

Elvanfoot. There are a number of wind farms near the Proposed Development, in particular the large-scale Clyde Windfarm to the east consisting of 173 turbines, as well as its extension. The noise environment in the surrounding area to the north and west is generally characterised by ‘natural’ sources, such as wind disturbed vegetation, birds, farm animals, and noise associated with agricultural activities at some farm properties. Other sources of noise include anthropological noise in Leadhills village to the south and intermittent local road and agricultural vehicle movements in the general area.

4.2 Details of the Baseline Background Noise Survey

4.2.1 A total of eight noise monitoring locations, consisting of two new survey location and six historical locations surveyed as part of the Harryburn Windfarm application²², were initially proposed in consultation to the Local Authority as being representative of the background noise environment for the nearest residences to the proposed wind farm site. However, due to access limitation, monitoring at one of the locations (Dentercleuch) could not be undertaken and as such, a representative historical baseline measurement location surveyed as part of the assessment North Lowther Energy Initiative²³ was used to represent this receptor. Therefore, data from seven historical baseline survey positions and one new background survey position (Snar Farm) have been used in this assessment. These locations are shown on the plan in Annex B and listed in Table 3 below, details are also given in Annex C Table C1 and Table C2.

Table 3 - Baseline Locations (approximate Easting / Northing)

No.	Property	Easting	Northing	Baseline Source
1	Douglas Lodge	295585	620699	Historical (Harryburn)
2	76 Dumfries Road	295239	617110	Historical (Harryburn)
3	Glencaple Cottage	292006	621445	Historical (Harryburn)
4	3 Symington Street	288654	615274	Historical (Harryburn)
5	Waterhead Toll Cottage	288879	618153	Historical (Harryburn)
6	South Shortcleugh	292848	616703	Historical (Harryburn)
7	Meadowfoot	286857	613234	Historical (North Lowther)
8	Snar Farm	286298	620062	Survey

4.2.2 The assessment has considered operational noise from the Proposed Development at the monitoring locations noted above, as well as other residential properties: these assessment locations are listed in Table 4. The list of receptor locations is not intended to be exhaustive but sufficient to be representative of noise levels typical of those receptors closest to the Proposed Development.

4.2.3 The results obtained from the survey positions listed in Table 3 have been used to represent the background environment expected to occur at other nearby assessment locations. The use of the data in this way is justified by similarity in the nature of the terrain and the dominant influence of ‘natural’ sources on background noise levels throughout the area (particularly at increased wind speeds). This approach is consistent with the guidance provided by ETSU-R-97 and current good practice as set out in the IOA GPG. Locations where such representations have been made, and the source of the representations, are represented in Table 4.

²² ECU00005277 - Harryburn Wind Farm Environmental Statement – Chapter 15: Noise – Technical Assessment 2: Noise & Vibration
²³ ECU00000426 - Noth Lowther Energy Initiative Environmental Statement – Chapter 11: Noise – Technical Appendix 11.2: Operational Noise Assessment

4.2.4 The assessment properties are also presented in Figure 10.1: Noise Assessment Locations and Noise Contours. These properties have been selected based on their location relative to the Proposed Development and other windfarms in the area. Figure 10.1 presents noise contours (at 10 m/s windspeed) from the Proposed Development and yellow shaded area where cumulative contributions are expected from other wind farms in combination with the Proposed Development. Properties within the grey shaded area (and outside the 35 dB(A) contour) are not included in the assessment as noise contributions from the Proposed Development are negligible at these locations (predicted noise levels are less than 35 dB(A), and 10 dB below noise levels from other wind farms). Green shade illustrates the area where the Proposed Development is dominant i.e., 10 dB above other windfarm predicted levels. Therefore, the assessment properties below are representative of all receptors in the area where the Proposed Development would have impact in isolation (properties within the green shaded area and 35 dB(A) contour) and cumulatively (properties within yellow shaded area).

