with no discernible drift in level observed. The measurement instrumentation used is listed in Annex A attached.

4.3 Results.

- 4.3.1 Time history plots of the two unattended measurements can be found in Annex B attached. During the unattended measurements at positions L1 and L2, two periods of rainfall on the early mornings of 28/02/2022 and 01/03/2022 measured by the rain gauge positioned at L1 were excluded from the analysis. Outside of these exclusions and for the attended survey days, weather and road surfaces were generally dry during the measured periods, as no periods of rainfall or strong adverse weather were observed on site or measured using the rain gauge. Therefore, no further exclusions were made to the attended noise data or the initial unattended noise data at positions L1 and L2.

4.4 Background noise levels.

- 4.4.1 In line with the requirements of BS 4142, in order to “*quantify what is typical during particular time periods*”, a statistical analysis of the measured background sound levels has been undertaken. The periods of interest have been taken as daytime (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00).
- 4.4.2 Assessment durations of 15-minutes are used for day, evening and night-time periods. A single $L_{A90,1h}$ measurement would always be higher than the lowest of the four 15-minute duration background sound levels it comprises. Therefore, this represents a conservative case.

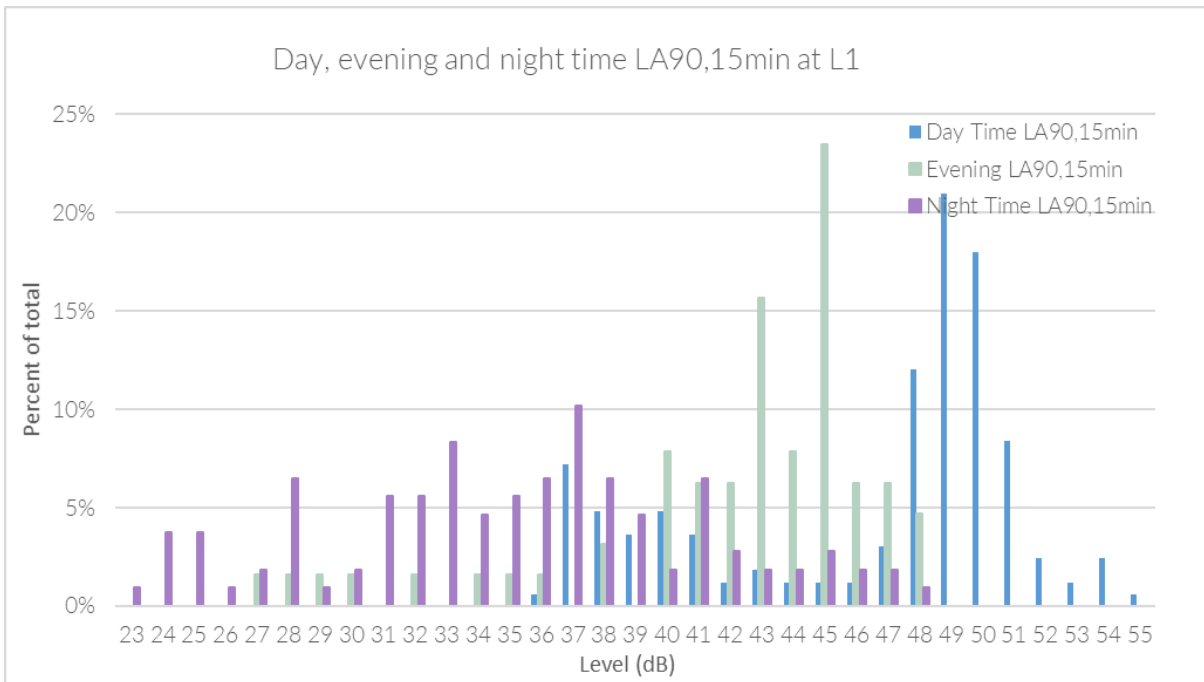


Chart 12.1.1 - Statistical analysis of measured background noise levels at Logger 1 (Elm Grange Farm).

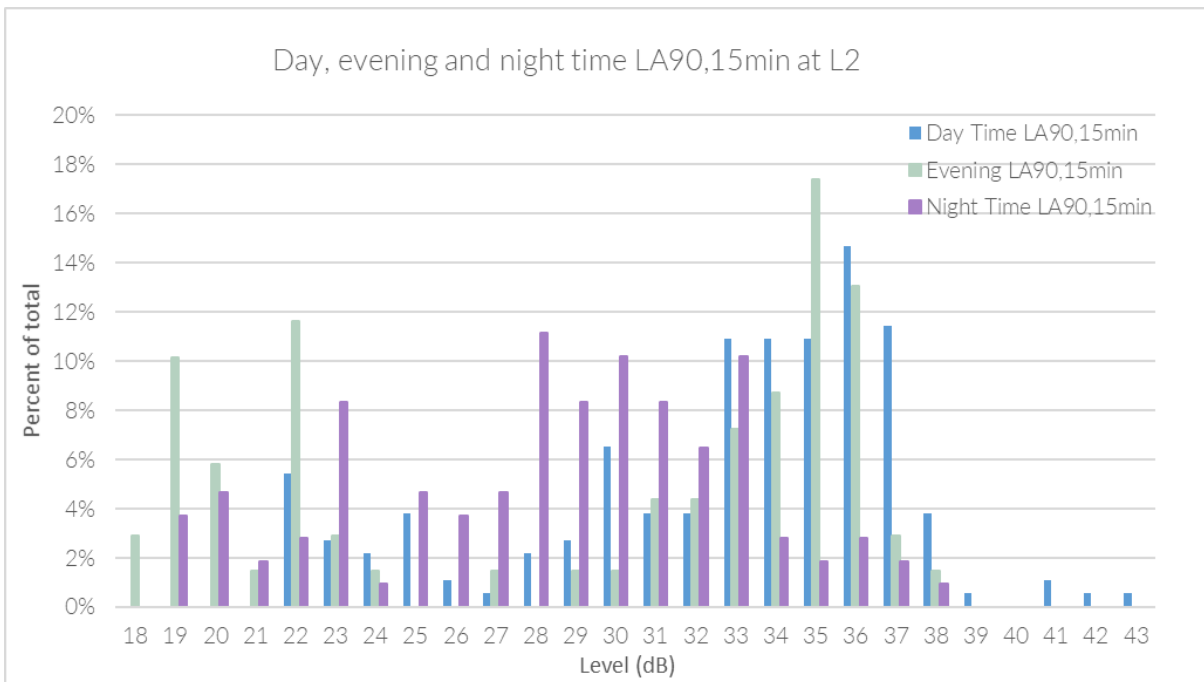


Chart 12.1.2 - Statistical analysis of measured background noise levels at Logger 2 (north-east of Site).

4.4.3 Using the above statistical analysis charts together with the time history charts included in Annex B, given the context of the site, typical lowest common background noise levels have been determined to represent each of the periods of interest. The results are set out in Table 12.1.1 for the unattended measurement positions.

Monitoring Location	LA90, T rep Background Noise Level (dB) measurement period (T) result		
	Day	Evening	Night
L1	49	45	37
L2	33	31	23

Table 12.1.1 - Resultant unattended measurement LA90 background noise levels

4.5 Attended measurements.

4.5.1 Attended noise measurements were carried out at 10 positions, over a 15-minute period per position on 25/02/2022 and 01/03/2022 during day-time hours. The attended measurements carried out were synchronised with the initial pair of unattended loggers' 15-minute measurement intervals.

