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# Brewster Wind Farm

## Appendix E

*Preconstruction Noise Assessment Audit*

December 2021



# Infotech Research

Date: October 29, 2021

**Independent verification of the preconstruction environmental noise assessment  
– Brewster Wind Farm (Marshall Day Acoustics report: Rp001 R04 20200543)**

Please refer to the attached verification report for the proposed wind farm. This review is based on compliance requirements provided in the *Policy Planning Guidelines for the Development of Wind Energy Facilities in Victoria* (pub. 2019) and the Victorian Planning Provisions 52.32 Wind Energy Facility, along with the EPA Environmental Reference Standard – Part 3 – Ambient Sound. The Victorian guidelines and the planning provisions refer to the New Zealand Standard - *Acoustics – Wind Farm Noise* (NZS 6808: 2010) for details of noise compliance assessment.

The scope of this verification report relates only to the requirements for noise controls for the proposed Brewster Wind Farm and no other requirements provided in the Guidelines.

I have found the **Brewster Wind Farm Environmental Noise Assessment** (Rp 001 R04 20200543) provided by Marshall Day Acoustics, dated October 17, 2021, complies with the relevant noise requirements stated above, in particular the Standard NZS 6808:2010 Acoustics Wind Farm Noise.

I confirm that I have no conflicts of interest and no involvement in the Brewster Wind Farm development. I am happy to further detail my findings at your request.

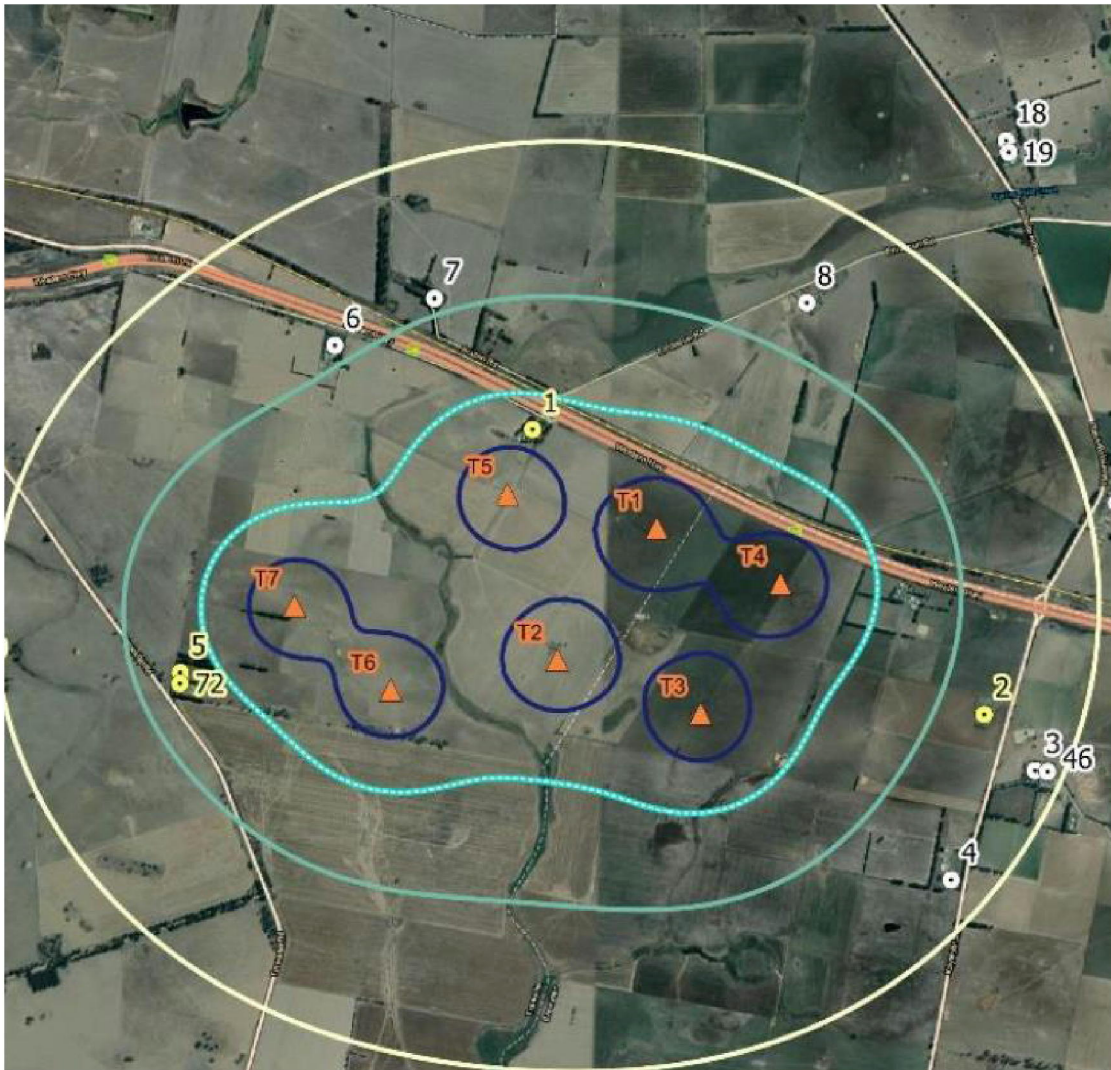
Yours sincerely

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# Pre-construction Noise Assessment Verification



## Brewster Wind Farm

7 Pin Oak Court, Trawalla, Victoria 3373

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**Dr. John Cumming  
Infotech Research**

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## Summary

The proposed Brewster Wind Farm was the subject of a noise assessment and an audit report dated June 9, 2021. Subsequently the proposed wind farm design has been expanded with additional wind turbines making the noise assessment and audit defunct. The location of the wind farm is the same as previously: south of the Western Highway, 30km west of Ballarat and 9 km east of Beaufort but with more turbine coverage of the available site. Marshall Day Acoustics conducted a revised noise assessment of this facility under the new noise protocols and regulations in Victoria issued in October 2021. This revised assessment has predicted noise emissions will comply with the New Zealand standard: NZS 6808:2010 Acoustics – Wind Farm Noise (The Standard).