Table 4 - Assessment properties in the vicinity of the proposed development

Property	Easting	Northing	Approximate Distance to Closest Turbine (m)	Closest Turbine (ID)	Survey Location
Lettershaws Farm	290245	620613	1800	T13	Waterhead Toll Cottage
Kirkton	293303	620959	1550	T10	Douglas Lodge
Glencaple Farm House	292048	621176	1650	T9	Glencaple Cottage
Glencaple	292118	621296	1780	T9	Glencaple Cottage
Boghead	294490	620593	2100	T10	Douglas Lodge
Carlisle Road North	294878	620663	2450	T11	Douglas Lodge
Hurlieburn Lodge	295436	620450	2780	T11	Douglas Lodge
Carlisle Road South	295915	620033	3040	T11	Douglas Lodge
Stoneyburn	296221	619519	3220	T11	Douglas Lodge
Elvanfoot Farm	295097	617828	2390	T11	76 Dumfries Road
Lodge Cottages	295292	617598	2680	T11	76 Dumfries Road
Leadhills Road	294978	617344	2580	T11	76 Dumfries Road
North Shortcleugh (FI)	292805	617366	920	T16	South Shortcleugh
South Shortcleugh	292830	616761	1360	T16	South Shortcleugh
Hass	290008	615252	2180	T21	Waterhead Toll Cottage
Waterhead Toll Cottage	288884	618129	670	T2	Waterhead Toll Cottage
New Glendorch	288813	617747	830	T2	Waterhead Toll Cottage
Glengeith	295230	616909	3060	T11	76 Dumfries Road
Leadhills	288736	615412	1990	T8	3 Symington Street
Leadhills (south)	288386	614587	2230	T8	3 Symington Street
Dentercleuch	284867	615397	2220	T7	Meadowfoot (NLEI)
Snar Farm	286311	620077	2000	T1	Snar Farm
Glendouran Farm	287493	620975	2060	T1	Snar Farm
Strancleugh Farm	286799	621094	2430	T1	Snar Farm

(FI) Financially involved with the Proposed Development

- 4.2.5 The background noise monitoring survey at Snar Farm was conducted over a period of just over four weeks between May and July 2025. The equipment used for the survey comprised one Rion NL-52 logging sound level meter. The meter was enclosed in environmental cases with battery power to enable 15 days of continuous logging at the required ten-minute averaging periods. Outdoor enhanced windshield system was used to reduce wind induced noise on the microphones and provide protection from rain. These windshield systems were supplied by the sound level meter manufacturer and maintain the required performance of the whole measurement system when fitted. The environmental enclosures provided an installed microphone height of approximately 1.2 to 1.5 metres (m) above ground level, consistent with the requirements of ETSU-R-97.
- 4.2.6 The sound level meter was located on the wind farm side of the property in question where possible, never closer than 3.5 m from the façade of the property and as far away as was practical from obvious atypical, localised sources of noise, such as running water, trees or boiler flues. Details and photographs of the measurement locations are presented in Annex C.
- 4.2.7 The measurement system was calibrated on their deployment on 29th of May and upon collection of the equipment on the 1st of July. No acoustically important (>0.5 dB(A)) drifts in calibration were found to have occurred on the system. This equates to a total ETSU-R-97 analysis period of at least 33 days at the location, which is in excess of the minimum of one week suggested by ETSU-R-97 and is compliant with the IOA GPG requirements.
- 4.2.8 The measurement system was set to log the $L_{A90,10min}$ and $L_{Aeq,10min}$ noise levels continuously over the deployment period. The internal clock on the sound level meter was synchronized with Greenwich Mean Time (GMT) using an online time service²⁴. The clock on the met mast from which wind data was subsequently collected for the analysis of the measured background noise as function of wind speed was also set to GMT.
- 4.2.9 Historical measurements for the Harryburn surveys were undertaken using Rion NL-31 and NL-52 sound level meters from 5th May to 22nd June 2016 with a minimum of 45 days of measurement for all locations except Elvanfoot, which was measured over a duration of 11 days. Historical data at the Meadowfoot location was taken from the North Lowther Energy Initiative survey using similar equipment specifications. This survey was undertaken from March to May 2016 over a minimum of 40 days duration. All historical data was stated to be compliant with the IOA GPG requirements in their respective assessments.
- 4.3 Measured Background Noise Levels
- 4.3.1 The ETSU-R-97 assessment method requires noise data to be related to wind speed data at a standardised height of ten metres, with wind speeds either directly measured at a height of ten metres or by calculation from measurement at other heights, the appropriate choice being determined by practitioner judgement and the available data sources. Since the publication of ETSU-R-97, the change in wind speed with increasing height above ground level has been identified as a potential source of variability when carrying out wind farm noise assessments. The effect of site-specific wind shear can be appropriately addressed by implementing the ETSU-R-97 option of deriving ten metre height reference data from measurements made at taller heights. It is this method that has been used in the noise assessment for the Proposed Development to account for the potential effect of site-specific wind shear. This method is consistent with the preferred method described in the IOA GPG. Wind speeds were measured on a LIDAR system at 129 m and 89 m heights located within the boundary of the development site (approximate 288125/617371 easting/northing). Values of wind speed at a standardised height of ten metres were calculated from those measured on the LIDAR (“standardised wind speed”). Full details of the calculation method are given in Annex F.

