10. Noise Issues

This section of the EA summarises the findings of an assessment of the potential noise impact arising from the construction and operation of the proposed Capital Wind Farm. A full assessment has been undertaken by Vipac Engineers and Scientists and their assessment is provided in Appendices H1 and H2. A summary of the key aspects of the assessment is included in the following sections.

10.1 Introduction

The ambient noise environment in rural areas may include noise from a variety of sources, including the wind, rain, animals and human activities. It can exhibit both diurnal and seasonal variability. A wind farm development can add to existing rural noise levels in the vicinity of the wind farm. Whether the additional noise is regarded as disturbing will depend on a range of factors including subjective factors as well as on measurable aspects such as how loud the sound is, how long it lasts, the tone of the sound and the time of day or night at which it occurs.

The following sections describe the nature of the existing acoustic environment, the nature of the noise arising from the proposed development, the potential impacts of the development and the options for mitigation of the impacts.

10.2 Overview of Noise Impacts and their Assessment

Potential noise impacts associated with the wind farm may be related to the construction or operational stages. The operational noise sources include:

- Rotating electrical and mechanical parts
- Aerodynamic noise as the blades pass through the air
- Transformer related noise
- Maintenance activities

Construction noise sources include transport vehicles, excavators, cranes, concrete batching plant activities and earth moving activities.

A comprehensive noise assessment has reviewed the potential impacts of these sources. Aspects of the noise assessment included:

- Identification of noise source locations
- Identification of residential receiver locations
- Measurement of existing background sound levels at eight representative residence locations
- Development of noise objectives based on existing background sound levels
- Identification of wind turbine source sound power levels and spectra
- Calculation of predicted sound levels of wind turbines at residential receiver locations
- Comparison of predicted sound levels and objectives
- Identification of construction noise sources and assessment of potential sound levels at residential locations
- Assessment of noise impact of the total project
- Identification of measures to mitigate potential impacts of the project

The method used in the assessment was guided by the requirements of the NSW Department of Environment and Conservation (DEC) (Appendix A), which required the use of the South Australian EPA's Guideline entitled "Environmental Noise Guidelines: Wind Farms February 2003".

10.3 Project Components relative to noise impacts

The assessment of the operating wind farm's noise impacts has been based on the use of 63 Suzlon S88 2.1 MW wind turbines and a 33,000 volt to 330,000 volt substation each of which will have specific noise characteristics. Associated electrical works including the underground cables, padmount transformers and an overhead power line will have negligible noise impacts. During operations the access roads will be used by a small number of site staff for inspection and maintenance. The turbines will be located in three groups and dispersed over a broad area (Figure 10.1).

The wind farm will be at least 1.2 kilometres from the nearest house on a neighbouring property and greater than two kilometres from all but 13 neighbouring residences. The proposed layout has been designed to achieve acceptable impacts at neighbouring residences. During the initial planning stage consideration was given to a greater number of turbines than is currently proposed. In response to issues raised by neighbours during consultation and findings of the noise impact assessment, Renewable Power Ventures has worked with the turbine suppliers to develop a more acceptable layout. This has meant an increase in the setback of turbines from many residences. The noise impact assessment has derived the predicted noise levels for each of the residences within 2 kilometres from the nearest wind turbine (see Tables 10.2 and 10.4) to ensure that the selected layout enables compliance with noise level objectives.

The substation includes a 135 MVA 33,000 Volt/330,000 Volt transformer and associated electrical equipment such as switchgear and circuit breakers. The noise arising from the transformer will increase with the wind farm output and can also be associated with 100 Hz tones.

10.4 Residential Receivers

The wind farm site is located in an area of rural land with both large and small properties. The larger properties, including those on which the wind farm is located, are up to 2,000 hectares in size and may have one or more residences. Smaller properties are located within clusters with many of the properties having residences. Some 26 residences are located within 2 kilometres of the nearest wind turbine of which only 12 are on neighbouring properties (relevant receivers) (Figure 10.1). All neighbouring residences are greater than 1.2 kilometres distance from the nearest turbine.

