Kerrs Creek Wind Farm

Preliminary Noise Impact Assessment

S6509.2C2

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Contents

GLOSSARY

A-weighting	Frequency adjustment applied to measured noise levels to replicate the frequency response of the human ear.
Ambient noise level	The noise level of the existing noise sources in the environment (in the absence of the wind farm).
Associated Residence	A landowner with a commercial agreement with the wind farm.
Background noise level	The ambient noise level which excludes intermittent noise sources.
Bulletin	*Wind Energy: Noise Assessment Bulletin - For State significant wind energy development (NSW Department of Planning and Environment, December 2016)*
CONCAWE	*The oil companies' international study group for conservation of clean air and water - Europe, The propagation of noise from petrochemical complexes to neighbouring communities (May 1981).*
dB(A)	A-weighted noise or sound power level in decibels.
EIS	Environmental Impact Statement
Equivalent noise level	Energy averaged noise level over a prescribed period of time
Non-associated Residence	Not an Associated Residence
SEARs	Secretary's Environmental Assessment Requirements
Sound power level	A measure of the sound energy emitted from a source of noise.
The Project	Kerrs Creek Wind Farm
Weather category 6	Weather category which is most conducive for the propagation of noise, resulting in highest predicted noise levels when using CONCAWE.
Worst-case	Conditions resulting in the highest noise level at residences.
WTG	Wind turbine generator comprising a three bladed, upstream facing, horizontal axis turbine mounted on steel towers with a common set of generic design components comprising a foundation, tower, nacelle, hub and blades

1 INTRODUCTION

A Preliminary Noise Impact Assessment has been undertaken in accordance with the New South Wales Planning and Environment *Wind Energy: Noise Assessment Bulletin* (**the Bulletin**) for the Kerrs Creek Wind Farm (the **Project**) proposed north of Orange in New South Wales (NSW).

This preliminary noise impact assessment has been prepared to assist the Project in applying for the Secretary's Environmental Assessment Requirements (**SEARs**) and to guide the preparation of the Environmental Impact Statement (**EIS**) for the Project.

2 PRELIMINARY NOISE IMPACT ASSESSMENT

The preliminary noise impact assessment is based on the following:

- Wind turbine generator (**WTG**) locations as summarised in Appendix A. The locations are for the purposes of a preliminary assessment only;
- Residence locations summarised in Appendix B including the nearest WTG, distance to the nearest WTG and preliminary predicted noise level;
- Local topographical contours;
- Noise level data for an indicative WTG (being the *VestasV162 6MW*). The indicative WTG is for the purposes of a preliminary assessment. In addition no adjustment has been made to the noise data to account for "uncertainty" or "guaranteed" noise levels; and,
- The WTG being free of any excessive levels of tonality or any other special noise characteristics at the residences.

2.1 Methodology

Predictions have been made using the CONCAWE noise propagation model and SoundPLAN noise modelling software. The sound propagation model considers the following influences:

- sound power levels and preliminary locations of WTGs;
- separation distances between WTGs and residences;
- topography of the area;
- influence of the ground;
- air absorption; and,
- meteorological conditions.

The CONCAWE system divides meteorological conditions into six separate "weather categories", depending on wind speed, wind direction, time of day and level of cloud cover. Weather Category 6 provides "worst-case" (i.e. highest noise level) conditions.

The preliminary assessment has been based on the following input conditions:

- weather category 6 (representing a temperature inversion and wind conditions that assist with the propagation of noise);
- atmospheric conditions at 10°C and 80% relative humidity (representing conditions that result in low levels of noise absorption from the atmosphere);
- wind direction from all noise sources to the particular residence under consideration, even in circumstances where sources are located in opposite directions from the residence (representing the worst-case noise propagation due to wind);
- acoustically soft ground (representing the pastoral nature of the land); and,
- maximum barrier attenuation from topography of 2 dB(A) (representing a conservative assessment of any shielding provided by topography).

2.2 Criteria

The Bulletin provides a baseline noise criterion of 35 dB(A) at non-associated residences. Where a landowner has formed a commercial agreement with the developer (associated residence), the Bulletin enables the baseline criterion to be increased.

It is noted that background noise level monitoring to be conducted as part of the EIS process may result in an increase in the noise assessment criteria above those provided by the baseline.

2.3 Results

The 35 dB(A) noise contour (the baseline noise level criterion in the Bulletin) and the residences are shown in Figure 1 for the times when the proposed wind farm is producing the highest level of noise (corresponding to hub height wind speeds of 10m/s and above).

