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Swansons Lane Wind Farm

Application for Planning Permit

Appendix B – Environmental Noise Assessment Audit

May 2025

RE Future Pty Ltd

Proposed Swansons Lane Wind Farm

Verification of Environmental (Predictive) Noise Assessment

Reference:

Rev B | 04 March 2024

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Job number 294635-00

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Distribution

Verification of Environmental (Predictive) Noise Assessment, Proposed Swansons Lane Wind Farm

04 March 2024

Copies	Recipient
1 PDF	RE Future Pty Ltd
1 PDF	Arup Project File

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Verification Statement of Environmental (Predictive) Noise Assessment – Swansons Lane Wind Farm

I, David W Spink, an environmental auditor appointed under Part 8.3 of the *Environment Protection Act 2017*, having:

1. Been requested by RE Future Pty Ltd to undertake a verification process and produce a Verification Report for the environmental (predictive) noise assessment for the proposed Swansons Lane Wind Farm, undertaken by Marshall Day Acoustics Pty Ltd.
2. Specifically, I have been requested to independently verify whether or not the pre-construction (predictive) environment noise assessment as provided in the report entitled Swansons Lane Wind Farm – Environmental Noise Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R01 20220544, dated 27 February 2024) has been conducted in accordance with New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise (NZS 6808:2010).
3. This verification is required under clause 52.32-4 of the Victorian Planning Provisions (*Planning and Environment Act 1987*)
4. Having regard to:
 - New Zealand Standard 6808:2010 Acoustics – Wind Farm Noise (NZS 6808:2010)
 - Planning Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023) (DTP Guidelines)
 - Victoria Planning Provisions (Amendments VC206 and VC234)
 - *Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018*
 - *Environment Protection Regulations 2021* as amended by the *Environment Protection Amendment (Wind Turbine Noise) Regulations 2022*and the following relevant documents:
 - ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, International Organisation for Standardisation, 1996
 - IEC 61400-11 (Ed 3, 2012) Wind Turbines – Acoustic noise measurement techniques
 - A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise, UK Institute of Acoustics, dated May 2013 (UK IoA Guidance)
 - Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2061, EPA Website)
 - Wind Energy Facility Noise Auditor Guidelines (EPA Publication 1692, dated October 2018)
 - Guidelines for Conducting Environmental Audits (EPA Publication 2041, dated February 2022)
 - Environmental Auditor Guidelines – Provision of statements and reports for environmental audits and preliminary risk screen assessments (EPA Publication 2022, dated August 2021)
 - Environmental Auditor Guidelines for Appointment and Conduct (Publication 865.14, dated December 2023)
5. Hereby declare that I am able to verify that the environmental (predictive) noise assessment for the proposed Swansons Lane Wind Farm, as provided in the report:

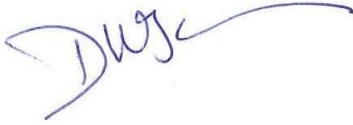
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- Swansons Lane Wind Farm – Environmental Noise Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R01 20220544 dated 27 February 2024)

has been conducted in accordance with NZS 6808:2010. Details on relevant specific issues are provided in the attached Verification Report.

Dated: 04 March 2024

Signed



David W Spink

Environmental Auditor (Industrial Facilities) – Appointed pursuant to the *Environment Protection Act 2017*

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List of Acronyms

Acronym	Definition
AGL	Above Ground level
dB(A)	A-weighted decibels, unit for the measurement of sound. The A-weighting is an adjustment to reflect how humans hear sound.
DTP	Department of Transport and Planning Victoria
DTP Guidelines	Planning Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023)
EPA	Environment Protection Authority Victoria
EP Act	<i>Environment Protection Act 2017</i> as amended by the <i>Environment Protection Amendment Act 2018</i>
EPA Guidelines	Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2016, EPA Website)
EP Regulations	Environment Protection Regulations 2021 as amended by the Environment Protection Amendment (Wind Turbine Noise) Regulations 2022
ERS	Environment Reference Standard
GED	General Environmental Duty (requirement under Section 25 of the EP Act)
IEC 61400-11:2012	International Standard IEC 61400-11:2012 for wind turbines Part 11: Acoustic noise measurement techniques
ISO 1996.2	International Standards Organisation ISO 1996 2:2017 Acoustics – Description, measurement and assessment of environmental noise Part 2: Determination of sound pressure levels
LA90(10 min)	A-weighted noise level exceeded for 90% of the measurement period, where the measurement period is 10 minutes
LGA	Local Government Area
MDA	Marshall Day Acoustics Pty Ltd
NMP	Noise Management Plan
NZS 6808:2010	New Zealand Standard Acoustics – Wind Farm Noise NZS 6808:2010
SAC	Special Audible Characteristic
Standard	New Zealand Standard Acoustics – Wind Farm Noise NZS 6808:2010
UK IoA Guidance	A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise (dated May 2013)
WEF	Wind Energy Facility
WEF Proponent	RE Future Pty Ltd
WTG	Wind Turbine Generator
VCAT	Victorian Civil and Administrative Tribunal
VPP	Victorian Planning Provisions

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1. Introduction

1.1 Purpose of the Verification Report

RE Future Pty Ltd (RE Future, the Proponent) is seeking approval for the construction and operation of the proposed Swansons Lane Wind Farm (proposed Project), comprising of five (5) wind turbine generators (WTGs) and related infrastructure on a site located 8 km southwest of Terang, Victoria. The site is located within the local government areas (LGAs) of Moyne Shire and Corangamite Shire. For consistency with applicable Victorian legislation, the proposed Project may also be referred to in this report as the proposed Wind Energy Facility (WEF).

