White Rock Wind Farm

Stage 2

Environmental Noise Assessment

S4646C10

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sonus.

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1 INTRODUCTION

An environmental noise assessment for the approved White Rock Wind Farm, consisting of 119 wind turbines in New South Wales has been conducted and detailed in the Sonus report S3486C4, dated August 2011 (the Original Assessment).

The Original Assessment addressed the Director-General's Requirements (DGRs) dated 13 October 2010, and ensured that the different noise components of the project complied with the following guidelines:

- Wind Turbines – the South Australian Environment Protection Authority's (SA EPA) *Wind Farms – Environmental Noise Guidelines* (2003);
- Substation - *NSW Industrial Noise Policy* (EPA 2000);
- Site Establishment and Construction - *Interim Construction Noise Guideline* (DECC 2009);
- Traffic Noise – *Environmental Criteria for Road Traffic Noise* (NSW EPA, 1999);
- Vibration – *Assessing Vibration: A Technical Guideline* (DECC, 2006); and,
- Blasting – *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC 1990).

The project was granted approval on 10 July 2012 and is subject to the specified Conditions of Approval, as modified.

As required by the project approval (Condition F6), Resonate Acoustics has conducted background noise level measurements at representative non-associated residence locations and have provided the noise criteria at these residences in report "S15650RP2, Revision A".

Also as required by the project approval (Condition F6), a *Verification Report* for Stage 1 of the White Rock Wind Farm (Sonus report S4646C6) has been prepared which details the operational noise predictions for the final wind turbine selection (GW121-2.5MW) and layout of the 70 turbine sites for Stage 1.

Modification 6 seeks to delete 1 of the 49 approved wind turbines, as well as relocating 20 of the approved turbine locations for the approved White Rock Wind Farm. This report updates the operational noise predictions for the combined operation of both the Stage 1 and Stage 2 turbines to confirm that their combined operation can achieve the criteria provided by the project approval.

2 LOCATION OF THE WIND FARM AND THE SURROUNDING RESIDENCES

The coordinates of the final Stage 1 and proposed Stage 2 turbine (WTGs) layouts and the non-associated residences are provided in Table 1, 2 and 3, respectively.

Table 1: Coordinates of Stage 1 turbines.

Turbine ID	Coordinates (UTM WGS 84 Zone 56)	
	Easting	Northing
1	359386.4	6705738
2	359210	6705405
3	359186	6705126
4	359247	6704867
5	359243	6704577
6	359665	6704433
7	359664	6704162
8	359658	6703876
9	359600	6703621
10	359686	6703353
11	359852	6703092
13	360324	6702385
14	360298	6702056
15	360204	6701757
19	359215	6701587
20	359393	6701309
21	359909	6701419
22	360020	6701111
25	359536	6700901
26	359873	6700707
27	359908	6700489
28	359928	6700252
29	359488.3	6700090
30	359863	6699736
31	360052	6699458
34	359822	6699193
35	360175	6699010
36	360188.6	6698709
37	360201	6698468
38	360248	6698187
39	360518.6	6697927
40	360825	6697677
41	360993	6697262
44	361420.6	6696362
47	361459	6695468

Turbine ID	Coordinates (UTM WGS 84 Zone 56)	
	Easting	Northing
48	361465	6695164
51	361682	6703607
52	361741.8	6703252
53	361251	6703057
54	361737	6702891
55	361686	6702678
56	361651	6702407
57	361550	6702184
58	361127	6701687
59	361287	6701426
60	361423	6701163
61	361206	6700913
62	361542.9	6699344
63	361525	6699085
64	361552	6698814
65	361628	6698554
68	362003	6697628
69	362218	6697426
71	362470	6698378
72	362561	6698100
73	362612	6697810
75	362534.5	6697141
76	362872.9	6696807
77	362829	6696560
78	362938.3	6696353
79	363005	6695984
80	363030	6695661
81	362948.8	6695388
82	362969	6695085
83	363366	6694909
109	360532	6693239
110	360440	6693021
111	360744	6692817
112	361447	6692821
113	361755	6692593

Table 2: Coordinates of Stage 2 turbines.

