ARUP

Neoen Australia Pty Ltd

Proposed Kentbruck Green Power Hub

Verification of Environmental (Predictive) Operational Noise Assessment – Wind Turbines Generators

Reference: R01

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Job number 289739-00

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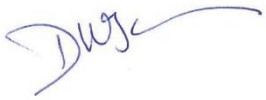
Signature			

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Auditor Verification Statement

Verification Statement for Proposed Kentbruck Green Power Hub - Environmental (Predictive) Operational Noise Assessment – Wind Turbines Generators

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

1. Been requested by Neoen Australia Pty Ltd to undertake a verification process and produce a Verification Report for the environmental (predictive) operational noise assessment for the Wind Turbines Generators (WTGs) at the proposed Kentbruck Wind Energy Facility (WEF), undertaken by Marshall Day Acoustics Pty Ltd.

2. Specifically, I have been requested to independently verify whether or not the environmental (predictive) noise assessment for the operational WTGs as provided in the report entitled Kentbruck Green Power Hub – Environmental Noise and Vibration Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R04 20200682, dated 16 July 2024) (Assessment Report) has been conducted in accordance with New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise (NZS 6808:2010 or Standard).

   The verification also included a review of the associated report entitled Kentbruck Green Power Hub – Background Noise Monitoring (Marshall Day Acoustics Pty Ltd, Report Rp 002 R03 20200682, dated 16 July 2024) (Background Noise Assessment Report).

3. Having regard to:

   - New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise
   - Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023)
   - Victoria Planning Provisions (Amendments VC199, VC212, VC206, 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, May 2013
   - Guide to the Environment Reference Standard (EPA Publication 1992, dated June 2021)
   - Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2061, EPA Victoria 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 (EPA Publication 865.14, dated December 2023)

Hereby declare that I am able to verify that the pre-construction (predictive) operational noise assessment for the WTGs at the proposed Kentbruck WEF, as provided in the Assessment Report has been conducted in accordance with NZS 6808:2010. Details on relevant specific issues are provided in the attached Verification Report.

Dated: 27 August 2024

Signed

David W Spink

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

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)
EES	Environment Effects Statement
EPA	Environment Protection Authority Victoria
EP Act	*Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018*
EPA Guidelines	Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2061, EPA Victoria 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 IEC61400-11:2012 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
Neoen	Neoen Australia Pty Ltd
NMP	Noise Management Plan
NZS 6808:2010	New Zealand Standard NZS 6808:2010 Acoustics - Wind Farm Noise
SAC	Special Audible Characteristic
Standard	New Zealand Standard NZS 6808:2010 Acoustics - Wind Farm Noise
UK IofA 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	Neoen Australia Pty Ltd
WTG	Wind Turbine Generator

1. Introduction

1.1 Purpose of the Verification Report

Neoen Australia Pty Ltd (Neoen, the Proponent) is seeking approval for the construction and operation of the proposed Kentbruck Green Power Hub (proposed Project), comprising of up to 105 wind turbines and related infrastructure on a site located near Nelson, Victoria. For consistency with applicable Victorian legislation, the proposed Project is referred to in this report as the proposed Kentbruck Wind Energy Facility (proposed Kentbruck WEF), and the wind turbines as Wind Turbine Generators (WTGs).

The approval pathway for the proposed Kentbruck WEF involves development of an Environmental Effects Statement (EES) for review by a Panel, triggered under the Victorian *Environment Effects Act 1978*. The publication entitled *Scoping Requirements for Kentbruck Green Power Hub Environmental Effects Statement* (EES Scoping Requirements) set out the matters to be investigated and documented in the Environmental Effects Statement (EES) and specifies the EES evaluation objectives.

Neoen retained Marshall Day Acoustics Pty Ltd (MDA) to undertake noise studies addressing these EES objectives for the proposed Kentbruck WEF. The outcome of this assessment is provided in the report entitled Kentbruck Green Power Hub Environmental Noise & Vibration Assessment (Marshall Day Acoustics Pty Ltd, Report No. Rp 001 R04 20200682, dated 16 July 2024) (Assessment Report).

In regard to assessment of operational noise from the WTGs, the Scoping Requirements require the proposed Kentbruck WEF to be assessed in accordance with *New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise* (NZS 6808:2010 or Standard), as required by the Department of Transport and Planning (DTP) in the publication entitled *Planning Guidelines for Development of Wind Energy Facilities* (dated September 2023) (DTP Guidelines).

The DTP Guidelines also state that the environmental noise assessment 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 New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise

David Spink, an environmental auditor (auditor) appointed under Part 8.3 of the *Environment Protection Act 2017* (EP Act), was requested by Neoen to undertake an independent verification process and produce a Verification Report. Specifically, the scope was to verify (or not) whether the environmental (predictive) noise assessment of the operational WTGs for the proposed Kentbruck WEF as provided in the Assessment Report, has been conducted in accordance with NZS 6808:2010. Additional technical support was provided to the auditor from his Expert Support Team member Dr Kym Burgemeister (as provided for under Environmental Auditor Guidelines for Appointment and Conduct (EPA Publication 865.14, dated December 2023).

