

Lal Lal Wind Farms Nom Pty Limited

Lal Lal Wind Farm

Verification of Stage 2 Post-Construction Noise Assessment – Wind Turbine Generators

Reference: R01

Issue | 24 September 2024

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.




Job number 270849-00

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Distribution

Lal Lal Wind Farm - Verification of Stage 2 Post-construction Noise Assessment – Wind Turbine Generators

24 September 2024

Copies	Recipient
1 PDF	Lal Lal Wind Farms Co Pty Limited c/- RES Australia Pty Limited Suite 6.01 Level 6 165 Walker Street North Sydney NSW 2055
1 PDF	Arup Project File

Auditor Verification Statement

Lal Lal Wind Farm - Verification Statement of Stage 2 Post Construction Noise Assessment for Wind Turbine Generators

I, David W Spink, an environmental auditor appointed pursuant to the *Environment Protection Act 2017*, having:

1. Been requested by Lal Lal Wind Farms Nom Co Pty Limited c/- RES Australia Pty Limited (RES) to provide an auditor's opinion (verification) for the Stage 2 post-construction noise assessment of the Lal Lal Wind Farm (LLWF), undertaken by SLR Consulting Australia Pty Ltd (SLR).
2. Specifically, I have been requested to independently provide an opinion on the methodology and results of the post-construction noise assessment, provided in the report entitled Lal Lal Wind Farm, Post-construction Noise Assessment – Stage 2 (SLR Consulting Australia Pty Ltd, Report No 640.11872 Rev 1.2, dated 20 September 2024) (Stage 2 Post-construction Noise Assessment Report) as required by Condition 25(d) of Planning Permit PL-SP/05/0461-2 (amended 12 April 2022) (Planning Permit), to confirm whether or not the assessment complies with the Noise Compliance Test Plan entitled Lal Lal Wind Farm, Noise Compliance Test Plan (Marshall Day Acoustics Pty Ltd, Report No 003 R03 20170649, dated 23 January 2018) (NCTP), approved by the Minister for Planning on 17 May 2018, and the noise limits specified in Condition 23 of the Planning Permit.
3. Having regard to, (amongst other things)
 - Lal Lal Noise Compliance Test Plan (Marshall Day Acoustics Pty Ltd, Report No 003 R03 20170649, dated 23 January 2018) (NCTP)
 - New Zealand Standard Acoustics – Wind Farm Noise NZS 6808:2010 (NZS 6808:2010)
 - *Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018* (EP Act)
 - Environment Protection Regulations 2021 as amended by the Environment Protection Amendment (Wind Turbine Noise) Regulations 2022 (EP Regulations)

and the following relevant documents

- Lal Lal Wind Farm – Elaine, Post-construction Noise Assessment (SLR Consulting Australia Pty Ltd, Report 640.11872-R04, v2.0, dated October 2023)
- Lal Lal Wind Farm – Elaine. Verification of the Post-construction Noise Assessment (Arup Australia Pty Ltd, Job Number 270849-00, dated 13 November 2023)
- Lal Lal Wind Farm – Yendon, Post-construction Noise Assessment (SLR Consulting Australia Pty Ltd, Report 640.11872-R15, v1.7, dated October 2023)
- Lal Lal Wind Farm – Yendon. Verification of the Post-construction Noise Assessment (Arup Australia Pty Ltd, Job Number 270849-00, dated 07 December 2023)
- Environmental Auditor's Opinion (Phillip Bayne, Jacobs Group (Australia) Pty Ltd), memo entitled Proposed Lal Lal Wind Farm - Review of Lal Lal Wind Farm Noise Compliance Test Plan, dated 24 January 2018
- Lal Lal Wind Farm, Background Noise Monitoring Report (Marshall Day Acoustics Pty Ltd, Report No 001 R01 20170649, dated 01 March 2018).
- Lal Lal Wind Farm, Pre-construction Predictive Modelling Assessment (Marshall Day Acoustics Pty Ltd, Report No 002 20170649, dated 17 January 2018).
- Lal Lal Wind Farm Compliance Baseline Noise Monitoring (SLR Consulting Australia Pty Ltd, Report 640.11872-R01, Version No v1.1, dated February 2021)

- Planning Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023) (DTP Guidelines)
 - Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Publication 2061, EPA Website) (EPA Guidelines)
 - 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)
 - Victoria Planning Provisions Clause 52-32
 - UK Institute of Acoustics Amplitude Modulation Working Group – Final Report – A Method for rating Amplitude Modulation in Wind Turbine (Version 1, dated 09 August 2016) (UK IOA AM Procedure)
 - International Standard IEC61400-11:2012 Wind turbines – Part 11: Acoustic noise measurement techniques (IEC 61400-11:2012)
 - International Standard ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels (ISO 1996-2:2017)
 - Annual Report to the Parliament of Australia, Office of the National Wind Farm Commissioner, 31 March 2017.
4. Hereby declare that I am of the opinion that the post-construction noise assessment for the LLWF as provided in the Stage 2 Post-construction Noise Assessment Report:
- a. Has been conducted in accordance with the NCTP; with the exception of comments regarding the inconsistency in the NCTP’s process for the assessment of AM, as discussed below, and
 - b. Demonstrates that the LLWF complies with the noise limits set out in Condition 23 of the Planning Permit.