Attended measurement position ID	Measurement periods start time	Noise level at Attended measurement position (dB)		Unattended background noise level comparison against synchronised attended background noise levels (dB)	
		LA90, 15min	LAeq, 15min	LA90, 15min Noise level at L1 Logger position	LA90, 15min Noise level at L2 Logger position
A1	25/02/2022 14:45	41	65	37	32
A2	01/03/2022 09:30	36	50	38	29
A3	01/03/2022 10:00	30	42	38	32
A4	01/03/2022 10:30	50	54	37	29
A5	01/03/2022 11:00	42	46	38	33
A6	01/03/2022 11:30	34	45	37	30
A7	01/03/2022 13:45	50	56	43	35
A8	01/03/2022 12:00	40	44	37	31
A9	01/03/2022 12:30	37	45	37	30
A10	01/03/2022 13:00	36	57	39	31

Table 12.1.2 - Attended survey results – 15 minute measurements.

5. Historical Background Noise Survey Data

5.1.1 Historical background noise data from previous noise surveys in the area was referenced from the applications for the Heckington Fen Wind Park and the Triton Knoll Onshore Electrical works. These can be considered relevant in relation to the background noise environment, in addition to the above survey, despite the developments which have occurred in the immediate area around the Site since the completion of the historical surveys in 2011 and 2014 respectively.

5.2 Heckington Fen Wind Park

5.2.1 Figure 12.1.1 below (document ref. Heckington Fen Wind Park EIA Chapter 10: Noise, Annex 10.B, March 2011) represents the historical unattended background logger locations, for a background noise survey undertaken for the Heckington Fen Wind Park application, for a measurement period between 29th March 2011 to 12th April 2011.



Figure 12.1.1 – Historical March 2011 Background noise survey locations (blue) and noise sensitive receptor locations (orange) from the Heckington Fen Wind Park application.

5.2.2 The historical L_{A90} (dB) background noise charts from the Heckington Fen Wind Park survey at relevant measurement locations are reproduced in Charts 3 to 16 in Annex C (document ref. Heckington Fen Wind Park Environmental Statement (ES), Chapter 10: Noise, Annex E, March 2011). These can be compared to the 2022 survey results at locations L1 and L2 described above. Loggers L1 and L2 measured existing background noise levels in the north and south areas of the proposed development

respectively, with road traffic noise generally observed as the dominant source to the south of the proposed site and but less present as survey progressed further north. Measurement data during periods of rainfall were excluded. For the purpose of the present analysis, background noise levels during periods within little to low wind speeds (< 5 m/s) are relevant. Charts for daytime periods are representative of evening and weekend periods as detailed in the Heckington Fen Wind Park ES.

- 5.2.3 The northern L2 measurement location is very close to the historical Mill Green Farm (proxy) survey location, and a comparable range of results were obtained in both cases. Table 12.1.1 derives a typical level of 31 L_{A90} (dB) for evening periods whereas lower levels were previously experienced in Chart 12.1.3 for wind speeds below 5 m/s. During night-time periods however the results are closer, with typical measurements below L_{A90} 25 dB in Chart 12.1.4.
- 5.2.4 Logger L1 was positioned towards the north of Elm Grange Farm in the southern-west area of the Site, as shown in **Figure 12.1- Noise Survey Locations** (document reference 6.2.12). Although the 2022 attended measurements (Table 12.1.2) suggest levels are marginally lower at Derwent Cottage, the historical data in Charts 12.1.5 and 6 shows substantially lower levels of around 35 dB for evening periods and below 30 dB for night-time. College Farm (charts 12.1.9 and 10) experienced levels of around 30dB.
- 5.2.5 Historical background noise data was measured in the rear amenity area at 2 Council House in East Heckington, relatively sheltered from the dominant road traffic noise source from the A17. Charts 7 and 8 show the historical evening and night-time L_{A90} background noise data at this location, which are comparable to the typical levels measured at L1 (Table 12.1.1), with typical measurements around 40 dB for quiet day-time periods and on average around 35 dB for the night-time periods, for wind speed conditions below 5 m/s. This is despite L1 being located further away from the A17, but with less screening from the road noise provided by intervening buildings.
- 5.2.6 Comparison of the historical background noise levels suggests that traffic noise levels on the A17 may have increased, as suggested in some of the consultation responses, and the 2022 survey results can be considered in addition to the historical results.

5.3 Triton Knoll Onshore Electrical System

- 5.3.1 Historical background noise surveys supporting application for the Triton Knoll Onshore Electrical System works were undertaken at Drove Farm and White House Barn in June 2014 (locations illustrated on **Figure 12.1- Noise Survey Locations** (document reference 6.2.12)). Table 12.1.3 below summarises the typical L_{A90} (dB) background noise levels determined in line with BS-4142 methodology, as set out in Table 1 in the Triton Knoll Onshore Electrical System Baseline Noise Report (Annex 11.1 of the Triton Knoll Electrical System Environmental Statement (ES), dated 11/12/2014).

Measurement Location	Typical Background Noise Levels (dB)			
	Daytime (07:00 to 23:00)		Night-time (23:00 to 07:00)	
	L _{A90}	L _{Aeq}	L _{A90}	L _{Aeq}
Drove Farm	35	50	28	42
White House Barn	34	48	31	48

Table 12.1.3 - Historical background noise levels at noise sensitive receptors relevant to the proposed development, from the Triton Knoll Electrical System ES

Annex A: Acoustic survey equipment & photos.

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	331833	12/05/2021
Pre-amplifier	Rion NH-25	21784	12/05/2021
Microphone	Rion UC-59	4900	12/05/2021

Table 12.1.B1 – Logger 1 – Unattended survey

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	832245	30/09/2021
Pre-amplifier	Rion NH-25	32273	30/09/2021
Microphone	Rion UC-59	05472	30/09/2021

Table 12.1.B1 – Logger 2 – Unattended survey

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	632045	23/11/2021
Pre-amplifier	Rion NH-25	32073	23/11/2021
Microphone	Rion UC-59	11317	23/11/2021

Table 12.1.B2 – Sound level meter (SLM) 3 – Attended survey

A field calibration was carried out at the start and end of the measurements, using:

Equipment	Type	Serial Number	Last Calibrated
Calibrator	Rion NC-74	34172706	14/06/2021

Table 12.1.B3 – Calibrator



Figure 12.1.B1 - 2022 survey - Unattended position L1 (Elm Grange Farm)



Figure 12.1.B2 - 2022 survey - Unattended position L1 (Mill Green Farm proxy)