Turbine ID	Coordinates (UTM WGS 84 Zone 56)	
	Easting	Northing
12	360138	6702698
42	361251	6696961
43	361347	6696676
45	361320	6696046
46	361422	6695759
49	362185	6695344
50	362280	6695007
66	361818	6698224
67	362015	6697923
70	362413	6698645
84	364459	6697276
85	364442	6697003
86	364626	6696645
87	364730	6696374
88	364727	6696088
89	364365	6695828
90	364655	6695615
91	364716	6695348
92	365190	6695204
93	365344	6694933
95	365636	6694599
105	367074	6697516
106	367109	6697097
107	366767	6696860

Turbine ID	Coordinates (UTM WGS 84 Zone 56)	
	Easting	Northing
108	368091	6696553
114	361291	6691510
115	361070	6691289
116	361311	6691034
120	362214	6691519
121	361160	6694785
122	360813	6694536
123	359796	6693798
124	360018	6694601
125	359906	6695045
126	358893	6695350
127	359366	6695518
128	358828	6695986
129	358087	6696270
130	359846	6693425
131	359180	6693573
132	365521	6696075
133	366943	6695444
134	367284	6695985
135	368202	6695772
136	368327	6696168
137	365440	6696898
138	361893	6690681
139	361677	6690162

Note: Revised numbering applies to the relocated turbines, now designated as 120 to 139.

Table 3: Coordinates of non-associated residences.

Residence ID	Coordinates (UTM WGS 84 Zone 56)	
	Easting	Northing
A12	352687.7	6699195
A50	352977.6	6706026
A71	352558.3	6704571
B61	353565.3	6705096
B62	353604.1	6705101
C210	354455	6690282
D65	355061.1	6704936
D121	355779.6	6699540
D160	355602.9	6694922
E50	356197.2	6706634
E140	356552.8	6697896
H20	359708.8	6709459
I40	360952.6	6707433
I221	360556.9	6689424
I222	360414.7	6689339
J20	361118.7	6710266
J21	361300.1	6709907
K30	362058.6	6708102
K260	362097.5	6685889
K261	362216.8	6685533
L200	363849.9	6691139
L230	363560.8	6688540
M60	364355.3	6705265
M80	364667.3	6703481
M220	364048.1	6689542
M221	363891.7	6689530
N90	365362.9	6702583
N100	365122.8	6700979
N180	365055.1	6693027
N190	365067.7	6692882
N230	365245.6	6688696
N240	365745	6687549
N250	365114	6686962
N251	365476.2	6686345
O191	366819.9	6692884
P20	367797.6	6709532
P70	367289.7	6704216
P190	367851.4	6692510

Residence ID	Coordinates (UTM WGS 84 Zone 56)	
	Easting	Northing
Q70	368678	6704716
Q80	368296.7	6703652
Q81	368210.8	6703336
Q82	368953.7	6703339
Q110	368814.7	6700757
Q170	368459	6694240
R40	369458.4	6707520
R80	369576.6	6703994
R90	369644.4	6702969
R91	369421.8	6702211
R120	369136.6	6699967
R121	368997.1	6699803
R130	369325.4	6698674
R190	369052.6	6692845
R270	369611.5	6684711
S30	370580.9	6708057
S60	370980.8	6705258
S130	370450.2	6698230
S160	370275.1	6695891
S170	370142.5	6695258
S180	370469.8	6693418
S200	370686.4	6691157
S210	370464.2	6690008
S220	370356.8	6689917
T30	371211	6708654
T31	371810	6708595
T60	371757.5	6705970
T70	371876.3	6704463
T100	371923.1	6701308
T170	371103.1	6694729
T200	371557.2	6691769
U60	372133.3	6705883
U61	372092.1	6705654
U62	372082	6705041
U180	372552.6	6693004
L220	363089.9	6689808

3 ENVIRONMENTAL NOISE CRITERIA

The Resonate report S15650RP2, Revision A details the relevant project noise criteria, which are consistent with the New South Wales Wind Energy: Noise Assessment Bulletin for State significant wind energy development (December 2016).

The criteria have been modified to suit the proposed hub height of the Stage 2 turbines and are summarised in Table 4.

Table 4: Turbine noise criteria.

Hub height wind speed, m/s	Noise criterion at location, dB(A)			
	D121	E50	L200	P190
3	35	35	35	43
4	35	36	35	44
5	35	37	35	44
6	36	38	35	45
7	37	39	35	45
8	38	40	37	44
9	39	40	39	44
10	40	41	41	44
11	40	41	43	44
12	41	42	46	44
13	43	43	48	45
14	44	44	49	45
15	46	45	51	47
16	49	48	52	48
17	52	50	52	51

4 NOISE PREDICTION MODEL

The noise from the combined operation of the Stage 1 and Stage 2 wind turbines has been modelled to demonstrate that the total (approved and proposed) wind farm development can achieve the project criteria.