It is noted that the verification process undertaken by the auditor was specifically for assessment of compliance with the conditions of the Planning Permit (Conditions 23 and 25). LLWF must also comply with the verification requirements of Regulation 131D.

The auditor further notes the following:

Assessment of Amplitude Modulation (AM)

The UK IOA AM Procedure referred to in Section 4.4.3 of the NCTP is not consistent with the fixed penalty of +5 dB in Section 5.8 of the NCTP. It uses a sliding scale penalty that starts at a 3 dB penalty for a 3 dB modulation depth, and increases to a 5 dB penalty at a 10 dB modulation depth. This matter is further discussed in the Stage 2 Post-construction Noise Assessment Report Section 8.3.3.2 and Appendix G.

The auditor and his team consider that the UK IOA AM Procedure used by SLR is a reasonable compromise approach in establishing an AM trigger; however, the issue needs to be further discussed with the regulators (EPA/DTP).

Whilst it is understood that this verification is not against compliance with the EP Regulations, the auditor recommends that SLR and RES discuss this issue with EPA before proceeding with additional assessment of this site for compliance with the EP Regulations.

Marginal noise level compliance

The level of compliance at several receiver sites (N31ab, M29aa, and K34aa: all at Yendon) at certain wind speeds during the night-time period is marginal. Comparison with the Stage 1 monitoring outcomes (refer to reports noted in Section 1, point 3 of this report) indicates that the marginal compliance at these locations at Yendon has been validated. Nevertheless, as indicated in Appendix C of NZS 6808:2010, where compliance is marginal and contested, further steps may be required to reduce uncertainty. In this case, while compliance is not contested, RES may consider adopting further on-off testing at these locations, for example, in accordance with Section 7.7 of NZS 6808:2010.

Dated: 24 September 2024

Signed



David W Spink

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

List of Acronyms

Acronym	Definition
AGL	Above Ground Level
AM	Amplitude Modulation
DELWP	Department of Environment, Land, Water, and Planning Victoria
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)
dB(A)	A-weighted decibels, unit for the measurement of sound. The A-weighting is an adjustment to reflect how humans hear sound.
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 Noise Regulation Guidelines (EPA Publication 2061, EPA Website)
EP Regulations	Environment Protection Regulations 2021 as amended by the Environment Protection Amendment (Wind Turbine Noise) Regulations 2022
ERS	Environmental Reference Standard
GED	General Environmental Duty (requirement under Section 25 of the EP Act)
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
Lal Lal	Lal Lal Wind Farms Nom Co Pty Limited
LA90(10 min)	A-weighted noise level exceeded for 90% of the measurement period, where the measurement period is 10 minutes
LLWF	Lal Lal Wind Farm
MDA	Marshall Day Acoustics Pty Ltd
NCTP	Noise Compliance Test Plan
NMP	Noise Management Plan
NZS 6808:2010	New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise
Planning Permit	Planning Permit PL-SP/05/0461-2 (as amended 12 April 2022) issued under the Moorabool Planning Scheme
RES	RES Australia Pty Ltd
SAC	Special Audible Characteristic
SLR	SLR Consulting Australia Pty Ltd
Standard	New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise
UK IOA AM Procedure	UK Institute of Acoustics Amplitude Modulation Working Group – Final Report – A Method for rating Amplitude Modulation in Wind Turbine (Version 1, dated 09 August 2016)
Vestas	Vestas Australian Wind Technology Pty Ltd
WEF	Wind Energy Facility
WEF Operator	Lal Lal Wind Farms Nom Co Pty Ltd c/- RES Australia Pty Ltd
WTG	Wind Turbine Generator

1. Background to verification

Lal Lal Wind Farm (LLWF) comprises of a total of 60 turbines, constructed across 2,100 Ha of land in the Moorabool Shire, approximately 17 km south-east of Ballarat. The LLWF has two sections located about 9 kilometres apart. There are 38 turbines located east of Yendon and a further 22 turbines located north of Elaine. Consistent with terminology used by the Victorian government, this report refers to the wind farm as a Wind Energy Facility (WEF), and a turbine as a Wind Turbine Generator (WTG).

Lal Lal Wind Farms Nom Co Pty Limited is the Operator of the LLWF. The LLWF was constructed by Vestas Australian Wind Technology Pty Ltd (Vestas) and Zenviron, using Vestas model V136-3.8MW turbines with serrated trailing edge technology. Construction was overseen by RES Australia Pty Ltd (RES), a global renewable energy company. RES continues as the Asset Manager for the operational phase under an Asset Management Agreement.

A planning permit was issued on 30 April 2009 under the Moorabool Planning Scheme (Permit No PL-SP/05/0461), with the current amendment (Permit No PL-SP/05/0461-2), dated 12 April 2022 (Planning Permit).

Key points noted:

1. The Planning Permit required:

- a. Operation of the LLWF must comply with New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise (NZS 6808:2010 or the Standard), except as allowed under Condition 23 (discussed further in Section 2.1).
- b. A Noise Compliance Testing Plan to be prepared and approved by the Minister for Planning before development of the LLWF (Condition 24). Marshall Day Acoustics Pty Ltd (MDA) prepared a Noise Compliance Testing Plan entitled Lal Lal Wind Farm - Noise Compliance Test Plan (Marshall Day Acoustics Pty Ltd, Report No 003 R03 20170649, dated 23 January 2018) (NCTP).