Figure 12.1.B3 – SLM 3 – Position A1



Figure 12.1.B1 – SLM 3 – Position A2



Figure 12.1.B5 – SLM 3 – Position A3



Figure 12.1.B6 - SLM 3 - Position A4



Figure 12.1.B7 - SLM 3 - Position A5



Figure 12.1.B8 - SLM 3 - Position A6



Figure 12.1.B9 – SLM 3 – Position A7



Figure 12.1.B10 – SLM 3 – Position A8



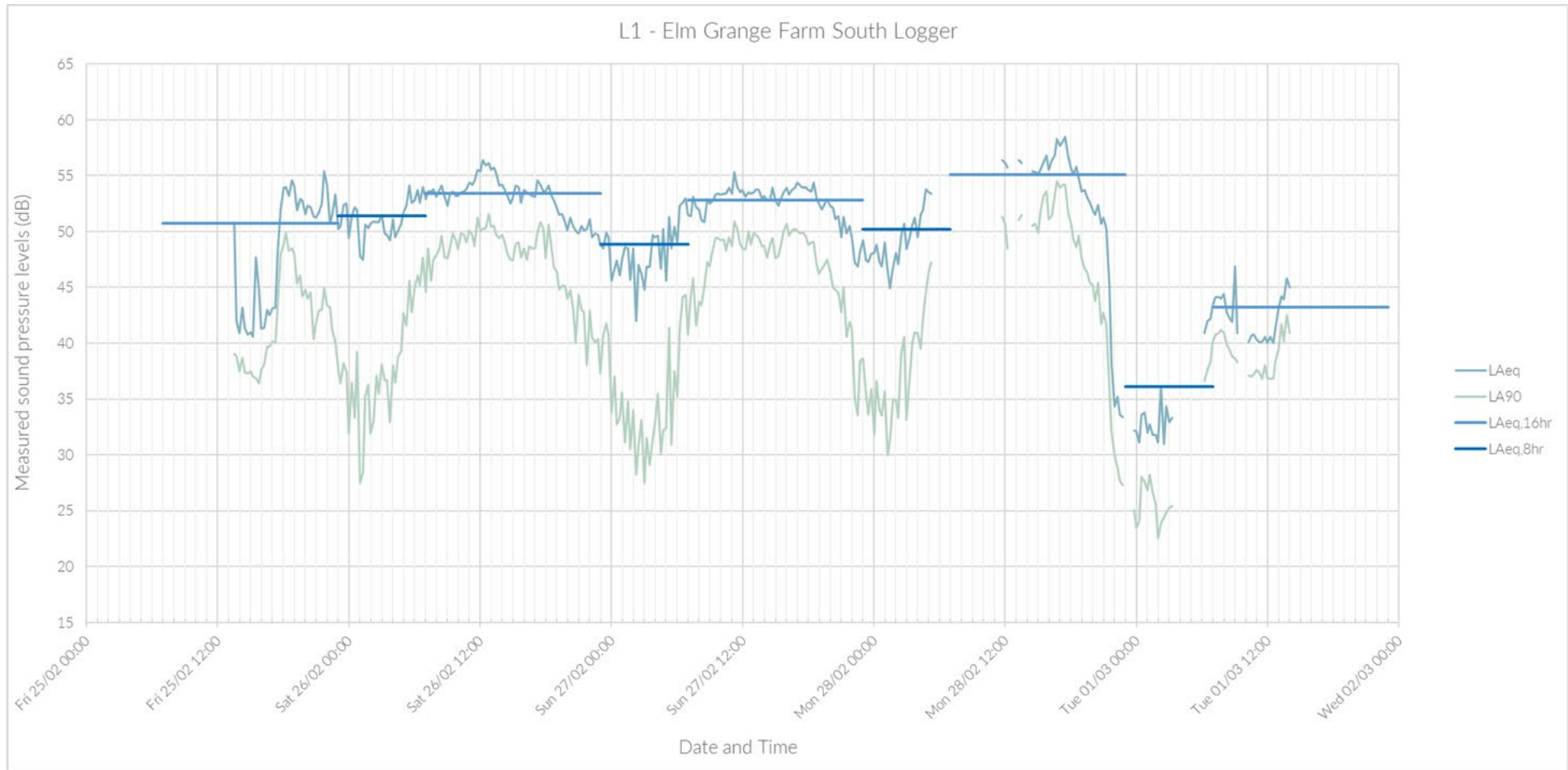
Figure 12.1.B11 - SLM 3 – Position A9



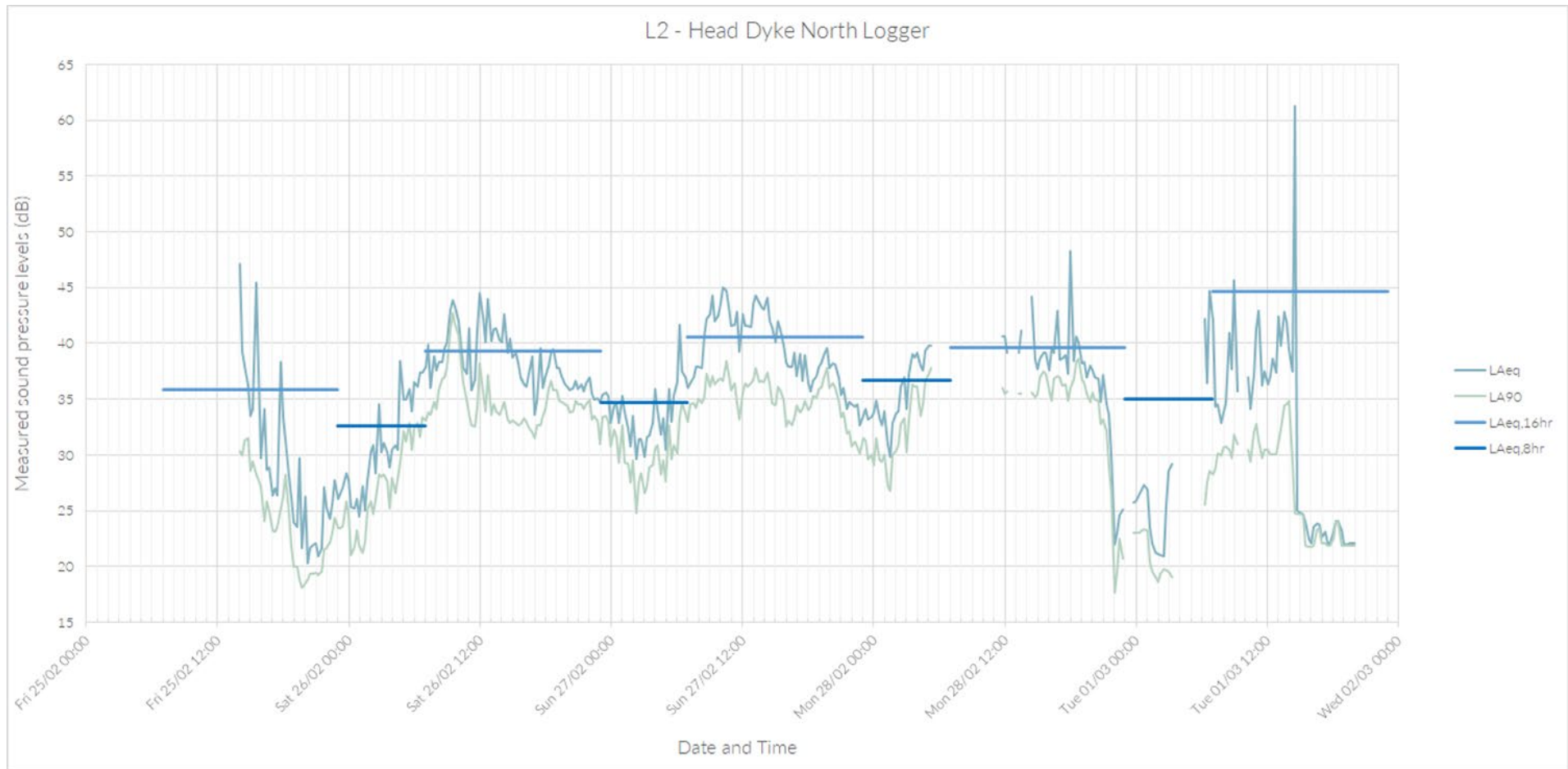
Figure 12.1.B12 – SLM 3 – Position A10

Annex B: Time history chart.