4.1 Noise Propagation Model

The noise from the wind turbines has been modelled using the CONCAWE[1] sound propagation model that takes into account:

- the sound power level and position of the noise sources;
- the separation between the noise sources and receivers;
- the topography between the noise sources and receivers;
- the hardness of the ground;
- atmospheric absorption at different frequencies; and,
- meteorological conditions.

4.2 Noise Model Inputs

4.2.1 Meteorological Conditions

The CONCAWE system categorises the possible meteorological conditions into six categories, from Category 1 to Category 6. Category 1 is considered the "best-case" meteorological conditions (i.e., lowest noise level) while Category 6 is considered the "worst-case" meteorological conditions (i.e., highest noise level).

For a conservative assessment, the noise model has considered meteorological conditions corresponding to Category 6 (night with no clouds and wind from the wind farm to the residence under consideration).

[1] 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"

4.2.2 Noise Sources and Data

Noise modelling has used separate turbine noise data for Stage 1and Stage 2 turbines. Stage 1 turbines are the GW121-2.5MW wind turbine with a hub height of 89.5m above ground level. As a part of the final layout, 11 turbines (52, 54, 55, 56, 57, 59, 60, 109, 110, 112 & 113) are proposed to operate with serrated blades. For further details, refer to the *Verification Report* for the White Rock Wind Farm (Sonus report S4646C6, April 2017).

The Stage 2 turbines have been modelled based on the GW140 wind turbine with a maximum hub height of 130m above ground level for both the 3.57MW and 3.0MW versions.

The noise from the turbines has been modelled based on the overall sound power levels provided by Goldwind for each of the wind turbine types. The one-third octave band noise spectrum for the GW121-2.5MW turbine has been based on the test data detailed in Aresse Engineering report "TR-15-033", *Acoustic Noise Test for a Goldwind GW121/2500 Wind Turbine*. In the absence of specific test data for the GW 140 turbines, the test data for the GW121-2.5MW turbine have also been used to derive the one-third octave band noise spectrum by adjusting the spectrum levels according to the difference in total levels.

The total sound power levels and the resultant one-third octave band spectrum levels for the Stage 1 turbines (GW121-2.5MW) and Stage 2 turbines (GW140-3.0MW/3.57MW) are summarised in Table 6 and Table 7, respectively[2].

4.2.3 Other Input Parameters

Other model input parameters associated with the atmospheric absorption, ground absorption and shielding are summarised below:

- atmospheric conditions at 10°C and 80% relative humidity;
- acoustically soft ground (finite acoustic impedance); and,
- a maximum barrier attenuation from topography of 2 dB.

[2] Sound power level data is not available for wind speeds below 8m/s.

Table 6: One-third Octave Band Sound Power Levels for GW121-2.5MW turbine.