The following is noted:

- The Assessment Report includes other construction and operational noise and vibration aspects; however, this verification is restricted to the predictive operational noise generated by the WTGs, to be conducted in accordance with NZS 6808:2010.
- Background noise monitoring has also been undertaken by MDA. The verification process included review of this monitoring as provided in the publication entitled Kentbruck Green Power Hub Background Noise Monitoring (Marshall Day Acoustics Pty Ltd, Report No. Rp002 R03, dated 16 July 2024) (Background Noise Monitoring Report)
- The scope of the verification also does not include other requirements specified in the EES Scoping Requirements.
- 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 the applicable noise limits, conducted in accordance with NZS 6808:2010.

- Additional requirements under the Environment Protection Regulations 2021 as amended by the Environment Protection Amendment (Wind Turbine Noise) Regulations 2022 (EP Regulations) will also apply, namely the development of a Noise Management Plan, and a post construction noise compliance assessment (both subject to independent review/ verification by an environmental auditor appointed under Part 8.3 of the EP Act).

1.2 Project description

A description of the proposed Project is provided in Section 1.2 of the Assessment Report.

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

- The proposed Kentbruck WEF is to be located within the Glenelg Shire Council local government area (Glenelg LGA), approximately 8 km east of the South Australian/Victorian border. The township of Nelson is located 3 km west of the site, with the city of Portland 30 km to the southeast. The proposed Kentbruck WEF would be situated inland of Discovery Bay.
- The WTGs are proposed to be primarily located in a managed pine plantation that abuts Portland-Nelson Road and Lower Glenelg National Park to the north and Discovery Bay Coastal Park to the south.
- The application is for construction and operation of up to 105 WTGs, plus associated infrastructure. Each WTG is to have a capacity of 4 – 8 MW, a tip height of up to 270 m, rotor diameter of up to 190 m, and minimum distance of rotor tip above ground level of 60 m.

2. Regulatory Considerations

2.1 Project Approval Pathway

As noted above, the proposed Kentbruck WEF is currently undergoing assessment under the *Environment Effects Act 1978*. Notwithstanding this approach, the requirements of VPP Clause 52.32 and the DTP Guidelines, and other relevant legislation including the EP Act, still need to be met.

It is beyond the scope of this verification process to consider factors other than the predictive operational noise from the WTGs at the proposed Kentbruck WEF, based on the WTG layout proposed in the Assessment Report. Further details of the approval pathway with respect to noise assessment is provided in the Assessment Report, Appendix D.

2.2 Planning Requirements

The planning requirements are summarised in Section 3 of the Assessment Report.

For the purposes of the verification process, the following is noted from the DTP Guidelines (Section 4.3.2).

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

- *Reports on a pre-construction (predictive) noise assessment conducted following 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*
- *Where the proposed wind energy facility will be the subject of a wind turbine agreement under 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 for that facility specified in the agreement is prepared on the basis that the relevant noise standard will be the New*

Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise and includes an assessment of whether a high amenity noise limit is applicable under Section 53 of the Standard.

These requirements are consistent with VPP Clause 52.32-4, and are also included in the Glenelg Planning Scheme.

However, the EP Regulations do not specifically address pre-construction (predictive) noise assessments.

2.3 Environment Protection Act 2017

The EP Act provides the following general requirements for the proposed Kentbruck WEF.

- *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*

  Unreasonable noise is defined in the EP Act:

  (a) Is unreasonable having regard to the flowing:

  (i) its volume, intensity or duration,

  (ii) its character,

  (iii) the time, place or other circumstances in which it is emitted,

  (iv) how often it is emitted,

  (v) any prescribed factors, or

  (b) is prescribed to be unreasonable noise

The EP Regulations came into effect in mid-2021 under the EP Act, focusing regulatory control of noise form WTGs at operational WEFs to the EPA under Regulation 131, with requirements summarised in the following table.

Regulation	Requirement
131A	Wind turbine noise agreement
131B	Relevant noise standard
131BA	Noise limits
131BB & 131BC	Alternative monitoring point & alternative monitoring point criterion
131CA	Duty to ensure compliance with noise limit or alternative monitoring point criterion
131D	Post-construction noise assessment
131E	Noise management plan (NMP)
131F	Annual statement
131G	Wint turbine noise monitoring

Regulation	Requirement
131H	Unreasonable noise
131I	Transitional provisions – noise limits
131J	Transitional provisions – annual statements
164	Functions of environmental auditors

In regard to unreasonable noise, Regulation 131H states that *wind turbine noise is unreasonable noise if it exceeds-*

a) the noise limit for the wind energy facility; or

b) if the wind turbine noise is assessed at an alternative monitoring point, the alternative monitoring point criterion for that alternative monitoring point.

Specifically, Regulation 131 provides requirements for assessment and management of operational WTG noise; however, it does not address requirements for pre-construction (predictive) noise assessments to be submitted to EPA, or for review by an environmental auditor.