²⁴ Globally accurate time website for receiver locations: <https://time.is>

- 4.3.2 Figures D1 and D2 reproduced at Annex D show the range of wind conditions experienced during the noise survey period. During the quiet day-time and night-time periods wind speeds of up to 17 m/s were measured. The wind was observed to be directed mainly from the south and south-west for most of the survey period, consistent with the typical prevailing wind direction for the UK, with other periods of southeast and westerly wind.
- 4.3.3 Figures E1 to E18 of Annex E show the results of the background noise measurements at Snar Farm and derived background trendline for the historical baseline locations. The measured background noise data are presented in terms of $L_{A90,10min}$ background noise levels plotted as a function of standardised ten metre height wind speed. Derived background levels have been adjusted for wind shear correction from the Historic baseline data. Two plots are shown for each location, one for quiet day-time periods and the other for night-time periods, both derived in accordance with ETSU-R-97.
- 4.3.4 Data from the survey location were inspected to identify periods which may have been influenced by extraneous noise sources, giving rise to atypical and elevated levels. ETSU-R-97 requires that any data affected by rainfall be excluded from the analysis. The noise monitoring location at Snar Farm also had a rain gauge installed during the noise survey period data from this gauge were therefore used to exclude those periods where rain was indicated.
- 4.3.5 In addition to the impact noise on surrounding vegetation and the sound level meter itself, in some environments rainfall can result in appreciable changes in background sound levels, for example as a result of wet roads which increase tyre noise emissions or dissipating flow noise in water courses and drainage systems. Observations whilst on-site indicated traffic noise to be a negligible influence on background sound levels, and thus the possible effect of increased tyre noise from wet roads is not considered relevant to this site. In terms of water flow noise, the monitoring location was also positioned as far as practically possible from water flow noise and residential drainage systems to minimise any associated noise influence. Based on the above, rainfall is considered to have a limited effect on background sound levels. Periods affected by atypical levels of elevated background following rainfall were excluded as indicated in the respective charts in Annex D and E.
- 4.3.6 The measured background noise data may also have been increased by other extraneous sources or atypical events. Time-histories of the noise levels at the survey location were therefore inspected to look for any atypical relationships when compared to the wind speeds present during that time. Any elevated levels found in this way were excluded. The trend of the data when plotted against wind speed was also inspected to look for atypical relationships or outliers within the dataset (particularly at low wind speeds) which were excluded. Any data removed from the analysis in this way is indicated on the charts as red circles. The analysis and filtering of the data was therefore undertaken in accordance with current good practice as set out in the IOA GPG.
- 4.3.7 No construction noise or sound from other wind turbines was audible²⁵ the monitoring location during the baseline survey, therefore measured levels have not been influenced by any contribution from any construction noise or existing wind turbine noise, as required by ETSU-R-97 and the IOA GPG.
- 4.3.8 Following removal of those data points, best-fit lines were generated using a polynomial fit of a maximum of 3rd order. These lines of best-fit define the ETSU-R-97 background noise levels (see Table 5 and Table 6). Where background levels derived from historical baseline data, these have referenced background levels which have been adjusted to account for wind shear corrections due to the difference in hub heights (80 m and 90 m) for the historical baseline turbines and the hub height (134 m) for the proposed turbines, in line with the IOA current good practice, as detailed in Annex C. These historical background levels, with and without wind shear adjustments, are presented in Annex C Table C3 and Table C4 respectively.

