Appendix 12-3 - Noise Model Assumptions and Inputs

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 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.
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.

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.

NSL Ref	Easting	Northng
H001	579,973	900,783
H002	579,957	900,776
H003	579,786	900,073
H004	579,808	899,965
H005	579,485	899,792
H006	579,177	899,725
H007	579,144	899,727
H008	579,030	899,932
H009	579,016	899,806
H010	580,035	901,764
H011	579,681	900,053
H012	579,050	899,708
H013	580,271	901,596
H014	580,113	901,692
H015	580,035	901,637
H016	579,939	901,876
H017	579,927	902,020
H018	580,006	900,756
H019	579,990	900,790
H020	579,255	900,356
H021	579,189	900,313
H022	579,201	900,695
H023	579,190	901,000
H024	579,290	901,301
H025	579,904	900,729
H026	578,904	898,500
H027	578,811	898,519
H028	578,762	898,315
H029	586,506	905,608
H030	582,129	901,778
H031	587,708	906,674
H032	579,105	900,326

NSL Ref	Easting	Northng
H033	578,690	898,860
H034	582,639	896,937
H035	582,399	896,299
H036	579,046	900,587
H037	578,974	900,533
H038	578,967	900,530
H039	579,284	900,316
H040	579,137	900,399
H041	579,053	900,298
H042	579,016	900,040
H043	579,066	900,057
H044	585,898	905,569
H045	585,709	905,512
H046	585,675	905,461
H047	585,365	905,275
H048	583,930	897,349
H049	582,228	896,607
H050	579,100	899,915
H051	579,076	900,464
H052	578,661	898,332
H053	578,786	898,754
H054	586,703	906,390
H055	586,700	906,380
H056	586,686	906,362
H057	586,679	906,366
H058	586,502	906,301
H059	586,468	906,086
H060	585,749	905,377
H061	585,678	905,361
H062	584,264	904,282
H063	583,861	899,089
H064	583,484	902,263
H065	583,396	902,215

NSL Ref	Easting	Northng
H066	583,342	902,142
H067	585,322	904,584
H068	585,676	904,919
H069	582,055	902,058
H070	584,139	903,211
H071	581,351	901,454
H072	582,541	902,494
H073	585,737	905,426
H074	583,122	902,985
H075	586,698	906,451
H076	585,295	905,236
H077	586,765	906,731
H078	586,887	906,214
H079	585,327	905,255
H080	585,188	905,124
H081	584,892	904,928
H082	585,137	904,899
H083	584,932	904,815
H084	584,720	904,808
H085	582,326	896,303
H086	582,270	896,262
H087	582,308	896,271
H088	579,784	900,440
H089	579,988	900,820
H090	580,008	900,882
H091	580,276	900,872
H092	580,250	900,950
H093	580,366	900,954
H094	580,516	901,091
H095	580,203	900,950
H096	580,585	899,847
H097	579,520	899,296
H098	586,822	905,979

NSL Ref	Easting	Northng
H099	586,716	905,796
H100	584,208	904,274
H101	584,314	904,192
H102	584,173	904,160
H103	582,120	902,157
H104	584,124	904,187
H105	584,105	904,170
H106	584,028	904,085
H107	583,983	904,057
H108	583,602	903,638
H109	583,122	902,953
H110	582,960	902,707
H111	582,414	902,465
H112	582,381	902,159
H113	582,169	902,198
H114	582,142	902,175
H115	581,666	901,623
H116	581,471	901,523
H117	579,497	899,383
H118	583,222	900,287
H119	582,943	900,382
H120	586,667	906,511
H121	586,659	906,466
H122	586,636	906,417
H123	586,554	906,420
H124	587,315	906,532
H125	579,122	899,725
H126	579,634	900,189
H127	588,681	901,894
H128	588,674	901,868
H129	582,937	897,080
H130	583,864	897,221
H131	583,729	903,777

