Appendix 9.6

Baseline Noise Survey Directional Analysis

SCOTTISHPOWER RENEWABLES

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9.1 Baseline Noise Survey Directional Analysis

1. The Department of Trade and Industry's ETSU-R-97 document: *The assessment and rating of noise from windfarms* (ETSU-R-97), and the Institute of Acoustics': *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* (IoA GPG) require that the baseline noise levels on which the operational windfarm assessment is undertaken do not include the contribution of noise from any existing windfarms or wind turbines.

2. In the case of the Proposed Development, the adopted noise measurement locations are at significant distances from the closest existing wind turbines. As such, the contribution of noise from existing wind turbines is not considered to be an issue. Notwithstanding this, to confirm no significant contribution, a directional analysis has been undertaken for Measurement Location C, Genoch Cottage (the closest measurement location to the operational Dersalloch Windfarm), and for Measurement Location F, Doughty Farm (the closest measurement location to the operational Hadyard Hill Windfarm).

3. The approach to the completed directional assessments has been:

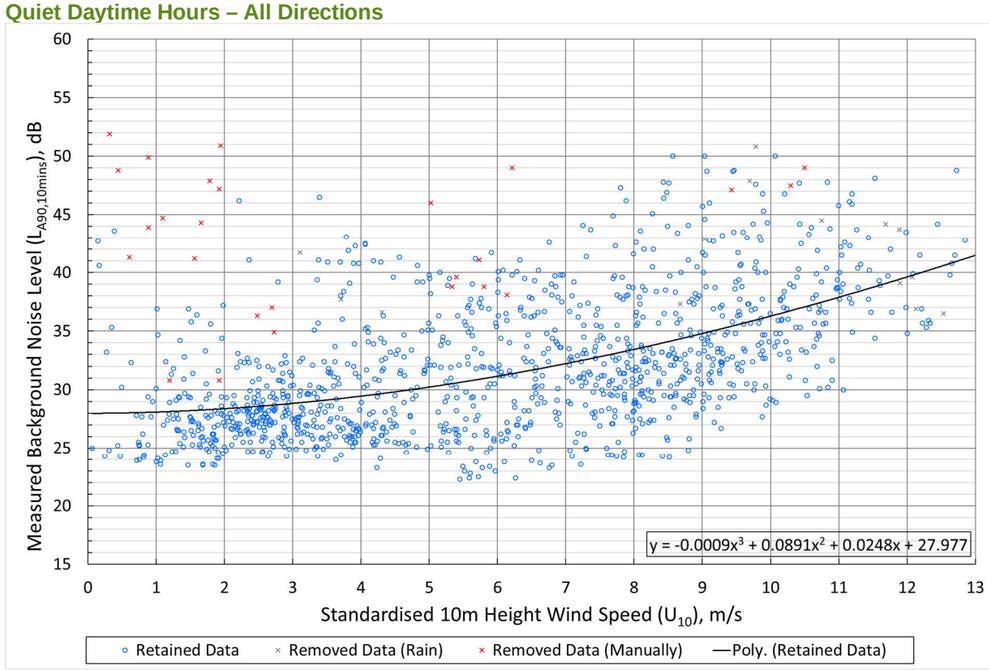
   - to determine the angle within which the receptor in question would be upwind of the existing windfarm under consideration (N.B. under upwind conditions, any noise from the existing windfarm (if present) will be substantially reduced);
   - for the quiet daytime periods, analyse the measured baseline data to determine the relationship between windspeed and background levels based on the data obtained for all wind directions;
   - repeat point two above for just upwind conditions;
   - compare the results of points two and three for integer wind speeds between three (a conservative windfarm cut-in speed and 10m/s (speed at which windfarm noise levels will typically be at their maximum/have plateaued); and
   - repeat steps two to four for the night-time period.

4. Where significantly lower noise levels are identified under upwind conditions, it can be considered that there is the potential for noise from the considered cumulative development to have contributed to the overall measured baseline noise levels.