Condition 25 of the Planning Permit also required that the NCTP must be accompanied by a report from an Environmental Auditor appointed under the *Environment Protection Act 1970* with their opinion on the methodology contained in the noise compliance testing plan. The NCTP was reviewed by an Environmental Auditor (Phillip Bayne, Jacobs Group (Australia) Pty Ltd, memo entitled Proposed Lal Lal Wind Farm - Review of Lal Lal Wind Farm Noise Compliance Test Plan, dated 24 January 2018), and approved by the Minister for Planning on 17 May 2018.

- c. A post-construction Noise Compliance Assessment to be conducted in accordance with the NCTP. Condition 25 also required that compliance reports must be accompanied by a report from an Environmental Auditor appointed under the *Environment Protection Act 1970* with their opinion¹ on the methodology and results against the requirements of the NCTP².
2. The NCTP, Section 4.3 required that the post-construction noise compliance assessment was to be conducted in 2 stages.
 3. The first stage of post-construction noise compliance assessment involving separate noise compliance assessments of the Yendon and Elaine sections of the LLWF, has been completed and

¹ The term “auditor’s opinion” has been replaced by the term “auditor’s verification”, consistent with the terminology currently used by the Department of Transport and Planning, and the Environment Protection Authority of Victoria

² The auditor considers that the intent of Condition 25(d) is that it requires that the auditor provide an opinion (verification) on the methodology and results in the final compliance report against the requirements of the approved NCTP

independently verified by an Environmental Auditor appointed under the *Environment Protection Act 2017*³. The reports generated from this Stage 1 process are:

- a. Lal Lal Wind Farm – Elaine, Post-construction Noise Assessment (SLR Consulting Australia Pty Ltd, Report 640.11872-R04, v2.0, dated October 2023)
 - b. Lal Lal Wind Farm – Elaine. Verification of the Post-construction Noise Assessment (Arup Australia Pty Ltd, Job Number 270849-00, dated 13 November 2023)
 - c. Lal Lal Wind Farm – Yendon, Post-construction Noise Assessment (SLR Consulting Australia Pty Ltd, Report 640.11872-R15, v1.7, dated October 2023)
 - d. Lal Lal Wind Farm – Yendon. Verification of the Post-construction Noise Assessment (Arup Australia Pty Ltd, Job Number 270849-00, dated 07 December 2023)
4. SLR Consulting Australia Pty Ltd (SLR) was engaged to undertake Stage 2 of the post-construction noise compliance assessment including the complete LLWF.

SLR subsequently issued a report of this Stage 2 assessment entitled Lal Lal Wind Farm. Post-construction Noise Assessment - Stage 2 (SLR Consulting Australia Pty Ltd, Report No 640.11872, Revision 1.2, dated 20 September 2024) (Stage 2 Post-construction Noise Assessment Report).

David Spink, an Environmental Auditor (auditor) appointed under the *Environment Protection Act 2017*, undertook an independent verification process for the post-construction noise assessment as provided in the Stage 2 Post-construction Noise Assessment Report, to provide an auditor’s opinion on the methodology and results against the NCTP. The auditor was supported in the technical aspects of the verification process by Dr Kym Burgemeister (Arup Australia Pty Ltd) in his role as nominated expert support team member (Environmental Auditor Guidelines for Appointment and Conduct, EPA Publication 865.14, dated December 2023).

Note that this Verification Report provides the auditor’s Verification Statement and findings of the verification process for the Stage 2 Post-construction Noise Assessment Report as required by the Planning Permit. It does not address any requirements for noise assessment under the Environment Protection Regulations 2021 as amended by the Environment Protection Amendment (Wind Turbine Noise) Regulations 2022.

2. Regulatory requirements

2.1 Planning Permit requirements

The original Planning Permit under the Moorabool Planning Scheme was issued on 30 April 2009, with the current amendment No PL-SP/05/0461-2 issued on 12 April 2022. This Planning Permit included conditions which specified requirements for the control of operational WTG noise from LLWF.

Key conditions relevant to the verification process include:

Operational Noise Limits (Condition 23)

Except as provided below in this condition, the operation of the wind energy facility must comply with New Zealand Standard 6808:2010 Acoustics – Wind Farm Noise (the Standard) at any noise sensitive location existing as at 20 March 2017, to the satisfaction of the Minister for Planning.

In determining compliance, the following requirements apply:

³ The *Environment Protection Act 1970* has now been replaced by the *Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018* (EP Act)

- a. *The operator must ensure that at any wind speed, wind farm sound levels, determined in accordance with the Standard at noise sensitive locations (as defined in the Standard) do not exceed a noise limit of 40 dB LA90, 10min, or background (LA90, 10 min) plus 5dB, whichever is greater;*
- b. *Compliance must be assessed separately for all-time and night time. For the purpose of this requirement, night time is defined as 10.00pm to 7.00am; and*
- c. *Where special audible characteristics, including tonality, impulsive sound or excessive amplitude modulation occur, the measured noise level with the identified special audible characteristics will be modified by applying a penalty of up to +6dB L90 in accordance with section 5.4 of the Standard.*

The limits specified under this condition do not apply if an agreement has been entered into with the relevant landowner waiving the limits. Evidence of the agreement must be provided to the satisfaction of the Minister for Planning upon request, and be in a form that applies to the land for the life of the wind energy facility.