NSL Ref	Easting	Northng
H132	583,302	903,166
H133	583,221	903,052
H134	582,878	902,809
H135	582,893	902,661
H136	582,600	902,503
H137	582,702	902,581
H138	582,340	902,052
H139	581,963	902,019
H140	582,065	901,996
H141	582,094	901,679
H142	582,110	901,755
H143	582,001	901,979
H144	581,880	901,797
H145	581,552	901,565
H146	581,280	901,375
H147	580,900	901,250
H148	581,008	901,240
H149	584,430	904,390
H150	579,120	900,866
H151	579,165	900,730
H152	579,067	900,535
H153	579,078	900,451
H154	586,682	899,336
H155	587,862	900,142
H156	580,183	900,945
H157	580,773	900,870
H158	580,025	901,788
H159	579,324	901,086
H160	587,925	906,817
H161	586,528	906,391
H162	581,921	901,629
H163	581,233	899,929
H164	582,177	896,217

NSL Ref	Easting	Northng
H165	582,146	896,203
H166	582,067	896,605
H167	583,334	897,378
H168	583,953	897,465
H169	583,654	897,042
H170	580,227	900,905
H171	581,528	901,503
H172	581,452	901,462
H173	581,406	901,532
H174	579,325	900,286
H175	578,968	899,822
H176	578,914	899,752
H177	579,665	900,096
H178	579,791	900,564
H179	580,123	900,930
H180	580,284	900,966
H181	580,388	901,055
H182	580,645	901,110
H183	580,573	901,074
H184	580,558	901,629
H185	580,571	901,483
H186	580,619	901,574
H187	579,868	901,950
H188	580,065	901,603
H189	586,490	906,210
H190	589,108	905,168
H191	589,260	905,126
H192	587,825	899,920
H193	580,229	900,891
H194	580,233	900,887
H195	580,209	900,869
H196	580,176	900,856
H197	580,168	900,851

NSL Ref	Easting	Northng
H198	580,206	900,865
H199	580,218	900,872
H200	580,233	900,882
H201	579,396	900,451
H202	579,379	900,480
H203	579,270	900,432
H204	579,266	898,091
H205	586,554	906,471
H206	586,688	905,742
H207	586,504	906,182
H208	586,519	906,170
H209	586,499	906,141
H210	585,767	905,493
H211	585,307	905,115
H212	581,737	901,858
H213	580,881	899,895
H214	586,559	906,373
H215	586,650	906,446
H216	581,570	901,630
H217	579,543	899,207
H218	583,584	899,620
H219	582,356	896,308
H220	587,754	899,796
H221	585,684	898,760
H222	586,450	899,413
H223	584,071	903,099
H224	585,243	904,307
H225	585,610	898,755
H226	586,850	906,011
H227	586,937	906,261
H228	586,819	906,380
H229	587,458	906,577
H230	588,908	905,265

NSL Ref	Easting	Northng
H231	589,646	902,642
H232	578,887	898,528
H233	578,782	898,356
H234	579,268	898,038
H235	579,262	898,155
H236	579,890	897,534
H237	580,402	901,522
H238	582,237	896,948
H239	582,204	896,678
H240	585,372	905,173
H241	581,364	901,724
H242	581,307	901,387
H243	586,069	898,725
H244	579,719	899,916
H245	580,560	901,059
H246	581,015	899,833
H247	581,750	901,797
H248	582,955	902,757
H249	585,812	905,485
H250	582,259	902,249
H251	579,017	899,878
H252	586,693	906,400
H253	580,023	901,876
H254	580,014	900,798
H256	580,951	901,270
H257	585,387	905,286
H258	586,664	906,503
H259	583,479	903,511
H260	583,456	903,443
H261	583,327	903,235
H262	586,193	905,889
H263	585,943	905,656
H264	585,624	905,364