The planning permit application process for the proposed Project involves assessment against the requirements of Clause 52.32 of the Victorian Planning Provisions (VPP) (*Planning and Environment Act 1987*). In accordance with Clause 52.32-4 (Amendment VC234), included in the Moyne and Corangamite Planning Schemes, the Proponent is required to include:

A pre-construction (predictive) noise assessment report prepared by a suitably qualified and experienced acoustician that (in part):

- *Reports on a pre-construction (predictive) noise assessment report demonstrating that the proposal will comply with the New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise.*
- *Provides an assessment of whether the proposed wind energy facility will comply with the noise limit for that facility under Division 5 Part 5.3 of the Environment Protection Regulations 2021.*

The Environment Protection Regulations 2021 have been amended to provide specific operational noise requirements for WEFs, through the Environment Protection Amendment (Wind Turbine Noise) Regulations 2022 (EP Regulations). Regulation 13(1B) of the EP Regulations states that the New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise (NZS 6808:2010) as the relevant standard for noise from operational turbines from the proposed Swansons Lane Wind Farm, or its modification, is replaced by the authorising document. In this case, an issued planning permit would be the authorising document.

Clause 52.32-4 also states that an application must be accompanied by:

- *A report prepared by an environmental auditor appointed under Part 8.3 of the Environment Protection Act 2017 that verifies whether or not the pre-construction (predictive) noise assessment was conducted in accordance with the New Zealand Standard NZS 6808:2010, Acoustics – Wind Farm Noise.*

David Spink, an environmental auditor (auditor) appointed under Part 8.3 of the *Environmental Protection Act 2017* (EP Act), has been requested by RE Future to undertake a verification process and produce a Verification Report against NZS 6808:2010 for the pre-construction (predictive) environmental noise assessment undertaken by Marshall Day Acoustics Pty Ltd (MDA) for the proposed Swansons Lane Wind Farm. The verification was undertaken to assess whether the pre-construction noise assessment for the operation of the WEF as provided in the following report:

Swansons Lane Wind Farm – Environmental Noise Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R01 20220544, dated 25 27 February 2024) (Predictive Noise Assessment Report)

has been conducted in accordance with NZS 6808:2010. Note that this report includes other construction and operational noise and vibration aspects; however, this verification is restricted to the predicted operational noise generated by the WTGs, as per NZS 6808:2010. Additional technical support was provided to the auditor by his Expert Support Team member Dr Kym Burgemeister (as provided for under EPA Publication 865.14 Environmental Auditor Guidelines for Appointment and Conduct, dated December 2023).

It is noted that a further pre-construction (predictive) noise assessment is required before any construction can commence, to model the final wind farm layout and selected WTG model to assess compliance with NZS 6808:2010. Additional requirements under the EP Regulations will also apply, namely the

development of a Noise Management Plan (including review by an Environmental Auditor appointed under the EP Act).

1.2 Project description

The proposed Project description is provided in Section 2.0 of the Predictive Noise Assessment Report.

For the purposes of the Verification Report, the following elements of the proposed Project are noted:

- The proposed Project is to be located within the Moyne Shire and Corangamite Shire local government areas (LGAs), approximately 8 km east of Terang. The Predictive Noise Assessment Report and the Auditors Verification Report will be provided as part of the documentation for an application for a Planning Permit for the proposed Project.
- The proposed Project includes an associated transformer station. The noise component of this transformer station is not included in the verification process addressed by this report.
- VPP Amendment VC 234 requires consideration of potentially triggering a more stringent noise limit. Zonings in the area (Farming Zone within the predicted 35 dB L_{A90} contour) are not considered to trigger a high amenity noise limit, required to be considered under Section 5.3 of NZS 6808:2010. This issue is discussed further in Section 6.3.1 of this report (Also refer to Section 3.5.4 and Section 6.1.1 of the Predictive Noise Assessment Report).
- NZS 6808:2010 (Section 2.4) provides a definition of noise sensitive locations. A total of 104 noise sensitive locations (receivers) have been identified by RE Future within 5 km of the proposed Project, and are considered in the noise assessment.
- Regulation 131B specifies that NZS 6808:2010 is the relevant noise standard for the proposed Project. NZS 6808:2010 (Section 2.4) states that the noise limits do not apply to receivers within the boundary of the proposed Project site (host or stakeholder receivers).
- Regulation 131A allows the noise limits provided in NZS 6808 to be modified if there is a wind turbine noise agreement in place between a WEF owner/ operator and a relevant landowner (stakeholder receiver). Regulation 131 BA still places a noise limit for this situation where such an agreement is made on or after 01 November 2021. It is understood that no such agreements are currently in place or proposed (Predictive Noise Assessment Report, Section 6.1.2). All off-site receivers are therefore non-involved receivers.
- The application is for construction and operation of five WTGs, with several options still under consideration. The Vestas V172-7.2MW has been chosen as the candidate (representative) WTG as it is likely to have the highest predicted wind turbine noise levels at receivers. This WTG has a power output of 7.2 MW and a rotor height of 150 m. The final WTG chosen would be selected after a tender process, and it is understood that a further pre-construction noise assessment would be undertaken on this final design.