This verification report has found that the pre-construction noise assessment report complies with the requirements of the Standard and the prevailing regulations.

Marshall Day Acoustics examined 75 residences within 5 km of the site for predicted noise compliance of 40 dB LA<sub>90(10 min)</sub> or less at the worst case. I examined 10 of the closest residences described as noise sensitive locations in the Standard and confirmed the positions and situation of these residences.

Marshall Day Acoustics applied standard methods accepted internationally to predict the downwind, noise levels at each residence. With the exception of the involved landowners at three nearby residences all others were predicted to have a wind farm noise at worst case of less than 35 dB. The EPA Environment Protection Regulations (Clause 131B (2)(b)) has the objective of 45 dB worst case for involved sites.

The Brewster Wind Farm has not had background noise monitoring undertaken as the noise sensitive locations are all predicted to be below the 35 dB contour predicted by Marshall Day Acoustics. This project will be the subject of a post-construction noise assessment that will be undertaken to confirm compliance with the Standard.

There are two nearby wind energy facilities, one in operation and the other partially in operation. These are the Waubra Wind Farm to the northeast, consisting of 128 turbines, and the Stockyard Hill Wind Farm to the southwest, consisting of 149 turbines. Neither is predicted to add significantly to the noise load of the noise sensitive receptors as their 30 dB contours do not intersect with the Brewster 30 dB contour.

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## Review of – Brewster WEF preconstruction noise assessment – John Cumming

### Review report summary

Item	Description
Reviewer	John Cumming
Auditor account number	75697
Auditor appointment end date	31/07/2022
Review type	53v (Wind farm pre-construction – noise)
Date EPA notified of request for review	28 <sup>th</sup> May 2021
Audit service order number	
Name of person requesting audit	Peter Lausberg / Severinn Staalesen
Relationship to premise/location	Project Manager (Brewster Wind Farm)
Date of request	20 <sup>th</sup> September 2021
Completion date of review	29 October 2021
Reason for audit	Planning requirement for pre-construction noise assessments for wind farms (planning permit and Wind Farm Planning Guidelines)
Verification category	Compliance with regulatory noise criteria for the proposed wind farm
Environmental segments	Air (noise) of the noise sensitive locations surrounding the proposed Brewster Wind Farm, being residences with human habitation
Required by	As a requirement of the Planning Permit application – VPP Guidelines Clause 52.32-4
Current land use zoning	FZ - Farming
EPA region	Southwest
Dominant – lot on plan	Volume 08790 Folio 959 Volume 09672 Folio 603
Additional - lot on plan	Volume 08242 Folio 342 Volume 11842 Folio 062
Site/premise name	Brewster Wind Farm
Building/complex sub-unit No.	
Street/lot – Lower no.	7
Street/lot – Upper no.	
Street name	Pin Oak
Street type (road,court etc.)	Court
Street Suffix (north, south etc.)	
Suburb	Trawalla
Postcode	3373
GIS coordinates of centroid	
Latitude	-37.453157
Longitude	143.511039
Site area (in square meters)	3,900,000 m <sup>2</sup>
Outcome of verification review	This verification report has found that the pre-construction noise assessment report complies with the requirements of the Standard and the prevailing regulations in Victoria.
Historic land use	Farming
Current land use	Farming
Proposed future land use	Farming
Surrounding land use - north	Farming (over the Western Highway)
Surrounding land use - south	Farming
Surrounding land use - east	Farming
Surrounding land use - west	Farming
Proposed land use zoning	FZ1 - Farming

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## Review of – Brewster WEF preconstruction noise assessment – John Cumming

### Background:

The Brewster wind energy facility has been proposed to be built by the Western Highway, 30km west of Ballarat, Victoria in the Shire of Pyrenees (address of the site: 7 Pin Oak Court, Trawalla, Victoria 3373). It comprises 7 Vestas V162-6.0MW turbines at a hub height of 166m.

This verification report is a regulatory requirement for the application for the permit of wind energy facilities, which requires a pre-construction assessment of noise by a qualified acoustics consultant. The document's function is to verify that the pre-construction noise assessment complies with the standard: NZS6808:2010 – Acoustics Wind Farm Noise. Thereby providing an assurance that the proposed wind energy facility will not adversely affect the amenity of sensitive receptors, nearby residents, to an unacceptable level.

This verification must be conducted by an environmental auditor according to section 52.32-4 of the

### Review objectives:

To assess compliance of the Wind Farm Pre-construction Noise Assessment Report with the requirements set out in:

1. Section 5.1.2 (a) Noise of the Policy and Planning Guidelines for the Development of Wind Energy Facilities in Victoria – July 2021 (VPPG)
2. New Zealand Standard: Acoustics – Wind Farm Noise NZS 6808:2010 (The Standard),
3. Environmental Protection Regulations – Part 5.3 Noise
4. Environmental Reference Standard – Part 3 – Ambient Sound

Apart from the ERS requirement for the transformer station, the other requirements point to the New Zealand Standard 6808:2010. This review focusses on the adherence of the noise assessment report to this Standard.

### Scope:

Activity	Wind energy facility (WEF) / wind farm operation
Element	Noise from turbine blades, the generators, gearboxes and hydraulics
Segment	Site environs surrounding the WEF as positioned near Trawalla, Victoria Centroid Latitude: -37.453157 Longitude: 143.511039 Area of site: 392 Ha In particular, the noise sensitive locations as defined in the standard: <i>NZS 6808:2010 Acoustics- Wind Farm Noise.</i>
Exclusions	The review has not considered construction noise, nor noise generated from equipment on site other than that listed. Compliance with other than noise requirements of the VPPG were not considered

Table 1. Scope

### Audit criteria:

The VPPG states:

- Section 5.1.2(a) Noise: that *the facility should comply with the noise limits recommended for dwellings and other noise sensitive locations set out in the New Zealand Standard – NZS 6808:2010 Acoustics- Wind Farm Noise (referred to in this audit report as the Standard).*
- *Similarly, the local government Planning Provisions in Clause 52.32-5 refers to the New Zealand standard and the VPPG as criteria for planning approvals.*
- *the local government Planning Scheme in Clause 52.32-3 that written consent of the owner of a dwelling positioned within one kilometer of the nearest wind turbine is required for planning approval. Evidence of written consent is required.*

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NZS 6808:2010

Noise limits for noise sensitive locations<sup>1</sup>

- Section 4.4.2 – Acceptable limit (40 dB  $L_{A90}(10min)$ , or background + 5 dB if higher)
- Section 4.4.3 - Special Audible Characteristics (tonal, impulsiveness, or amplitude modulation) receive a +6 dB penalty added to the noise level.
- Section 5.3 - High Amenity Areas (35 dB  $L_{A90}(10min)$ , or background + 5 dB if higher) to be applied for evening and night times.