B.1 Unattended measurement position L1 (Elm Grange Farm)



B.2 Unattended measurement position L2 (Mill Green Farm proxy)



Annex C: Historical background noise data charts

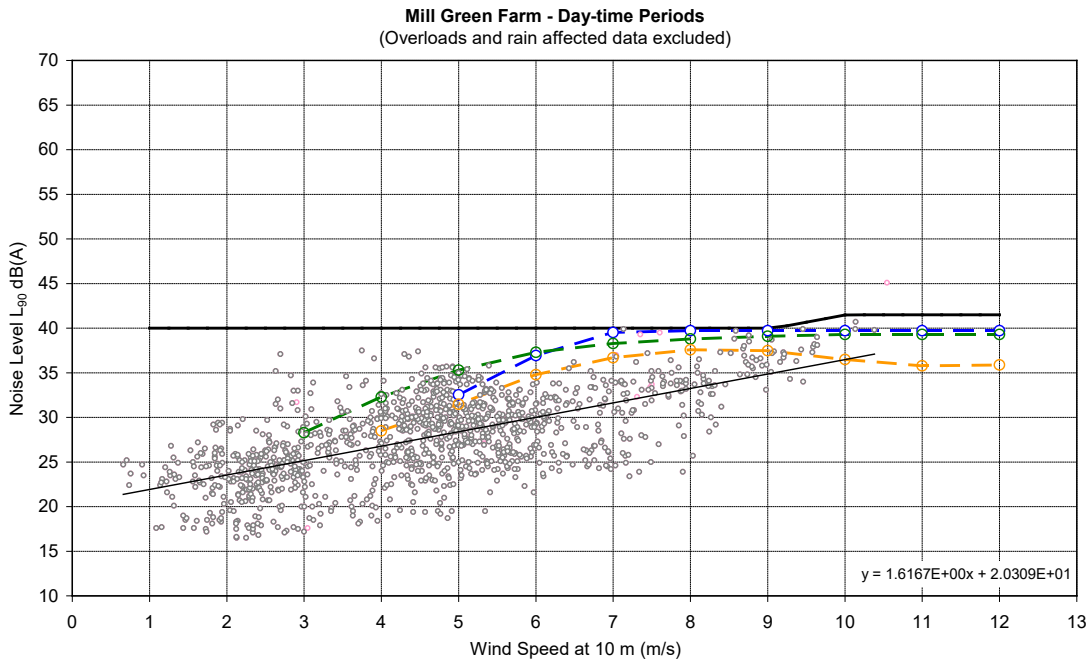


Chart 12.1.3 - Historical Mill Green Farm (proxy) daytime background noise data

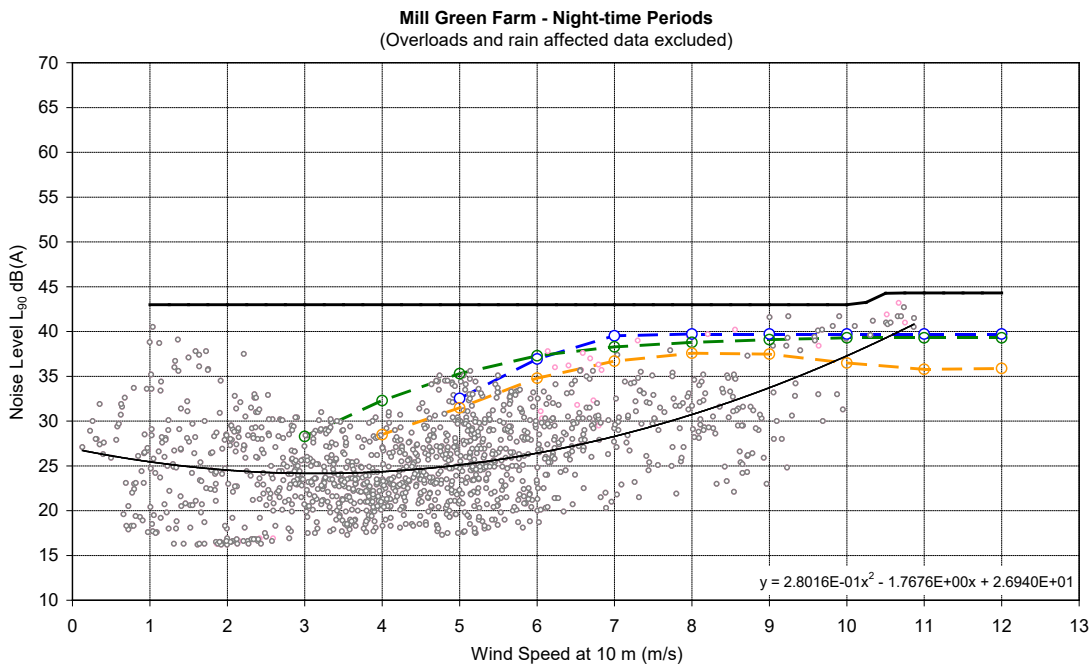


Chart 12.1.4 - Historical Mill Green Farm (proxy) night-time background noise data

