

CALCULATION PARAMETERS AND SETTINGS FOR NOISE MODEL

Prediction calculations for turbine noise have been conducted in accordance with *ISO 9613: Acoustics - Attenuation of sound outdoors, Part 2: General method of calculation, 1996*. Guidance in terms of the calculation settings has been obtained from the Institute of Acoustics (IoA) Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IoA GPG) and its associated supplementary guidance notes. The following are the main aspects that have been considered in terms of the noise predictions presented in this instance.

Directivity Factor:

The directivity factor (D) allows for an adjustment to be made where the sound radiated in the direction of interest is higher than that for which the sound power level is specified. In this case appropriate consideration is given to the issue of wind directivity as detailed in the relevant sections of the chapter.

Ground Effect:

Ground effect is the result of sound reflected by the ground interfering with the sound propagating directly from source to receiver. The prediction of ground effects is inherently complex and depend on source height receiver height propagation height between the source and receiver and the ground conditions.

The ground conditions are described according to a variable defined as G, which varies between 0.0 for hard ground (including paving, ice concrete) and 1.0 for soft ground (includes ground covered by grass trees or other vegetation) Predictions have been carried out using a source height corresponding to the hub height of the proposed turbines, a receiver height of 4m and a ground effect factor of G=0.5.

Geometrical Divergence

This term relates to the spherical spreading in the free-field from a point sound source resulting in an attenuation depending on distance according to the following equation:

$$A_{geo} = 20 \times \log(d) + 11$$

where d = distance from the source

A wind turbine may be considered as a point source beyond a distance corresponding to one rotor diameter.

Atmospheric Adsorption

Sound propagation through the atmosphere is attenuated by the conversion of the sound energy into heat. This attenuation is dependent on the temperature and relative humidity of the air through which the sound is travelling and is frequency dependent with increasing attenuation towards higher frequencies.

In these predictions, a temperature of 10°C and a relative humidity of 70% have been used, which give relatively low levels of atmosphere attenuation and corresponding worst case noise predictions.

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Barrier Attenuation

The effect of any barrier between the noise source and the receiver position is that noise will be reduced according to the relative heights of the source, receiver and barrier and the frequency spectrum of the noise. The barrier attenuations predicted by the ISO9613 model have been shown to be significantly greater than that measured in practice under down wind conditions. For this study, the ground is relative flat and therefore topographical screening effects have not been factored into the calculations.

Turbine coordinates (ING) for other wind farms included in the calculations are presented in the following Tables.

Turbine coordinates used for Cloghan Wind Farm

Turbine Ref.	Coordinates – Irish Grid (IG)	
	Easting	Northing
C1	208,163	215,337
C2	208,634	215,649
C3	208,159	215,723
C4	208,788	216,008
C5	208,378	216,130
C6	208,709	216,503
C7	208,369	216,717
C8	208,651	217,067
C9	209,186	217,295

Turbine coordinates used for Meenwaun Wind Farm

Turbine Ref.	Coordinates – Irish Grid (IG)	
	Easting	Northing
M1	204,707	213,585
M2	204,985	213,339
M3	205,172	213,020
M4	205,253	212,656
M5	205,575	212,460