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2. Applicable legislation and guidelines

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A summary of the applicable legislation and guidelines is provided in Section 3.0 of the Predictive Noise Assessment Report. The following comments are provided with respect to the specific issue of WTG noise associated with the proposed Project.

2.1 Planning requirements for proposed wind farms

The planning requirements for the proposed Project are provided under Clause 52.32 of the Victorian Planning Provisions (VPP), and included in the Moyne and Corangamite Planning Schemes. The current specific requirements that need to be included in an application for a permit to develop a WEF are specified in Clause 52.32-4 (Amendment VC234, dated 04 July 2023).

In regard to noise assessment, Clause 52.32 requires that the permit application is required to include the following:

A pre-construction (predictive) noise assessment report prepared by a suitably qualified and experienced acoustician that:

- *Reports on a pre-construction (predictive) noise assessment report demonstrating that the proposal will comply with the New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise.*
- *Provides an assessment of whether the proposed wind energy facility will comply with the noise limit for that facility under Division 5 Part 5.3 of the Environment Protection Regulations 2021*
- *Where the proposed wind energy facility will be the subject of a wind turbine noise agreement under Division 5 of Part 5.3 of the Environment Protection Regulations 2021, specifies the premises of the relevant landowner (including any particular buildings) to which the agreement relates and provides an assessment of whether the proposed wind energy facility will comply with the modified noise limit specified in the agreement.*

A report prepared by an environmental auditor appointed under Part 8.3 of the Environment Protection Act 2017 that verifies whether or no the pre-construction (predictive) noise assessment was conducted in accordance with New Zealand Standard NZS 6808:2010 Acoustics- Wind Farm Noise

The Department of Environment, Land, Water and Planning (DELWP)¹ has previously issued guidance through the publication Development of Wind Farm Facilities in Victoria – Policy and Planning Guidelines (DELWP, November 2021) (DELWP Guidelines). Following introduction of the EP Regulations, the Department of Transport and Planning (DTP) has revised the publication – the current document being Planning Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023) (DTP Guidelines). Specifically, Section 5.1.2 of the DTP Guidelines states that the VPP Section 52.32.4 requires that *the Verification Report to be provided by the environmental auditor, that verifies if the acoustic assessment for the pre-construction (predictive) noise assessment report has been conducted in accordance with the standard and in this case, NZS 6808:2010 is also referred to as the Standard.*

It is noted that the Predictive Noise Assessment Report refers to the previous DELWP Guidelines, rather than the current DTP Guidelines. This is not considered to be a material issue for the auditor review, since the two documents are very closely aligned.

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2.2 Environment Protection Act 2017

The EP Act provides the following general requirements for the construction and operation of the proposed Project.

- General Environmental Duty (GED) (EP Act, Section 25)

A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise these risks, so far as is reasonably practicable.

- Unreasonable Noise (EP Act, Section 166)

A person must not, from a place or premises that are not residential premises –

- *Emit an unreasonable noise; or*
- *Permit an unreasonable noise to be emitted*

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The Environment Protection Regulations 2021 were introduced under the EP Act, and came into effect in mid-2021, focusing regulatory control of operational WEFs to the Environment Protection Authority (EPA).

¹ The Department of Environment, Land, Water and Planning (DELWP) morphed into the Department of Energy, Environment and Climate Action (DEECA) with certain functions also going into a new Department of Transport and Planning (DTP) on 01 January 2023. The planning functions for wind farms was transferred to DTP.

The current amendment Environment Protection Amendment (Wind Turbine Noise) Regulations 2022 (EP Regulations) was made in October 2022. Division 5 – Wind turbine noise (Regulation 131) provides requirements for assessment and management of operational turbine noise; however, it does not specifically address requirements for pre-construction (predictive) noise assessments, or for verification by an environmental auditor.

The Environmental Reference Standard (ERS) provide noise indicators and objectives for various land use categories (Reference: Guide to the Environmental Reference Standard, EPA Publication 1992, dated June 2021). However, assessment of operational turbine noise is directly addressed in the EP Regulations.

The Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2061, EPA Website) (EPA Guidelines) refers to the General Environmental Duty (GED) under the EP Act. Application of the GED requires engagement *in any activity that may give rise to risks of harm to human health or the environment from pollution or waste to minimise those risks, so far as reasonably possible*. Specifically with respect to operation of WEFs: the EP Act (Section 166) imposes an obligation not to emit an unreasonable noise or permit an unreasonable noise to be emitted. To comply with the GED, Regulation 131B states that an operator of WEFs must ensure that wind turbine noise complies with the noise limits set out in the relevant noise standard. For the proposed Swansons Lane Wind Farm, the standard referred to is NZS 6808:2010.

Guidance on the audit of pre-construction noise is provided in Section 2.4.1 of Wind Energy Facility Noise Auditor Guidelines (EPA Publication 1692, dated October 2018). This does provide some general guidance that has been utilised in the verification process.

While this verification is strictly not an audit process, reference has also been made to the following EPA publications:

- Guidelines for Conducting Environmental Audits (EPA Publication 2041, dated February 2022)
- Environmental Auditor Guidelines for Appointment and Conduct (Publication 865.14, dated December 2023)

2.3 Auditor's additional comments

Specific guidelines such as NZS 6808:2010 have been developed to address the unique requirements for the prediction, measurement and assessment of sound from WEFs, because the usual measurement and assessment standards adopted in Victoria (such as Australian Standard AS 1055:2018 Acoustics: Description and Measurement of Environmental Noise and the Noise Protocol (EPA Publication 1862.4 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues) are unsuitable. In addition, the Environment Reference Standard (ERS) (Victorian Government Gazette No S 245, 26 May 2021) does not provide specific guidance on noise from WEFs.