The residences are distinguished by whether they are on properties where the landowners have leases or easements for the operation of the wind farm, referred to as 'wind farmer' residences, or if they are neighbours, in which case they are regarded as non-'wind farmer' residences. For the purpose of noise impact assessment, residences are classified as follows:

- Relevant receivers - the neighbouring residences to the wind farm site. Also referred to as non-wind farmer residences.
- Non-relevant receivers - those residences on the properties on which the wind farm is located. Also referred to as wind farmer residences.

In the case of wind farmer residences that may experience wind farm noise levels above relevant criteria, the SAEPA Guideline provides for agreements to be reached between the proponent and the owner of an affected residence. The agreement must document the nature of the impact likely to occur at the wind farmer residence and the owners acceptance of the predicted noise levels. In the case of wind farmer residences, World Health Organisation noise amenity guidelines are deemed applicable.

The nearest residences to the wind turbines, L'Orizon A and B, are wind farmer residences where the landowner has entered into an option to lease the property to allow the construction and operation of the wind farm. RPV will also be leasing the two L'Orizon residences. Renewable Power Ventures will arrange suitable agreements for the other wind farmer residences where necessary.

The closest non-wind farmer residence (relevant receiver) on a neighbouring property is located about 1.2 kilometres from the nearest wind turbine. The noise impact for relevant receivers has been assessed and

is described in later sections. All residences on neighbouring properties more distant than 2 km from the nearest turbines will have very low levels of wind farm noise, often below average background levels.

10.5 Background Sound Levels and Objectives

Sound levels were measured at the eight representative residential receiver locations as listed in Table 10.1 and as shown on Figure 10.1. Measurements were by continuous monitoring of sound levels at locations close to the residences over the period 9th February to 25th February, 2005. Type 1 and Type 2 logging sound level meters were used for the noise measurements. At four noise monitoring locations measurements were also taken of wind speed and direction at the microphone height and rainfall.

Two additional locations provide relevant background monitoring data. The sites, Torokina (G18) and Bonnie Doon (H25) (Figure 10.1) were assessed in conjunction with the Woodlawn Wind Farm and reported in the EIS for that project.

The background sound levels identified during the monitoring period are considered to be typical of the Southern Tablelands rural environment and suitable for development of noise objectives for protecting against intrusive noise and loss of amenity. The background values obtained for the Capital and Woodlawn wind farm sites are also comparable for the wind speeds where impacts are more likely to occur and where the acoustic setting is similar.

Wind speed data from the on-site Sunnybrook wind monitoring tower was obtained for the period of the background monitoring and synchronised with the background noise monitoring results. Measurement intervals of 10 minutes were used for both noise, weather condition monitoring and wind monitoring as required for the assessment. The selection of 10 minute intervals has been influenced by the industry standard use of 10 minute intervals for collecting wind data.

The background sites are in rural locations distant from the nearest towns and railways but in some cases close to local roads that are subject to low levels of usage. Consequently, background sound levels were expected to be relatively low.

The major noise sources at these locations include the residents' normal activities, stock noises, birds, frogs and crickets in wet areas, wind in vegetation and distant transport (planes, trains and motor vehicles). Farm equipment such as pumps, generators, machinery and windmills can also contribute to the noise environment.

In setting objectives for noise from the wind farms it is recognised that, whilst background sound levels can be relatively low at low wind speeds, the wind turbines do not operate at these speeds. Objectives therefore need to consider the background sound levels over the range of wind speeds in which the turbines will operate. The South Australian EPA's *Environmental Noise Guideline "Wind farms"* recommends that objectives be determined by a regression analysis of the receiver L_{A90} sound levels for each period, with the wind speeds occurring in the same period at the location of the wind turbines. The reference wind speeds used for the assessment were obtained from data at the wind monitoring tower located on a high point on the southern end of the Groses Hill ridgeline. The regression analyses are shown in Appendix H1. Both second and third-order polynomial curves were found to be suitable fits for the analyses. Where the trendline of the analyses was less than 35 dB(A), then the objective was set at 35 dB(A).