Hub Height Wind Speed	1/3 Octave Band Centre Frequency																							Overall
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
Standard Sound Power Level																								
8 m/s	82.3	86.0	84.9	86.8	89.6	92.1	95.1	97.9	100.1	100.7	101.2	101.3	99.9	98.5	96.2	93.8	91.4	90.0	85.5	81.2	77.0	73.6	72.5	71.2	109.5
9 m/s	82.8	86.3	85.2	87.1	89.6	92.0	94.9	97.7	99.9	100.6	101.2	101.3	100.0	98.7	96.5	94.1	91.6	89.9	85.5	81.2	76.9	73.6	72.6	71.2	109.5
10 m/s	83.5	86.6	85.4	87.3	89.5	91.8	94.6	97.4	99.7	100.4	101.1	101.3	100.1	99.0	96.9	94.5	92.0	89.9	85.6	81.2	76.9	73.7	72.7	71.3	109.5
11 m/s	84.9	87.5	85.4	87.0	88.8	90.6	93.1	96.0	98.5	99.7	100.8	101.5	100.7	99.9	98.3	96.1	93.4	90.6	86.1	81.3	76.8	73.9	73.2	71.8	109.5
12 m/s	85.9	88.1	85.9	87.3	88.7	90.0	92.3	95.2	97.8	99.1	100.5	101.4	100.8	100.4	99.0	97.0	94.2	91.1	86.6	81.5	76.9	74.1	73.5	72.1	109.5
13 m/s	86.4	88.4	86.4	87.6	88.8	89.8	92.0	94.8	97.4	98.8	100.3	101.3	100.8	100.6	99.4	97.4	94.7	91.4	86.9	81.7	77.0	74.2	73.6	72.2	109.5
14 m/s	85.7	88.0	85.7	87.0	88.5	89.7	92.0	94.7	97.4	98.8	100.3	101.2	100.8	100.7	99.5	97.5	94.8	91.3	86.8	81.5	76.8	74.0	73.5	72.2	109.5
Serrated Blade Sound Power Level																								
8 m/s	78.4	82.1	81.0	82.9	85.7	88.2	91.2	94.0	96.2	96.8	97.3	97.4	96.0	94.6	92.3	89.9	87.5	86.1	81.6	77.3	73.1	69.7	68.6	67.3	105.6
9 m/s	79.7	83.1	82.0	83.9	86.4	88.8	91.7	94.5	96.7	97.4	98.0	98.1	96.8	95.5	93.3	90.9	88.4	86.7	82.4	78.0	73.7	70.4	69.4	68.0	106.3
10 m/s	80.9	84.0	82.8	84.7	86.9	89.2	92.0	94.8	97.1	97.8	98.5	98.7	97.5	96.4	94.3	91.9	89.4	87.4	83.0	78.6	74.3	71.1	70.1	68.7	106.9
11 m/s	82.0	84.5	82.4	84.0	85.8	87.6	90.2	93.1	95.5	96.7	97.9	98.5	97.7	97.0	95.3	93.2	90.4	87.6	83.2	78.4	73.9	71.0	70.3	68.9	106.5
12 m/s	82.4	84.6	82.4	83.8	85.2	86.5	88.8	91.7	94.3	95.6	97.0	97.9	97.3	96.9	95.5	93.5	90.7	87.6	83.1	78.0	73.4	70.6	70.0	68.6	106.0
13 m/s	82.5	84.5	82.5	83.7	84.9	85.9	88.1	90.9	93.5	94.9	96.4	97.4	96.9	96.7	95.5	93.5	90.8	87.5	83.0	77.8	73.1	70.4	69.7	68.3	105.6
14 m/s	82.1	84.4	82.1	83.4	85.0	86.1	88.4	91.1	93.8	95.2	96.7	97.6	97.2	97.1	95.9	93.9	91.2	87.7	83.2	77.9	73.2	70.4	70.0	68.6	105.9

Table 7: One-third Octave Band Sound Power Levels for GW140-3.0MW/3.57MW turbines.

Hub Height Wind Speed	1/3 Octave Band Centre Frequency																							Overall
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
GW140-3.0MW Sound Power Level																								
8 m/s	77.1	80.9	79.8	81.7	84.5	87.1	90.1	92.9	95.1	95.7	96.2	96.2	94.8	93.4	91.0	88.7	86.3	84.9	80.5	76.2	71.9	68.6	67.5	66.1	104.4
9 m/s	78.2	81.7	80.6	82.5	85.1	87.6	90.5	93.3	95.5	96.2	96.7	96.8	95.5	94.2	91.9	89.5	87.1	85.5	81.1	76.8	72.5	69.2	68.1	66.7	105.0
10 m/s	78.7	81.9	80.8	82.8	85.1	87.5	90.3	93.2	95.4	96.1	96.7	96.9	95.6	94.4	92.1	89.8	87.3	85.4	81.1	76.7	72.4	69.2	68.1	66.7	105.0
11 m/s	79.7	82.6	80.9	82.7	84.7	86.8	89.5	92.3	94.7	95.6	96.5	97.0	96.0	95.0	93.1	90.8	88.2	85.8	81.4	76.8	72.4	69.4	68.5	67.1	105.0
12 m/s	81.0	83.3	81.0	82.4	84.1	85.7	88.1	91.0	93.6	94.9	96.2	97.0	96.3	95.8	94.3	92.2	89.4	86.3	81.9	76.9	72.4	69.6	68.9	67.5	105.0
GW140-3.57MW Sound Power Level																								
8 m/s	79.1	82.9	81.8	83.7	86.5	89.1	92.1	94.9	97.1	97.7	98.2	98.2	96.8	95.4	93.0	90.7	88.3	86.9	82.5	78.2	73.9	70.6	69.5	68.1	106.4
9 m/s	80.7	84.2	83.1	85.0	87.6	90.1	93.0	95.8	98.0	98.7	99.2	99.3	98.0	96.7	94.4	92.0	89.6	88.0	83.6	79.3	75.0	71.7	70.6	69.2	107.5
10 m/s	81.2	84.4	83.3	85.3	87.6	90.0	92.8	95.7	97.9	98.6	99.2	99.4	98.1	96.9	94.6	92.3	89.8	87.9	83.6	79.2	74.9	71.7	70.6	69.2	107.5
11 m/s	82.2	85.1	83.4	85.2	87.2	89.3	92.0	94.8	97.2	98.1	99.0	99.5	98.5	97.5	95.6	93.3	90.7	88.3	83.9	79.3	74.9	71.9	71.0	69.6	107.5
12 m/s	83.5	85.8	83.5	84.9	86.6	88.2	90.6	93.5	96.1	97.4	98.7	99.5	98.8	98.3	96.8	94.7	91.9	88.8	84.4	79.4	74.9	72.1	71.4	70.0	107.5