Noise Compliance Testing Plan (Conditions 24 and 25)

Condition 24 states:

Before the development starts, a noise compliance testing plan must be prepared by a suitably qualified acoustics expert to the satisfaction of the Minister for Planning.

MDA was engaged to develop an NCTP, entitled Lal Lal Wind Farm, Noise Compliance Test Plan (MDA Report No 003 R03 20170649, dated 23 January 2018). The NCTP was subsequently submitted to the Department of Environment, Land, Water and Planning (DELWP), and approved on 06 April 2018 by the Minister for Planning.

Condition 25 states (in part):

The noise compliance testing plan must be accompanied by a report from an auditor accredited under the Environment Protection Act 1970 with the auditor's opinion on the methodology contained in the noise compliance testing plan.

This condition was complied with - Phillip Bayne (Jacobs Group (Australia) Pty Ltd), an Environmental Auditor appointed under the *Environment Protection Act 1970*, was engaged to provide an Auditor's Opinion of the NCTP. The Auditor's Opinion was provided in a memo entitled Proposed Lal Lal Wind Farm - Review of Lal Lal Wind Farm Noise Compliance (dated 24 January 2018).

Condition 25 states (in part)

(c) A final compliance report must be submitted to the Minister for Planning after a 12 month period following full operation of the facility.

The NCTP states that the compliance measurements would be conducted in two stages (Section 4.3).

SLR was engaged to undertake the Stage 1 individual post-construction noise compliance assessments of the Elaine and Yendon portions of the LLWF. These reports are noted in Section 1 of this report.

SLR was also engaged to undertake the Stage 2 combined post-construction noise compliance assessment for LLWF, with the outcome provided in the Stage 2 Post-construction Noise Assessment Report.

(d) The final compliance report must be accompanied by a report from an auditor accredited under the Environment Protection Act 1970 with the auditor's opinion on the methodology and results contained in the noise compliance testing plan.

Auditor verification reports were provided for each of the Stage 1 post-construction noise assessment reports. These reports are noted in Section 1 of this report.

This Verification Report is provided as the auditor verification of the Stage 2 Post-construction Noise Assessment Report

Several points should be noted in respect of the Planning Permit conditions:

- The *Environment Protection Act 1970* has been replaced by the *Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018* (EP Act). The Environmental Auditor involved in the verification of the Stage 2 compliance assessment is now appointed under the (current) EP Act.
- With the introduction of the EP Act and the EP Regulations (refer below), the requirement for an NCTP for new wind farms under a Planning Permit has been superseded by other requirements under the control of the Environment Protection Authority (EPA) (eg conduct of a post-construction noise assessment, and development of a Noise Management Plan, under Regulation 131). However, a requirement to comply with the conditions of an NCTP under an existing Planning Permit also remains valid and must be complied with, unless the Planning Permit is subsequently amended to remove or modify this condition.
- As an interim measure, with the Planning Permit operational noise conditions still in place for the LLWF, the auditor has undertaken a verification of compliance with the NCTP (This Verification Report). A separate process will be required for noise assessment against the requirements of the EP Regulations.
- The Department of Environment, Land, Water and Planning (DELWP) has previously issued guidance through the publication *Development of Wind Farm Facilities in Victoria – Policy and Planning Guidelines* (DELWP, November 2021). Following introduction of the EP Regulations, DTP⁴ has revised the publication to reflect these changes – the current document being *Planning Guidelines for Development of Wind Energy Facilities* (DTP, September 2023) (DTP Guidelines).

The DTP Guidelines acknowledge that Amendment VC203 to the Victorian Planning Provisions (VPP) and all planning schemes defer to the EP Act and EP Regulations (refer below) for the regulation of operational WTG noise at a WEF. A further amendment (VC234, dated 04 July 2023) was made to VPP Clause 52.32, that clarified additional mandatory requirements to be included in the preconstruction (predictive) noise assessment report – no additional requirements were included for post-construction noise assessments since operational noise issues are now under the control of EPA requirements.

2.2 EPA requirements

The EP Act includes the following specific requirements;

- 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 (EP Act Section 25)

- 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 following:*
 - (i) *its volume, intensity or duration,*

⁴ 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.

- (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 Environment Protection Regulations 2021 came into effect in mid-2021 under the EP Act, focusing regulatory control of turbine noise from operational wind farms to the EPA under Regulation 131. The current amendment Environment Protection Amendment (Wind Turbine Noise) Regulations 2022 (EP Regulations) includes the 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
131 CA	Duty to ensure compliance with noise limit or alternative monitoring point criterion
131D	Post-construction noise assessment
131E	Noise management plan
131F	Annual statement
131G	Wind turbine noise monitoring
131H	Unreasonable noise
131I	Transitional provisions – noise limits
131J	Transitional provision – annual statements
164	Functions of environmental auditors

It is noted that the Planning Permit is the relevant Authorising Document under Regulation 131B. The Planning Permit specifies NZS 6808:2010 as the applicable noise standard, subject to the requirements specified in Condition 23.