In all cases, background noise levels increased with wind speeds. While the pattern of increase varied at individual locations, the results for the eight receiver locations were similar. At 8 metres/second wind speed, the variation in average background noise level obtained from regression analyses of the eight monitoring sites is only about 5 dB(A) with differences being able to be explained by the nature of the particular sites.

The regression analysis of the background monitoring data showed that the objectives range from 35 dB(A) at 4 m/s (the cut-in wind speed of the turbine) to over 50 dB(A) at 14 m/s (the rated wind speed). The objectives for each the integer wind speeds at the eight representative background monitoring sites are shown in Table 10.1 below.

Table 10. 1 - Derived L_{Aeq} Sound Level Objectives at Selected Receiver Locations

Capital Wind Farm – Background Noise Criteria ($L_{Aeq,10min}$)															
Receiver Location		**Wind Speed ms^{-1} (Sunnybrook tower)**													
	Status	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***
Luckdale (G2)	N	35	36	38	39	41	42	43	45	46	47	48	49	50	50
Euroka (G7)	W	35	35	35	36	37	38	40	41	43	45	47	49	51	53
Sunnybrook (G8)	W	35	35	35	36	37	39	40	42	43	44	46	47	49	50
The Patch (H15)	N	36	37	38	39	40	41	42	43	44	48	49	50	50	49
Gray (Lot 7) (H5)	N	35	35	35	35	36	37	39	40	42	43	45	46	47	47
L'Orizon (E2)	W	35	35	35	38	40	43	45	47	49	51	54	55	57	59
Currandooley (H2)	W	35	35	35	37	38	39	40	41	42	43	44	44	45	46
Wyoming (E1)	W	35	35	35	36	37	39	40	41	43	45	45	47	48	49
Woodlawn Wind Farm EIS background sites															
Bonnie Doon (H25)	N	35	35	35	37	40	43	46	50	53	56	59	61		
Torokina (G18)	N	35	35	36	37	38	39	40	42	44	46	49	53		

W – Wind farmer (non-relevant receiver), N – Neighbour (relevant receiver)

10.6 Source Sound Characteristics

The wind turbine generators that could potentially be used for the wind farm and which were referenced for the noise assessment were the Suzlon S88 2.1 MW units. The Suzlon units have a stated sound power level of 105.9 dB(A) when measured according to the standard IEC 612400-11 at the reference condition of 8m/s at 10m height. The sound power levels increase with increasing wind speed, as shown in Appendix H2, taken from information supplied by Suzlon Energy. The measured noise spectra of this type of turbine are shown in Appendix H2. These spectral characteristics are considered to be non-tonal within the requirements of the Industrial Noise Policy (INP) issued by the NSW EPA.

Current wind turbine designs are not a significant source of low frequency noise or infrasound – even nearby (less than 500m), any infrasound is well below the threshold of human perception and would not cause health effects.

The electrical substation located in the south of the project area will contain a 135 MVA 33,000volt/330,000volt power transformer. The transformer has not yet been selected but it may emit sound levels of about 100dB(A). The location and distance of the substation from the nearest residence means that substation noise is likely to be inaudible at neighbouring residences. Its maximum sound

levels will occur at times of maximum wind farm generation when the wind is blowing strongly and when background noise levels will be elevated. During periods of low wind speed the transformer noise will be correspondingly lower.

During construction, there will be vehicles, cranes and portable power equipment (air-compressors, electrical power tools), a concrete batch plant and site sheds. The noise from these equipment and facilities will be variable, intermittent and temporary. While the construction in total may extend over 8 months, the locations of the active works will vary across the sites and often be distant from residences. The time for excavation of a turbine footing and erection of a turbine at a particular location may only involve a matter of several weeks. Appendix H2 indicates how the construction noise levels will diminish with distance.

10.7 Sound Level Prediction Modelling for Wind Turbines

10.7.1 Methodology

Sound levels from noise sources can be predicted at receiver locations if a number of parameters are known. These include:

- Sound power level spectra of the source over its operating range.
- Meteorological conditions (wind speed and direction, temperature, humidity, and atmospheric absorption).
- Ground surface conditions between source and receivers (topography, ground surface sound absorption).

