APPENDIX 1 1-4

MODEL CALCULATION PARAMETERS AND SETTINGS

APPENDIX 11.4 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 (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.

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

CALCULATION PARAMETERS AND SETTINGS (Continued)

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. 3D ground topography data supplied by MKO was used in the noise prediction modelling. Attenuation from topography screening has been limited to a maximum of 2 dB in the tabulated results in accordance with the IoA GPG.

Wind Turbine Valley Correction

The IOA GPG recommends a correction of +3 dB should be added to the calculated overall A-weighted noise level for propagation "across a valley", i.e. a concave ground profile, or where the ground falls away significantly, between the turbine and the receiver location. The following criterion of application is recommended:

$$hm \geq 1.5 \times (abs\ (hs - hr)\ /2)$$

where hm is the mean height above the ground of the direct line of sight from the receiver to the source (as defined in ISO 9613-2, Figure 3), and hs and hr are the heights above local ground level of the source and receiver, respectively. The recommended Valley correction has been incorporated into the turbine prediction calculations.

Turbine coordinates (ITM) for other wind farms used in the noise prediction modelling are presented in the following Tables.

Turbine coordinates used for Slievecallan Wind Farm

Turbine Ref.	Coordinates – Irish Transverse Mercator (ITM)	
	ITM X	ITM Y
1	513111	675045
2	513563	675137
3	514307	675703
4	513843	675811
5	514177	676137
6	513594	676319
7	513962	676789
8	514290	676568
9	514746	676497
10	515319	676765
11	514854	677035

Turbine Ref.	Coordinates – Irish Transverse Mercator (ITM)	
	ITM X	ITM Y
12	515233	677314
13	515150	677761
14	514225	678157
15	514216	678943
16	513984	678554
17	513807	678159
18	513401	678227
19	513432	678605
20	512914	678153
21	513008	677700
22	512562	677702
23	512316	677334
24	511874	677250
25	512790	676977
26	513235	677054
27	513103	676222
28	512605	676148
29	512030	675965

Turbine coordinates used for Coor Shanavogh Wind Farm

Turbine Ref.	Coordinates – Irish Transverse Mercator (ITM)	
	ITM X	ITM X
1	511060	675116
2	510706	675084
3	511186	674865
4	510909	674851
5	510217	674901
6	510508	674875

The original Coor Shanavogh Wind Farm planning application was for a six-turbine layout as presented in the table above. The current application decision is under appeal with An Bord Pleanála (ABP) and it is understood that the number of proposed turbines was reduced to four as part of the further information process. The six-turbine layout was used in the turbine noise prediction calculations for this assessment to present worst case.

A full list of the coordinates of the noise sensitive receptors (NSLs) is included in the following table. Noise predictions calculations were undertaken at a height of 4m above ground at all NSL's in

accordance with the IoA GPG. An asterisk (*) has been placed beside the NSL References that have been classified as a derelict property.

Coordinates for NSLs used in the assessment

NSL Ref.	Coordinates – Irish Transverse Mercator (ITM)		NSL Ref	Coordinates – Irish Transverse Mercator (ITM)	
	ITM X	ITM X		ITM X	Northing
R001	512952	681689	R100	509202	679090
R002	510039	680384	R101	509133	679895
R003	510358	680253	R102	509295	679899
R004	510313	680498	R103	509374	679885
R005*	510730	680605	R104	509412	679881
R006	510773	680747	R105*	509668	679886
R007	510795	680756	R106	509622	679927
R008	510939	681008	R107	509431	679956
R009	513337	681877	R108	509477	679962
R010	510939	681407	R109	509444	680035
R011	510885	681380	R110	509559	680036
R012	511289	681321	R111	509606	680075
R013	511494	681771	R112	509696	680053
R014	511487	681806	R113	509726	680069
R015	511948	681472	R114	509681	680110
R016	511917	681611	R115	509674	680433
R017	513918	681413	R116	509868	680228
R018	511982	681596	R117	509921	680333
R019	512022	681565	R118	509978	680328
R020	512123	681534	R119	510016	680366
R021	510900	679956	R120	511519	682641
R022	513472	681016	R121	514374	681289
R023	513401	680946	R122	510427	677805
R024	512990	682133	R123	509009	678732
R025	513545	681794	R124	509411	678733
R026	511472	681722	R125	513854	681975
R027	511879	681583	R126	513828	682029
R028	514261	680402	R127	513781	682180
R029	514187	681141	R128	514514	681383
R030	514176	680393	R129	514625	681269