The introduction of the EP Regulations provides the current framework for post-construction noise assessment and the verification process. Specifically, Regulation 131D of the Regulations provides requirements that states in part:

(2) *A post-construction noise assessment must-*

- a. *be conducted in accordance with NZS 6808:2010 by a suitably qualified and experienced acoustician; and*
- b. *demonstrate whether or not the facility complies with the noise limits set out in accordance with NZS 6808:2010.*

(3) *The operator must –*

- a. *ensure that a report of the post-construction noise assessment is prepared; and*

- b. *engage an environmental auditor to prepare a report under regulation 164(ca)(i) in relation to the post-construction noise assessment.*

Regulation 164 (ca) (i) specifies that the auditor is to:

- (i) *... independently verify whether or not any noise assessment conducted for the wind energy facility was conducted in accordance with the relevant noise standard.*

EPA Victoria has issued Wind Energy Facility Noise Regulation Guidelines (EPA Publication 2061, EPA Website) (EPA Guidelines), that provides some general guidance on the implementation of the EP Regulations pertaining to operational WTG noise from WEFs (Regulation 131).

EPA had previously issued Wind Energy Facility Noise Auditor Guidelines (Publication 1692, October 2018) (EPA 2018 Guidelines) to complement the DTP (DELWP) Guidelines, that set out the requirements for an audit of post-construction noise assessments (Section 2.4.2). In the current absence of any additional guidance from EPA or DTP in regard to verification of the planning permit requirements, the scope of the verification was generally consistent with the EPA 2018 Guidelines.

The 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 EP Regulations state that an operator of WEFs must ensure that wind turbine noise complies with the noise limits set out in the relevant noise standard. In this case, the standard referred to is NZS 6808:2010. It is noted that the WEF Operator must also comply with a number of other requirements under Regulation 131, including the development of a Noise Management Plan (Regulation 131E) (including independent review by an Environmental Auditor appointed under Part 8.3 of the EP Act - compliance with these requirements is not included in the scope of this verification).

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 operational WTG noise is directly addressed in the EP Regulations.

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 (EPA Publication 865.14, dated December 2023)

The verification process for the Stage 2 Post-construction Noise Assessment Report was consistent with the relevant aspects of these EPA publications.

2.3 Auditor’s additional comments

The current situation with respect to regulatory control of operational WTG noise is complex, when there are requirements under both an active planning permit and the EP Regulations. The EP Regulations do allow any noise requirements/ agreements made under an active planning permit to remain in place (Regulation 131B recognises an existing planning permit as an authorising document, that sets out conditions to modify or replace NZS 6808:2010 in relation to wind turbine noise); however, it is anticipated that planning permits issued in the future will simply defer to the EP Regulations for all post-construction noise issues. It is also noted that a WEF with an existing planning permit may also apply for an amendment, to remove the overlapping requirements.

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 AS 1055⁵ and the previous EPA SEPP N-1⁶) are unsuitable. In addition, the Environment Reference Standard (ERS) does not provide specific guidance on turbine noise from WEFs.

There are other standards and guidelines such as AS4959:2010⁷, the draft National Guidelines⁸, the UK ETSU-R-97⁹ and the Annual Report of the National Wind Farm Commissioner¹⁰ that can provide helpful background information and secondary guidance that can also assist with the assessment of projects where the Standard 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 was to provide an auditor's opinion (verification) on the methodology and results contained in the post-construction noise assessment of the LLWF, as provided in the report entitled Lal Lal Wind Farm – Post-construction Noise Assessment – Stage 2 (SLR Consulting Australia Pty Ltd, Ref 640.11872-R17-v1.2, dated 20 September 2024) (Stage 2 Post-construction Noise Assessment Report), as required by Condition 25(d) of the Planning Permit – to confirm whether or not:

- The assessment complies with the Noise Compliance Test Plan (Lal Lal Wind Farm, Noise Compliance Test Plan (Marshall Day Acoustics Pty Ltd, Report No 003 R03 20170649, dated 23 January 2018) (NCTP), approved by the Minister for Planning on 17 May 2018, and;
- The noise limits specified in Condition 23 of the Planning Permit.

The relevant noise standard is NZS 6808:2010, subject to the requirements of Condition 23 of the Planning Permit.

4. Applicable noise limits

Condition 23 of the Planning Permit states that the wind farm must comply with NZS 6808:2010, except for specific requirements provided in the condition.

In summary, these noise limits are consistent with NZS 6808:2010:

- Acceptable limit, ie 40 dBL_{A90(10min)}, or background + 5 dB - whichever is higher
- Special Audible Characteristics (tonal, impulsiveness, or amplitude modulation) receive a penalty between 1–6 dB added to the L90 noise level, in accordance with Section 5.4 of NZS 6808:2010.

However, the following additional requirements are also included in Condition 23:

⁵ AS 1055.1-1997 *Acoustics - Description and measurement of environmental noise - General procedures*, Standards Australia, 1997.