An accurate predictive noise model was constructed by Vipac using the validated and accepted Concawe algorithm for noise propagation in different meteorological conditions. Inversion conditions are unlikely to exist when there is sufficient wind to operate the wind turbines. Vipac indicated that the accuracy of the noise model was likely to be in the order of ±2 dB(A) but also indicated that the model would provide conservative predictions of noise levels from the wind farm.

Turbine sound power level spectra and the sound power levels for the Suzlon S88 2.1 MW turbine used in the assessment are shown in Appendix H2. As there are no noise characteristics (tonality, impulsiveness, modulation or low frequency components) no penalty adjustments were required to be applied to predicted levels.

Predictions of sound levels at all receiver locations within 2 km of the nearest turbine have been made using the Vipac Concawe based model. Noise level contours for neutral conditions and for reference wind speed of 8 m/s are provided in Appendix H2. The noise level contours for the 8 m/s wind speed are also provided in Figure 10.2. A detailed analysis of noise impacts for 16 wind directions was also undertaken and is provided in Appendix H2. A summary of the predicted noise impacts at relevant and non relevant receivers is provided in the following sections.

10.7.2 Relevant Receivers

Results of sound level predictions at integer wind speeds for 'relevant receivers' are given in Table 10.2. Objective sound levels derived from the background monitoring are also included in the table.

The results shown in Table 10.2 indicate that for most receivers, at most wind speeds, the objective sound levels are not exceeded.

However, the predicted noise levels for relevant receivers Luckdale, La Granja, and E7 residences are either at or show slight exceedances of noise criterion at some wind speeds.

The layout has been adjusted to achieve compliance with noise criteria at relevant receivers and has excluded turbines on the basis of potentially unacceptable noise impact. However, small exceedances are predicted at some wind speeds at three of the relevant receiver locations. The fact that the exceedances are small and that the model is considered to be conservative means that the actual noise levels may comply with criteria. In the event of an exceedance the turbine operation can be adjusted if required, to ensure compliance. A slight exceedance of the criteria, particularly of short duration, would not necessarily result in annoyance at the receiver locations.

Table 10. 2 - Predicted and Objective Sound Levels at Relevant Receiver Locations

