

APPENDIX 13.3 NOISE MODEL 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 (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 Calculations have been conducted 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 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 relatively 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 been shown to be significantly greater than that measured in practice under down wind conditions.

Turbine coordinates (ING) for the Sliabh Bawn wind farm included in the calculations are presented in the following Table.

Ref.	Co-ordinates (ING)		Ref.	Co-ordinates (ING)	
	Eastings	Northing		Eastings	Northing
SB01	195,457	274,222	SB11	195,969	273,949
SB02	195,876	275,843	SB12	195,712	274,804
SB03	195,282	274,646	SB13	196,357	276,799
SB04	195,323	276,968	SB14	196,199	277,271
SB05	195,509	273,777	SB15	196,128	276,235
SB06	195,907	274,396	SB16	196,378	274,288
SB07	195,754	277,112	SB17	195,407	276,472
SB08	195,911	276,648	SB18	196,037	275,155
SB09	196,450	275,639	SB19	196,312	274,780
SB10	196,107	277,772	SB20	195,284	275,762

A full list of the various noise sensitive locations and coordinates used in the noise model is presented in the following Table:

Ref.	Co-ordinates (ING)		Ref.	Co-ordinates (ING)	
	Eastings	Northing		Eastings	Northing
H003	204,421	268,527	H456	202,246	269,153
H004	204,427	268,380	H462	205,381	272,198
H005	207,682	266,778	H463	205,288	271,277
H006	208,023	262,919	H464	205,409	270,310
H007	210,278	262,506	H465	203,144	268,640
H015	201,852	269,476	H469	207,327	267,819
H021	204,481	266,807	H470	207,357	267,701
H022	207,514	267,076	H471	207,658	266,818
H023	207,527	267,038	H472	207,848	265,666
H024	207,535	267,014	H473	207,632	265,531
H025	205,195	271,485	H474	207,043	265,213
H026	204,901	272,161	H475	204,412	266,714
H027	204,667	271,954	H476	204,228	266,874
H028	203,984	272,842	H477	204,581	266,872
H029	202,895	272,899	H478	204,882	267,386
H030	202,784	273,206	H479	204,596	267,992
H042	204,399	266,695	H480	204,470	268,253
H043	208,902	266,896	H481	202,953	270,405
H044	208,528	266,344	H482	202,954	270,176
H045	210,989	264,251	H483	201,595	270,097
H046	210,967	264,279	H484	201,726	269,706
H047	202,817	270,582	H486	201,969	269,366
H048	202,493	269,298	H487	202,082	269,390
H049	203,185	269,281	H488	202,784	269,406
H050	204,379	268,440	H489	203,045	269,365
H051	204,500	268,190	H490	203,133	269,366
H052	206,673	263,795	H491	203,544	268,989
H053	206,580	263,930	H492	202,845	269,122
H054	204,617	267,726	H493	202,275	269,103
H055	204,366	268,808	H494	202,219	269,113
H056	203,188	268,696	H495	202,412	269,238
H057	203,122	268,463	H496	202,392	269,220
H058	201,295	271,868	H497	202,369	269,210
H059	207,276	268,753	H498	202,323	269,175
H060	207,375	267,616	H499	202,299	269,162
H061	207,048	265,180	H500	202,192	269,159
H062	210,684	264,461	H501	202,168	269,168
H063	210,358	266,043	H502	202,142	269,111
H064	211,132	264,151	H514	205,196	272,111
H065	211,231	263,736	H515	205,614	272,158
H066	211,390	263,495	H516	205,210	271,521
H067	206,058	264,565	H517	205,236	271,397
H068	210,656	266,838	H518	205,220	271,317
H175	210,367	267,340	H519	205,240	271,253
H214	205,455	271,290	H520	205,387	271,280
H215	205,496	271,235	H521	205,501	270,031