NSL Ref.	Coordinates – Irish Transverse Mercator (ITM)		NSL Ref	Coordinates – Irish Transverse Mercator (ITM)	
	ITM X	ITM X		ITM X	Northing
R031	513205	678918	R130	514597	681349
R032	510982	678013	R131	514712	679989
R033*	512882	681127	R132	514751	679980
R034*	510904	678525	R133	514742	679896
R035*	513408	680032	R134	514065	679550
R036	514132	680061	R135	514652	681233
R037	514102	679788	R136*	514389	680026
R038	513819	679736	R137*	514370	679936
R039	513135	679828	R138	513826	682286
R040	513201	679768	R139	512138	682318
R041	513815	679470	R140	509572	680457
R042	513634	679434	R141	509539	680476
R043	513646	679169	R142	509500	680527
R044	512840	678927	R143	509482	680457
R045*	512966	679146	R144	509450	680477
R046*	512770	679138	R145	509421	680504
R047	512622	678759	R146	509397	680523
R048	512165	678579	R147*	509766	678105
R049	512129	678334	R148	510942	677077
R050	512077	678317	R149	509884	677362
R051	511595	678103	R150	509971	677376
R052	511397	678085	R151	514661	679076
R053	511313	678048	R152	509194	679412
R054	511020	678047	R153	514770	679444
R055	510783	678042	R154	514969	679659
R056	510927	678542	R155	509028	679745
R057	510957	678583	R156	509187	679894
R058	510961	678680	R157	514943	679898
R059	510573	678901	R158	514843	679949
R060	510478	678248	R159	515131	680153
R061	510657	679500	R160	509327	680287
R062	510401	679349	R161	509042	680415
R063	510217	679245	R162	509143	680427

NSL Ref.	Coordinates – Irish Transverse Mercator (ITM)		NSL Ref	Coordinates – Irish Transverse Mercator (ITM)	
	ITM X	ITM X		ITM X	Northing
R064	512922	682079	R163	509294	680610
R065	510125	679053	R164	515201	681163
R066	513084	681951	R165	514925	681242
R067	512874	681435	R166	514879	681268
R068	511219	682745	R167	515169	681281
R069	511290	682553	R168	514843	681286
R070	511434	682532	R169	514864	681310
R071	511653	682733	R170	514958	681433
R072*	512190	682274	R171	514370	681890
R073	514053	681412	R172	514660	682082
R074	514210	681120	R173	513890	682250
R075	514281	681048	R174	513927	682335
R076	514553	680582	R175	513873	682466
R077	514430	680546	R176	513879	682543
R078	514383	680514	R177	510125	682551
R079	514566	680014	R178	510329	682590
R080	511120	677096	R179	513792	682595
R081	510667	677587	R180	510370	682604
R082	510605	677650	R181	510580	682614
R083	510584	677891	R182	510468	682623
R084	510368	677871	R183	510189	682625
R085	510321	677924	R184	513405	682627
R086	509939	678092	R185	513420	682651
R087	509900	678091	R186	510247	682659
R088	509835	678109	R187	510602	682684
R089	510091	677446	R188	510644	682689
R090	509781	678171	R189	510329	682698
R091	509598	677872	R190	510865	682742
R092	509545	677975	R191	510885	682750
R093	509648	678403	R192	511045	682765
R094	509788	678838	R193	512787	682975
R095	509705	679161	R194	512491	683212
R096	509353	678133	R195	514884	679915

NSL Ref.	Coordinates – Irish Transverse Mercator (ITM)		NSL Ref	Coordinates – Irish Transverse Mercator (ITM)	
	ITM X	ITM X		ITM X	Northing
R097	509298	678103	R196	509219	678095
R098	509189	678274	R197*	514907	680565
R099	509237	678313	R198	511267	682563