These noise limits produced in the Standard apply to all times of the day and night, other than for high amenity areas.

*The EPA released its Environmental Reference Standard Part 3 – Ambient Sound*

*This provides in Table 3.3 a set of indicators for various categories of land use a set of noise indicators and objectives. Rural and Farming Zones are given the following objectives:*

- Day 40 dB(Aeq 16h) – 6am to 10pm
- Night 34 dB(Aeq 8h) – 6am to 10pm.

*The limits do not apply to the wind turbines but may apply to the transformers used in the site substation.*

### Verification method:

The noise assessment was examined with reference to the compliance criteria. Explanations were sought from the author of the pre-construction Noise Assessment report. The proponents of the WEF were interviewed and provided further documentation to support the proposal.

Plans were checked against maps to confirm dwelling locations.

Task	Comment (ref. to documents / site visit)
1. Confirm noise outputs of the wind turbines	Refer to Vestas V162-6.0 MW turbine data provided to RE Future
2. Confirm the criteria relevant to the NZS 6808: 2010 standard and the EPA noise in regional Victoria guidelines	Refer to Standard NZS 6808:2010 and EPA NIRV Guidelines
3. Site inspection of the wind turbine and receptor locations and site specific issues relating to noise generation and reception	A site visit was conducted on March 10 <sup>th</sup> . 2021 (See appended inspection report)
4. Check the models used and outputs provided in the Marshall Day report	Refer to: Brewster Wind Farm Environmental Noise Assessment Rp 001 R04 20200543 Marshall Day Acoustics
5. Review of the background noise assessment	No background noise assessment has been undertaken
6. Noise assessment prediction report analysis	Refer to Environmental Protection Regulations 2021 and the Environmental Reference Standard and the VPPG

Table 2. Task list

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<sup>1</sup> Noise sensitive locations are defined in the standard as being associated with habitable areas such as residences, education spaces or accommodation. They are referred to in this report also as receptors with given identification as R(number).

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## Review of – Brewster WEF preconstruction noise assessment – John Cumming

### Documents examined:

1. Policy and Planning Guidelines for the Development of Wind Energy Facilities in Victoria (the Guidelines) March 2019
2. Victorian Planning Provisions Clause 52-32 (Wind Energy Facility)
3. NZS 6808:2010 Acoustics - Wind Farm Noise
4. WEF – Brewster Wind Farm Environmental Noise Assessment Report number R001 R04 20200543 (October 17, 2021, Marshall Day Acoustics)
5. Preparation of Environmental audit reports on risk to the environment (EPA pub. 952.5 December 2015)
6. Wind energy facility noise auditor guidelines (EPA pub. 1692 October 2018)
7. Environmental Protection Regulations 2021
8. Environmental Reference Standard – Part 3 (Ambient Sound)

### Review findings:

#### Cumulative effects

The possibility of competing noise from other wind farm projects was considered in the Marshall Day predictive assessment. There are two wind farms visible nearby: Waubra (128 turbines commissioned in 2009) to the northeast and Stockyard Hill (149 turbines construction completed December 2020) to the southwest. Both of these wind farms are operational. Another smaller wind farm is approximately 16 km to the southeast: Chepstowe with 3 turbines was commissioned in 2015.

No other wind farms in this vicinity were featured in the Victorian wind energy database<sup>2</sup> last updated October 25, 2021.

The MD modelling of the two nearest wind farms and compared the 30 dB contours for each. These contours did not intersect with the 30 dB contour from Brewster indicating no noticeable noise interference is expected between the wind farms (see Figure 1 from the MDA report).