The predicted noise level at each non-associated residence is provided in Appendix B and has been compared against the baseline criterion of the Bulletin. The baseline criterion of 35 dB(A) is achieved at all non-associated residences.

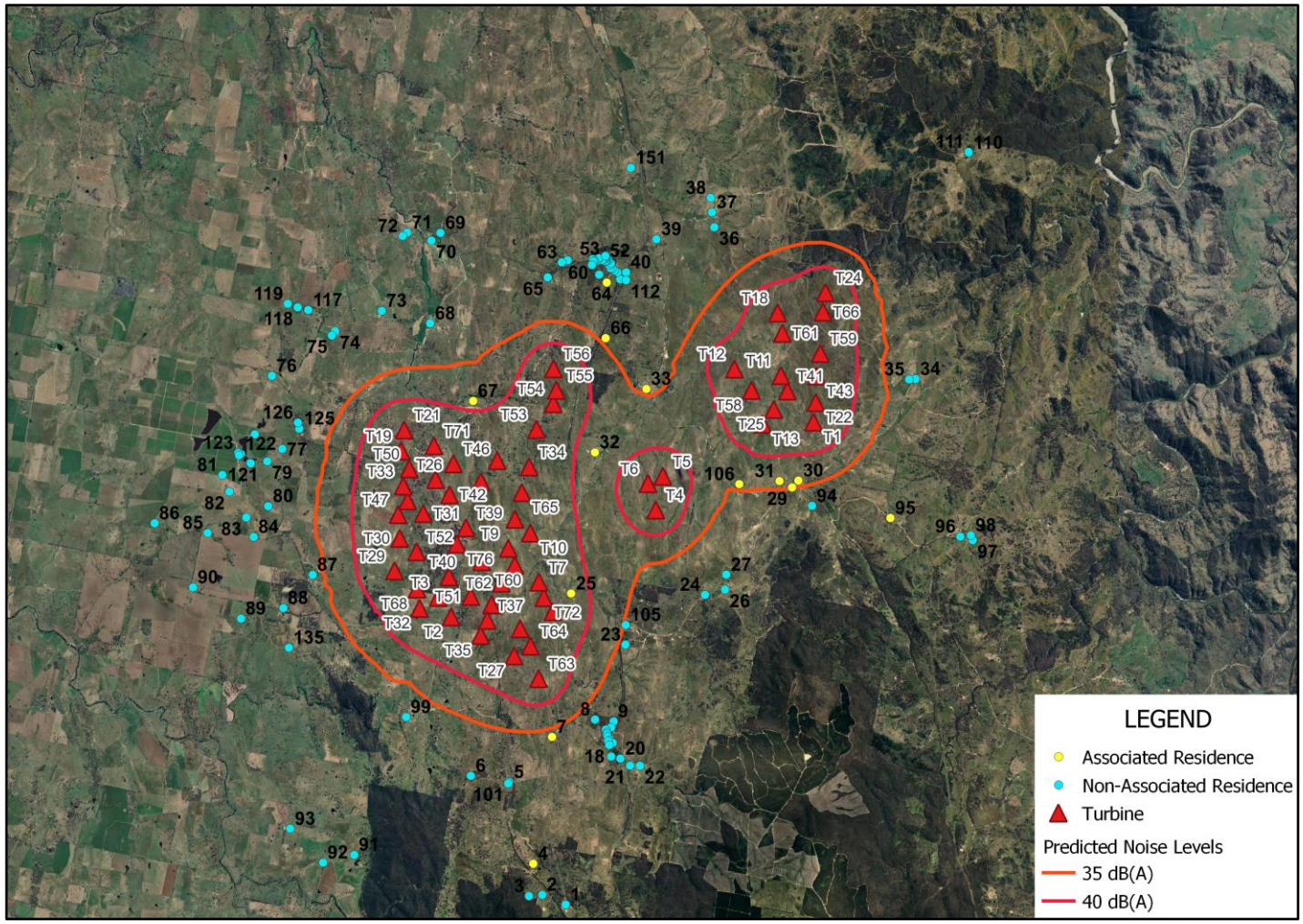

Figure 1: *Noise contours with WTGs and nearby Residences*

3 ACOUSTIC IMPACT ASSESSMENT

A detailed acoustic assessment will be prepared for inclusion in the EIS addressing each of the SEAR's, which are likely to require the following :

- WTG noise in accordance with the Bulletin;
- Ancillary noise in accordance with the *NSW Noise Policy for Industry, 2017*;
- Construction noise in accordance with the *Interim Construction Noise Guideline, 2009*;
- Traffic noise in accordance with the *NSW Road Noise Policy, 2011*; and
- Vibration in accordance with *Assessing Vibration: A Technical Guideline, 2006*.