Relevant Receiver	Nearest Turbine	Distance (km)	Wind speed (metres/second)								
			4	5	6	7	8	9	10	11	12
Groses Hill											
Criterion: Luckdale (G2)			*35*	*36*	*38*	*39*	*41*	*42*	*43*	*44*	*46*
G2* Luckdale	4	1.2	**36**	**37**	**38**	38	39	39	39	39	39
G4 Lakoona	6	2.3	23.5	24.5	26	26	26.5	26.5	27	27	26.5
Criterion: Euroka (G7)			*35*	*35*	*35*	*36*	*37*	*38*	*40*	*41*	*43*
G5 Bernallah	6	2.0	25	26	27	27.5	27.5	27.5	28	28	27.5
G6 Widgemore	6	1.3	31.5	32	33.5	34	34	34	34.5	34.5	34
Criterion: Sunnybrook1 (G8)			*35*	*35*	*35*	*36*	*37*	*39*	*40*	*42*	*43*
G10 La Granja	15	1.6	34	34.5	**36**	**36**	36.5	36.5	37	37	36.5
G11	15	1.9	32	33	34	34.5	35	35	35	35	35
G12 Narine Green	15	1.8	32	33	34	34.5	35	35	35	35	35
G13	15	2.4	29.5	30.5	31.5	31.5	32	32	32	32	32
G14	15	2.3	30	31	32	32.5	33	33	33	33	33
G15	15	2.4	30	30.5	32	32	32.5	32.5	32.5	32.5	32.5
G16	15	2.6	29	29.5	31	31	31.5	32	32	32	32
G17	15	2.6	29.5	30.5	32	32	32.5	32.5	33	33	32.5
Criterion: Torokina (G18) (Woodlawn WF EIS)			*35*	*35*	*36*	*37*	*38*	*39*	*40*	*42*	*44*
G18 Torokina	6	2.4	26	26.5	28	28	28.5	28.5	28.5	28.5	28.5
Ellenden											
Criterion: Currandooley (H2)			*35*	*35*	*35*	*37*	*38*	*39*	*40*	*41*	*42*
E7	32	1.5	33.5	34	**35.5**	36	36	36.5	36.5	36.5	36.5
Hammonds Hill											
Criterion: The Patch (H15)			*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*
H13 Story	51	2.8	29	29.5	31	31.5	31.5	32	32	32	32
H15 The Patch	57	2.6	30	30.5	32	32	33	33	33	33	33
H17 D&K Jones	57	3.5	25.5	26.5	28	28	28.5	29	29	29	29
H18 Fairy Meadow	57	3.8	24.5	25.5	26.5	27	27.5	27.5	27.5	27.5	27.5
H20 D&T Douch	57	2.9	28	28.5	30	30.5	30.5	30.5	30.5	30.5	30.5
H21	58	2.7	28.5	29.5	31	31	31.5	32	32	32	32
H22	57	3.8	20	21	22	22	22.5	23	23	23	23
H26	63	2.4	28	29	30.5	30.5	31	31.5	31.5	31.5	31.5
H27	63	2.2	28.5	29.5	30.5	31	31.5	32	32	32	32
Criterion: Gray Lot (H5)			*35*	*35*	*35*	*35*	*36*	*37*	*39*	*40*	*42*
H4 TCE	39	1.9	24	25	26.5	26.5	27	27.5	27.5	27.5	27.5
H5 Gray Lot 7	39	2.1	23.5	24	25.5	25.5	26	26.5	26.5	26.5	26.5
H6 TCE	39	2.6	25.5	26.5	27.5	28	28.5	29	29	29	29
H7 Clearview Lot 8	39	2.3	26	27	28.5	28.5	29	29.5	29.5	29.5	29.5
H8 TCE	39	1.6	31	31.5	33	33	33.5	34	34	34	34
H9 Rosehill	39	1.9	29	30	31	31.5	32	32	32	32	32
H10 Hill Top	39	2.1	28	29	30	30.5	31	31.5	31.5	31.5	31.5
H11 TCE	39	2.9	24	24.5	26	26.5	27	27	27	27	27
H12 TCE	39	2.3	26.5	27.5	28.5	29	29.5	29.5	29.5	29.5	29.5
H16 S Powrie	41	3.4	23.5	24.5	25.5	26	26.5	26.5	26.5	26.5	26.5
H19 M&E Wellford	41	3.7	20.5	21.5	23	23	23.5	24	24	24	24
H24 Wroxham	39	1.5	31.5	32	33.5	34	34	34	34	34	34
Criterion: Bonnie Doon (Woodlawn WF EIS)			*35*	*35*	*35*	*37*	*40*	*43*	*46*	*50*	*53*
H25 Bonnie Doon	39	1.8	29.5	30	31.5	31.5	32	32.5	32.5	32.5	32.5

Note: (1) Predicted noise values that equal or exceed criteria are shown in bold/shaded.
(2) Distance is to the closest turbine

A summary of the relevant receivers where predicted wind farm noise levels exceed or are equivalent to the criterion is provided in Table 10.3. The criterion are exceeded by 0.5 dB(A) at E7 for a 6 m/s wind speed, by 1 dB(A) at La Granja (also at 6 m/s) and 1 dB(A) exceedance at 5 m/s is predicted at Luckdale, the closest of the relevant receivers.

Table 10.3 – Summary of Predicted Exceedances of Criteria at Relevant Receivers

Residence	Distance (km)	Maximum Predicted Exceedance (See Table 10.2 or Appendix H2)
G2 Luckdale	1.2	1 dB(A) at 4 and 5 m/s
G10 La Granja	1.6	1 dB(A) at 6 m/s
E7	1.5	0.5 dB(A) at 6 m/s

The exceedances predicted may not occur for the operating wind farm due to the conservative assumptions used by the modelling.

10.7.3 Non-Relevant Receivers

Table 10.4 shows predicted noise levels at non-relevant (wind farmer) receiver locations. Renewable Power Ventures will enter into agreements with non relevant receiver residences that exceed background +5 dB(A). The agreements will describe the nature of the impact to the affected landowner.