²⁵ Distance to other wind farm turbines was sufficient that existing turbine or construction noise would be inaudible at the survey location.

4.3.9 The background noise levels were then used to derive the noise limits required by ETSU-R-97 that apply during the day-time and night-time periods up to 12 m/s. The corresponding ETSU-R-97 noise limits are summarised in Table 7 and Table 8. The noise limits have been set either at the prevailing measured background level plus 5 dB, or at the relevant fixed lower limit, whichever is the greater. The derivation of the relevant fixed lower limit value used for day-time periods (37 dB(A)) is described in a subsequent section. For financially Involved (FI) properties the lower absolute limit becomes 45 dB(A).

Table 5 - Day time L_{A90} (dB) background noise levels from the baseline noise survey and historical data according to ETSU-R-97.

Property	Standardised 10 m Wind Speed (m/s)											
	1	2	3	4	5	6	7	8	9	10	11	12
Snar Farm	39.6	37.3	35.8	35.1	35.2	35.8	37.0	38.6	40.7	43.1	45.7	48.4
Glencaple Cottage	35.3	35.3	35.3	35.3	35.4	35.7	36.1	36.8	37.8	39.1	40.8	42.9
Waterhead Toll Cottage	32.9	32.9	33.2	33.6	33.9	34.2	34.5	34.9	35.2	35.5	35.8	36.2
Douglas Lodge	36.0	36.0	36.6	37.1	37.7	38.3	38.8	39.4	40.0	40.5	41.1	41.6
76 Dumfries Road	38.2	38.2	38.5	38.7	39.0	39.3	39.6	39.9	40.2	40.5	40.7	41.0
South Shortcleugh	27.9	27.9	28.8	29.7	30.7	31.7	32.9	34.1	35.5	37.1	38.8	40.7
3 Symington Street	30.1	30.1	29.8	29.5	29.6	30.0	31.0	32.4	34.3	36.5	38.9	41.1
Meadowfoot	26.6	26.6	27.4	28.1	28.6	29.2	29.8	30.6	31.5	32.7	34.3	36.3

Table 6 - Night time L_{A90} (dB) background noise levels from the baseline noise survey and historical data according to ETSU-R-97.

Property	Standardised 10 m Wind Speed (m/s)											
	1	2	3	4	5	6	7	8	9	10	11	12
Snar Farm	35.1	35.6	35.7	35.8	35.9	36.2	36.7	37.7	39.1	41.3	44.2	48.0
Glencaple Cottage	33.8	33.8	34.0	34.1	34.3	34.5	34.6	34.8	34.9	35.1	35.3	35.4
Waterhead Toll Cottage	33.0	33.0	33.2	33.4	33.6	33.8	34.1	34.3	34.5	34.7	34.9	35.1
Douglas Lodge	34.2	34.2	34.6	35.0	35.3	35.7	36.1	36.5	36.9	37.2	37.6	38.0
76 Dumfries Road	36.9	36.9	37.3	37.7	38.0	38.4	38.8	39.2	39.6	39.9	40.3	40.7
South Shortcleugh	30.7	30.7	31.1	31.5	31.9	32.3	32.7	33.1	33.5	33.8	34.2	34.6
3 Symington Street	21.2	21.2	22.0	22.8	23.6	24.4	25.2	26.0	26.8	27.6	28.5	29.3
Meadowfoot	26.2	26.2	27.5	28.3	28.6	28.6	28.4	28.2	28.1	28.3	28.8	29.8