9.2 Measurement Location C, Genoch Cottage

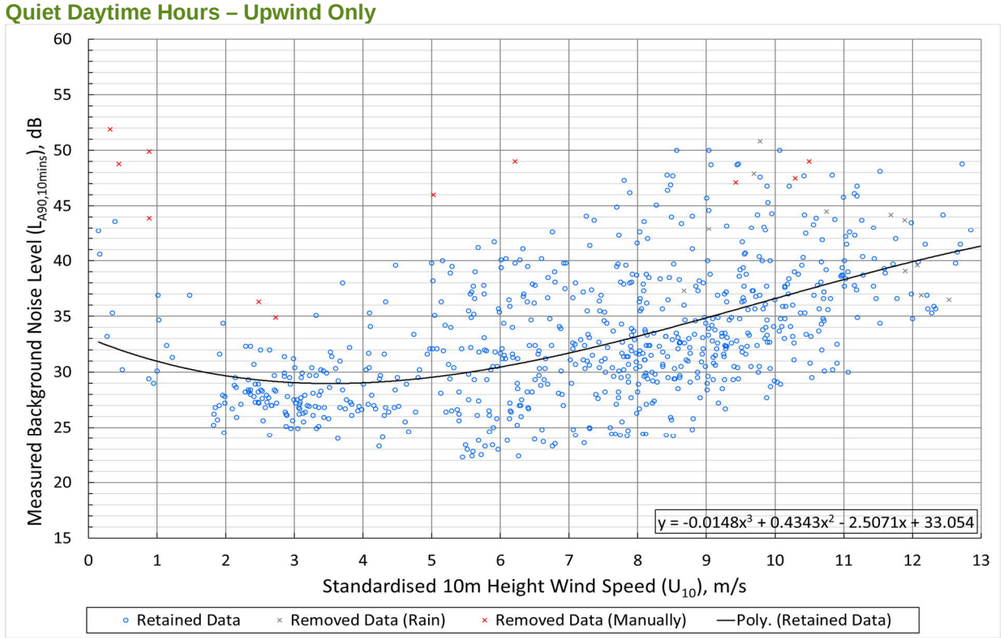
5. Dersalloch Windfarm is located in a general north-north-easterly direction from Measurement Location C, with the closest existing wind turbine at a distance of greater than three kilometres (km). Upwind conditions have been identified to be within the angle 150° to 283° for this measurement location. The results of the directional analysis for this receptor are presented in **Graphs 9.6.1 to 9.6.4** and **Table 9.6.1 and Table 9.6.2** below, with a summary presented beneath.

Quiet Daytime Hours – All Directions



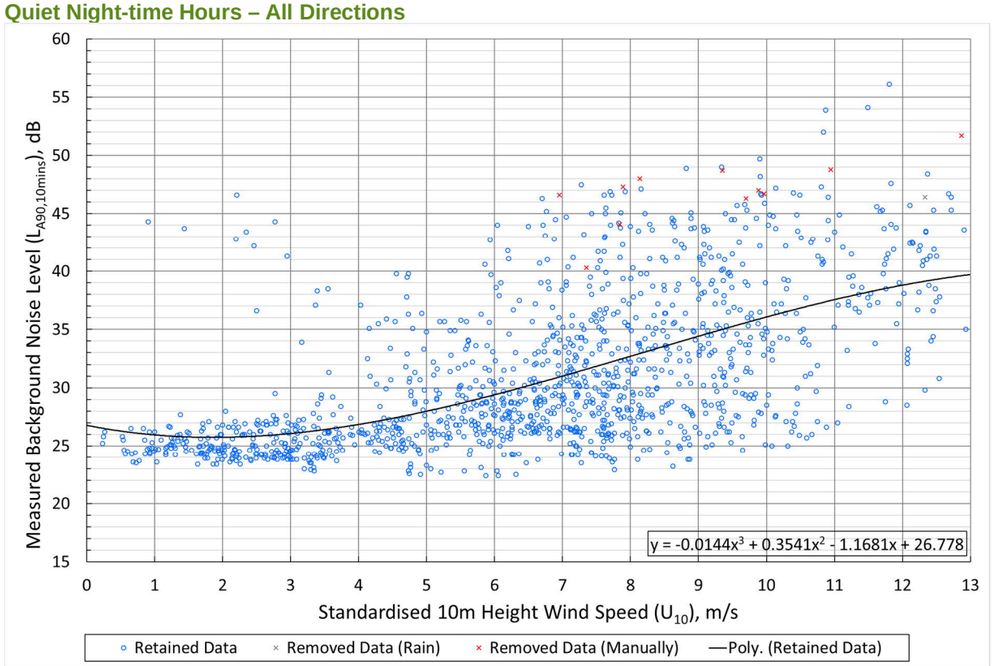
Graph 9.6.1 Location C Genoch Cottage – Quiet Daytime Background Noise (dB(A)) Versus Wind Speed (m/s) – All Wind Directions