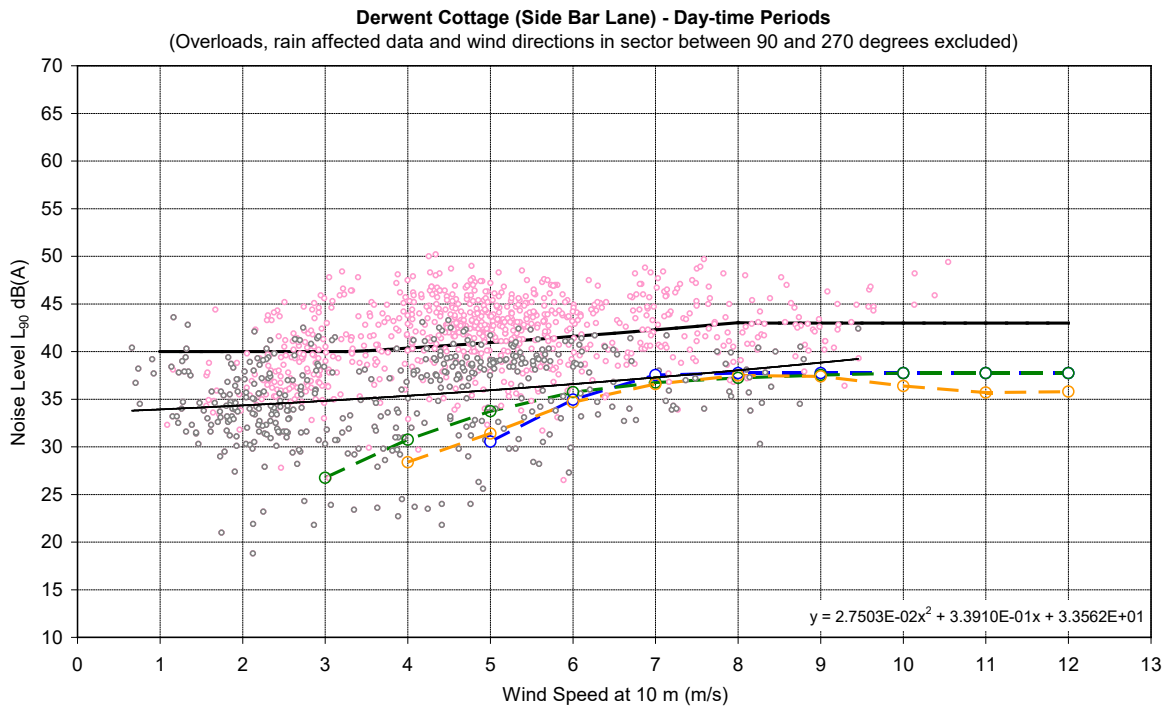


Chart 12.1.5 - Historical Derwent Cottage daytime background noise data

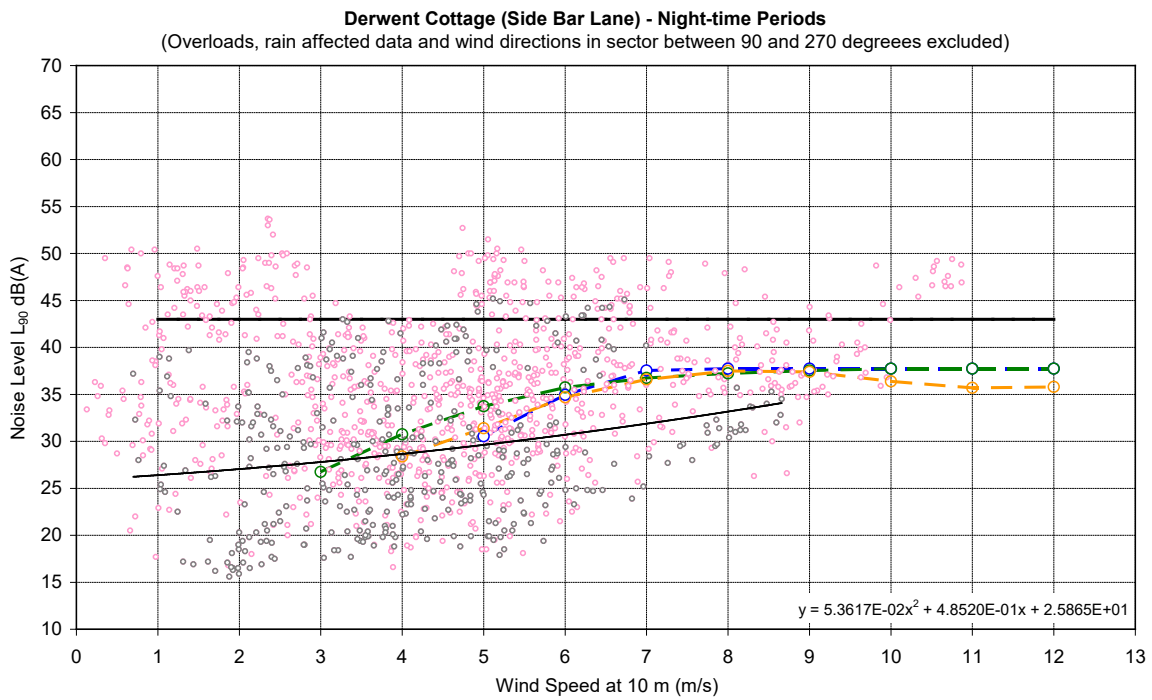


Chart 12.1.6 - Historical Derwent Cottage night-time background noise data

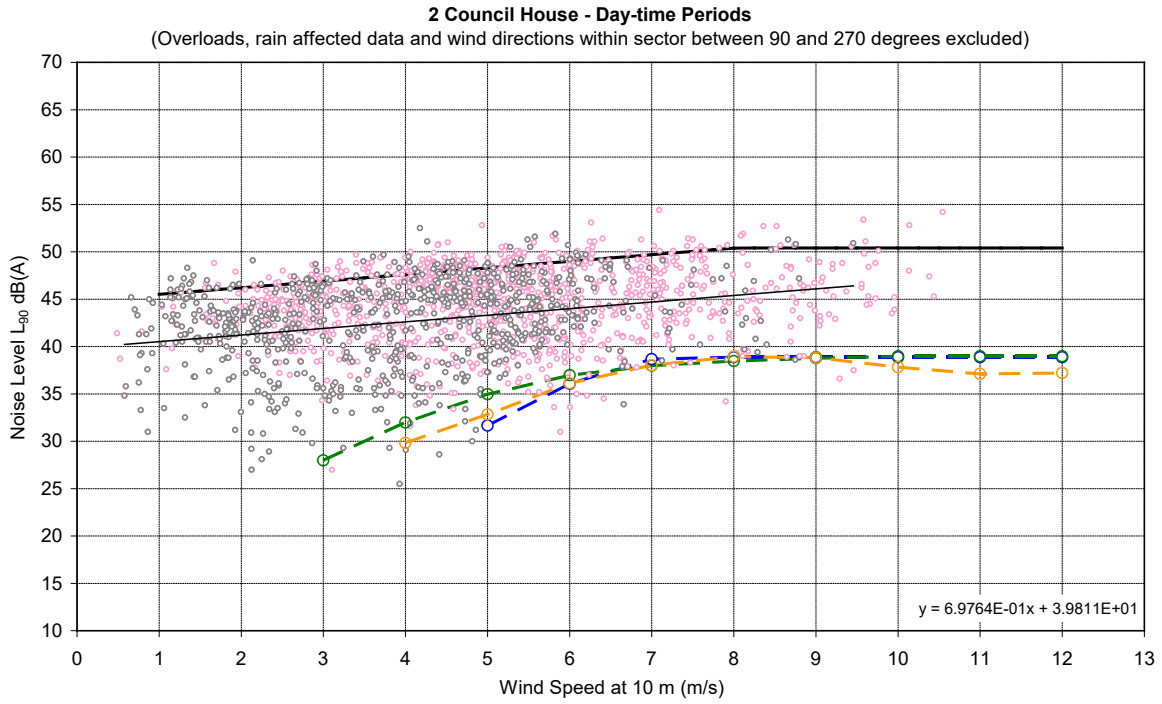


Chart 12.1.7 - Historical 2 Council House daytime background noise data

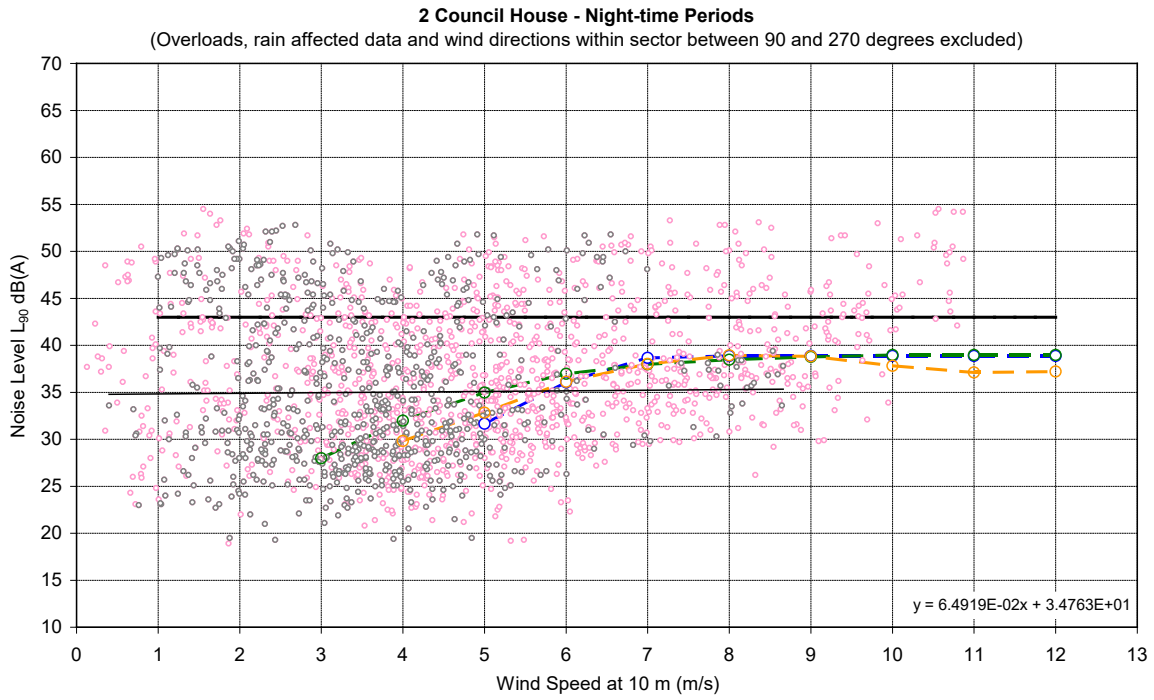