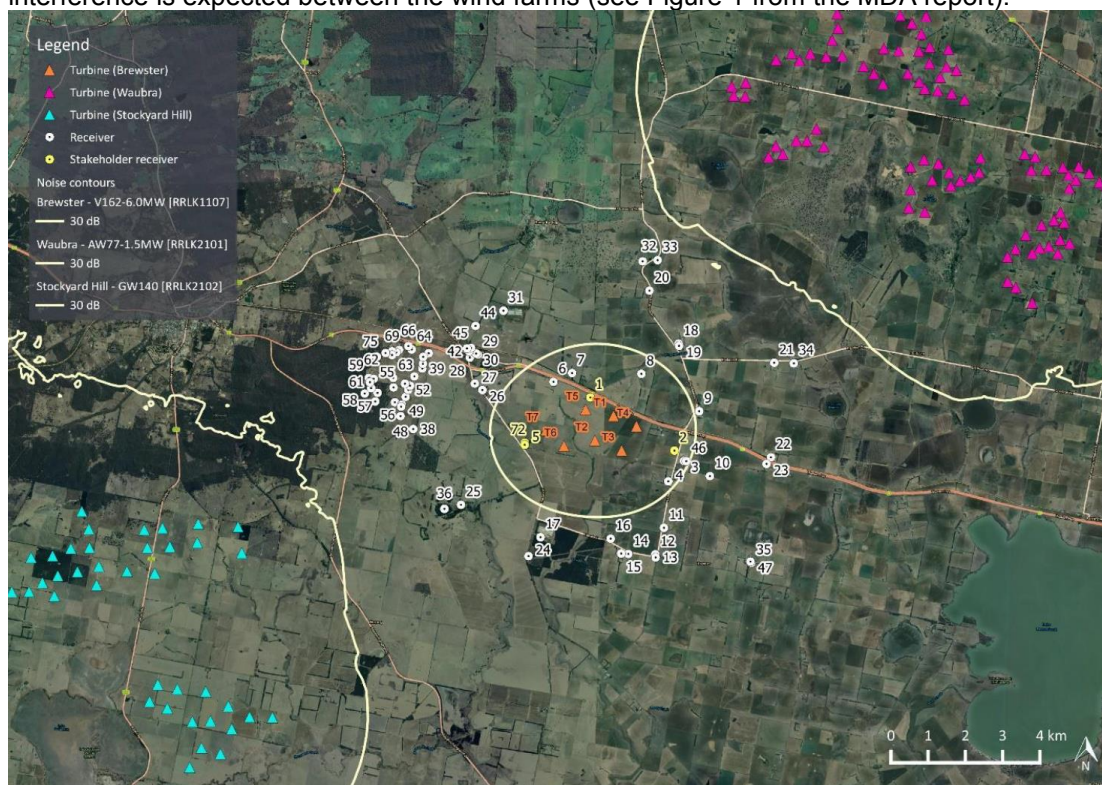


Figure 1. Cumulative assessment of noise interference examination (MDA report Figure 3)

<sup>2</sup> Victorian Planning site: <https://www.planning.vic.gov.au/permits-and-applications/specific-permits/topics/wind-energy-facilities/wind-energy-projects-planning>

### Pre-construction noise assessment predictions

Noise predictions were modelled by Marshall Day Acoustics, MDA, using the software package SOUNDPLAN version 8.2. This package models noise propagation using the standard for environmental noise propagation ISO 9613-2 (*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of calculation*). This is the most widely used international method for the prediction of wind farm noise. It has been reported that this method suits the application to Australian conditions with relatively flat topography.

Vestas V162-6.0 MW turbines operated in an unconstrained mode where noise reduction is not practised, with sound power output data from Vestas, which provided a maximum sound output of 105.3 dB at hub height wind speeds from 10 m/s up. A further 1 dB was added to this for the modelling.

The key input parameters in this case used by MDA are typically used in Victorian wind farm studies:

Ground absorption factor  $G=0.5$

Temperature = 10°C

Humidity = 70%.

These noise predictions are conservative and predict maximum noise levels for down-wind conditions for all turbines at the receptors for A-weighted audible frequencies. The prediction does not allow for shielding effects of the up-wind turbines leading to reduced wind speed for down wind turbines. Both of these modelling decisions lead to a higher noise prediction at noise sensitive locations.

The modelling output derived in the MDA predicted noise report is maximum wind farm noise levels as  $L_{A90(10min)}$  for integer hub height wind speeds and the equivalent turbine sound output. This review has examined the maximum A-weighted noise level for each of the receptors in determining predicted compliance at the worst case.

### Noise sensitive locations

Noise sensitive locations were identified by RE Future. using information from Landata and the shire, cross referenced with aerial photography and visual inspections to confirm the presence of buildings used as residences, schools, healthcare facilities, aged and disability facilities as described in section 2.4 of the standard.

These were residences in each case and were confirmed during the auditor inspection on March 10<sup>th</sup> 2021<sup>3</sup>. One additional residential development was observed on the Western Highway which was confirmed as a position from which the house at R2 was repositioned during highway developments. This is owned by an involved landowner.

The predicted noise report mapped 75 noise sensitive locations as receptors, of which 4 were involved receptors, or stakeholders in the Brewster Wind Farm facility. Three of these (R1, R5 and R72) were classified as a noise sensitive location under section 2-4 and were within the 35 dB contour. These are all involved receptors and are subject to a higher 45dB limit according to the Environmental Protection Regulations 2021 section 131B.

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<sup>3</sup> See Appendix 2 – Site inspection  
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Noise maxima for the 10 nearest receptors are given in Table 3.

Receptor Site	Highest predicted noise level (dB L <sub>A90</sub> )	Compliance margin (dB L <sub>A90</sub> )	Comment
R1 (involved receptor)	42.5	2.5	As an involved receptor R1 is generally considered to have a limit of 45 dB. Receptor 1 is situated to the west of the wind farm is not habited
R2 (involved receptor)	33.1	11.9	Receptor 2 is also an involved receptor situated east of the wind farm
R3	30.8	9.2	Receptor 3 is situated to the east of the wind farm
R4	31.2	8.8	Receptor 4 is situated to southeast of the wind farm
R5 (involved receptor)	37.5	7.5	Receptor 5 is situated to the west of the wind farm
R6	34.3	5.7	Receptor 6 is situated to the northwest of the wind farm
R7 (unoccupied)	34.3	5.7	Receptor 7 is situated to the northwest of the wind farm
R8	33.0	7.0	Receptor 8 is situated to the north of the wind farm
R9	29.2	10.8	Receptor 9 is situated to the east of the wind farm
R72 (involved)	37.2	7.8	Receptor 72 is west of the wind farm

**Table 3. Predicted noise compliance at key receptor sites**

These modelling points were taken from Table 11 Appendix H of the MDA report giving the predicted maximum noise levels for the nearest receptors. It predicts compliance for the 10 nearest receptors, and by inference the other identified receptors at a greater distance. The Standard states that receptors outside the 35 dB contour are not required to be further considered (sec. 6.1.1).

### High Amenity Areas

If a site is classified as a high amenity area under the Standard a 35 dB limit (or background + 5 dB) applies to evening and night-time noise. The land is zoned for farming (FZ1) to the north, east, south, and west and the noise sensitive locations are unlikely to meet the high amenity criteria. The presence of the Western Highway in this vicinity will also add considerably to background noise for the receptors to the north. This situation will be considered in planning deliberations and, if such an area is declared, the conditions as set out in the Standard section C5.3.1 will be considered.

There does not appear to be a candidate for high amenity classification.