Quiet Daytime Hours – Upwind Only



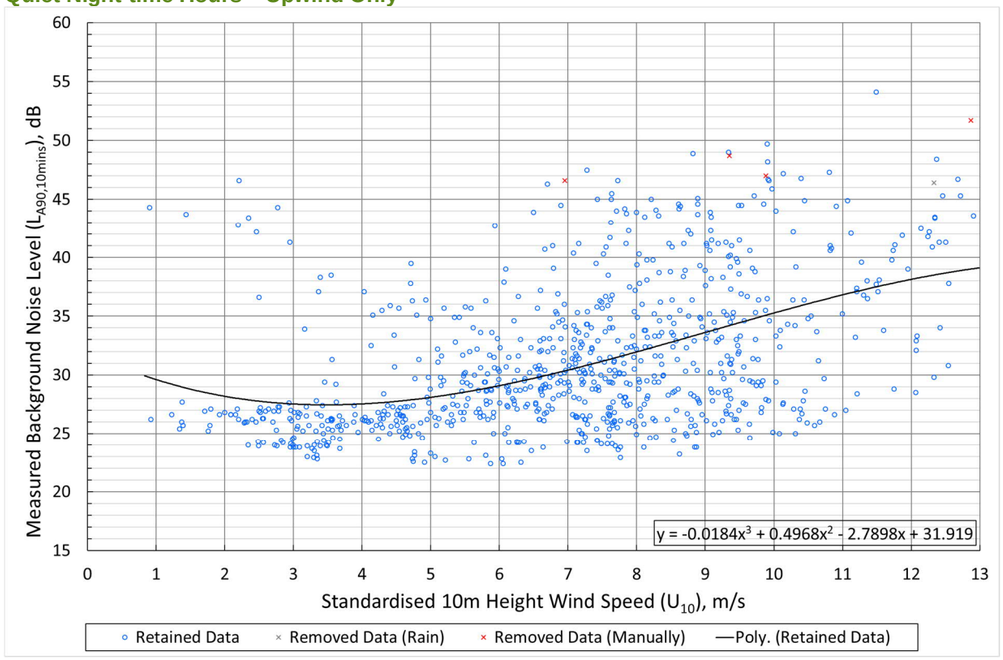
Graph 9.6.2 Location C Genoch Cottage – Quiet Daytime Background Noise (dB(A)) Versus Wind Speed (m/s) – Upwind Directions Only

Quiet Night-time Hours – All Directions



Graph 9.6.1 Location C Genoch Cottage – Night-time Background Noise (dB(A)) Versus Wind Speed (m/s) – All Wind Directions

Quiet Night-time Hours – Upwind Only



Graph 9.6.2 Location C Genoch Cottage – Night-time Background Noise (dB(A)) Versus Wind Speed (m/s) – Upwind Directions Only

Period	Wind Speed Referenced to 10m Height (Standardised U_{10}), m/s									
	3	4	5	6	7	8	9	10	11	12
All Directions [A]	28.8	29.4	30.2	31.1	32.2	33.4	34.8	36.2	37.8	39.5
Upwind Only [B]	29.0	29.0	29.5	30.4	31.7	33.2	34.9	36.6	38.3	39.9
Difference [A-B = C]	-0.2	0.4	0.7	0.7	0.5	0.2	-0.1	-0.4	-0.5	-0.4

Table 9.6.1 Location C Genoch Cottage - Quiet Daytime Contribution Check

Period	Wind Speed Referenced to 10m Height (Standardised U_{10}), m/s									
	3	4	5	6	7	8	9	10	11	12
All Directions [A]	26.1	26.8	28.0	29.4	31.0	32.7	34.4	36.1	37.6	38.9
Upwind Only [B]	27.5	27.5	28.1	29.1	30.4	32.0	33.6	35.3	36.9	38.2
Difference [A-B=C]	-1.5	-0.7	-0.1	0.3	0.6	0.7	0.8	0.8	0.8	0.7