The Environmental Reference Standard (ERS) provide noise indicators and objectives for various land use categories (Reference: Guide to the Environment Reference Standard, EPA Publication 1992, dated June 2021). However, assessment of 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, the Regulation 131B state 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 Kentbruck WEF, 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)

2.4 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 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues (EPA Publication 1862.4)) 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 WTGs at a WEF. The ERS is primarily relevant to aspects that are not controlled by the EP Regulations, and potentially includes natural areas where an environmental value may exist eg human tranquillity and enjoyment outdoors in natural areas. This matter is

considered further in Section 11.0 of the Assessment Report; however, is beyond the scope of this verification.

There are other standards and guidelines such as Australian Standard AS4959:2010 Acoustics – Measurement, prediction and assessment of noise from wind turbine generators, the UK Government Assessment and rating of noise from wind farms (ETSU-R-97, 2008) 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

The objective of the verification was to assess whether or not the environmental (predictive) noise assessment, provided in the report entitled Kentbruck Green Power Hub – Environmental Noise and Vibration Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R04 20200682, dated 16 July 2024) (Assessment Report) has been conducted in accordance with NZS 6808:2010.

The verification process has included a review of the background noise monitoring, provided in the report entitled Kentbruck Green Power Hub – Background Noise Monitoring (Marshall Day Acoustics Pty Ltd, Report Rp 002 R02 20200682, dated 16 July 2024) (Background Noise Monitoring Report), to verify whether or not this assessment has been conducted in accordance with NZS 6808:2010.

It is noted that the Assessment Report has been prepared to address the environmental noise and vibration assessment requirements of the EES Scoping Requirements and the DTP Guidelines. The scope of the verification did not include other associated issues specified in the EES Scoping Requirements. It specifically excludes the following aspects included in the Assessment Report (these will be assessed separately during the EES process):

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

4. Approach to verification process

There is only general published guidance on undertaking a verification process for the pre-construction (predictive) noise from WTGs at a WEF. The DTP Guidelines do not provide any detail on the expected auditor verification process. EPA has provided some guidance in the EPA Guidelines for requirements under Regulation 131D for post-construction noise assessments; however, this does not include pre-construction (predictive) noise 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) (EPA Publication 1692). The verification process was generally consistent with Section 2.4.1 of EPA Publication 1692, and included:

1. Inception meeting with Kentbruck WEF management.
2. Familiarisation of the proposed Kentbruck WEF development and planned operation.
3. Site inspection of the proposed Kentbruck WEF site and surrounding environment, including the rigour of the process used in identifying surrounding noise sensitive locations.

4. Review of Background Noise Monitoring Report
5. Review of the environmental (predicted) noise assessment provided in the Assessment Report, against the requirements of NZS 6808:2010. A summary checklist of issues to be addressed was developed.
6. Preparation of the Verification Report (this report).

5. Documents reviewed for the verification

5.1 Documents specific to the current scope of the proposed Kentbruck WEF

- Kentbruck Green Power Hub – Environmental Noise and Vibration Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R04 20200682, dated 16 July 2024) (Assessment Report)
- Kentbruck Green Power Hub – Background Noise Monitoring (Marshall Day Acoustics Pty Ltd, Report Rp 002 R03 20200682, dated 16 July 2024) (Background Noise Monitoring Report)

5.2 Other references

- New Zealand Standard 6808:2010: Acoustics – Wind Farm Noise (NZS 6808:2010 or Standard)
- Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023) (DTP Guidelines)
- Victoria Planning Provisions (Amendments VC199, VC212, VC206, 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)
- Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2061, EPA Victoria website) (EPA Guidelines)
- Guide to the Environment Reference Standard (EPA Publication 1992, dated June 2021)
- 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, May 2013
- Wind Energy Facility Noise Auditor Guidelines (EPA Publication 1692, dated October 2018)
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- 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 (EPA Publication 865.14, dated December 2023)

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 objectives set out in Section 3.

6.1 Review of the proposed Kentbruck WEF site and surrounding area

An inspection of the general area in which it is proposed to locate the Kentbruck WEF was undertaken by the auditor on 26 September 2022, in conjunction with a local Neoen employee. The intent of the site inspection was to ascertain the environmental and community context, the proposed WTG placements in relation to the location of identified noise sensitive receiver locations, and the locations used for background noise monitoring. The inspection confirmed general conditions on the site and surrounding locations referred to in the Assessment Report and Background Noise Monitoring Report. The scope of the verification did not include confirming GPS locations of individual WTGs.

6.2 Background noise monitoring and determination of noise limits

While a review of the background noise monitoring is not strictly required as part of this verification process, the measured background noise levels are used to set the noise limits at some wind speeds, for some of the noise sensitive receiver locations. It is therefore appropriate to review the methodology and findings of the background noise monitoring to confirm that the approach used complied with NZS 6808:2010.

The background noise monitoring was undertaken by MDA, as documented in the report entitled Kentbruck Green Power Hub – Background Noise Monitoring (Marshall Day Acoustics Pty Ltd, Report No. 002 R03 20200682, 16 July 2024) (Background Noise Monitoring Report). A summary of the findings of the background monitoring assessment are also presented in Section 5.0 of the Assessment Report.

The following key points were noted from a review of the Background Noise Monitoring Report and Section 5.0 of the Assessment Report. A checklist (Appendix A1) has been prepared to summarise compliance against the requirements of NZS 6808:2010, for undertaking the background noise monitoring assessment.