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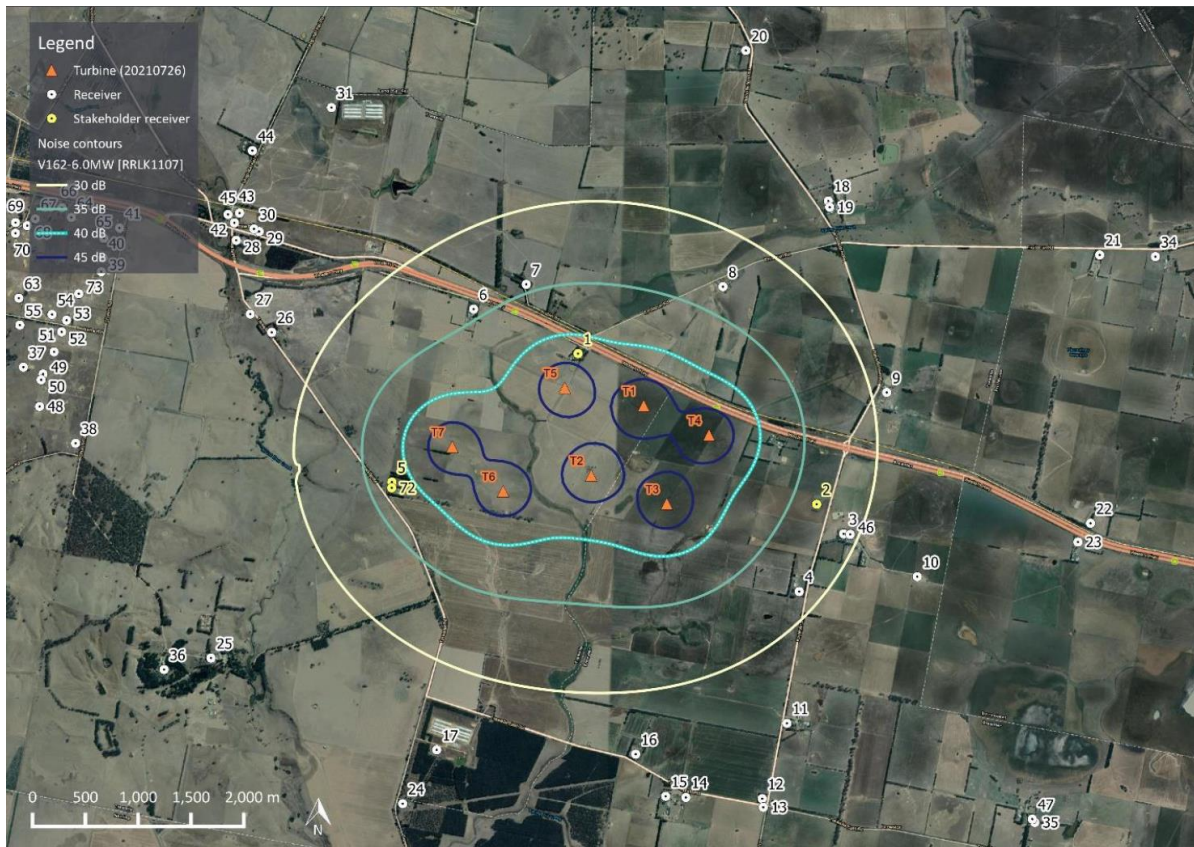


Figure 2. Highest predicted noise level contours from the Marshall Day report (Figure 1)

## Special Audible Characteristics (SACs)

The New Zealand standard requires a noise penalty for noise containing tonality likely to be audible. Amplitude modulation and impulsiveness also need to be considered, which are not assessed at this stage of development. However, this is still an issue that must be addressed by checking for SACs in noise monitoring after construction and operations commencing.

## Background noise assessment

No background noise assessment has been conducted at this time. This is in accordance with the Standard Sec 7.1.4 that does not require background noise measurements when the noise sensitive locations are all outside the 35 dB contour prediction.

R1, R2, R5 and R72 are not considered as they are involved landowner residences with higher noise allowances.

It is understood that at least one uninvolved receptor will likely be monitored for background noise prior to wind farm operation to determine compliance noise levels at differing wind speeds. A meteorological mast is in place to provide wind conditions during monitoring periods.

## Noise from substation

A substation is proposed for the Brewster Wind Farm to step up the voltage from the turbines for the grid. Based on the proposed turbine capacity Marshall Day estimated a 50 MVA capacity is required for the transformers. The noise requirements for ambient noise are provided in the EPA (Victoria) Environmental Reference Standard Part 3.

The noise limits required by the ERS for farming zones and low density rural receptors are:  
Day < 40 dB(A) $L_{90}$  and Night 34 dB(A) $L_{90}$

These limits do not apply the wind energy facilities but apply to ambient noise

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## Review of – Brewster WEF preconstruction noise assessment – John Cumming

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Marshall Day Acoustics estimated the sound power output from the transformers at 90 dB  $L_{WA}$ . They modelled this noise to the nearest receptor, R2, 1.2km to the southeast of the substation. The predicted noise level at R2 was 13 dB  $L_{eff}$  (including a + 2dB adjustment for the potential tonality). This predicts a 21 dB compliance margin to the nighttime noise objective.

### New Zealand Standard compliance predictions

The MDA report concludes that the Brewster Wind Farm will comply with the noise level requirements of the Standard. This assessment includes the potential cumulative effects of the Waubra and Stockyard Hill wind farms and noise generated by a substation.

### Error analysis

ISO 9613-2:1996 prediction methodology used by the software SoundPLAN 8.2 has an inherent uncertainty. This has a typical accuracy of overall A-weighted noise levels of  $\pm 3$  dB at a distance of up to 1 km from the source. The error will be affected by the parameters used in the model and the variations that can occur in atmospheric conditions. As this uncertainty sits within the smallest compliance margin of 5.7 dB, there is a low probability of non-compliance. This is based on the assumption that there is no systematic error in the predicted noise levels.

It is clear from the modelling method that a series of conservative decisions have been made to the application of the model that increase the predicted maximum noise levels. These modelling decisions include:

- Addition of +1 dB to stated turbine sound power outputs,
- Guaranteed turbine sound power outputs are the maximum expected output,
- The use of a conservative ground absorbance factor  $G = 0.5$ ,
- The use of all turbine noise contributions being downwind of the receptor,
- No addition of upwind turbine wake effects (all turbines modelled to experience the measured hub height wind speed).

