CALCULATION PARAMETERS AND SETTINGS

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 (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 this 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 are 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) Our predictions have been carried out using a source height corresponding to the hub height of the proposed turbines, a receiver height of 4m and an assumed ground 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.

CALCULATION PARAMETERS AND SETTINGS (Continued)

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 relativity low levels of atmosphere attenuation and corresponding worst case noise predictions.

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, however, been shown to be significantly greater than that measured in practice under down wind conditions. The results of a study of propagation of noise from wind farm sites carried out for ETSU concluded that an attenuation of just 2 dB(A) should be allowed where the direct line of site between the source and receiver is just interrupted and that 10 dB(A) should be allowed where a barrier lies within 5m of a receiver and provides a significant interruption to the line of site. No shielding has been included in any of the noise predictions, since there is no significant shielding at this location.

Turbine coordinates for other windfarm considered in the calculations are presented in the following Tables.

Turbine coordinates assumed for Lough Golagh windfarm

Ref.	Co-ordinates		Ref.	Co-ordinates	
	Easting	Northing		Easting	Northing
T01	204,094	383,751	T14	204,236	382,963
T02	203,999	383,598	T15	203,706	383,084
T03	203,958	383,438	T16	203,592	383,137
T04	204,040	383,054	T17	203,580	383,294
T05	204,546	382,988	T18	203,505	383,453
T06	204,663	383,070	T19	203,514	382,410
T07	204,669	383,208	T20	203,636	382,346
T08	204,792	383,033	T21	203,757	382,297
T09	204,900	383,130	T22	203,899	382,240
T10	205,010	383,060	T23	203,283	383,291
T11	204,980	383,278	T24	203,297	383,116
T12	204,958	383,437	T25	203,300	382,976
T13	205,070	383,562	--	--	--

Turbine coordinates assumed for Meenablagh windfarm

Ref.	Co-ordinates		Ref.	Co-ordinates	
	Easting	Northing		Easting	Northing
T01	213,255	384,287	T07	214,299	382,267
T02	213,291	383,861	T08	214,562	382,500
T03	213,168	383,522	T09	213,854	382,385
T04	213,343	383,143	T10	214,535	382,115
T05	213,410	382,847	T11	214,754	382,295
T06	213,609	382,572	--	--	--

Turbine coordinates assumed for Meenakeeran windfarm

Ref.	Co-ordinates		Ref.	Co-ordinates	
	Easting	Northing		Easting	Northing
T01	210,358	382,692	T03	210,994	382,485
T02	210,788	382,639	T04	210,403	382,388

Turbine coordinates assumed for Straness windfarm

Ref.	Co-ordinates		Ref.	Co-ordinates	
	Easting	Northing		Easting	Northing
T01	201,391	379,375	T15	204,538	381,412
T02	201,184	379,803	T16	204,995	381,283
T03	201,657	379,700	T17	205,317	381,177
T04	202,072	379,754	T18	205,626	381,039
T05	202,449	379,940	T19	204,768	380,926
T06	202,785	379,906	T20	204,638	380,438
T07	203,410	379,700	T21	204,940	380,144
T08	203,665	379,367	T22	205,259	380,032
T09	203,339	379,806	T23	205,111	379,639
T10	203,171	380,116	T24	205,472	379,506
T11	203,931	380,020	T25	206,083	379,672
T12	204,334	380,146	T26	205,681	379,239
T13	204,017	380,439	T27	205,893	378,983
T14	204,207	380,814	T28	206,261	379,263