Table 9.6.2 Location C Genoch Cottage - Night-time Contribution Check

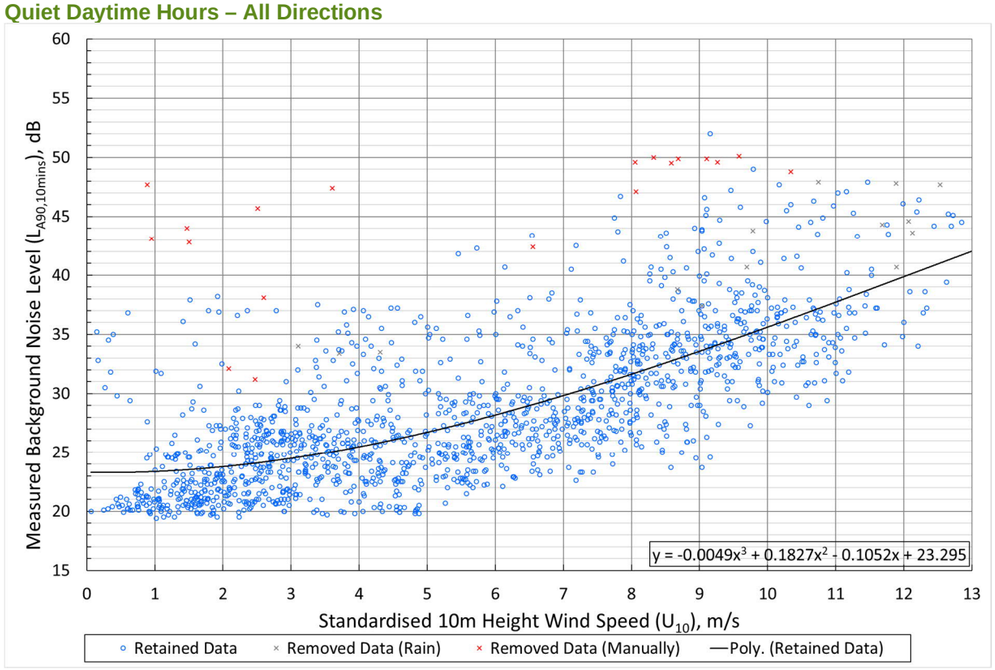
9.2.1 Genoch Cottage Summary

8. It can be seen from **Table 9.6.1** and **Table 9.6.2** above that noise levels under upwind conditions remain within 1dB of those identified for all wind conditions. In fact, at some windspeeds (e.g. 9 to 12m/s during the daytime), slightly higher, not lower, noise levels are identified (denoted by [C] values being negative). This confirms that noise from existing windfarms has not made a significant contribution to the measured baseline data. This tallies with surveyor observations made during visits to this location, for which subjective judgement did not identify any windfarm noise contribution.

