APPENDIX 12-3

NOISE MODELLING PARAMETERS

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Prediction calculations for turbine noise have been conducted in accordance with ISO 9613: *Acoustics – Attenuation of sound during propagation 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* (2013) (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.

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).

Noise 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:

$$A_{geo} = 20\log(d) - 11 \text{ dB}$$

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 accordance with the guidance set out in the IOA GPG for calculations, 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.

Topographic Screening

In the IOA GPG, section 4.3.11 the following is stated: "*Topographic screening effects of the terrain (ISO 9613-2, Equation 12) should be limited to a reduction of no more than 2 dB, and then only if there is no direct line of sight between the highest point on the turbine rotor*

and the receiver location." The modelling software takes account of these limitations on the degree of screening from terrain. The "valley correction" from section 4.3.9 of the IOA GPG is also applied where relevant.

The atmospheric attenuation outlined in Table A12-1 were used for all calculations in accordance with the guidance outlined in the IOA GPG. No meteorological corrections were applied to all calculations.

Table A12-1 Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Temp (°C)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.92	3.66	9.70	33.06	118.4

Propagation Effects

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. For calculation of wind turbine noise, barrier and ground corrections have been applied in accordance with of ISO 9613-2 Annex D Calculation of sound pressure levels caused by wind turbines, sections D.3 and D.4

The noise prediction calculations have been undertaken using OSI ground topography data to account for propagation effects. The noise prediction software, iNoise, described in Section 12.4.5.1 of the EIAR incorporates the setting outlined in this appendix.

Table A12-2 Coordinates (ITM) for Noise Sensitive Locations (NSLs)

ID	ITM X	ITM Y
H001	608,051	887,579
H002	609,702	887,805
H003	609,836	887,713
H004	609,933	887,584
H005	608,962	888,612
H006	608,914	888,607
H007	608,874	888,609
H008	610,736	887,198
H009	610,245	888,698
H010	610,373	889,109
H011	611,372	886,553
H012	610,430	889,195
H013	611,186	888,661
H014	610,540	889,350
H015	610,556	889,385
H016	611,652	886,223
H017	610,640	889,481
H018	611,561	888,610
H019	611,611	888,650
H020	606,567	889,847

Table A12-3 presents the proposed wind turbines locations in Irish Transverse Mercator coordinates system.

Table A12-3 Turbine Coordinates in Irish Transverse Mercator

Turbine ID	ITM X	ITM Y
T1	607,083	884,169
T2	607,639	884,209
T3	606,809	884,614
T4	608,056	884,820
T5	607,191	885,029
T6	607,587	885,277
T7	608,211	885,488
T8	607,105	885,583
T9	608,682	885,893
T10	606,753	885,946
T11	608,133	885,993
T12	607,533	886,077
T13	608,329	886,520
T14	606,933	886,553
T15	607,750	886,642
T16	608,896	886,662
T17	608,581	887,045
T18	607,398	887,064
T19	609,123	887,206