There are other standards and guidelines such as the UK Government Assessment and rating of noise from wind farms (ETSU-R-97, 2008), the UK Institute of Acoustics Good Practice Guides, and the Annual Reports of the National Wind Farm Commissioner that can provide helpful background information and secondary guidance that can also assist with the assessment of projects where NZS 6808:2010 does not provide detailed or explicit guidance.

In particular, NZS 6808:2010 states that it does not set limits that provide absolute protection for residents from audible wind farm sound, but rather provides guidance on noise limits that are considered reasonable for protecting sleep and amenity from wind farm sound at noise sensitive locations.

3. Objective of the verification

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The objective of the verification was to assess whether or not the predictive operational noise assessment, provided in the report entitled Swansons Lane Wind Farm – Environmental Noise Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R01 20220544, 27 February 2024) (Predictive Noise Assessment Report) has been conducted in accordance with NZS 6808:2010.

This verification process has been limited to the predictive noise issues associated with the operational WTGs, for assessment against NZS 6808:2010. It therefore excludes the following aspects:

- Construction noise and vibration, including the quarry operations.
- Operational noise other than the WTGs (eg substation)
- Operational vibration

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4. Approach to verification process

As stated above, there is only general published guidance on undertaking verification processes for wind farm assessments. For instance, the EPA Guidelines provide some guidance for requirements under Regulation 131D of the EP Regulations for Noise Management Plans (NMPs) and post-construction noise assessments; however, this does not include pre-construction (predictive) assessments.

Reference has therefore been made to the guidance provided in the previous EPA publication Wind Energy Facility Noise Auditor Guidelines (Publication 1692, dated October 2018). The verification process is generally consistent with Section 2.4.1 of Publication 1692, and included:

1. Inception meeting with Swansons Lane Wind Farm management.
2. Familiarisation of the proposed Swansons Lane Wind Farm development and planned operation.
3. Site inspection of the proposed Project site and surrounding environment, including the rigour of the process used in identifying surrounding noise sensitive locations.
4. Review of the pre-construction (predicted) noise assessment as provided in the Predictive Noise Assessment Report, against the requirements of NZS 6808:2010. A summary checklist of issues to be addressed has also been developed.
5. Preparation of the Verification Report (this report).

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5. Documents reviewed for the verification

5.1 Documents specific to the Swansons Lane WEF

- Swansons Lane Wind Farm – Environmental Noise Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R01 20220544, dated 27 February 2024) (Predictive Noise Assessment Report)

5.2 General references

- New Zealand Standard 6808:2010: Acoustics – Wind Farm Noise (NZS 6808:2010)
- Planning Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023) (DTP Guidelines).
- Victoria Planning Provisions (Amendments VC206 and VC234)
- *Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018*
- Environment Protection Regulations 2021 as amended by the Environment Protection Amendment (Wind Turbine Noise) Regulations 2022 (EP Regulations)
- ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, International Organisation for Standardisation, 1996
- IEC 61400-11 (Ed 3, 2012) Wind Turbines – Acoustic noise measurement techniques

- A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise, UK Institute of Acoustics, dated May 2013 (UK IoA Guidance)
- Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2061, EPA Website)
- Wind Energy Facility Noise Auditor Guidelines (EPA Publication 1692, dated October 2018)
- Guidelines for Conducting Environmental Audits (EPA Publication 2041, dated February 2022)
- Environmental Auditor Guidelines – Provision of statements and reports for environmental audits and preliminary risk screen assessments (EPA Publication 2022, dated August 2021)
- Environmental Auditor Guidelines for Appointment and Conduct (Publication 865.14, dated December 2023)

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6. Findings of the verification process

The key findings of the verification process outlined in Section 4 are provided in this section, and address the objective set out in Section 3.

6.1 Review of the proposed Project site

An inspection of the general area in which it is proposed to locate the Swansons Lane Wind Farm was undertaken by the auditor on 14 April 2023. The intent of the site inspection was to ascertain the environmental and community context, the proposed turbine placements in relation to the location of identified noise sensitive receiver locations, and the potential locations used for noise monitoring. The scope of the verification did not include confirming GPS locations of proposed individual WTGs.

6.2 Background noise monitoring

Background noise monitoring is generally undertaken to inform the setting of specific noise limits at receiver locations due to the proposed WTGs. MDA has determined that the noise modelling predicts that the noise will be below 35 dBL_{A90} for all receivers outside of the proposed Project boundary, including involved receivers. As such, no background monitoring has been undertaken to date. The auditor confirms that this approach is in accordance with Section 7.1.4 of NZS 6808:2010. Further, the guidance provided in Section 4.3.2 of the DTP Guidelines does not require a mandatory background monitoring assessment to be included in an application for a planning permit. However, this situation will need to be also ratified during the approval process.

The auditor agrees with the MDA recommendation that background noise monitoring should be undertaken prior to construction of the wind farm (Predictive Noise Assessment Report, Section 5.0).

6.3 Environmental (predictive) noise assessment

The following assessment is based on information provided in the Predictive Noise Assessment Report, Section 6.0, and associated appendices.