Chart 12.1.8 - Historical 2 Council House night-time background noise data

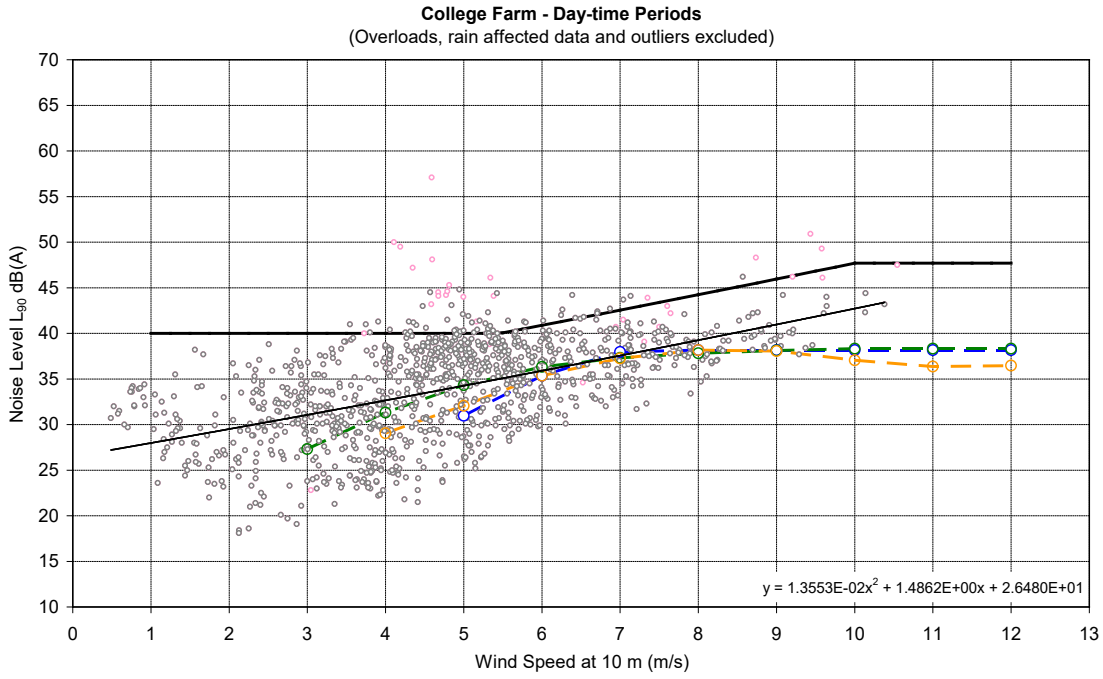


Chart 12.1.9 - Historical College Farm daytime background noise data

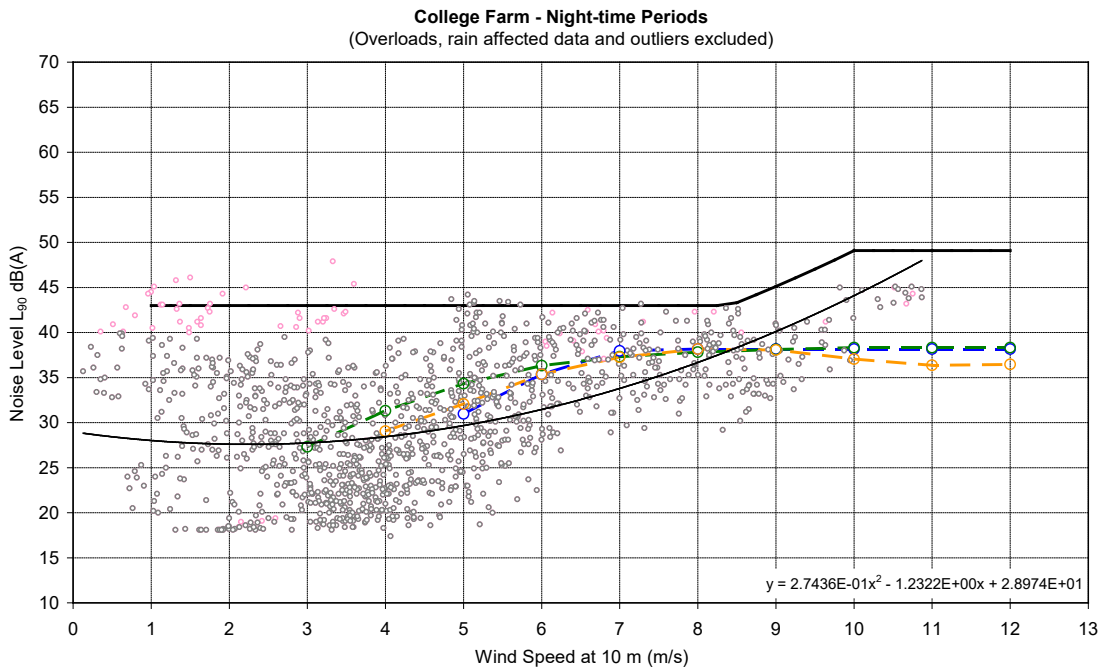


Chart 12.1.10 - Historical College Farm night-time background noise data

The Old Church - Day-time Periods
 (Overloads, rain affected data and outliers excluded)