6.2.1 Selection of background monitoring locations

The selection of appropriate background monitoring locations for assessment of potential noise levels on sensitive receivers is dependent on several factors, including the proposed configuration of the WTGs. Key points noted:

- As noted in Section 1.2, the proposed array of WTGs is to be located primarily in a managed pine plantation that abuts Portland-Nelson Road to the north and Discovery Bay Coastal Park to the south. At the time the background noise monitoring was undertaken, an additional section of the WEF was proposed to be located on agricultural land that abuts the Lower Glenelg National Park (to the north) and Cobboboonee Forest Park (to the east). Neoen advised the auditor that some WTG locations were removed from the eastern end of the proposed Project during the further assessment process following conduct of the background monitoring in 2021. Comparison of Figure 1 in the Background Noise Monitoring Report and Figures 1 in the Assessment Report indicate some differences in number and location of the WTGs. Therefore, an initial step in the verification process was to ascertain whether the locations used for the background monitoring remain valid for the current proposed WTG configuration and sensitive receiver locations, as specified in the Assessment Report.
- Noise sensitive locations are defined in NZS 6808:2010, Section 2.4. It is understood that, based on the proposed array of WTGs when the background monitoring was undertaken, MDA initially identified a total of 48 noise sensitive locations within 5 km of the proposed WTGs. This number has been reduced to a total of 40 noise sensitive locations with the current proposed WTG array:
    - A total of 34 are non-stakeholder receivers on properties that are not associated with the proposed Project, including 15 residential properties and 19 designated camping grounds.

- A total of 6 residential dwellings that are associated with the proposed Project - stakeholder receivers that are understood to have a contractual arrangement with Neoen with respect to WTG noise agreements.
    - 2 within the proposed Project boundary – Receivers 41 and 676 where Receiver 676 is an abandoned dwelling owned by a landowner associated with the proposed Project
    - 2 outside the proposed Project boundary with a WTG noise agreement - Receivers 21 and 675
    - 2 outside the proposed Project boundary which have been identified as hosts for either substation or underground cable easements - Receivers 43 and 44.

  It is noted that MDA identify that *the relevant types of noise sensitive locations in NZS 6808 are generally consistent with those of the noise sensitive areas in the EP Regulations (ie inclusion of camping grounds).* (Assessment Report, Section 4.0).

The auditor notes that noise sensitive locations are defined in NZS 6808:2010, Section 2.4 Definitions as:

The location of a noise sensitive activity, associated with a habitable space or education space in a building not on a wind farm site…. In some instances, holiday cabins and camping grounds might be considered as noise sensitive locations. Matters to be considered include whether it is an established activity with existing rights.

- A total of 5 background monitoring locations (Receivers 10, 21, 31, 81 and 673) were initially identified by MDA (Background Noise Monitoring Report, Section 2.1). The auditor considers that MDA has appropriately:
    - identified representative background monitoring locations consistent with NZS 6808:2010 Sections 7.1.3 – 7.1.5.
    - undertaken monitoring at Receiver 10 proxy location, given that consent was not granted to undertake background monitoring at the Receiver10 location (MDA note that with the current WEF array, *predicted WEF noise at Receiver 10 would be less than 35 dBL_{A90} and as such, background noise monitoring would no longer be required in accordance with NZS 6808)*.

      It is noted that this approach is consistent with the EP Regulations - Regulation 131BB does allow the use of alternative monitoring points for noise measurements:

      > *(a) if a monitoring point for the WEF is not readily accessible; or*
      >
      > *(b) if-*
      >
      > > *(i) an assessment of wind turbine noise at a monitoring point for the WEF would be affected by extraneous noise to a greater extent than an assessment of wind turbine noise at the alternative monitoring point; and*
      > >
      > > *(ii) the alternative monitoring point is closer to a wind turbine or group of wind turbines in the WEF than that monitoring point.*
      >
      > *(Note: alternative monitoring points are not intended for use for the assessment of wind turbine noise during the post-construction noise assessment under Regulation 131D).*
    - Undertaken monitoring at a Receiver 673 Int location, due to poor security at Receiver 673 (within the camping ground). It is noted that MDA undertook further assessment of Receiver 673 Int due to the audible coastal noise. Background noise levels at Receiver 673 Int were provided by MDA *for indicative purposes only*.

- Undertaken monitoring at 3 other locations (21, 31, 81), consistent with the initial WEF array. However, two of these are no longer required in accordance with NZS 6808:2010 since:
    - Receiver 21 is now a stakeholder receiver where a noise agreement is proposed
    - Receiver 81 is now located approximately 7.2 km from the nearest proposed WTG, outside the 5 km study area (and below a predicted 35 dB L_{A90} noise level from the WEF).

Overall, the auditor accepts the complexity of this site in regard to undertaking appropriate background noise monitoring, and concludes that the number and position of the monitoring locations used for the background monitoring remain adequate for the predictive noise assessment.