A checklist has been prepared for the verification process to summarise compliance against the requirements of NZS 6808:2010, for undertaking the pre-construction (predictive) noise assessment (attached as Appendix A1). This should be referred to, in addition to the discussion of key issues in the following sections (which typically follow the general content of the above report for ease of reference).

6.3.1 Noise limits

- **Consideration of high amenity noise limits**

A discussion of the consideration of high amenity noise limits is provided in Section 6.1.1 of the Predictive Noise Assessment Report, as required by Section 4.3.2 of the DTP Guidelines.

NZS 6808:2010 Section 5.3.1 provides guidance as to whether a high amenity noise limit may be justified, and states (in part):

“The wind farm noise limit of 40 dB $L_{A90(10\ min)}$... is appropriate for protection of sleep, health, and amenity of residents at noise sensitive locations. In special circumstances, at some noise sensitive locations a more stringent noise limit may be justified to afford a greater degree of protection of amenity during evening or night-time.”

The auditor accepts that MDA has documented an appropriate assessment of this issue, including acknowledgement of precedents set by the Victorian Civil and Administrative Tribunal (VCAT) determination for the Cherry Tree Wind Farm (consistent with further guidance provided in Section 5.1.2 of the DTP Guidelines).

Specially, the auditor accepts that the areas within the Farming Zone (Refer to Appendix F of the Proposed Swansons Lane Wind Farm Predictive Assessment Report for Zoning Map) around the proposed Project do not warrant consideration of a high amenity noise limit.

- **Involved receivers**

NZS 6808:2010 (Section 2.4) provides a definition of noise sensitive locations. A total of 104 noise sensitive receiver locations (receivers) have been identified by RE Future within 5 km of the proposed Project, and are considered in the noise assessment.

Stakeholders can either be “involved” (ie have a noise agreement with the proponent of the proposed WEF), or “non-involved” (ie do not have an agreement with the proponent of the proposed WEF). The noise limits that apply will depend on whether stakeholders are involved or non-involved.

- At this stage, the auditor understands that no such agreements are currently in place or proposed (Predictive Noise Assessment Report, Section 6.1.2). All off-site stakeholders are therefore non-involved receivers. Should this situation change during the approval process, written evidence will need to be provided to confirm the status of involved stakeholders as these agreements allow a potential increased noise limit.
- **Noise limits**

The proposed applicable noise limits in Table 5, Section 6.1.3 of the Predictive Noise Assessment Report are consistent with Regulation 131BA and the DTP Guidelines for involved and non-involved stakeholders.

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6.3.2 Candidate wind turbine

- **Choice of candidate turbine**

NZS 6808:2010 does not provide any requirements on the choice of WTG. The choice of WTG option(s) selected for the predictive noise assessment should be consistent with the likely option to be finally selected. Specifically, the assessment can then take into account sound power levels and any Special Audible Characteristics (SACs) of the turbine options.

The auditor is satisfied that the candidate WTG (Vestas V172-7.2MW) is appropriate for this initial assessment, and notes that a further assessment of the preferred option will be undertaken when selected, including achieving compliance with the planning permit limits at surrounding receivers. It is noted that MDA advised that *the proponent is considering two different hub heights (150 m and 166 m). A sensitivity analysis indicated that a hub height of 150 m resulted in marginally higher predicted noise levels at receivers, by up to 0.2 dB. As a conservative approach, this lower hub height of 150 m is used in this assessment* (Refer to Section 6.2.1 of the Predictive Noise Assessment Report). This approach is appropriate from a noise assessment perspective, although the potential additional height may have other considerations beyond the scope of this verification process.

- **Sound power levels**

The source sound power levels used in the noise predictions are based on the documented sound power level data and spectral (octave band) data for the candidate turbine provided by the

manufacturer Vestas, in accordance with Section 6.2.1 of NZS 6808:2010 (Refer to Section 6.2.2 of the Predictive Noise Assessment Report, and Appendix I).

It is unclear whether these source levels have been determined by Vestas in accordance with IEC 61400-11 (Ed 3, 2012) Wind Turbines – Acoustic noise measurement techniques (IEC 61400-11: 2012), or are estimates or predictions made by Vestas (either are acceptable under NZS 6808:2010). Nevertheless, the reported noise emission levels appear consistent with the levels that would be expected from large wind turbines of this type.

- **Consideration of Special Audible Characteristics**

Wind farm sound that exhibits Special Audible Characteristics (SACs), such as tonality, impulsiveness or amplitude modulation is subject to penalties between 1–6 dB to account for the additional audibility and annoyance caused by sound with these characteristics. However, as noted in Section 5.4 of NZS 6808:2010, special audible characteristics cannot always be predicted in advance.

MDA has noted that there is limited data or evidence for tonality, or prediction of amplitude modulation and impulsiveness (Refer to Section 6.2.3 of the Predictive Noise Assessment Report). Therefore no adjustment has been made for SACs in the assessment.

This approach is considered to be reasonable at this stage. However, it is recommended that measurements of the tonality of the turbine selected for installation (in accordance with IEC 61400-11:2012) are reviewed as they become available, or verified by on-site emission testing of the first turbines commissioned on the site.

6.3.3 Noise prediction model

The noise prediction model is described in Appendix G of the Predictive Noise Assessment Report.

The noise level predictions have been undertaken using the noise propagation model provided in ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, International Organisation for Standardisation, 1996 (ISO 9613-2:1996), which has been shown in national and international studies to provide reasonable results for wind farm noise level predictions. NZS 6808:2010 (Section 6.1.3) refers to ISO 9613-2:1996 as “an example of a prediction method that has been shown to correlate well with measured data for wind farms...”