Table 10.4 – Predicted Noise Levels at Non Relevant Receivers

Site	Residence	Distance to nearest turbine (km)	Criterion Level		Predicted L_{Aeq} Level dB(A) @ 8ms^{-1} wind
			Based on Background + 5 dB(A)	WHO Criterion	
Wind farmers (Non-relevant receivers)					
G1	Panhandle	1.0	41	45	39.5
G3	Kullingrah	1.4	41	45	36.5
G7	Euroka	0.7	37	45	42.5
G8	Sunnybrook 1	1.4	37	45	38
G9	Sunnybrook 2	1.3	37	45	39
E1	Wyoming	2.1	37	45	30
E2	L'Orizon	0.1	40	45	**59**
E3	L'Orizon B	0.3	40	45	**50**
E4	Ellenden A	0.8	38	45	43.5
E5	Ellenden B	1.1	38	45	41.5
E6	Vacant	1.5	40	45	39.5
H1	Currandooley Cottages	2.1	40	45	36.5
H2	Currandooley	2.1	38	45	38.5
H3	Nardoo A	1.1	37	45	38
H23	Nardoo B	1.4	37	45	36

Notes: (1) Predicted wind farm noise levels that exceed WHO criterion are shown bold and shaded
(2) The L'Orizon cottages E2 and E3 will be leased by Renewable Power Ventures.

10.8 Substation Noise

The substation will include a large transformer, switchgear and circuit breakers that can each contribute to noise at the substation site. The 33,000volt/330,000 volt transformer of about 135 MVA capacity to be used at the substation can emit noise approaching 104 dB(A), particularly at the harmonic frequencies of the line around 100 Hz. The noise from the transformer will increase with the wind farm output.

The sound levels at the nearest residences (at about 1.2 km) caused by such a transformer, at full power, have been calculated. With the same atmospheric conditions used for the wind turbine calculations the sound levels at full power, would be less than 35 dB(A). During most conditions, the substation noise is likely to be inaudible.

10.9 Construction Noise

During the wind farm construction there will be noise during the daytime from vehicle movements to and from the site, and noise from construction and earthmoving machinery.

Initial construction activities will involve construction of access tracks to turbine sites and the substation. This activity will progress across the site to complete the necessary access system.

Construction at each turbine site will typically involve excavators, earth-moving machinery, cranes and portable power tools and supporting equipment. Noise from the operation of these may occasionally be discernible at the residences on the properties where the wind turbines will be located. However, they will be a short term impact for any residence and are unlikely to cause noise levels to exceed EPA criteria for the area, or to cause annoyance at any residence.

Activities at the site of the two batch plants will generate noise associated with front end loaders, trucks, unloading and loading activities and the normal operational noise of the batch plant and accordingly they have been located to avoid significant noise impact from these activities at the nearby residences. Additionally, they will only operate during the daytime.

During pouring of the footings for each wind turbine, concrete trucks will operate between the respective on-site batch plant and the respective turbine site over a 10 hour period. These movements may marginally increase the sound levels at any residences adjoining the route, with one loaded truck passing on average every 10 minutes. As most of this will occur on the site's access tracks, it will be mainly wind farmer residences that will be impacted. The pouring of the turbine footings will only occur on 63 days, spread over the period for construction of footings that may extend for approximately 4 to 5 months.

There will also be additional road traffic during construction from the construction workforce attending the site. These traffic movements (up to 50 vehicles per day or less with car pooling) will add marginally to the total number of vehicle movements along the roads in the area. There will be a lesser number of 'overmass' and 'oversize' vehicles delivering plant and materials to the site. As most residences in the area are distant from the local roads and because of the rural nature of the area, traffic noise levels are not expected to exceed EPA policy levels. The traffic movements will be primarily during daylight hours consistent with the construction work period and are a temporary impact.

Appendix H2, Table 8 provides details of noise levels for various items of construction equipment at distances of 500, 1000, 1500 and 2000 metres. It clearly shows a considerable reduction in noise levels with distance and that noise levels at the surrounding relevant receivers will be acceptable.