6.2.2 Monitoring survey methodology

The monitoring methodology used by MDA is provided in the Background Noise Monitoring Report, Section 2.2, Table 2. The background noise survey and analysis is noted as being conducted in accordance with NZS 6808:2010 and adopts the supplementary guidance in the UK Institute of Acoustics publication A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise (dated May 2013) (UK IoA Guidance).

Key points noted:

- Detailed information regarding the microphone location at each monitoring location is provided, including individual aerial and site photographs showing specific measurement locations. This indicates that the measurement locations were located at appropriate positions relative to nearby sensitive receiver locations and the proposed locations of the wind turbines.
- The equipment adopted for the background noise level measurements, and wind shielding appears to be appropriate. Further details of survey instrumentation are provided in Appendix C of the Background Noise Monitoring Report.
- The background noise monitoring has been undertaken over approximately 7 weeks between May and July 2021. Between 7,616–7,639 noise level/wind speed 10-minute data pairs were recorded at each location, with around 1,200–2,600 data points removed to exclude periods with extraneous noise or measured during rainfall. This exceeds the minimum requirement of 1,440 data pairs given in NZS 6808:2010.
- The site wind-speed measurements have been undertaken using conventional anemometers located at heights of 80 m and 109 m on three met-masts on the site. The hub-height (165 m AGL) wind speed has been based on an analysis of the measured wind-shear coefficients undertaken by Aurecon. This method is appropriate and undertaken in accordance with NZS 6808:2010, Section 7.3.2. Further details of coordinates of the 3 reference masts, analysis process and wind roses are provided in Appendix D of the Background Noise Monitoring Report.
- The background noise level measurements have been undertaken in accordance with NZS 6808:2010. A comparison between the measurement methodology and the requirements of NZS 6808:2010 are provided in the table in Appendix A1 of this report.

6.2.3 Data analysis

The methodology used by MDA for analysis of the data is provided in the Background Noise Monitoring Report, Section 2.3 (particularly Table 3). Background noise levels and derived noise limits (both all-time and night-time) are provided in Sections 3.1 and 3.2 respectively.

Key points noted:

- The data analysis includes filtering out data that is affected by rainfall or extraneous noise in accordance with S7.2.4 of NZS 6808:2010. Periods with likely extraneous noise have been

identified using the one-third octave band methodology documented by Griffin et. al[1]. This approach has been shown to remove data pairs with generally higher noise levels from the regression analysis, and so will result in a conservative assessment of the background noise level.

- The background noise level and filtered wind speed data has been analysed using a 3rd order polynomial regression generally between the cut-in wind speed (3 m/s) and the maximum expected operational speed (20 m/s), which is appropriate. The regression has been truncated at some locations at low wind speeds, where the polynomial regression would result in an increase in noise level with reducing wind speed, in accordance with the UK IoA Guidance.
- The monitoring results and summary of data analysis for each monitoring location are shown in Appendix F – J of the Background Noise Monitoring Report
- Regression analyses was undertaken for both the 24-hour data, and night-period data only.
- The reported square of the correlation coefficient (r^2) is generally 0.11–0.28 considering all time data, and between 0.09–0.30 for the night-period data only (shown in Appendix E of the Background Noise Monitoring Report). This is not particularly high, and representative of a relatively wide range of results, rather than highly correlated data.
- Noise limits have been derived at integer hub-height wind speeds, and are consistent with the noise limits provided in NZS 6808:2010 Section 5.2 for sensitive receiver locations.

6.3 Environmental (Predictive) Operational Noise Assessment

The following assessment is based on information provided in the Assessment Report, Section 9.0, and associated appendices.

A checklist (Appendix A1) has been prepared to summarise compliance against the requirements of NZS 6808:2010, for undertaking the pre-construction (predictive) noise assessment. 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 Assessment criteria

Key points noted:

- Consideration of high amenity area noise limit

  NZS 6808:2010 Section 5.3.1 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."

  NZS 6808:2010 Section 5.3.1 provides guidance as to whether a high amenity noise limit may be justified. The auditor accepts that MDA has documented an appropriate assessment of this issue in the Assessment Report, Section 9.1.1, including acknowledgement of precedents set by the Victorian Civil and Administrative Tribunal (VCAT) determination of the Cherry Tree Wind Farm and the Planning Panel assessment of the Golden Plains Wind Farm. The additional discussion on the applicability of the potential application of a high amenity area for the Public Park and Recreation Zone (PPRZ), and the associated application of the ERS, is also noted. MDA concluded that *there is no clear precedent, indication or justification for the application of a high amenity limit*. Further assessment provided in Section 9.4 concluded that even if a high amenity limit was deemed appropriate, then the noise generated from the WEF would still be within the noise limits

[1] Griffin, D., Delaire, C. and Pischedda, P. (2013) *Methods of identifying extraneous noise during unattended noise measurements*. 20th International Congress of Sound and Vibration.

up to a hub height wind speed of 6 m/s, considered by EPA to be the upper limit for application of a high amenity noise limit (EPA Guidelines).

Based on this information, the auditor accepts that a high amenity limit is not justified for the proposed Kentbruck WEF – although noting that the application remains the subject of a separate EES and planning process, and this matter may well be discussed further.

- Stakeholders

  Stakeholder receivers are discussed in the Assessment Report, Section 9.1.2.