- In the opinion of the auditor and his team, the calculation parameters that have been adopted for temperature, humidity and ground absorption are reasonable, and correspond to best practice.
- The noise level predictions have adopted the following conservative assumptions:
 - Barrier effect limited to 2 dB
 - Screening based on turbine tip height, not hub height
 - +3 penalty for ‘concave’ ground topography (‘valley’ effects).

These considerations are not explicitly required by NZS 6808:2010 or implemented in ISO 9613-2:1996; however, they are commonly adopted as good practice for wind farm noise assessment based on the good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise, UK Institute of Acoustics, dated May 2013 (UK IoA Guidance).

6.3.4 Predicted noise levels

The highest predicted L_{A90} noise levels are provided in Table 9 of Section 6.3 of the Predictive Noise Assessment Report. In summary, the assessment predicted that the highest noise levels:

- at all non-involved receiver locations outside the proposed Project boundary complied with the applicable noise limit of 40 dB L_{A90}

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- at all involved receiver locations within the proposed Project boundary complied with the reference noise limit of 45 dB L_{A90}. It is understood that there are no agreements in place with stakeholders located beyond the site boundary.

These noise limits are consistent with those required in Regulation 131BA and the DTP Guidelines.

6.4 Other matters under NZS 6808:2010

There are a number of other matters potentially required to comply with the requirements of NZS 6808:2010 for a pre-construction (predictive) noise assessment.

6.4.1 Cumulative Impacts

NZS 6808:2010 Section 5.6 requires that:

... the noise limits in Sections 5.2 and 5.3 should apply to the cumulative sound level of all wind farms affecting any noise sensitive location.

MDA state that they are *not aware of any approved or operating wind farms in the immediate vicinity (10 km radius) of the proposed project area... with the nearest approved and/or operating wind farm (being) the Mortlake South Wind Farm, approximately 17 km to the North* (Predictive Noise Assessment Report, Section 6.4). For the purposes of this verification, the auditor accepts this assertion and would not expect any cumulative impacts; however, the proximity of adjacent wind farms should be checked as part of the planning approval process.

6.4.2 Uncertainty

NZS 6808:2010 Section 5.7 states that:

“Prediction and measurement of sound levels from wind farms available for the site purpose with enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

NZS 6808:2010 Appendix C – Uncertainty states that:

It is good practice the state the uncertainty and confidence level for any sound levels determined in accordance with this Standard. Uncertainty should be determined in accordance with the procedures of Craven and Kerry (2001)

MDA used SoundPlan v9.0 software, utilising the international standard ISO 9613-2:1996 sound propagation model as the method to calculate the level of broadband A-weighted wind farm noise expected to occur at surrounding sensitive receiver locations.

The software in conjunction with the digital terrain model of the site, has been used to evaluate the path between each turbine and receiver pairing, and then subsequently applies the adjustments to each turbine’s predicted noise contribution where appropriate. As mentioned above, NZS 6808:2010 notes that the ISO 9613-2:1996 sound propagation model has been demonstrated to generally result in conservative noise predictions.

All acoustic measurements and noise predictions are subject to measurement and calculation uncertainty. While MDA’s analysis is not subject to a detailed Uncertainty Analysis, it does generally adopt conservative assumptions, including a +1.0 dB contingency to account for input data uncertainty. The auditor and his team agree that this approach for modelling noise from WEFs is appropriately conservative.

7. Conclusion

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David Spink, an Environmental Auditor appointed under the *Environment Protection Act 2017*, has completed an independent verification of the environmental (predictive) noise assessment of the proposed Swansons Lane Wind Farm. Specifically, the objective was to independently verify whether or not the pre-

construction (predictive) noise assessment has been conducted in accordance with New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise NZS 6808:2010 (NZS 6808:2010 or Standard).

This verification is required under clause 52.32-4 of the Victorian Planning Provisions (*Planning and Environment Act 1987*), and the guidance document entitled Planning Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023) (DTP Guidelines).

The verification process was based on information provided in the following document:

- Swansons Lane Wind Farm – Environmental Noise Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R01 20220544, dated 27 February 2024)

The verification process concluded that the environmental (predictive) noise assessment for the proposed Swansons Lane Wind Farm, as provided in the above report, has been conducted in accordance with NZS 6808:2010. Details on relevant specific issues are provided in this Verification Report, and Appendix A1.

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Appendix A

New Zealand Standard 6808:2010: Acoustics – Wind farm noise Checklist

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A.1 NZS 6808:2010 Checklist

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Information Source:

Swansons Lane Wind Farm – Environmental Noise Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R01 20220544, dated 27 February 2024)