Ref.	Co-ordinates (ING)		Ref.	Co-ordinates (ING)	
	Eastings	Northing		Eastings	Northing
H216	205,349	271,218	H522	205,424	269,672
H217	205,336	271,276	H523	203,724	268,993
H218	205,286	271,216	H524	207,348	267,746
H219	204,934	265,534	H525	207,586	266,959
H220	204,993	265,577	H526	207,598	266,933
H221	204,456	266,780	H527	207,625	266,891
H222	204,752	267,612	H528	207,757	266,665
H223	204,838	267,999	H529	207,792	265,641
H224	204,515	268,159	H530	207,301	265,329
H225	204,421	268,328	H531	207,253	265,313
H226	204,403	268,729	H532	207,201	265,319
H227	201,772	269,598	H533	207,187	265,258
H228	201,931	269,361	H534	207,088	265,209
H229	201,998	269,373	H535	204,513	266,852
H230	204,751	268,830	H536	204,427	266,751
H231	205,429	269,581	H537	204,371	266,666
H232	207,395	267,501	H538	204,202	266,896
H233	207,579	267,046	H539	204,287	266,773
H234	207,552	266,977	H540	204,337	266,919
H235	207,782	266,710	H541	204,373	266,913
H236	208,759	265,954	H542	204,999	266,668
H237	210,971	264,309	H543	204,631	266,820
H238	206,759	263,654	H544	204,711	267,055
H284	205,457	271,231	H545	204,960	267,263
H285	204,782	267,532	H546	204,753	267,447
H286	204,386	268,305	H547	204,668	267,794
H287	207,937	265,691	H548	204,548	268,068
H291	204,774	267,337	H549	204,488	268,225
H292	204,637	267,960	H550	204,490	268,440
H293	207,428	267,710	H551	204,422	268,474
H294	211,408	263,934	H552	204,576	268,865
H295	204,491	266,898	H553	204,302	268,840
H296	204,261	266,995	H764	208,768	266,764
H297	201,609	270,392	H765	208,671	266,620
H298	207,722	266,741	H766	208,650	266,373
H299	208,708	266,708	H767	209,141	265,436
H300	202,183	272,583	H768	208,930	265,671
H301	208,957	265,722	H769	208,813	265,830
H302	211,279	263,468	H770	208,669	266,100
H305	206,697	265,028	H771	208,812	262,972
H306	206,733	265,054	H772	208,155	262,935
H307	206,727	269,674	H773	207,548	262,957
H308	206,835	269,480	H774	206,954	263,406
H309	210,910	266,601	H775	206,230	264,339
H313	202,448	269,281	H776	206,175	264,449
H314	202,387	269,290	H777	206,144	264,491
H317	204,334	268,825	H778	206,109	264,535
H318	201,760	269,629	H779	206,079	264,503
H319	210,093	266,814	H780	206,062	264,412

Ref.	Co-ordinates (ING)		Ref.	Co-ordinates (ING)	
	Eastings	Northing		Eastings	Northing
H320	208,248	262,931	H781	206,052	264,442
H321	206,581	263,901	H782	208,894	263,051
H327	208,936	265,752	H783	208,836	263,050
H393	202,308	269,108	H784	208,775	262,971
H394	207,220	265,292	H785	208,694	263,024
H407	206,652	263,842	H786	208,064	262,968
H408	206,060	264,418	H787	207,548	262,881
H409	205,029	264,614	H788	207,422	263,014
H410	207,111	269,701	H789	207,292	263,063
H411	206,327	269,235	H790	207,441	263,968
H412	206,394	269,188	H791	206,710	263,709
H413	206,251	269,160	H792	206,435	264,182
H414	206,405	269,132	H793	206,323	264,321
H415	206,419	269,204	H794	206,231	264,373
H416	206,706	269,436	H795	206,069	264,483
H417	206,980	269,062	H796	206,169	264,458
H418	210,559	266,983	H797	206,159	264,471
H421	210,480	267,154	H798	206,152	264,479
H422	210,241	267,542	H799	206,138	264,498
H425	209,449	267,292	H800	206,127	264,509
H427	210,102	266,571	H801	206,121	264,516
H428	210,884	264,617	H802	206,071	264,489
H429	211,010	264,223	H803	206,075	264,495
H430	211,073	264,170	H804	206,083	264,510
H431	211,619	263,963	H805	206,086	264,515
H432	210,196	263,314	H806	206,101	264,533
H433	211,500	263,139	H807	206,058	264,426
H434	209,009	267,561	H808	206,056	264,433
H435	209,305	267,494	H809	206,050	264,450
H436	209,903	267,394	H810	206,020	264,478
H437	210,295	266,453	H811	204,497	265,990
H438	210,272	266,395	H812	204,782	265,738
H439	210,428	265,825	H813	205,031	264,574
H440	210,776	264,742	H814	205,158	264,532
H441	210,870	264,644	H815	205,199	264,670
H442	210,939	264,357	H816	204,573	265,981
H443	210,968	264,314	H817	204,788	265,841
H444	211,036	264,213	H818	204,719	265,834
H445	211,053	264,184	H819	204,918	265,634
H446	203,157	272,761	H820	205,101	265,494
H447	202,967	269,891	H821	205,076	264,621
H448	202,990	270,021	H825	203,227	268,273
H449	201,563	270,014	H826	205,154	265,431
H451	203,030	269,432	H827	203,555	269,022
H452	203,207	269,254	H828	205,535	271,235
H453	202,255	269,105	H829	205,547	271,234
H454	202,459	269,286	H831	205,153	272,108
H455	202,347	269,194	H832	205,197	266,388