⁶ *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1*, Victoria Government Gazette No. S31, 1989.

⁷ AS4959:2010 *Acoustics – Measurement prediction and assessment of noise from wind turbine generators*. (Withdrawn)

⁸ *National Wind Farm Development Guidelines – Draft*, Environment Protection and Heritage Council, July 2010.

⁹ *The Assessment and Rating of Noise from Wind Farms*, UK Department of Trade and Industry, ETSU-R-97, September 1996.

¹⁰ *Annual Report to the Parliament of Australia*, Office of the National Wind Farm Commissioner, 31 March, 2017.

- Compliance must be assessed separately for all-time and night-time periods. These noise limits apply to all times of the day and night.
- The limits do not apply if an agreement has been entered into with any landowner waiving these limits.

5. Approach to verification process

The DTP Guidelines do not provide specific guidance on the methodology for conducting a post-construction noise compliance assessment, except for identifying NZS 6808 as the applicable standard.

EPA has provided some general guidance for requirements under Regulation 131D - Post-construction noise assessment in the EPA Guidelines, although this does not include specific guidance on planning permit issues.

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 was relatively consistent with Section 2.4.2 of Publication 1692, and included:

1. Inception meeting with LLWF management.
2. Review of LLWF site and surrounding area
3. Review of background noise assessment.
4. Review of the NCTP.
5. Technical verification of the Stage 2 Post-construction Noise Assessment Report (also with reference to the Stage 1 Post-construction Noise Assessment Reports for Yendon and Elaine sections of the LLWF), including:
 - a. methodology applied to conduct the assessment
 - b. noise monitoring equipment and parameters used
 - c. sound modelling programs employed
 - d. verification that assessment was conducted in line with NZS 6808:2010, except as provided in Condition 23 of the Planning Permit.
6. Review of compliance with the noise limits set out in Condition 23 of the Planning Permit, based on the assessment provided in the Stage 2 Post-construction Noise Assessment Report.
7. Risk assessment, including a qualitative statement on the risk of non-compliance (and operational plans to manage potentially adverse impacts).
8. Preparation of the Auditor's Verification Statement and Verification Report.

6. Documents reviewed for the verification process

6.1 Documents specific to the LLWF

- Lal Lal Wind Farm, Post-construction Noise Assessment – Stage 2 (SLR Consulting Australia Pty Ltd, Report No 640.11872-R17 Rev 1.2, dated 20 September 2024) (Stage 2 Post-construction Noise Assessment Report)
- Planning Approval PL-SP/05/0461-2 under the Moorabool Planning Scheme (Amendment dated 12 April 2022) (Planning Permit)

- Lal Lal Noise Compliance Test Plan (Marshall Day Acoustics Pty Ltd, Report No 003 R03 20170649, dated 23 January 2018) (NCTP)
- Lal Lal Wind Farm – Elaine, Post-construction Noise Assessment (SLR Consulting Australia Pty Ltd, Report 640.11872-R04, v2.0, dated October 2023)
- Lal Lal Wind Farm – Elaine. Verification of the Post-construction Noise Assessment (Arup Australia Pty Ltd, Job Number 270849-00, dated 13 November 2023)
- Lal Lal Wind Farm – Yendon, Post-construction Noise Assessment (SLR Consulting Australia Pty Ltd, Report 640.11872-R15, v1.7, dated October 2023)
- Lal Lal Wind Farm – Yendon. Verification of the Post-construction Noise Assessment (Arup Australia Pty Ltd, Job Number 270849-00, dated 07 December 2023)
- Environmental Auditor’s Opinion (Phillip Bayne, Jacobs Group (Australia) Pty Ltd), memo entitled Proposed Lal Lal Wind Farm - Review of Lal Lal Wind Farm Noise Compliance Test Plan, dated 24 January 2018
- Lal Lal Wind Farm, Background Noise Monitoring Report (Marshall Day Acoustics Pty Ltd, Report No 001 R01 20170649, dated 01 March 2018) (Background Noise Monitoring Report).
- Lal Lal Wind Farm, Pre-construction Predictive Modelling Assessment (Marshall Day Acoustics Pty Ltd, Report No 002 20170649, dated 17 January 2018).
- Lal Lal Wind Farm Compliance Baseline Noise Monitoring (SLR Consulting Australia Pty Ltd, Report 640.11872-R01, Version No v1.1, dated February 2021)

6.2 General references

- New Zealand Standard Acoustics – Wind Farm Noise NZS 6808:2010 (NZS 6808:2010)
- Planning Guidelines for Development of Wind Energy Facilities (Department of Transport and Planning, dated September 2023) (DTP Guidelines)
- *Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018* (EP Act)
- 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 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)
- Victoria Planning Provisions Clause 52-32
- UK Institute of Acoustics Amplitude Modulation Working Group – Final Report – A Method for rating Amplitude Modulation in Wind Turbine (Version 1, dated 09 August 2016) (UK IOA AM Procedure)
- International Standard IEC61400-11:2012 Wind turbines – Part 11: Acoustic noise measurement techniques (IEC 61400-11:2012)

- International Standard ISO 1996-2:2007 Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels (ISO 1996-2:2007)
- Annual Report to the Parliament of Australia, Office of the National Wind Farm Commissioner, 31 March 2017.