The EIS will incorporate the following information to assist in considering the detailed assessment:

1. Background noise monitoring results;
2. Establishment of criteria in accordance with the background noise monitoring results;
3. Predictions which account for the sound power levels and locations of WTGs and ancillary infrastructure;
4. A construction noise assessment and framework for a management plan;
5. A traffic noise assessment and input to a management plan where required;
6. Commentary on vibration impacts; and,
7. Noise reduction measures (including modifying the WTG layout and/or applying a curtailment strategy) where the relevant operational or construction assessment criteria cannot be achieved.

APPENDIX A:

WTG ID	WTG Coordinates (UTM WGS84 55H)	
	Easting	Northing
T1	700794	6349524
T2	691619	6344597
T3	691291	6345088
T4	696800	6347302
T5	696980	6348151
T6	696602	6347969
T7	693838	6345475
T8	694196	6344729
T9	693066	6346329
T10	693622	6346717
T11	699968	6350703
T12	698790	6350869
T13	699503	6349475
T18	699885	6352286
T19	690351	6348796
T21	690428	6349325
T22	700851	6350018
T24	701098	6352800
T25	699788	6349846
T26	691224	6348069
T27	693212	6343609
T28	692391	6345994
T29	690184	6345759
T30	690315	6346582
T31	690912	6347212
T32	690818	6344812
T33	690405	6347908
T34	693592	6348389
T35	692364	6344127
T37	692531	6344509
T38	693366	6344297
T39	691995	6346848

WTG ID	WTG Coordinates (UTM WGS84 55H)	
	Easting	Northing
T40	691562	6345609
T41	700132	6350312
T42	691576	6347685
T43	700872	6350691
T44	692372	6348017
T45	692785	6348550
T46	691675	6348471
T47	690277	6347184
T48	690513	6347533
T49	693234	6347067
T50	690558	6348342
T51	692114	6345112
T52	690742	6346244
T53	693779	6349343
T54	694206	6349990
T55	694280	6350330
T56	694209	6350875
T58	699223	6350328
T59	700967	6351262
T60	693227	6345902
T61	700006	6351773
T62	692888	6345447
T63	693831	6343033
T64	693626	6343858
T65	693408	6347744
T66	701032	6352309
T68	690755	6345300
T71	691182	6348926
T72	693964	6345085
T76	691764	6346437
T77	692640	6344901

APPENDIX B:

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
1	694518	6337314	NO	T63	5760.2	17
2	693925	6337562	NO	T63	5471.7	18
3	693588	6337532	NO	T63	5506.4	18
4	693698	6338351	YES	T63	4684.2	21
5	693085	6340415	NO	T63	2722.3	28
6	692117	6340574	NO	T63	2997.5	29
7	694172	6341558	YES	T63	1513.5	34
8	695261	6341999	NO	T63	1764.9	33
9	695733	6341949	NO	T63	2189.1	31
10	695669	6341796	NO	T63	2215.3	30
11	695535	6341744	NO	T63	2136.3	31
12	695562	6341671	NO	T63	2202.3	30
13	695564	6341630	NO	T63	2229.7	30
14	695583	6341564	NO	T63	2286.4	30
15	695637	6341474	NO	T63	2386.0	29
16	695711	6341406	NO	T63	2486.0	29
17	695595	6341448	NO	T63	2371.6	29
18	695620	6341353	NO	T63	2454.0	29
19	695670	6341061	NO	T63	2696.2	28
20	695904	6341008	NO	T63	2897.2	27
21	696148	6340831	NO	T63	3195.8	26
22	696400	6340826	NO	T63	3386.3	25
23	696031	6343895	NO	T8	2016.1	34
24	698047	6345153	NO	T4	2484.9	29
25[1]	694655	6345187	YES	T8	648.9	44
26	698555	6345287	NO	T4	2672.1	29
27	698587	6345664	NO	T4	2424.0	29
29	700252	6347871	YES	T1	1739.6	35
30	700411	6348044	YES	T1	1528.1	36
31	699934	6348032	YES	T13	1505.9	36
32	695259	6348759	YES	T6	1558.2	39
33	696563	6350363	YES	T5	2251.4	35
34	703376	6350613	NO	T59	2494.7	32
35	703217	6350605	NO	T59	2343.6	32
36	698281	6354456	NO	T18	2697.7	28
37	698224	6354834	NO	T18	3041.6	27
38	698194	6355201	NO	T18	3369.7	26
39	696816	6354152	NO	T18	3591.9	26
40	696051	6353313	NO	T56	3055.7	28
41	695898	6353139	NO	T56	2824.3	28
42	695826	6353318	NO	T56	2929.7	28
43	695761	6353360	NO	T56	2929.5	28
44	695702	6353406	NO	T56	2938.4	27