9.3 Measurement Location F, Doughty Farm

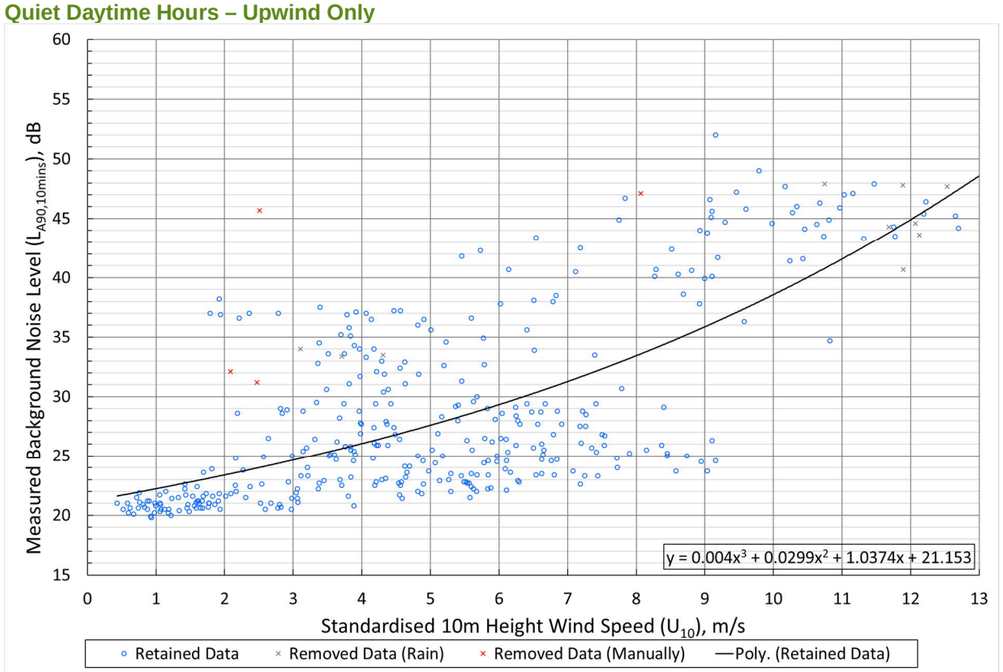
9. Hadyard Hill Windfarm is located in a general westerly direction from Measurement Location F, with the closest existing wind turbine at a distance of approximately 2.8km. Upwind conditions have been identified to be within the angle 29° to 169° for this receptor. The results of the directional analysis for this receptor are presented in **Graphs 9.6.5 to 9.6.8** and **Table 9.6.3 and Table 9.6.4** below, with a summary presented beneath.

Quiet Daytime Hours – All Directions



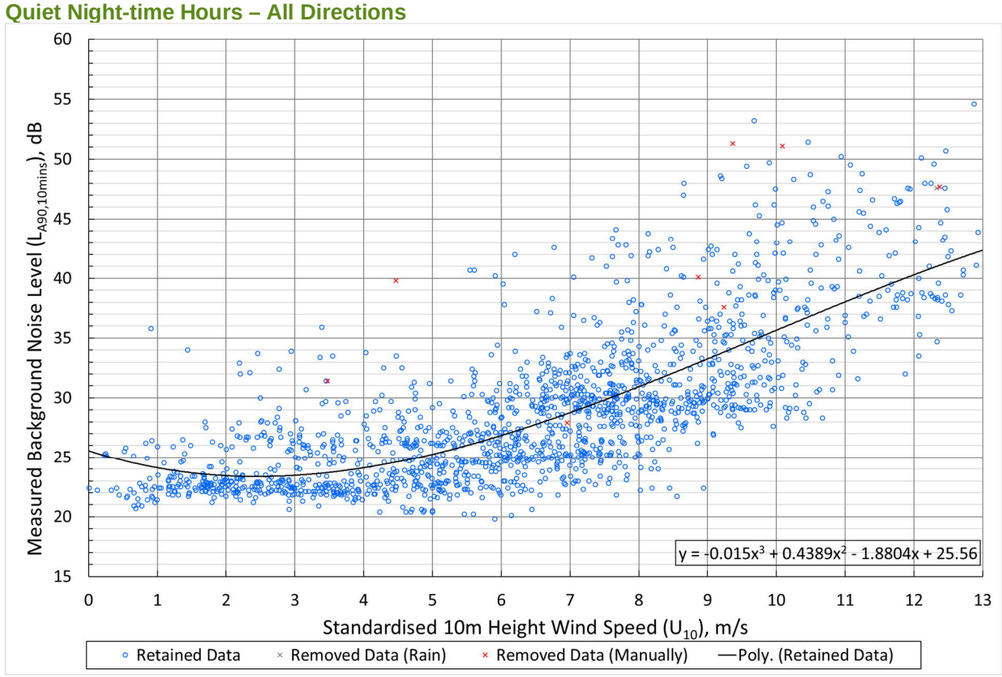
Graph 9.6.5 Location F Doughty Farm – Quiet Daytime Background Noise (dB(A)) Versus Wind Speed (m/s) – All Wind Directions