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
3.1.3	Adopt A-frequency weighted L90 centile level for wind farm sound	S6.2.2 Tables 7 and 8	LAeq adopted for source levels. LAeq levels will result in conservative predictions compared to L90 level.	Comply
5.2	Noise Limits – Non-involved and Involved stakeholders	S6.1.3 Table 5	Noise limits based on EP Regs 131BA requirements	Comply
5.3	Assessment of applicability of High Amenity Areas Noise Limits	S6.1.1	The wind farm is not in an area with zonings where the 'high amenity noise limit' would apply	Comply
5.4	Assessment for Special Audible Characteristics	S6.1.2	No quoted IEC 61400-11 test emission data for candidate turbine. Assessment based on observation that the occurrence of tonality is unusual. Amplitude modulation is impractical to determine pre-construction.	Comply
5.6	Cumulative Effects	S6.4	MDA state that the nearest approve and/or operating wind farm understood to be Mortlake South Wind Farm, located 17 km to the North. Should be checked during approval process.	Comply
5.7	Uncertainty	S6.2.2.	+1 dB adjustment adopted to account for typical values of test uncertainty.	Comply
6.1.1	Noise modelling method Predictions should identify all noise sensitive locations that might be exposed to > 35 dB LA90(10 min), and then predictions to establish the likely wind farm sound levels at each of these locations	S6.3	All receivers located outside the project boundary are predicted to all have WEF highest noise levels < 35 dBLA90(10 min)	Comply

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
6.1.2	Noise modelling method Factors that the predictions of wind farm sound levels should take into account a) Sound power levels and positions of wind turbines b) Directivity of propagation c) Meteorological conditions d) Attenuation due to geometric spreading e) Attenuation due to atmospheric absorption f) Ground attenuation g) Miscellaneous attenuation h) Barrier and terrain screening	S6.2.2 Appendices E & G	Appropriate modelling, propagation and attenuation parameters have been adopted ADVERTISED PLAN	Comply
6.1.3	Noise modelling method Sound propagation calculation method (ISO 9613-2 noted, detailed in Appendix B). Other prediction methods can be used, provided the details, assumptions, and limitations of the model are stated.	Appendix G	ISO 9613-2:1996 used with the adoption of appropriate modelling parameters	Comply
6.1.4	Noise modelling method ... the wind farm sound levels at a given noise sensitive location shall be determined by calculating the individual contributions of each wind turbine in octave-bands from at least 63 Hz to 4 Hz, and then A-weighting and energy adding these results to determine an overall predicted level at a given wind speed	Appendix G	Octave bands from 31.5Hz–8kHz centre frequencies have been adopted for the noise modelling.	Comply
6.1.5	Noise modelling method A set of overall levels will be predicted covering the wind speed range for which sound power level data are available from the manufacturer. As a minimum, the wind speed range shall include the range specified by IEC 61400-11 and the wind speed corresponding to the highest sound level generated by the turbine. All predicted wind farm sound levels shall be calculated at hub-height wind speeds.	Appendix H	Wind speeds from 3–15 m/s adopted for prediction and assessment.	Comply

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
6.1.6	Noise modelling method The levels predicted for the wind speed corresponding to 95% rated power of the turbines should be used for determining the positions of the 35 dB and 40 dB sound level contours around the wind farm.	S6.2.2	Predictions based on highest source level corresponding to 100% rated power and maximum sound power output. This is more conservative than 95%.	Comply
6.2.1	Sound Power Levels The sound power levels of a wind turbine used for predicting sound levels should be obtained from the wind turbine manufacturer. For the purposes of this Standard, it is recommended that wind farm sound level predictions be based on the apparent sound power and tonality values for the nominated wind turbine model, determined in accordance with IEC 61400-11.	S6.2.2 Appendix I		Comply
7.1.3	Measurement Every sound level measurement must be made at clearly identified noise sensitive locations	N/A		Not assessed
7.1.4	Measurement Background sound level measurements and subsequent analysis to determine the relative noise limits should be carried out where wind farm sound levels of 35 dBL _{A90(10min)} or higher are predicted for noise sensitive locations, when the wind turbines are at 95% rated power.	N/A	No background measurements taken to date. All involved and non-involved receivers outside the project boundary are at locations which are predicted to all have highest noise levels < 35 dBL _{A90(10min)} . Also refer to S6.1	Not assessed
7.1.5	Measurement When considering a group of noise sensitive location, it is acceptable to conduct background sound level measurements at a representative location. These measurements shall then be used to define noise limits that apply to every noise sensitive location in that group. The sound generating features at the representative location shall be similar in proximity and character to those at other noise sensitive locations represented by that location.	N/A	Refer to previous comment S7.1.4	Not assessed

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
7.1.6	<p>Measurement</p> <p>Sound power measurements should be made at noise sensitive locations and where practical should be on the wind farm side of buildings. Measurement positions should be 3.5m from any significant reflecting surfaces other than the ground, and from other structures or objects...</p>		Refer to previous comment S7.1.4	Not assessed
7.2.1/ C7.2.1	<p>Sound Data</p> <p>Sound level measurements should be made during a representative range of wind speeds and directions generally expected at the wind farm...</p> <p>“... a minimum of 10 days of continuous monitoring will be required to give suitable range of data. Typically, this will give in excess of 1440 data points, which should be plotted against the appropriate corresponding wind data</p> <p>It may require measurements to be made for extended periods of time to ensure that data includes the representative range of wind conditions....</p>		Refer to previous comment S7.1.4	Not assessed
7.2.2	<p>Sound data</p> <p>Sound levels shall be measured in accordance with NZS 6801 except for the restrictions in 7.2.3 and 7.2.4 of NZS6801... Measurement time intervals of 10 minutes shall be used</p>		Refer to previous comment S7.1.4	Not assessed
7.2.3	<p>Sound data</p> <p>The instrumentation used for the sound measurements shall meet the requirements of section 5 of NZS 6801.</p>		Refer to previous comment S7.1.4	Not assessed
7.2.4	<p>Sound data</p> <p>Extraneous sound levels caused by events, including precipitation, insects, fauna, and so on, should, as far as is practical for an unattended monitoring exercise, be identified and removed from the data.</p> <p>Methods for identifying extraneous sound events include octave-band spectrum measurements and asking residents to keep an activity log during measurements.</p>		Refer to previous comment S7.1.4	Not assessed