5 PREDICTED NOISE LEVELS

5.1 Wind Turbine Operational Noise

The predicted noise levels at residences where background noise logging has been conducted are provided in Table 8, for the use of the GW140-3.57MW wind turbine in Stage 2.

Table 8: Predicted noise levels from wind turbine operation.

Name	Noise Level (dB(A)) at Integer Hub Height Wind Speeds									
	8		9		10		11		12	
	Criteria	Prediction	Criteria	Prediction	Criteria	Prediction	Criteria	Prediction	Criteria	Prediction
D121	38	*31*	39	*31*	39	*31*	40	*30*	41	*30*
E50	39	*30*	40	*30*	40	*30*	41	*29*	41	*29*
L200	36	*35*	38	*36*	40	*36*	42	*36*	44	*35*
P190	45	*29*	44	*29*	44	*29*	44	*29*	44	*29*

The predicted noise levels achieve the criteria for the available wind speed data range at these residences.

A contour map of the predicted noise levels for a wind speed of 10m/s is provided as Appendix A of this report.

Notwithstanding the above, in order to provide an exhaustive assessment, the predicted noise levels at all other non-associated residences have been considered. A conservative method to assess a wind farm in the circumstance where background noise levels are not available at all non-associated residences is to apply criteria determined from the lowest measured background noise levels at any location. Based on the method above, the resultant noise criteria along with the predicted noise levels at the other non-associated residences are summarised in Table 9.

Table 9 indicates that the predicted noise from the combined Stage 1 and Stage 2 wind farm would be marginally non-compliant at residences I221, N180 and N190.

Table 9: Predicted noise levels from wind turbine operation at other non-associated residences.

Residence	Noise Level (dB(A)) at Integer Hub Height Wind Speeds				
	8	9	10	11	12
Criteria	*36*	*38*	*39*	*40*	*41*
A12	20	21	21	20	20
A50	19	19	19	19	18
A71	19	19	19	19	18
B61	20	20	20	20	19
B62	20	20	20	20	19
C210	19	19	20	19	18
D65	27	27	27	27	26
D160	29	30	30	29	29
E140	33	34	34	33	33
H20	25	25	25	25	25
I40	33	33	33	33	33
I221	**37**	38	38	38	38
I222	36	37	37	37	37
J20	21	21	21	21	20
J21	22	22	22	22	21
K30	28	28	28	27	27
K260	20	21	21	21	20
K261	19	20	20	20	19
L230	30	31	31	30	30
M60	29	30	30	29	29
M220	31	32	32	31	31
M221	32	33	33	33	32
N90	30	30	30	30	29
N100	33	33	33	33	32
N180	**38**	38	38	38	38
N190	**37**	38	38	37	37
N230	24	25	25	24	24
N240	20	21	21	21	20
N250	20	21	21	21	20
N251	16	17	17	17	16
O191	33	33	33	33	33
P20	13	13	13	13	12
P70	20	21	21	20	20
Q70	17	18	18	17	17
Q80	19	20	20	19	19
Q81	20	20	20	20	19
Q82	19	20	20	19	19
Q110	25	26	26	25	25
Q170	36	37	37	37	36
R40	13	13	13	13	12
R80	18	18	18	18	17

