APPENDIX 12-4

Noise Model Parameters

APPENDIX 12.4 – NOISE MODEL PARAMETERS

Prediction calculations for turbine noise have been conducted in accordance with ISO 9613: *Acoustics – Attenuation of sound during propagation outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors*, 2014. 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:

$$A_{geo} = 10\log(d) - 11 \text{ dB}$$

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 to noise prediction calculations (where relevant).

Table A.12.4.1 presents the turbine sound power noise emission values used the assessment of the Knockacummer and Glentane / Glentanemacelligot Wind Farm (Glentane Phase 1 & Phase 2).

Wind Speed (m/s)	Octave Band (Hz) Sound Power Levels (dB re 10^{-12}W)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
3	78.7	82.8	87.2	87.6	86.1	85.0	81.0	73.4	93.5
4	82.7	86.8	91.2	91.6	90.1	89.0	85.0	77.4	97.5
5	86.2	90.3	94.7	95.1	93.6	92.5	88.5	80.9	101
6	89.2	93.3	97.7	98.1	96.6	95.5	91.5	83.9	104
7	90.2	94.3	98.7	99.1	97.6	96.5	92.5	84.9	105
≥8	90.7	94.8	99.2	99.6	98.1	97.0	93.0	85.4	105.5

Table 12.4.1 Sound Power Levels used for 80 m HH

Table A.12.4.2 presents the coordinates for all the Noise Sensitive Locations (receptors) included in the noise prediction modelling.

NSL Ref.	Occupancy	ITM X	ITM Y	NSL Ref.	Occupancy	ITM X	ITM Y
H01	occupied	521921	613930	H36	occupied	523522	609605
H02	occupied	520292	612927	H37	occupied	524867	610625
H03	occupied	520329	612353	H38	occupied	522733	609933
H04	occupied	521612	610670	H39	occupied	522930	609969
H05	occupied	520664	612443	H40	occupied	523666	610274
H06	unoccupied/derelict	524514	611392	H41	occupied	523525	609612
H07	occupied	523574	609674	H42	occupied	523544	609239
H08	occupied	522811	609978	H43	occupied	521338	613400
H09	occupied	521657	610628	H44	occupied	521723	613818
H10	occupied	521589	611206	H45	occupied	521677	613893
H11	occupied	522721	613510	H46	occupied	520963	612165
H12	occupied	521667	613898	H47	occupied	520570	612874
H13	occupied	520362	612922	H48	occupied	520504	612865
H14	occupied	520400	612681	H49	occupied	520564	612916
H15	occupied	520579	612869	H50	occupied	520535	612948
H16	occupied	521728	610732	H51	occupied	520433	613159
H17	occupied	521662	610649	H52	occupied	520300	613080
H18	occupied	521579	610688	H53	occupied	523725	613665
H19	occupied	521139	611915	H54	occupied	521906	613917
H20	occupied	521952	613901	H55	occupied	523493	609727
H21	occupied	524728	610762	H56	occupied	520763	610848
H22	occupied	524426	611318	H57	occupied	520961	611303
H23	occupied	524872	611972	H58	occupied	523510	609518
H24	occupied	523530	609795	H59	occupied	523433	609829
H25	occupied	523436	610141	H60	occupied	523529	609905
H26	occupied	523344	609838	H61	occupied	521869	610642
H27	occupied	522993	609949	H62	occupied	522181	610345
H28	occupied	522359	610340	H63	occupied	523544	609322
H29	occupied	522065	609261	H64	occupied	523280	609884
H30	occupied	523477	609131	H65	occupied	520449	612988
H31	occupied	523193	609009	H66	occupied	520956	613796
H32	unoccupied/ derelict	521490	609587	H67	occupied	520773	613807
H33	occupied	521492	611181	H68	unoccupied	521816	609981
H34	occupied	521032	612356	H69	unoccupied/ derelict	523511	609640

NSL Ref.	Occupancy	ITM X	ITM Y	NSL Ref.	Occupancy	ITM X	ITM Y
H35	occupied	523608	609301	H70	unoccupied/ derelict	523911	610638

Table 12.4.2 List of Receptors

Table A.12.4.3 presents the coordinates of the Knockacummer and Glentane / Glentanemacelligot Wind Farm (Glentane Phase 1 & Phase 2) turbine used in the noise prediction modelling.

Turbine Ref	Development	ITM X	ITM Y
K-T01	Knockacummer	523516	612759
K-T02	Knockacummer	523395	613023
K-T03	Knockacummer	523687	613216
K-T04	Knockacummer	523911	612871
K-T05	Knockacummer	524119	613180
K-T06	Knockacummer	524271	612778
K-T07	Knockacummer	524610	612961
K-T08	Knockacummer	524476	613320
K-T09	Knockacummer	524832	613216
K-T10	Knockacummer	525230	613219
K-T11	Knockacummer	525604	613295
K-T12	Knockacummer	525929	613511
K-T13	Knockacummer	524324	613663
K-T14	Knockacummer	524678	613657
K-T15	Knockacummer	525099	613584
K-T16	Knockacummer	525480	613665
K-T17	Knockacummer	525929	613862
K-T18	Knockacummer	526199	614176
K-T19	Knockacummer	525823	614325
K-T20	Knockacummer	525559	614044
K-T21	Knockacummer	525180	613960
K-T22	Knockacummer	524276	614092
K-T23	Knockacummer	525371	614429
K-T24	Knockacummer	525071	612888
K-T25	Knockacummer	524776	612596
K-T26	Knockacummer	524450	612433
K-T27	Knockacummer	523990	612054
K-T28	Knockacummer	524346	612052
K-T29	Knockacummer	524332	611659
GT-T01	Glentane/ Glentanemacelligot	519191	610133
GT-T02	Glentane/ Glentanemacelligot	519563	609904
GT-T03	Glentane/ Glentanemacelligot	519946	609815
GT-T04	Glentane/ Glentanemacelligot	520315	609969
GT-T05	Glentane/ Glentanemacelligot	520311	609614
GT-T06	Glentane/ Glentanemacelligot	520687	609607
GT-T07	Glentane/ Glentanemacelligot	520776	609931
GT-T08	Glentane/ Glentanemacelligot	521223	610098
GT-T09	Glentane/ Glentanemacelligot	521131	609040
GT-T10	Glentane/ Glentanemacelligot	520653	608849
GT-T11	Glentane/ Glentanemacelligot	520769	609241