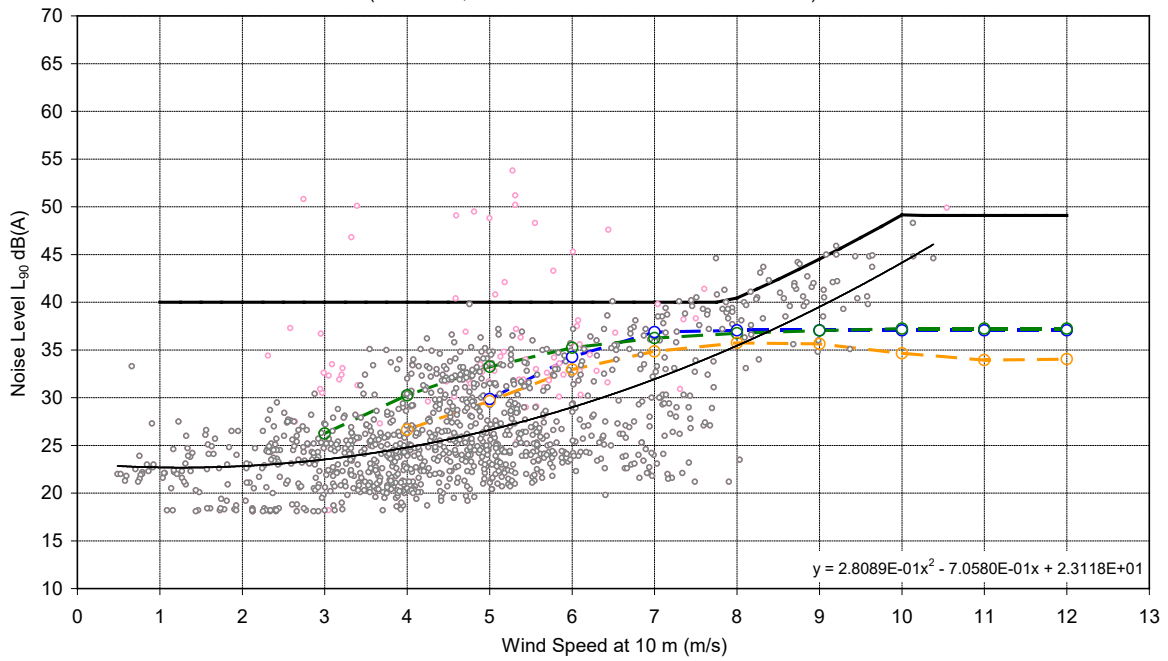


Chart 12.1.11 - Historical The Old Church daytime background noise data

The Old Church - Night-time Periods
 (Overloads and rain affected data excluded)

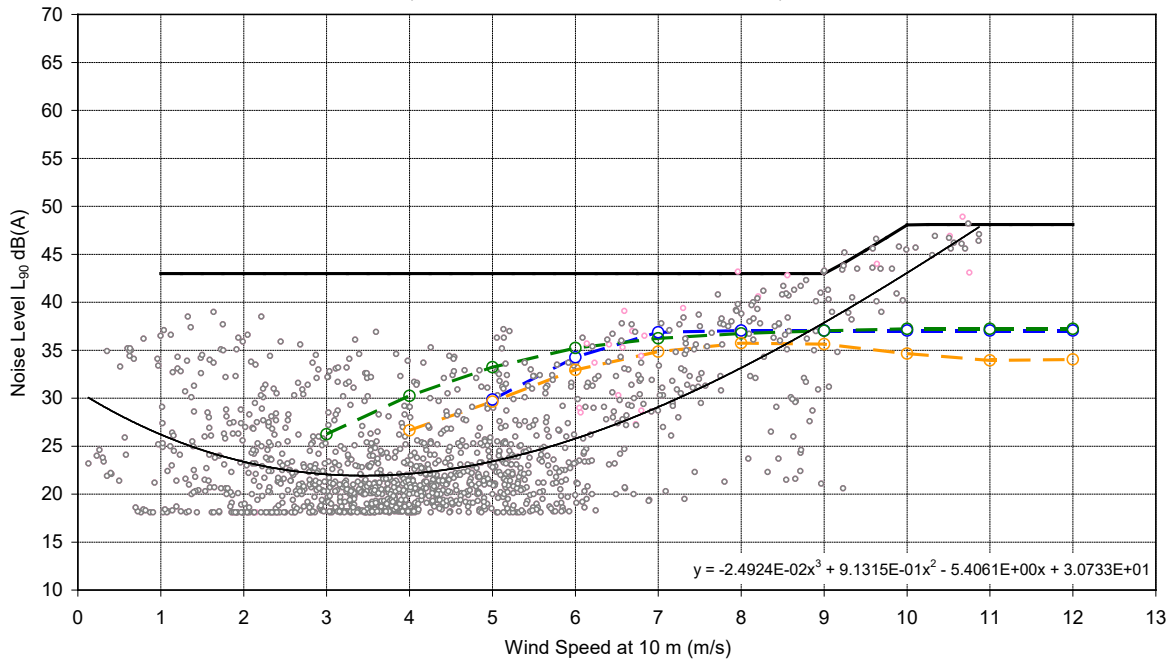


Chart 12.1.12 - Historical The Old Church daytime background noise data

Glebe Farm - Day-time Periods
(Overloads and rain affected data excluded)

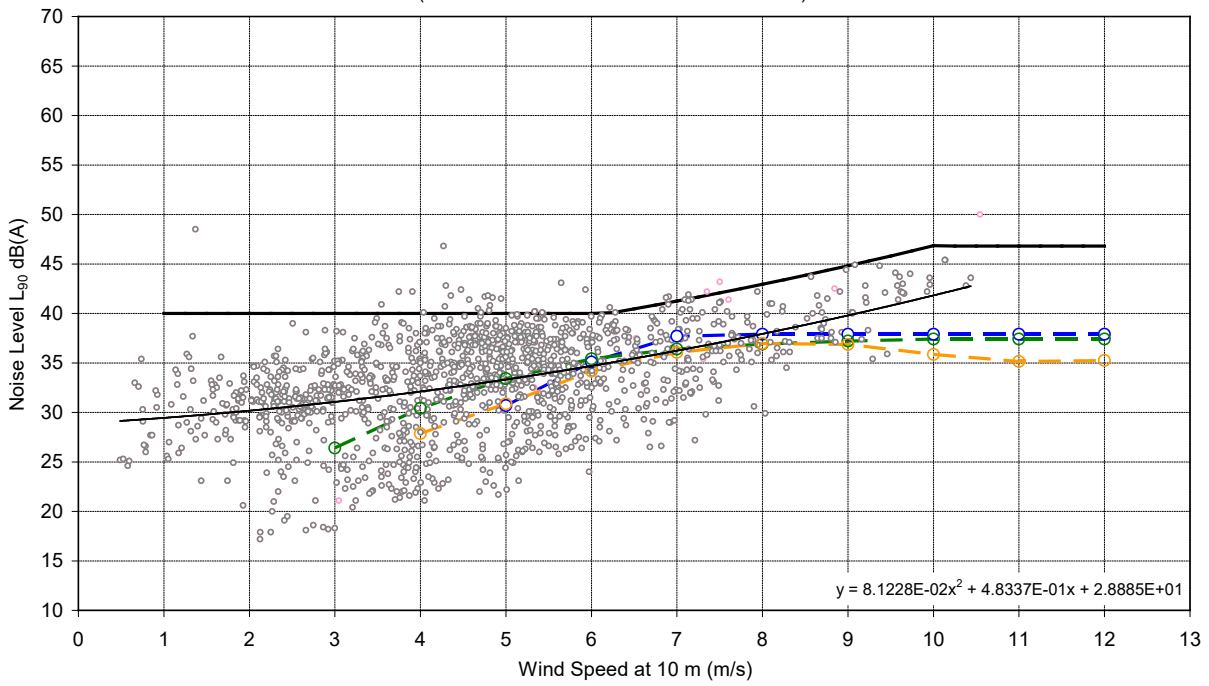


Chart 12.1.13 - Historical Glebe Farm daytime background noise data

Glebe Farm - Night-time Periods
(Overloads and rain affected data excluded)