Residence	Noise Level (dB(A)) at Integer Hub Height Wind Speeds				
	8	**9**	**10**	**11**	**12**
Criteria	*36*	*38*	*39*	*40*	*41*
R90	19	19	19	19	18
R91	20	21	21	20	20
R120	27	28	28	28	27
R121	28	29	29	29	28
R130	31	32	32	32	32
R190	27	28	28	28	27
R270	11	11	11	11	10
S30	12	12	12	12	11
S60	14	15	15	14	14
S130	29	30	30	29	29
S160	32	33	33	33	33
S170	33	34	34	34	33
S180	26	27	27	26	26
S200	18	19	19	18	18
S210	17	18	18	17	17
S220	17	18	18	17	17
T30	11	11	11	11	10
T31	10	10	11	10	10
T60	12	13	13	12	12
T70	14	14	14	14	13
T100	18	18	18	18	17
T170	25	26	26	26	25
T200	18	19	19	18	18
U60	12	13	13	12	12
U61	12	12	12	12	11
U62	13	13	13	13	12
U180	19	20	20	19	19
L220	37	38	38	38	37

In addition, specific agreements will need to be entered into with associated landowners in accordance with the Conditions of Approval, which note:

"However, these criteria[3] do not apply if the Proponent has an agreement with the owner/s of the relevant residence or land to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement."

[3] As summarised in Table 8.

5.2 Management Strategy

In order to achieve the project criteria at all locations using a conservative assessment approach, the following options have been modelled to be satisfactory:

1. Replace a portion of the Stage 2 3.57MW turbines with the 3.0MW variant with a lower sound power level (see Table 7, 2 to 2.5 dB reduction at wind speeds 8 – 12m/s);
2. Remove turbines 93, 95 and 139 from the proposed Stage 2 layout and retain the 3.57MW turbines at all other Stage 2 turbine locations; or
3. Implement a sector management strategy which would require specific turbines to be switched off at specific wind speeds and directions. A sector management strategy has been considered below.

In addition to the above, specific agreements are currently being entered into with associated landowners in accordance with the Conditions of Approval.

Sector Management Strategy

A directional analysis of the wind farm noise has been conducted to determine a sector management system that can achieve the project criteria.

The analysis considered the predicted noise levels from the wind farm (Stages 1 and 2) under different wind directions, within the sectors (45° wide) centred at 0°, 45°, 90°,135°, 180°, 225°, 270° and 315°. The noise predictions have been conducted using the CONCAWE sound propagation model.

Based on the predictions, the wind farm exceeds the criteria at wind speeds (at 130m above ground level) up to and including 8m/s at the following receivers:

- I221 for the wind direction sectors centred at 0°, 45°, 90° and 315°;
- N180 and N190 for the wind direction sectors centred at 0°, 45° and 315°.

In order to comply with the project criteria at all residences, the sector management system will need to switch off the following turbines at wind speeds (at 130m above ground level) below 9m/s:

- T139 for wind direction sectors centred at 0°, 45°, 90° and 315°;
- T95 for wind direction sectors centred at 0°, 45° and 315°; and,
- T93 for wind direction sectors centred at 315°.

6 CONCLUSION

An environmental noise assessment for the approved White Rock Wind Farm in New South Wales has been conducted and detailed in the Sonus report S3486C4, dated August 2011 (the Original Assessment).

The project was granted approval on 10 July 2012, with specific conditions requiring background noise logging to be conducted at several residences in the vicinity of the wind farm, in order to determine the project criteria and to prepare a Verification Report based on the final turbine selection and layout for Stage 1.

Modification 6 seeks to delete 1 of the 49 approved wind turbines, as well as relocating 20 of the approved turbine locations for the approved White Rock Wind Farm. This report updates the operational noise predictions for the combined operation of both the Stage 1 and Stage 2 turbines to confirm that their combined operation can achieve the criteria provided by the project approval.

The predicted noise levels from the combined operation of the Stage 1 and Stage 2 approved and proposed wind turbines achieve the project criteria at residences where background noise logging has been conducted.

In addition to the above, noise criteria have been conservatively applied at the remaining non-associated residences based on the lowest measured background noise levels. These criteria are predicted to be achieved through either of the following options;

1. Replacing a portion of the Stage 2 3.57MW wind turbines with the 3.0MW variant;
2. Removing three Stage 2 3.57MW turbines from the layout and retain the 3.57MW turbines at all other locations; or,
3. Implementing sector management to switch off specific turbines at specific wind speeds and directions.

Finally, specific agreements are currently being entered into with associated landowners in accordance with the Conditions of Approval.

APPENDIX A: NOISE CONTOUR MAP (10M/S AT 130M HUB HEIGHT)