  Stakeholders can either be "involved" (ie have a noise agreement with the Proponent of the WEF), or "non-involved" (ie do not have a noise agreement with the Proponent of the WEF).

  The noise limits that apply will depend on whether stakeholders are involved or non-involved. Written evidence will need to be provided ideally during the EES process, to confirm the status of involved stakeholders as these noise agreements allow a potential increased noise limit (up to 45 dBL_{A90}, or background sound level plus 5 dB, whichever is the greater) as is discussed below.

- Noise limits

  NZS 6808:2010, Sections 5.2 states that as a guide:

  "…at a sensitive receiver location, at any wind speed, wind farm sound levels (L A90(10 min) should not exceed the background sound level by more than 5 dB, or a level of 40 dB LA90(10 min), whichever is the greater."

  The noise limits provided in the Assessment Report, Section 9.1.3 for non-involved stakeholders comply with this guidance.

  The noise limits that apply to involved stakeholders has also been clarified with the introduction of the EP Regulations. Regulation 131BA(2)(b) specifies as per the above, except that the limit is defined as 45 dBL_{A90} or the background sound level plus 5 dB, whichever is the greater.

  The assessment allows for separate night-time noise limits to be established.

6.3.2 Candidate wind turbines

- Choice of representative turbine

  NZS 6808:2010 does not provide any requirements on the choice of WTG. The choice of WTG options 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 considers that the assessment of the four WTG candidate options in the Assessment Report, Section 9.2 provides appropriate confidence in the potential range of WTG noise that will be emitted from the WEF. It is also noted that one of the applicable Environmental Performance Requirements (MM-NV05) of the EES process requires a pre-development noise assessment to be undertaken, based on the final selected turbine model, prepared in accordance with the assessment and documentation requirements of NZS 6808:2010 (Assessment Report, Section 12.0, Table 37).

- Sound power levels

  The sound power levels of the four WTG options is discussed in the Assessment Report, Section 9.2.2.

  The source sound power levels (SPLs) used in the noise predictions are based on the documented SPL data and spectral (octave band) data for the four WTG options (General Electric GE 6.0-164, Vestas V162-6.2-170, Siemens Gamesa SG6.2-170, Nordex N163/5.7) provided by the manufacturers in accordance with S6.2.1 of NZS 6808:2010. It is unclear whether these source levels have been determined by the manufacturers 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 the manufacturers (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

  Special Audible Characteristics (SACs) are discussed in the Assessment Report, Section 9.2.3.

  Wind farm sound that exhibits 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 NZS 6808:2010 Section 5.4, special audible characteristics cannot always be predicted in advance.

  Therefore, MDA have assessed the likelihood that the turbines will result in tonal noise emission and noted that the occurrence of tonality is unusual.

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 propagation model

The noise prediction model is described in Appendix E of the Assessment Report. Key issues noted:

- 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 6806:2010, 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 UK IoA Guidance.

6.3.4 Predicted noise levels

Predicted noise levels are provided in the Assessment Report, Section 9.3.

Noise level contours have been provided for the selected four candidate WTGs. It is accepted that the assessment has been undertaken in accordance with the requirements of NZS 6808:2010, and the resulting assessment demonstrates that the predicted noise levels for the WEF will achieve the noise criteria established by NZS 6808:2010, Specifically:

- Table 28 indicates that the highest predicted noise levels will comply with the required noise level criteria at all of the non-involved noise sensitive receiver locations.
- The assessment also indicates that the wind farm sound levels comply with the 45 dB(A) base noise criteria at the involved /stakeholder residences.

The highest predicted noise levels for all WTG options at the locations of all the non-involved sensitive receivers are below the base noise limit of 40 dBL_{A90}, which is in compliance with the noise limit provided in

NZS 6808:2010, Section 5.2. The alternative noise limit of background level plus 5 dB provided in NZS 6808:2010 has not been applied, at the discretion of the Proponent for the proposed Kentbruck WEF.

It is noted that the 40 dBL_{A90} base noise limit is exceeded at one involved sensitive receiver location (21), with a highest predicted noise level of 41.7 dBL_{A90}. However, this predicted level is below the 45 dBL_{A90} noise limit specified in Regulation 131BA(2)(b) for involved landowners *if an agreement was made on or after 01 November 2021….* (Note that this same Regulation 131BA(2)(b) still allows for *the background sound level plus 5 dB*).

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.

The Assessment Report Section 9.5 states that *to our knowledge, the nearest approved and/or operating wind farm is the Cape Bridgewater Wind Farm (approximately 20 km to the south-east*). The auditor agrees that this separation distance would be sufficient to not warrant any assessment of potential cumulative noise impacts; however, this separation from other wind farms should be confirmed during the planning process.

6.4.2 Uncertainty

NZS 6808:2010 Section 5.7 states that:

Prediction and measurement of sound levels from wind farms involve values of a range of parameters that can be known or predicted only within a certain tolerance. The size of such uncertainties determine the level of confidence in the overall results.

NZS 6808:2010 Appendix C – Uncertainty states that:

It is good practice to 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).