These factors lead to a conservative noise level prediction at the receptors which may contribute 1 to 2 dB to the receptor noise predictions. If this is taken into consideration, there is a reduced probability of non-compliance with the Standard.

The Standard states that compliance is at a predicted 40 dB at the noise sensitive locations, consequentially compliance with the Standard is concluded from these noise predictions.

### Conclusions

1. The Marshall Day Acoustics noise predictions were conducted in accordance with the appropriate Standard, planning provisions and associated guidelines.
2. Noise level predictions for noise sensitive locations comply with limits set in the *New Zealand standard NZS 6808:2010*.
3. The compliance margins for the closest receptors are large enough to ensure compliance when systematic as well as random errors are considered.
4. Receptor sites have been inspected and no circumstances were found that could potentially adversely affect compliance at the receptor sites (R1-R75).
5. The proposed Brewster Wind Farm preconstruction noise assessment report provided by Marshall Day Acoustics complies with the noise requirements set out in the Standard.

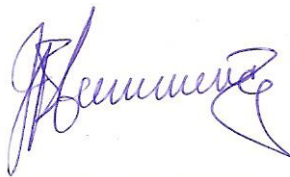


### Recommendations:

1. The project will require, post background noise monitoring, a noise management plan.
2. Background noise monitoring is recommended for at least one uninvolved noise sensitive location (R4 or R6).
3. The assumptions used in the noise predictions provided by Marshall Day Acoustics can be tested with post construction noise monitoring. There should, however, be a contingency built into the monitoring plan if receptors withdraw from the post construction noise assessment.
4. A sound emission guarantee should be sought from the wind turbine supplier assuring that no special audible characteristics will apply to the turbines purchased.
5. Predicted noise levels in the case of significant movement of the turbines must be undertaken to re-examine compliance with the standard.

Details of the compliance elements of the Marshall Day Acoustics report are given in Appendix 1.

This audit report has been prepared for RE Future. for the proposed Brewster Wind Farm development and assumes that the data provided is correct and the development will proceed as planned.



John Cumming  
Auditor pursuant to the Environment Protection Act (2017)  
October 29<sup>th</sup> 2021

End

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# Appendix 1 - Preconstruction Noise Assessment document checklist

## Brewster Wind Farm

Wind farm noise assessment	Review of assessment document					
	Condition	Reference document	Noise assessment report	Comment	Rectification required	
Planning Provisions (Victoria)	Requirement for a mandatory noise assessment	VPP Clause 52.32-4	MDA report Rp001 R04 20200543			
	Planning condition VC124 Planning amendment (noise sensitive locations within 1 km of wind turbines have written agreement)	52.32-3	Appendix C Receiver Locations	There are no uninvolved noise sensitive locations within 1 km of the nearest turbine		
	Conformance to the Victorian PP Guidelines and NZS 6808:2010	52.32.4	10.0 Summary	Conclusion of proposal compliance with NZS 6808:2010		
Planning Provisions						
Policy and Planning Guidelines for Developments of Wind Energy Facilities in Victoria (July 2021)	Written consent of owners of dwellings within 1 km of any turbine	52.32-3	Appendix C.	Receptors R1 and R5 are within 1km of a turbine but has a contract with the project.		
	Not in an urban growth zone or within 5 km of major regional cities	VPPG Sec. 2.1.5	Appendix F - Planning zone map	The area surrounding the turbines is Farming zone FZ1. The nearest township is Trawalla > 5km from the nearest turbine. There is an RL2 zone approximately 5 km from the nearest turbine.		
	An Environmental Effects Statement is either completed or not required	VPPG Sec.3.3.1		An EES requirement is unlikely as the wind farm is situated on farmland		
	Approval under the EPBC Act has been given	VPPG Sec.3.3.2		No suggestion of endangered species presence was determined		

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Review of – Brewster WEF preconstruction noise assessment – John Cumming

	Condition	Reference document	Noise assessment report	Comment	Rectification required
	Acoustic compliance report for the proposed wind energy facility is prepared by a suitably qualified and experienced acoustics engineer	VPPG Sec.4.3.2	MDA report Rp001 R04 20200543	The pre-construction noise assessment report was prepared by Marshall Day using suitably qualified acoustics engineers	
	Noise assessment positions located according to the standard and shown on a map		Fig 1. and Appendix C	A compliant map (Fig. 1) and GPS positions for the receptors were given in Appendices C	
	Compliance reports are to be publicly available			This is a function of RE Future as a site management responsibility	
	Sec. 5.1.2a requires compliance with noise limits for dwellings and other noise sensitive locations stated in NZS 6808:2010	VPPG Sec.5.1.2a	Appendix H Assessment results	Noise predictions were given for the noise sensitive locations all complied with the 40 dB limit.	
Local Government		Pyrenees			

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Review of - Brewster WEF preconstruction noise assessment - John Cumming

	Condition	Reference document	Noise assessment report	Comment	Rectification required
NZS 6808:2010 Acoustics - Wind Farm Noise					
Compliance assessment	Assessment to include all noise sources coming from the wind farm - blades, generator, gearbox, hydraulics and from transformers on site	C1.5	Sec. 6.3 noise emissions Sec. 7.0 transformer	Sound power output of the turbines Appendix I Substation assessment Sec. 7.0	
	A 40 dB limit is applied for noise sensitive locations with allowance for background noise on top	5.1	Sec. 6.1 Noise Limits	Noise limits were defined	
	High amenity receptors are considered	5.3.1	Sec. 6.1.1 High amenity locations	No high amenity receptors were reported. This area is zoned for farming and high amenity is unlikely. Independently checked	
	Special audible characteristics are considered	5.4	Sec. 6.3.2 Noise Emissions	Tonality of the sound output from the Vestas V162-6 MW turbines was not examined	This needs to be tested at the post construction stage in the second noise assessment
	Consideration of Other Factors	5.5		Other factors such as ultrasound and infrasound were not considered, nor was ground vibration.	These are considered to be currently discounted by authorities
	Application of noise level compliance to cumulative sound levels of all wind farms in the area.	5.6	Sec. 6.5 Cumulative assessment	Impacts of the Waubra and Stockyard Hill wind farms were included in the assessment	