Table 7 - Day time L_{A90} (dB) noise limits derived from historical baseline data and the baseline noise survey according to ETSU-R-97 and lower fixed limit of 37 dB(A) for the Proposed Development. Noise assessment locations considered financially involved with the Proposed Development are indicated with '(FI)'.

Property	Standardised 10 m Wind Speed (m/s)											
	1	2	3	4	5	6	7	8	9	10	11	12
Lettershaws Farm	37.9	37.9	38.2	38.6	38.9	39.2	39.5	39.9	40.2	40.5	40.8	41.2
Kirkton	41.0	41.0	41.6	42.1	42.7	43.3	43.8	44.4	45.0	45.5	46.1	46.6
Glencaple Farm House	40.3	40.3	40.3	40.3	40.4	40.7	41.1	41.8	42.8	44.1	45.8	47.9
Glencaple	40.3	40.3	40.3	40.3	40.4	40.7	41.1	41.8	42.8	44.1	45.8	47.9
Boghead	41.0	41.0	41.6	42.1	42.7	43.3	43.8	44.4	45.0	45.5	46.1	46.6
Carlisle Road North	41.0	41.0	41.6	42.1	42.7	43.3	43.8	44.4	45.0	45.5	46.1	46.6
Hurlieburn Lodge	41.0	41.0	41.6	42.1	42.7	43.3	43.8	44.4	45.0	45.5	46.1	46.6
Carlisle Road South	41.0	41.0	41.6	42.1	42.7	43.3	43.8	44.4	45.0	45.5	46.1	46.6
Stoneyburn	41.0	41.0	41.6	42.1	42.7	43.3	43.8	44.4	45.0	45.5	46.1	46.6
Elvanfoot Farm	43.2	43.2	43.5	43.7	44.0	44.3	44.6	44.9	45.2	45.5	45.7	46.0
Lodge Cottages	43.2	43.2	43.5	43.7	44.0	44.3	44.6	44.9	45.2	45.5	45.7	46.0
Leadhills Road	43.2	43.2	43.5	43.7	44.0	44.3	44.6	44.9	45.2	45.5	45.7	46.0
North Shortcleugh (FI)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7
South Shortcleugh	37.0	37.0	37.0	37.0	37.0	37.0	37.9	39.1	40.5	42.1	43.8	45.7
Hass	37.9	37.9	38.2	38.6	38.9	39.2	39.5	39.9	40.2	40.5	40.8	41.2
Waterhead Toll Cottage	37.9	37.9	38.2	38.6	38.9	39.2	39.5	39.9	40.2	40.5	40.8	41.2
New Glendorch	37.9	37.9	38.2	38.6	38.9	39.2	39.5	39.9	40.2	40.5	40.8	41.2
Glengeith	43.2	43.2	43.5	43.7	44.0	44.3	44.6	44.9	45.2	45.5	45.7	46.0
Leadhills	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.4	39.3	41.5	43.9	46.1
Leadhills (south)	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.4	39.3	41.5	43.9	46.1
Dentercleuch	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.7	39.3	41.3
Snar Farm	40.1	40.1	40.1	40.1	40.2	40.8	42.0	43.6	45.7	48.1	50.7	53.4
Glendouran Farm	40.1	40.1	40.1	40.1	40.2	40.8	42.0	43.6	45.7	48.1	50.7	53.4
Strancleugh Farm	40.1	40.1	40.1	40.1	40.2	40.8	42.0	43.6	45.7	48.1	50.7	53.4