7. Review of the Noise Compliance Test Plan

The document entitled Lal Lal Wind Farm, Noise Compliance Test Plan, Marshall Day Acoustics Pty Ltd, Report No 003 R03 20170649, 23 January 2018) (NCTP) outlines the procedures to be undertaken to complete the operational (post-construction) noise compliance monitoring for the LLWF. The following key points are relevant to the verification process:

- As stated previously, the NCTP has been independently reviewed by an Environmental Auditor with an opinion provided, and was subsequently endorsed by the Minister for Planning on 6 April 2018. It is therefore not the intent of this verification process to re-assess the efficacy of the already approved NCTP; however, it was reviewed to understand the relationship between NZS 6808:2010 and the intended approach to the post-construction noise assessment.
- The noise measurement methodology developed in Section 4.2 of the NCTP is reasonable, and corresponds to the requirements of NZS 6808:2010.
- The noise limits have been determined in accordance with Condition 23 of the Planning Permit. These are consistent with NZS 6808:2010 except for the following:
 - NZS 6808:2010 provides operational noise limits for a 24 hour (all-time) period. Condition 23 of the Planning Permit also requires compliance based on an all-time period; however, it also requires compliance to be assessed separately for the night-time period (10pm – 7am)
 - NZS 6808:2010 does not differentiate between involved and non-involved receivers in regard to the noise limits. Condition 23 of the Planning Permit represents a modification in that the limits specified in this condition do not apply if an agreement has been entered into with the landowner waiving the limits.
- As noted in Section 5.0 of the Stage 2 Post-construction Noise Assessment Report, the all-time and night-time noise limits show in Tables 2 and 3 of the NCTP respectively included a transcription error, and did not match those established in the corresponding Tables 6 and 7 of the Background Noise Monitoring Report¹¹. The noise limits shown in the original Background Noise Monitoring Report are understood to be correct (with the exception of location K15aa, which have been established by subsequent baseline noise monitoring undertaken by SLR – refer to next point).
- The background monitoring undertaken by MDA at location K15aa was affected by extraneous noise (potentially air conditioning). SLR subsequently undertook further background monitoring at Receiver K15aa with the objective of collecting representative pre-operational baseline conditions for this location where in the earlier MDA background monitoring campaigns the data had been likely unduly influenced by extraneous noise sources. The updated baseline regressions curve for this was used to establish reasonable noise limits for this receiver location (Lal Lal Wind Farm Compliance Baseline Noise Monitoring (SLR Consulting Australia Pty Ltd, Report No R640.11872-R01, Version No v1.1, dated February 2021) the results and noise limits included for the Stage 2 Post-construction Noise Assessment Report.

Further assessment of the background noise monitoring data for K15aa was undertaken by SLR in

¹¹ Lal Lal Wind Farm, Background Noise Monitoring Report (Marshall Day Acoustics Pty Ltd, Report No 001 R01 20170649, dated 01 March 2018).

2024, since it was established that some commissioning activities were underway during the survey at K15aa. SLR state that this assessment concluded that *the influence on background noise levels of occasional WTG operation during the K15aa monitoring period had no substantive bearing on background monitoring and subsequent Stage 1 and Stage 2 post-construction compliance assessments* (Refer to Appendix H of the Stage 2 Post-construction Noise assessment Report for further details). The auditor and his team accept this conclusion.

- Additional procedures allow for the removal of measurement data that is adversely impacted by rainfall or extraneous noise. These procedures are well established, and are consistent with the requirements of NZS 6808:2010 and/or the NCTP.
- Screening for atypical wind farm operation is discussed in Section 5.3 of the NCTP, and adopts an approach of screening out periods where some turbines are not operational. This screening is undertaken on the basis that certain turbines are not considered relevant to the assessment where they are far enough from the particular sensitive receiver that their predicted noise contribution is less than or equal to 0.1 dB. This approach is understood to be consistent with the approach outlined in Explanatory Note C7.6.3 of NZS 6808:2010.
- Penalties for Special Audible Characteristics (SACs) are to be determined in accordance with NZS 6808:2010 (Section 5.8). The NCTP Section 4.4.2 refers to objective procedure for assessment of amplitude modulation (AM) is the publication from the UK Institute of Acoustics' Amplitude Modulation Working Group entitled Final Report – A Method for Rating Amplitude Modulation in Wind Turbine Noise, Version 1 dated 09 Aug 2016 (UK IOA AM Procedure). There is a degree of interpretation required as to what constitutes “clearly audible AM” as identified in NZS 6808:2010, Appendix B3. Also, there would appear to be a difference in assessment strictly required under NZS 6808:2010 against the approach provided in the UK IOA AM Procedure.

As noted in Section 8.3.1.2 of the Stage 2 Post-construction Noise Assessment Report, two (only) events of AM were noted during listening surveys. This issue is discussed further in 8.3.4 of this report.

Based on this previous finding and that the NCTP has been approved, the auditor accepts that the methodology included in the NCTP is consistent with NZS 6808:2010, with allowance for the additional requirements of Condition 23 of the Planning Permit.