NSL Ref	Easting	Northng
H265	584,692	904,768
H266	585,149	905,079
H267	584,493	904,809
H268	579,632	899,889
H269	579,624	899,951
H270	579,815	900,036
H271	579,774	900,095
H272	579,633	900,149
H273	579,662	900,129
H274	579,726	900,264
H275	579,359	900,891
H276	586,928	906,940
H277	586,653	906,715
H278	586,627	906,495
H279	583,616	903,661
H280	583,244	903,090
H281	587,848	906,738
H282	581,844	901,767
H283	585,658	905,323
H284	580,226	900,898
H285	580,195	900,862
H286	578,688	898,634
H287	586,620	906,425
H288	579,774	899,933
H289	580,133	901,639
H290	579,796	900,595
H291	579,520	900,185
H292	579,565	900,369
H293	585,115	904,895
H294	582,239	896,241
H295	581,978	896,629
H296	581,993	896,643
H297	589,633	902,617

NSL Ref	Easting	Northng
H298	587,975	899,982
H299	579,877	900,026
H300	579,892	900,053
H301	578,990	899,936
H302	586,711	906,495
H303	586,681	906,446
H304	583,048	902,862
H305	582,932	902,738
H306	582,196	902,219
H307	582,118	901,802
H308	581,601	901,652
H309	581,588	901,542
H310	581,340	901,396
H311	581,150	901,291
H312	586,180	905,811
H313	578,779	898,413
H314	579,204	898,161
H315	578,883	898,036
H316	579,949	901,861
H317	584,838	904,564
H318	584,554	904,449
H319	580,718	899,864
H320	584,553	904,488
H321	584,257	904,224
H322	584,189	904,217
H323	579,148	900,864
H324	579,193	900,990
H325	579,160	901,148
H326	579,583	899,897
H327	579,207	901,293
H328	582,222	896,642
H329	580,189	900,858
H330	578,948	899,667

NSL Ref	Easting	Northng
H331	580,061	901,676
H332	583,619	897,040
H333	578,615	898,841
H334	579,033	899,996
H335	578,612	898,996
H336	583,624	899,746
H337	579,117	901,097
H338	578,789	898,794
H339	581,320	901,395
H340	581,942	901,932
H341	587,482	899,889
H342	586,533	906,157
H343	586,482	906,150
H344	582,180	901,734
H345	578,736	898,793
H346	578,799	898,627
H347	578,753	898,742
H348	578,724	898,667
H349	578,982	898,328
H350	584,003	897,410
H351	580,912	899,840
H352	580,895	899,844
H353	583,459	899,703
H354	578,730	899,003
H355	584,228	897,426
H356	584,154	897,608
H357	582,873	897,046
H358	582,652	896,902
H359	582,770	897,049
H360	582,556	896,918
H361	582,163	896,747
H362	583,943	898,970
H363	583,342	900,114

NSL Ref	Easting	Northng
H364	580,014	901,815
H365	580,020	900,586
H366	579,035	899,979
H367	586,806	906,798
H368	585,993	905,698
H369	582,473	896,832
H370	580,222	900,877
H371	582,113	901,835
H372	578,777	899,614
H373	586,515	906,131
H374	584,008	904,053
H375	582,842	902,682
H376	581,865	901,785
H377	580,497	899,803
H378	578,720	898,604
H379	578,725	898,825
H380	582,735	897,009
H381	582,925	897,079
H382	582,366	896,899
H383	581,288	901,381
H384	585,579	904,881
H385	579,956	901,859
H386	578,954	899,740
H387	579,498	900,046
H388	579,253	898,034
H389	579,079	900,425
H390	579,056	900,089
H391	579,862	900,739
H392	579,055	900,565
H393	584,946	904,877
H394	579,689	900,257
H395	579,191	900,413
H396	579,119	900,448