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Review of – Brewster WEF preconstruction noise assessment – John Cumming

	Condition	Reference document	Noise assessment report	Comment	Rectification required
	Uncertainty of measurements / calculations is considered	5.7		This is considered not necessary due to the conservative wind farm noise prediction method and the compliance margin predicted	To date the conservatism of predicted noise has been correct for Australian conditions
	Method of noise predictions Use of ISO 9613-2 model	6.1 Appendix D	Appendix G	The modelling method ISO 9613-2 was used and the parameters justified in Appendix G for uncurtailed turbine operation	
	Sound power levels for turbines provided by the manufacturer	6.2	Table 4 and Appendix I	Sound power levels at wind speeds 4 to >12m/s were tabulated for Vestas V162-6.0MW turbines	
	Background noise measurements	7.4		Background noise measurement was not necessary due to the noise sensitive locations being beyond the 35 dB contour	
	Prediction of the 35 dB wind farm sound contour mapped	7.6.1	Sec. 6.4 Predicted noise levels Fig. 1	30, 35, 40 and 45 dB contours were mapped in Fig. 1	
	Prediction of sound levels for all noise sensitive locations inside the 35 dB contour	7.6.1	Appendix C Table 10	Noise levels were predicted for 75 receptors within 5km. at 4 to >10 m/s hub height wind speeds	
<b>Report requirements</b>					
<b>predictions</b>	Map showing topography (contours)	8.1 (a)	Appendix E	This provides an overlay of the receptors on a topographical map	
	Map showing position of turbines	8.1 (a)	Appendix D Figure 4		

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	Condition	Reference document	Noise assessment report	Comment	Rectification required
<b>Report requirements predictions</b>	Map showing positions of receptors (noise sensitive locations)	8.1 (a)	Fig.4.5,6 Appendices D,E and F	Adequate maps showing stakeholders and uninvolvement receptors (noise sensitive locations)	
	Sound levels calculated for sensitive receptors	8.1 (b)	Sec.2.0 Appendix H Table 10	Predicted noise levels as dB LA(A90) were given at hub height wind speeds from 4 to >10 m/s	
	Wind turbine sound power levels provided	8.1 (c)	Sec. 6.3.1 Appendix I	Sound power levels at operating wind speeds were provided	
	Make and model of wind turbines provided	8.1 (d)	Table 3 Sec. 6.2	Vestas V162-6.0 MW wind turbines were specified in the report	
	Hub height of the wind turbines provided	8.1 (e)	Table 3 Sec. 6.2	166 m. hub height	
	Distance to noise sensitive locations described	8.1 (f)	Appendix C Table 10	GPS position and distance to nearest turbine were provided for each receptor	
	Calculation procedures provided	8.1 (g)	Sec. 4.3 Appendix G	The use of ISO 9613-2:1996 was described with the SoundPLAN v8.2 software and parameters used	
	Meteorological conditions provided	8.1 (h)	Appendix I	T 10°C, 70% Rel. H., P = 101.325 kPa	
	Air absorption parameters used in calculations	8.1 (i)	Appendix I table	Atmospheric attenuation factors used per octave band	
	Ground attenuation parameters provided	8.1 (j)	Appendix E	A ground attenuation factor of G=0.5 was used and justified. Contours provided in Appendix E	
	Topography / screening stated	8.1 (k)	Appendix E	1 m resolution within the site boundary and 10m resolution thereafter.	

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**Review of – Brewster WEF preconstruction noise assessment – John Cumming**

	Predicted far field wind farm sound levels	8.1 (I)	Appendix H Sec. 6.4	Far field calculations used ISO 9613-2:1996 standard	
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Electrical Sub station	Condition	EPA (Vic) NIRV Guideline	Noise report	Comment	Rectification required
Victoria EPA Environmental Reference Standard	Substation location		Appendix D Figure 4	The planned substation was located on the turbine map at the northeastern corner of the site.	
Part 3 – Ambient Sound	Substation sound power levels and dB(A)		Section 7.2	Sound power of 90 dB L <sub>WA</sub> estimated for a 50 MVA transformer	
	Maximum Noise levels (Day, Evening, Night)	Table 1	Section 7.3	The night-time limit of 34 dB was met with a predicted transformer noise at the nearest receiver of L <sub>WA</sub> of 13 dB at R2 (nearest receiver)	
	Compliance with limits provided		Section 7.3	Limits provided at 45 dB day 39 dB evening and 34 dB night considering the Farming Zone standard.	

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## Appendix 2 – Site inspection

### Brewster Wind Farm – proposed Site inspection (John Cumming)

Date: 10.3.2021

The site is located directly to the south of the Western Highway between Ballarat and Beaufort. The land is basically flat with a minor fall of 2-3 meters to the south and west. It is bounded to the west by Spring Hill Creek. There is a low lying area to the west that has been drained. The land is used for cropping and sheep grazing with some intensive farming of chickens in the vicinity. There is a small area of tree plantation to the south of the site

The noise sensitive locations within two kilometres are all farmhouses. There was the Brewster Primary School about 3 km to the southeast, but this is closed. The farmhouses are generally protected by mature pine trees and most of these residences are accompanied by extensive sheds.

Forty seven noise receptors were identified in the Marshall Day Noise Assessment report. The nearest 9 of these were examined in this inspection. One involved and two uninvolved residents were interviewed as a part of the inspection. The numbering system in the noise assessment report has been copied in this case.

#### Identified noise receptors



#### Receptor 1 –

7 Pin Oak Court Trawalla

This is owned by an involved farmer.

Maximum predicted noise level =  
42.8 dB  $L_{A90}$



The house is derelict and unoccupied.

There are some large sheds  
Nearest turbine (T1 672 m to the east)

The met mast is approx. 2km to the southeast

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**Receptor 2 –**

Kayleys Lane (also Involved landowner)

Double story house

Nearest turbine T4 - 1.22km to the west

Maximum predicted noise level = 33.1 dB L<sub>A90</sub>



This house was moved from its original position on the Western Highway to Kayleys Lane. The house has little protection from the elements from immature trees and directly faces the wind farm.