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
45	695651	6353421	NO	T56	2926.0	27
46	695624	6353499	NO	T56	2981.6	27
47	695661	6353543	NO	T56	3037.9	27
48	695599	6353623	NO	T56	3079.7	26
49	695563	6353634	NO	T56	3073.7	26
50	695533	6353634	NO	T56	3060.6	26
51	695538	6353594	NO	T56	3026.7	26
52	695514	6353601	NO	T56	3022.6	26
53	695506	6353657	NO	T56	3069.4	26
54	695468	6353636	NO	T56	3034.1	26
55	695440	6353625	NO	T56	3012.8	26
56	695327	6353616	NO	T56	2960.5	26
57	695347	6353671	NO	T56	3019.0	26
58	695206	6353652	NO	T56	2950.5	26
59	695250	6353601	NO	T56	2917.5	26
60	695215	6353596	NO	T56	2901.1	26
61	695367	6353257	NO	T56	2648.5	28
62	694570	6353620	NO	T56	2768.8	27
63	694419	6353568	NO	T56	2700.9	27
64	695559	6353057	YES	T56	2565.9	28
65	694065	6353186	NO	T56	2315.9	29
66	695531	6351649	YES	T56	1531.8	34
67	692176	6350059	YES	T71	1507.2	39
68	691087	6352024	NO	T21	2778.3	30
69	691348	6354312	NO	T56	4472.2	22
70	691118	6354120	NO	T56	4481.9	23
71	690505	6354321	NO	T21	4996.0	22
72	690391	6354234	NO	T21	4909.0	22
73	689863	6352340	NO	T21	3066.9	28
74	688680	6351827	NO	T21	3051.5	27
75	688598	6351717	NO	T21	3011.1	27
76	687079	6350694	NO	T21	3617.2	25
77	687342	6348846	NO	T19	3009.6	30
78	686647	6349214	NO	T19	3726.9	27
79	686962	6348532	NO	T19	3399.3	29
80	686984	6347398	NO	T47	3299.6	29
81	685824	6348187	NO	T47	4564.6	24
82	686002	6347763	NO	T47	4314.2	25
83	686430	6347111	NO	T47	3847.8	27
84	686617	6346619	NO	T29	3669.0	28
85	685450	6346719	NO	T29	4829.5	23
86	684109	6346966	NO	T47	6171.8	19
87	688113	6345659	NO	T29	2073.2	34
88	687368	6344819	NO	T29	2968.6	29
89	686297	6344551	NO	T29	4069.7	25

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
90	685081	6345342	NO	T29	5119.0	22
91	689163	6338572	NO	T35	6410.7	18
92	688375	6338377	NO	T32	6883.0	17
93	687541	6339236	NO	T32	6467.2	18
94	700757	6347405	NO	T1	2118.7	32
95	702742	6347098	YES	T1	3110.9	26
96	704513	6346626	NO	T1	4715.0	20
97	704828	6346537	NO	T1	5019.4	19
98	704780	6346657	NO	T1	4910.3	20
99[2]	690479	6342061	NO	T32	2771.0	32
101	693064	6340381	NO	T63	2760.5	28
105	696040	6344392	NO	T8	1874.7	35
106	698914	6347956	YES	T13	1629.2	35
110	704730	6356335	NO	T24	5068.7	18
111	704723	6356360	NO	T24	5081.1	16
112	696048	6353114	NO	T56	2897.8	28
113	695525	6353729	NO	T56	3142.5	26
114	695184	6353501	NO	T56	2801.0	26
117	687999	6352361	NO	T21	3887.7	24
118	687732	6352429	NO	T21	4110.5	23
119	687481	6352519	NO	T21	4345.6	22
120	686522	6348494	NO	T19	3840.3	27
121	686543	6348482	NO	T19	3820.8	27
122	686296	6348715	NO	T19	4055.2	26
123	686225	6348741	NO	T19	4125.7	26
124	686245	6348687	NO	T19	4107.0	26
125	687773	6349359	NO	T19	2638.2	30
126	687736	6349511	NO	T21	2697.5	29
135	687509	6343815	NO	T29	3306.0	28
151	696168	6355960	NO	T18	5225.8	21

1. The landowner has agreed to relocate or demolish the dwelling.
2. Owner has indicated wish to remove dwelling and preference for more turbines.