Quiet Daytime Hours – Upwind Only



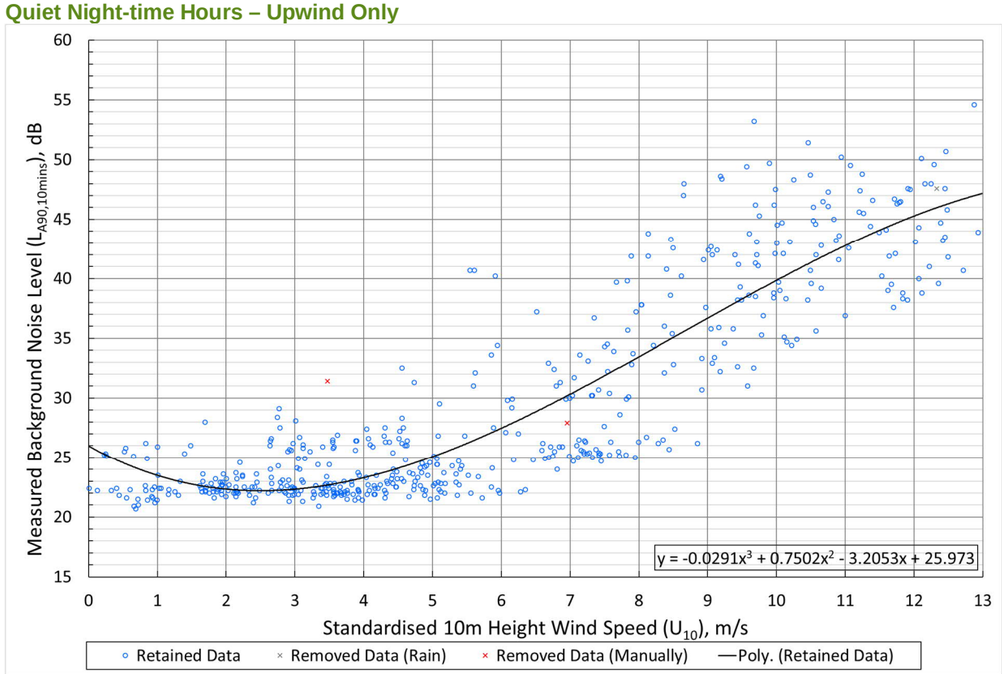
Graph 9.6.6 Location F Doughty Farm – Quiet Daytime Background Noise (dB(A)) Versus Wind Speed (m/s) – Upwind Directions Only

Quiet Night-time Hours – All Directions



Graph 9.6.7 Location F Doughty Farm – Night-time Background Noise (dB(A)) Versus Wind Speed (m/s) – All Wind Directions

Quiet Night-time Hours – Upwind Only



Graph 9.6.8 Location F Doughty Farm – Night-time Background Noise (dB(A)) Versus Wind Speed (m/s) – Upwind Directions Only

Period	Wind Speed Referenced to 10m Height (Standardised U_{10}), m/s									
	3	4	5	6	7	8	9	10	11	12
All Directions [A]	24.5	25.5	26.7	28.2	29.8	31.6	33.6	35.6	37.7	39.9
Upwind Only [B]	24.6	26.0	27.6	29.3	31.3	33.4	35.8	38.5	41.5	44.8
Difference [A-B = C]	-0.1	-0.5	-0.9	-1.1	-1.5	-1.8	-2.2	-2.9	-3.8	-4.9

Table 9.6.3 Location F Doughty - Quiet Daytime Contrition Check

Period	Wind Speed Referenced to 10m Height (Standardised U_{10}), m/s									
	3	4	5	6	7	8	9	10	11	12
All Directions [A]	23.4	24.0	25.1	26.7	28.5	30.6	32.8	35.1	37.4	39.6
Upwind Only [B]	22.3	23.3	25.1	27.5	30.3	33.4	36.7	39.8	42.8	45.3
Difference [A-B=C]	1.1	0.7	0.0	-0.8	-1.8	-2.8	-3.9	-4.7	-5.4	-5.7

Table 9.6.4 Location F Doughty - Night-time Contrition Check

9.3.1 Doughty Farm Summary

12. It can be seen from **Table 9.6.3 and Table 9.6.4** above that noise levels under upwind conditions are identified to be generally higher, not lower when compared to the results for all directions (denoted by [C] values being negative). This confirms that noise from existing windfarms has not made a significant contribution to the measured baseline data. This tallies with surveyor observations made during visits to this location, for which subjective judgement did not identify any windfarm noise contribution.

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