Nevertheless, it is proposed that Noise Management Control measures will be incorporated in the Project EMP and will be implemented for the construction stage of the project. This will identify aspects such as operating hours and noise controls and provide a system for responses to any complaints raised by the community.

10.10 Mitigation Matters

The layout of the wind farm has considered the potential noise impacts of its operation and incorporates set backs from residences to ensure that the noise impacts are acceptable. Renewable Power Ventures has deleted turbines to achieve a noise compliant array.

The owners of the closest residences to wind turbines on the properties being used for the wind farm (non-relevant receivers) have landowners that have indicated their support for the development by entering into leases with Renewable Power Ventures. Where predicted noise levels at these residences exceed the criteria applicable to relevant receivers, statements of the likely noise impacts will be provided to the landowners and agreements will be negotiated to formalise their acceptance of the impacts.

While minor exceedances of noise criteria have been predicted for three relevant receivers (the neighbouring residences currently in the area) using a conservative noise model, it is possible that these exceedances will not be experienced from the operating wind farm. This conclusion is based on the minor nature of predicted exceedances and the conservative nature of the predictive noise model that is considered to over estimate the impacts. To confirm the impact, wind farm noise levels at the closest neighbouring residences will be assessed for compliance with criteria following commissioning of the wind farm.

If a noise nuisance is reported by a relevant receiver after the wind farm is commissioned, Renewable Power Ventures will review the nature of the noise impact and assess the potential sources. If necessary, the equipment supplier will be required to perform testing to confirm that equipment performance is in accordance with the required noise specification.

If any noise exceedance is shown to be occurring at a relevant receiver due to the turbine operation, Renewable Power Ventures will vary operation of the relevant turbine(s) to achieve noise compliance. In addition, Renewable Power Ventures may consult with any affected landowner in regard to other measures such as installation of double glazing or other forms of sound insulation.

A construction noise management plan will be implemented as part of the Project EMP for the construction stage of the project to mitigate potential adverse noise impacts that could affect nearby residents.

The batch plants will be located at more than one kilometre distance from neighbouring residences.

10.11 Conclusions

This assessment has reviewed the potential noise impact of the proposed wind farm for the construction and operational stages on residential receivers.

Objective sound levels for the project have been developed using the approach in the South Australian Noise Assessment Guidelines for wind turbines. Predictions of sound levels from the operation of the wind farm have been made using an accurate predictive noise model based on the validated and accepted Concawe algorithm for noise propagation in different meteorological conditions.

Exceedances of noise criterion have been identified at non-relevant receivers and Renewable Power Ventures is negotiating with each of the respective landowners to establish a suitable agreement in respect of the noise impacts in accordance with SA EPA Noise Assessment Guideline.

The predicted contribution sound levels at relevant receivers were found to be acceptable under all wind speeds at all relevant residences except for those shown in Table 10.3.

Given the small degree of predicted exceedance and the conservative nature of the noise prediction model used, it is possible that the actual wind farm noise levels at all relevant receivers will be within the criterion. Additionally, the nature of wind farm noise and the distances involved is such that the noise impact may not result in annoyance. Nevertheless, a management plan has been developed to assess

any noise impacts that arise once the wind farm is operational. Should noise impacts occur the proponent will undertake elements of the following to resolve the issue.

- investigate the nature of the impacts through discussion with the affected resident
- confirm the turbines compliance with the noise specification
- undertake monitoring to assess noise impacts
- identify the control measures necessary to ensure compliance
- apply turbine operational controls to mitigate any unacceptable impact.
- implement noise control measures at residences if agreeable to landowner

During the construction period, noise from construction machinery may be discernible on occasions at residences on the various properties, but these will be short term impacts that occur at different parts of the site over the course of the project. These impacts will not cause an increase in long-term sound levels. A noise management plan will be implemented as part of the EMP for the construction stage to mitigate any adverse noise impacts. Traffic generated by the construction workforce movements and delivery of materials will increase sound levels at residences adjoining the main access routes for short periods of time. These traffic noise impacts will be temporary and limited to site working hours.