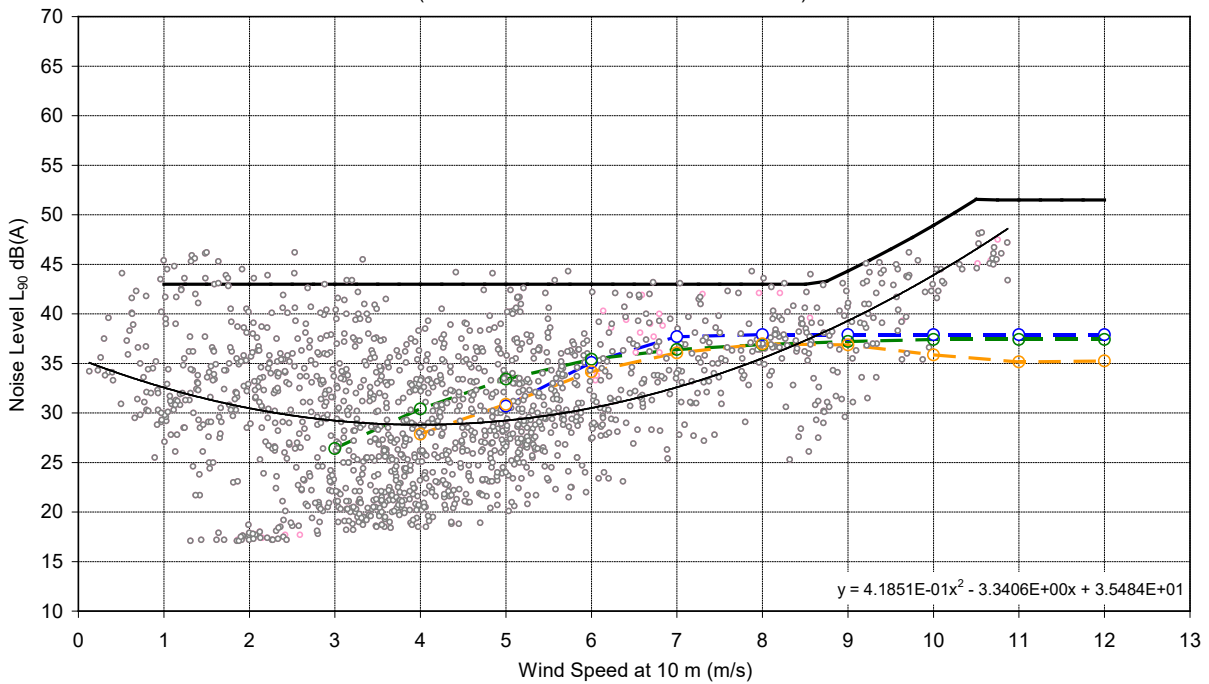


Chart 12.1.14 - Historical Glebe Farm night-time background noise data

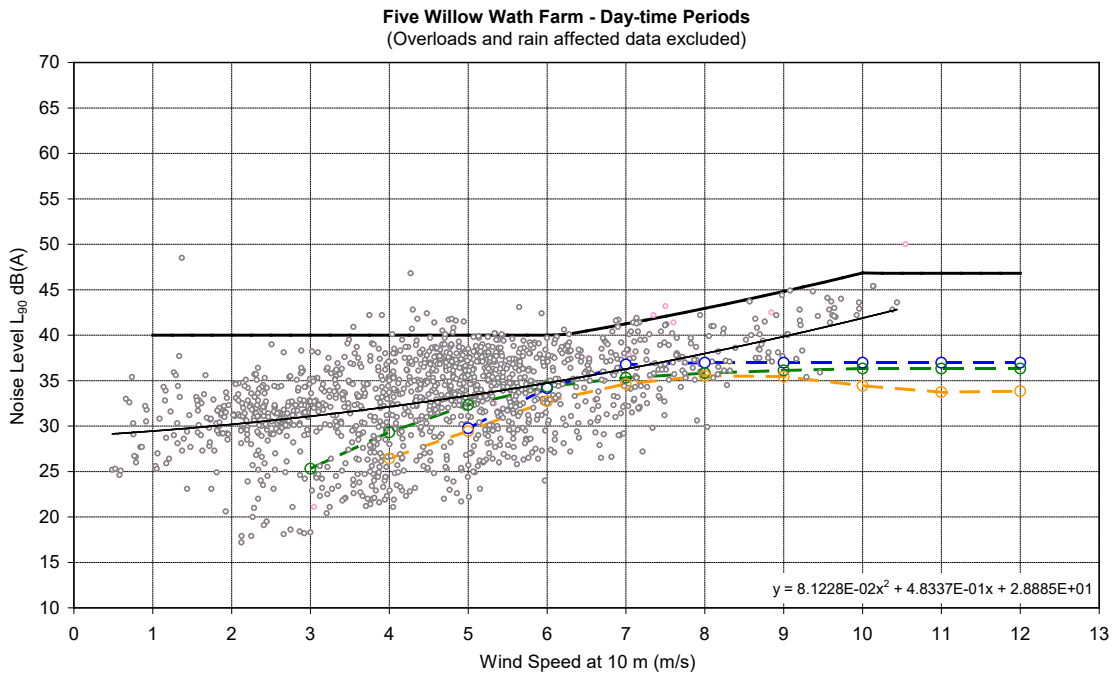


Chart 12.1.15 - Historical Five Willow Wath Farm daytime background noise data

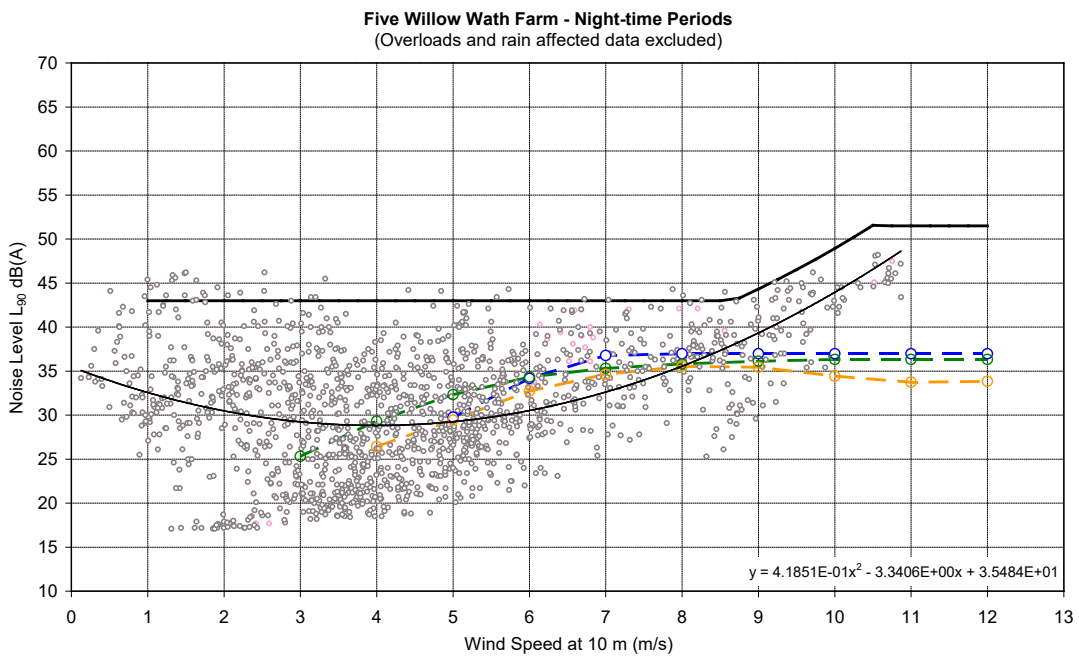


Chart 12.1.16 - Historical Five Willow Wath Farm night-time background noise data