NSL Ref	Easting	Northng
H397	581,924	901,819
H398	581,550	901,606
H399	581,395	899,774
H400	581,792	901,617
H401	580,293	900,911
H402	579,195	900,951
H403	587,507	906,690
H404	589,126	905,299
H405	584,283	897,442
H406	584,073	904,134
H407	578,470	898,899
H408	581,925	901,831
H409	582,012	902,035
H410	582,003	902,017
H411	582,004	902,029
H412	582,031	902,038
H413	583,662	903,717
H414	585,463	904,758
H415	585,500	905,312
H416	581,902	896,531
H417	587,939	900,197
H418	578,670	898,265
H419	589,165	905,370
H420	587,237	899,420
H421	580,443	896,501
H422	578,768	898,689
H423	578,808	899,021
H424	578,946	898,478
H425	586,817	906,445
H426	586,796	906,447
H427	586,712	906,701
H428	579,231	901,200
H429	582,622	902,513

NSL Ref	Easting	Northng
H430	582,479	902,429
H431	581,164	899,879
H432	580,646	899,842
H433	581,265	901,357
H434	581,222	901,402
H435	580,069	900,908
H436	579,689	899,889
H437	579,271	900,351
H438	579,634	899,783
H439	580,436	901,530
H440	579,185	900,928
H441	579,182	900,886
H442	585,899	905,545
H443	585,928	905,577
H444	585,727	905,410
H445	585,668	905,397
H446	585,862	905,460
H447	585,755	905,654
H448	582,843	902,667
H449	582,817	902,649
H450	583,747	903,786
H451	582,777	897,211
H452	581,358	901,414
H453	586,710	899,367
H454	583,974	897,389
H455	586,115	905,763
H456	588,614	901,738
H457	583,496	903,538
H458	582,110	901,674
H459	580,994	901,287
H460	581,107	901,283
H461	582,264	901,902
H462	582,115	901,892

NSL Ref	Easting	Northng
H463	579,841	900,662
H464	582,091	896,667
H465	578,918	899,024
H466	578,719	898,754
H467	583,968	897,468
H468	579,933	901,906
H469	585,264	905,165
H470	584,861	904,672
H471	582,122	896,705
H472	583,795	897,196
H473	579,194	901,105
H474	585,757	905,433
H475	580,673	901,064
H476	581,244	901,409
H477	582,248	902,039
H478	586,126	905,792
H479	579,217	901,030
H480	586,985	906,996
H481	580,531	901,508
H482	579,845	900,099
H483	580,286	901,015
H484	584,868	904,881
H485	579,145	901,089
H486	583,563	903,590
H487	582,019	902,005
H488	586,086	899,112
H489	586,463	899,025
H490	582,795	897,066
H491	586,672	906,461
H492	586,678	906,408
H493	586,671	906,412
H494	586,663	906,417
H495	586,626	906,406

NSL Ref	Easting	Northng
H496	586,621	906,397
H497	586,682	906,493
H498	586,674	906,495
H499	586,669	906,519
H500	586,639	906,515
H501	586,634	906,507
H502	586,587	906,454
H503	586,614	906,419
H504	586,609	906,411
H505	586,574	906,315
H506	586,537	906,225
H507	586,519	906,327
H508	586,509	906,284
H509	586,487	906,114
H510	579,052	900,338
H511	579,067	900,256
H512	579,710	900,021
H513	580,848	901,152
H514	580,728	900,709
H515	579,686	900,471
H516	579,642	899,745
H517	589,470	904,895
H518	586,044	898,684
H519	589,217	905,173
H520	586,797	906,778
H521	583,289	897,368
H522	583,270	900,241
H523	578,595	897,581
H524	578,418	898,336
H525	578,366	898,309
H526	578,389	898,289
H527	578,516	898,057
H528	586,810	906,805

NSL Ref	Easting	Northng
H529	578,396	898,010
H530	578,361	897,841
H531	578,434	897,779
H532	580,227	896,503
H533	578,441	898,366
H534	578,462	898,329
H535	583,551	902,312
H536	581,085	899,864
H537	580,349	899,685
H538	579,602	899,933
H539	580,474	901,528
H540	581,838	901,625
H541	583,477	897,336
H542	586,809	906,802