No specific information has been provided on the uncertainty of the predictive assessment undertaken in the Assessment Report, although a 1 dB contingency has been adopted in the calculation as a contingency, in addition to other conservative prediction assumptions.

MDA used SoundPlan v8.2 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 with this approach for modelling noise from WEFs is appropriately conservative.

7. Conclusion

David Spink, an environmental auditor appointed under the EP Act, has completed an independent verification of the pre-construction (predictive) noise assessment of the operational WTGs at the proposed Kentbruck Green Power Hub (proposed Kentbruck WEF). Specifically, the objective was to independently verify whether or not the pre-construction (predictive) noise assessment of the operational WTGs had been conducted in accordance with NZS 6808:2010.

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

- Kentbruck Green Power Hub – Environmental Noise and Vibration Assessment (Marshall Day Acoustics Pty Ltd, Report Rp 001 R04 20200682, dated 16 July 2024) (Assessment Report)
- Kentbruck Green Power Hub – Background Noise Monitoring (Marshall Day Acoustics Pty Ltd, Report Rp 003 R02 20200682, dated 16 July 2024) (Background Noise Monitoring Report)

The verification process concluded that the pre-construction (predictive) noise assessment for the operational WTGs at the proposed Kentbruck WEF, as provided in the Assessment Report, has been conducted in accordance with NZS 6808:2010. Details on relevant specific issues are provided in this Verification Report, and Appendix A1.

Appendix A

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

A.1 NZS 6808:2010 Checklist

Information Sources:

1. Kentbruck Green Power Hub – Environmental Noise and Vibration Assessment (Marshall Day Acoustics Pty Ltd, Report No. Rp 001 R04 20200682, dated 16 July 2024)
2. Kentbruck Green Power Hub – Background Noise Monitoring (Marshall Day Acoustics Pty Ltd, Report Rp 002 R03 20200682, dated 16 July 2024)

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
3.1.3	Adopt A-frequency weighted L_{90} centile level for wind farm sound	S9.2.2 Tables 26 and 27		LAeq adopted for source levels. LAeq levels will result in conservative predictions compared to L_{90} level.	Comply
5.2	Noise Limits – Non-involved and Involved stakeholders	S9.1.3 Tables 22 and 23		Noise limits based on measured background noise level analysis.	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
5.3	Assessment of applicability of High Amenity Areas Noise Limits	S9.1.1 S9.4		The wind farm is not in an area with zonings where the 'high amenity noise limit' would strictly apply. The discussion around applicability of determining whether the coastal area designated Public Park and Recreation Zone (PPRZ) where there are camping sites concluded that *there is no clear precedent, indication or justification for the application of a high amenity limit*. Further assessment provided in Section 9.4 concluded that even if a high amenity limit was deemed appropriate, then the noise generated from the WEF would still be within the noise limits up to a hub height wind speed of 6 m/s (considered by EPA to be the upper limit for application of a high amenity noise limit (EPA Guidelines). The auditor accepts the outcome of the assessment although it still may be open to further discussion at Panel.	Comply
5.4	Assessment for Special Audible Characteristics	S9.2.3		No quoted IEC 61400-11 tonality assessment data for candidate turbines. Assessment based on observation that the occurrence of tonality is unusual. Amplitude modulation is impractical to determine pre-construction. Recommended that IEC 61400-11 tonality assessment is reviewed for selected project turbine.	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
5.6	Cumulative Effects	S9.5		MDA note that (to their knowledge), the nearest approved and/or operating wind farm is the Cape Bridgewater wind Farm, located approximately 20 km to the south east. No cumulative impacts from nearby WEF identified	Comply
5.7	Uncertainty	S9.2.2.		+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 $L_{A90(10\ min)}$), and then predictions to establish the likely wind farm sound levels at each of these locations	S9.3 Figures 5 - 8		Locations > 35 dBLA90(10 min) are identified.	Comply
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	S9.2.2 Appendix E		Appropriate modelling, propagation and attenuation parameters have been adopted	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 E		ISO 9613-2:1996 used with the adoption of appropriate modelling parameters	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
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	S9.2.2		Octave bands from 63Hz–4kHz 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.	S9.2.2		Wind speeds from 4–15 m/s adopted for prediction and assessment.	Comply
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.	S9.2.2 S9.2.3 Appendix E		Predictions based on highest source level corresponding to 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…. Sound power L_{eq} emission values to be converted to received L_{90} sound pressure levels as part of the prediction process.	S9.2.2		SPL data sources summarised in Table 25.	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
6.2.2	Sound Power Levels IEC 61400-11 requires wind turbine sound power levels to be reported against a wind speed measured at 10 m AGL. However, this Standard uses hub height wind speeds in the analysis of the background and post-installation sound levels.	S9.2.2		Hub-height wind speed sound power data adopted	Comply
7.1.3	Measurement Every sound level measurement must be made at clearly identified noise sensitive locations		S2.1, Figure 1 Appendices F - J	Noise measurement locations clearly identified	Comply
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 $dBL_{A90(10\ min)}$ or higher are predicted for noise sensitive locations, when the wind turbines are at 95% rated power.		S2.1 Figure 1	Background noise level measurements undertaken at representative locations within the 35 $dBL_{A90(10min)}$ contour.	Comply
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.		S2.1 Figure 1	Background noise level measurements undertaken at representative locations within the 35 $dBL_{A90(10min)}$ contour. The comments regarding sensitive receivers 10 and 673 in Section 2.1 are noted. Also, the background monitoring was undertaken, at a time when there was proposed to be WTGs located to the eastern area. Hence, sensitive receiver 81 was included; however, this location is currently approximately 7.1 km from the nearest WTG.	Comply
7.1.6	Measurement 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 3.5 m from any significant reflecting surfaces other than the ground, and from other structures or objects…		Appendices F - J	Background noise level measurements undertaken on wind farm sound of buildings, and > 3.5 m from significant reflecting surfaces	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
7.2.1/ C7.2.1	Sound Data Sound level measurements should be made during a representative range of wind speeds and directions generally expected at the wind farm… "… 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 It may require measurements to be made for extended periods of time to ensure that data includes the representative range of wind conditions….		Appendices F - J	Background noise levels measured in windspeeds 0–22 m/s > 1,440 data points at all measurement locations	Comply
7.2.3	Sound data The instrumentation used for the sound measurements shall meet the requirements of section 5 of NZS 6801.		Appendix C	Sound level measurement instrumentation and wind shields are appropriate.	Comply
7.2.4	Sound data 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. Methods for identifying extraneous sound events include octave-band spectrum measurements and asking residents to keep an activity log during measurements.		S2.3	Extraneous noise has been identified and removed from data analysis	Comply
7.3.1	Wind data …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. Wind speed measurements are usually not required at the locations where the sound measurements are made		S2.2 Table 2 Appendix D	Wind speed and direction measured at 3 met masts on site.	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
7.3.2	Wind data If measurements have not been conducted at hub-height, then the hub-height wind speeds should be predicted from wind-shear relationships.		S2.2 Table 2 Appendix D	Wind speed and direction data at hub height has been predicted from wind-shear relationships and site analysis undertaken by Aurecon	Comply
7.3.3	Wind data The same location and height should be used for the wind measurements before and after installation provided the wind at this position is not likely to be affected by the turbines.			Not applicable at this stage. This same condition allows for alternative monitoring position(s) where there is uncertainty about whether the original wind speed measurement position(s) by the turbines.	
7.4.1	Background measurements 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. 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		Appendices F - J	Regression analysis undertaken for each measurement location.	Comply
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.		Appendices F - J	Regression curves identified and used to determine average background sound levels	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
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.		Appendices F - J	Correlation is reasonable	Comply
7.4.4	Background measurements Where multiple regressions are indicated, and therefore several regression curves have bene obtained, noise limits should be set on the basis of each regression curve derived.		Appendices F - J	24-hour and night-time only regressions have been undertaken	Comply
7.5	Post-installation measurements			Not applicable	
7.6	Compliance Assessment			Not applicable	
7.7	On –Off Testing			Not applicable	