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**Receptor 3 – 97 Kayleys Lane (east side)**

Nearest turbine T4 - 1.59 km to the west

Maximum predicted noise level = 30.8 dB  $L_{A90}$



Single story weatherboard house with extensive shedding and silos. There is mature vegetation along the driveway and surrounding the buildings

There is a small house also on this property identified as receptor 10. This is apparently unoccupied.



**Receptor 10** – This is the second house on 97 Kayleys Lane property positioned a kilometre to the east of the main farmhouse. Single story weatherboard house. Nearest turbine T4 2.33 km to the west (not inspected)

Maximum predicted noise level = 26.7 dB  $L_{A90}$

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**Receptor 4 -**  
146 Kayleys Lane  
Nearest receptor T3 – 1.51km to the west  
Maximum predicted noise level  
= 31.2 dB  $L_{A90}$



Single story weatherboard house, 4 sheds and a row of mature pine trees to the west. Further trees both evergreen and deciduous surround the house paddock.

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**Receptor 5** – Trawalla Road (involved landowner owned)  
This property is rented from an involved landowner.  
Nearest receptor T2 – 1.83 km to the west  
Maximum predicted noise level = 37.5 dB  $L_{A90}$

**Receptor 72** – Trawalla Road is another residence at this site of an involved landowner  
Maximum predicted noise level = 37.2 dB  $L_{A90}$



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**Receptor 6 – 117 Pin Oak Court**

This farmhouse is owned by the farmer whose property is directly west of the wind farm. Maximum predicted noise level = 34.3 dB  $L_{A90}$

Nearest turbine T1 - 1.72 km to the southeast



Single story weatherboard house with 5 sheds and 2 silos/water tanks.

The house paddock is large with an extensively planted range of exotic plants. Mature trees have been planted along the house paddock fence lines.

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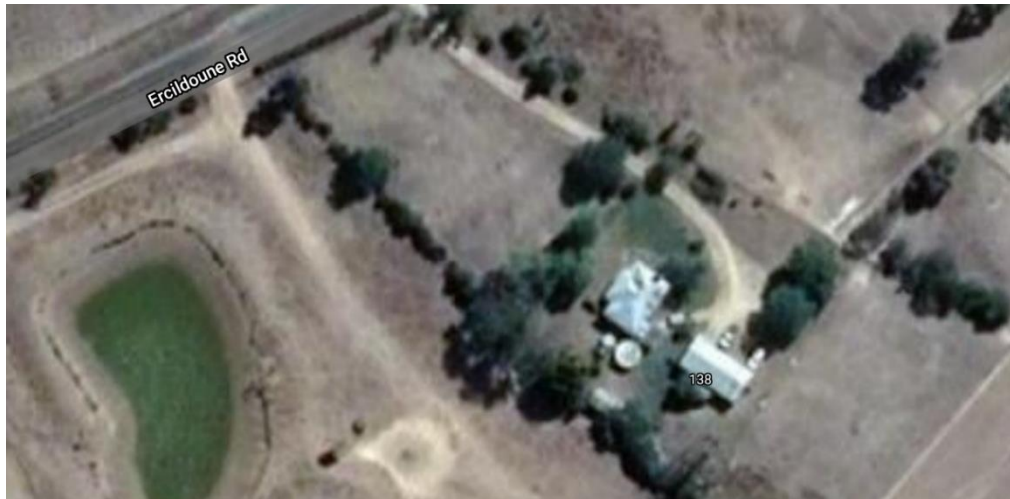
**Receptor 7 – Scullins Road**  
House unoccupied  
(Not inspected)  
Nearest turbine is T1 – 1.47 km  
to the southeast  
Maximum predicted noise level  
= 34.3 dB  $L_{A90}$



The house has a shed and two silos, but is overgrown heavily with pine trees.

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**Receptor 8 –**  
138 Ercildoune  
Road

Nearest turbine  
T1 1.38 km to  
the southwest

Maximum  
predicted noise  
level = 33.0 dB  
L<sub>A90</sub>



This is a single story  
weatherboard house with one  
large shed. Mature trees are dotted  
around the house and along the  
fence line of the house paddock.

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**Receptor 9 –**  
60 Black Bottom Road  
Nearest turbine T4 at 1.74 km to  
the southwest  
Maximum predicted noise level  
= 29.2 dB L<sub>A90</sub>



Single story house with 5 sheds

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**Interviews with involved residents**

**Doug Hobson** (brother of Barry Hobson) at Receptor 1 – 7 Pin Oak Court

As an involved landowner, Doug was pleased to see the wind farm plans. He explained that they had no plans to renovate Receptor 1 house which would remain unoccupied for the foreseeable future.

**Michael Loader** at Receptor 2 – Kayleys Lane

Michael was not present at the residence and did not answer the telephone call.

**Incidental interviews with uninvolved residents**

**Alison and David Vowles** at Receptor 6 – 117 Pin Oak Court

Alison and David were concerned about the potential noise from the wind farm affecting their sleep.

**Gary Swan** at Receptor 4 – 146 Kayleys Lane

Issues voiced by the resident:

- Variation in background noise especially between summer and winter
- Background noise variation when old trees are removed
- Line of sight to the turbines
- Audibility of the turbines within the house.

**Inspection Conclusions:**

1. There were two homes, (R1, R5 and R72), positioned within the 35 dB contour. R1 is derelict and not occupied, R5 and R72 are involved landowner properties.
2. No other possible noise sensitive locations were observed within the 35 dB contour.
3. Apart from R8 ( at a predicted maximum noise level of 33.0 dB, the next nearest uninvolved receptors: R3, R4, R6, and R7 are all outside the 35 dB contour. R8 is positioned to the north of the wind farm with the Western Highway in between.
4. The topography is flat with a gentle slope to the east. No valley effects are expected in noise predictions.
5. The land surrounding the proposed Brewster Wind Farm site is all cropping or grazing farmland as such a ground transmission factor of  $G = 0.5$  should lead to a conservative noise prediction at receptor locations.
6. The nearby receptors inspected all have considerable vegetation around the homes.

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