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
7.3.1	<p>Wind data</p> <p>...concurrent measurements of wind speed and direction shall be taken within the wind farm site at a known height AGL, preferable at the height of the wind turbine hub.</p> <p>Wind speed measurements are usually not required at the locations where the sound measurements are made</p>		Refer to previous comment S7.1.4	Not assessed
7.3.2	<p>Wind data</p> <p>If measurements have not been conducted at hub-height, then the hub-height wind speeds should be predicted from wind-shear relationships.</p>		Refer to previous comment S7.1.4	Not assessed
7.3.3	<p>Wind data</p> <p>The same location and height should be used for the wind measurements before and after installation provided this position is not likely to be affected by the turbines.</p>		Refer to previous comment S7.1.4	Not assessed
7.4.1	<p>Background measurements</p> <p>Background sound level measurements should be plotted against the hub-height wind speeds existing at the time of each measurement to obtain a scatter plot. Examine this plot to determine whether a singular regression relationship is evident.</p> <p>If there are markedly different groups within the scatter plot, then separate scatter plots may be required for different condition, including wind directions, and times of day</p>		Refer to previous comment S7.1.4	Not assessed

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
7.4.2	Background measurements Find the regression curve that gives the best correlation coefficient between sound level and wind speed for each scatter plot and use it to describe the average background sound level at different wind speed. Sparseness of data or obvious outliers should not be allowed to unreasonable influence the regressions curve. ...at extremes of the wind speed range analysed. In these cases, it may be more appropriate to use a 'bin analysis' procedure as outlined in IEC 61400-11.		Refer to previous comment S7.1.4	Not assessed
7.4.3	Background measurements If there is a poor correlation between wind speed and sound level, further investigation of wind conditions should be undertaken, possibly including wind-flow modelling, local knowledge, site observations or local wind monitoring.		Refer to previous comment S7.1.4	Not assessed
7.4.4	Background measurements Where multiple regressions are indicated, and therefore several regression curves have been obtained, noise limits should be set on the basis of each regression curve derived.		Refer to previous comment S7.1.4	Not assessed
7.5	Post-installation measurements		Not applicable	
7.6	Compliance Assessment		Not applicable	
7.7	On-Off Testing		Not applicable	
8.1	Any report of wind farm noise predictions in accordance with this Standard shall refer to this Standard and provide the following:			
	a) A map showing the topography (contour lines) in the vicinity of the wind farm, the position of the wind turbines, and noise sensitive locations;	Appendix E		Comply

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
	b) Noise sensitive locations for which wind farm sound levels are calculated;	Appendix C, Appendix D		Comply
	c) Wind turbine sound power levels;	S6.2.2 Appendix H		Comply
	d) The make and model of the wind turbines;	S6.2.1 Table 6		Comply
	e) The hub-height of the wind turbines;	S6.2.1 Table 6		Comply
	f) Distance of noise sensitive locations from the wind turbines;	Appendix C		Comply
	g) Calculation procedure used;	Appendix G		Comply
	h) Meteorological conditions assumed;	Appendix G		Comply
	i) Air absorption parameters used;	Appendix G		Comply
	j) Ground attenuation parameters used;	Appendix G		Comply
	k) Topography/ screening assumed;	Appendix G		Comply
	l) Predicted far-field wind farm sound levels	S6.3 Table 9 Figure 1 Appendix H		Comply

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
8.2	<p>Documentation</p> <p>Any report of background sound level measurements and assessment in accordance with this Standard shall refer to this Standard and provide the following:</p> <ul style="list-style-type: none"> a) Description of the sound monitoring equipment including ancillary equipment; b) The location of sound monitoring positions; c) Description of the anemometry equipment including the height AGL of the anemometer; d) Positions of wind speed measurements; e) Time and duration of the monitoring period; f) Averaging period for both sound and wind speed measurements; g) Atmospheric conditions: the wind speed and direction at the wind farm position and rainfall shall be recorded; h) Number of data pairs measured (wind speed in m/s, background sound in L90); i) Description of the regression analysis; j) Graphical plots showing the data scatter and the regressions curves. 		<p>Refer to previous comment S7.1.4.</p> <div style="border: 2px solid red; padding: 10px; margin: 10px 0;"> <p>This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright</p> </div>	Not assessed
8.3	<p>Documentation</p> <p>Compliance Assessment</p>	N/A	Not applicable	Not applicable
8.4	<p>Documentation</p> <p>Submission of Reports</p>	N/A	Not applicable	
Appendix A	Recommended Consent Conditions	N/A	Not applicable	

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source	Assessment	Compliance
Appendix B	Special Audible Characteristics	S6.2.3	Refer to S6.3.2 of this report. The proposed approach is considered to be reasonable at this stage. However, it is recommended that measurements of the tonality of the turbine selected for installation (in accordance with IEC 61400-11:2012) are reviewed as they become available, or verified by on-site emission testing of the first turbines commissioned on the site.	Comply
Appendix C	Uncertainty	S6.2.2	Refer to S6.3.5 & 6.4.2	Comply
Appendix D	Prediction Method Example	Appendix G	ISO 9613 has been adopted	Comply

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