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
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 H			Comply
	b) Noise sensitive locations for which wind farm sound levels are calculated;	Figures 1-3			Comply
	c) Wind turbine sound power levels;	S9.2.2 Table26,27			Comply
	d) The make and model of the wind turbines;	S9.2.2 Table 25			Comply
	e) The hub-height of the wind turbines;	S6.2.2 Table 10			Comply
	f) Distance of noise sensitive locations from the wind turbines;	Appendix F, Table 43			Comply
	g) Calculation procedure used;	S8.3 Table 21, Appendix E			Comply
	h) Meteorological conditions assumed;	S8.3 Table 21			Comply
	i) Air absorption parameters used;	S8.3 Table 21, Appendix E			Comply
	j) Ground attenuation parameters used;	S8.3 Table 21, Appendix E			Comply
	k) Topography/ screening assumed;	Appendix E			Comply
	l) Predicted far-field wind farm sound levels	S9.3 Table 28 Appendix K			Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference Section from Information Source 1.	Reference Section from Information Source 2.	Assessment	Compliance
8.2	Any report of background sound level measurements and assessment in accordance with this Standard shall refer to this Standard and provide the following:				
	a) Description of the sound monitoring equipment including ancillary equipment;		Appendix C		Comply
	b) The location of sound monitoring positions;		Appendices F - J		Comply
	c) Description of the anemometry equipment including the height AGL of the anemometer;		S2.2 Table 2 Appendix C Table 11		Comply
	d) Positions of wind speed measurements;		S2.1 Figure 1 Appendix D		Comply
	e) Time and duration of the monitoring period;		S2.2 Table 2		Comply
	f) Averaging period for both sound and wind speed measurements;		S2.2 Table 2		Comply
	g) Atmospheric conditions: the wind speed and direction at the wind farm position and rainfall shall be recorded;		Appendix D		Comply
	h) Number of data pairs measured (wind speed in m/s, background sound in L90);		Appendices F - J		Comply
	i) Description of the regression analysis;		S2.3 Table 3 Appendix E		Comply
	j) Graphical plots showing the data scatter and the regressions curves.		Appendices F - J		Comply
8.3	Documentation Compliance Assessment			Not applicable	
8.4	Documentation Submission of Reports			Not applicable	