8. Technical verification of the Stage 2 Post-construction noise assessment

The Stage 2 post-construction compliance noise assessment was undertaken by SLR and documented in the report Lal Lal Wind Farm, Post-construction Noise Assessment (SLR Consulting Australia Pty Ltd, Report No 640.11872-R17 Revision 1.2, dated 20 September 2024)) (Stage 2 Post-construction Noise Assessment Report).

Key aspects of the verification of the Stage 2 Post-construction Noise Assessment Report are provided in the following sections.

8.1 Monitoring program

The noise monitoring program is summarised in Section 6.0 of the Stage 2 Post-construction Noise Monitoring Report.

Key observations/ findings in regard to verification of the monitoring program are summarised as follows:

- The monitoring was undertaken by SLR, a suitably qualified and experienced specialist acoustics company. The level of technical information in the Stage 2 Post-construction Noise Assessment Report provided to the auditor is appropriate for the verification process.

- It is noted that *a relocated proxy location was selected for receptor N31ab as access to the property was not granted by the owner. The relocated measurement location was positioned adjacent to McGuigans Road and approximately 90 m closer to the nearest WTG.* (Reference Table 5).
- The monitoring program was completed over approximately 2–6 months, between March 2023 and January 2024, using appropriate measurement equipment that was calibrated and used ‘enhanced’ windshield systems.
- Site wind speed and direction data was determined from anemometers on two meteorological masts located at hub-height (93 m AGL) located at each of Yendon and Elaine on the wind farm site, and wake-corrected by a third-party wind engineer (Aurecon) using an appropriate analytical technique (included as Appendix D of the Stage 2 Post-construction Noise Assessment Report).
- Local ground level wind speed and precipitation were also measured by weather stations situated at each sensitive receiver location during noise monitoring.
- Attended subjective listening observations were undertaken (included as Appendix C of the Stage 2 Post-construction Noise Assessment Report).
- SCADA operational and power generation data collected during the monitoring period was provided by RES.

Based on the information provided, the auditor and his team are satisfied that the monitoring program was consistent with Sections 4.1 – 4.3 of the NCTP.

8.2 Data screening process

The data screening and assessment process is summarised in Sections 7.0 and 8.0 of the Stage 2 Post-construction Noise Monitoring Report.

8.2.1 Screening process

Key observations/ findings in regard to the screening process are summarised as follows:

- The raw data was screened by excluding data intervals as follows;
 - Periods of rain
 - Hub height wind speeds > 20 m/s and < 3m/s (turbine cut in)
 - Periods potentially affected by extraneous noise (eg insect or frog noises)
 - When one or more WTGs that are considered critical to wind farm noise at a receptor were not operating – refer below.
- Identification of SACs

The assessment of SACs is provided in Section 8.0 of the Stage 2 Post-construction Noise Assessment Report.

SLR undertook subjective evaluation of SACs, including tonality, impulsiveness and amplitude modulation (AM), with Subjective Attended Observations provided in Appendix C. It is noted that *as far as practical, the listening position was the same as the noise logger position used for the measurement of the A-weighted SPLs.* The subjective assessment resulted in the following observations:

- *At some of the surveys there was an audible and discernible “hum” noise at some locations, confirmed by additional listening tests at intermediary and positions close to the turbines that confirmed that the source of the hum was from turbines.*
- *At two of the listening surveys conducted in the early morning of 07/03/2023, it was observed that the wind farm noise exhibited a more pronounced amplitude modulation, characterised by having more discernible low frequency beats related to blade pass*

frequency. This is different in character to normal aerodynamic “swish” that is regularly observed.

The auditor notes that neither of these SACs was noted for other attended surveys.

On this basis of these subjective observations, SLR has subsequently undertaken an objective assessment of both AM and tonality in accordance with the NCTP and NZS 6808:2010, and applied appropriate penalties to measurement periods where SACs were identified by the objective testing. These issues are discussed further below.

8.3 Data assessment process

8.3.1 Valid Data

SLR state that *as a consequence of the valid data screening process (to remove adverse local weather, relevant turbine outages and extraneous noise) a considerable amount of data was discarded from the analysis data at each reference location. However, the extended monitoring period combined with the valid data screening has resulted in a good distribution of data across wind conditions and consideration of seasonal influence ... such that the NCTP screened data sets should be considered statistically robust* (Section 9.0).

NZS 6808:2010 Section C7.2.1 states that *a minimum of 10 days of continuous monitoring will be required to give a suitable range of data. Typically, this will give in excess of 1440 data points.* Section C7.2.1 also states that it may be necessary to take further measurements in certain circumstances.

Review of Table 6 indicated that monitoring at all 6 locations easily satisfied the 10 day criteria; however, after screening, datasets at K34aa - 853, H18aa - 1315 and L18aa – 1084 (night time period only) were considerably reduced.

The auditor has some concern about K34aa since, as will be discussed later, this location is only marginally compliant with the applicable noise limits for all time and night-time at certain wind speeds.

8.3.2 Relevant turbines

The NCTP method of assessment requires consideration of all turbines based on a predicted individual “relevant” turbine noise contribution of < 0.1 dB at a sensitive receiver location.

This approach was discussed with the auditor and his team during the Stage 1 verification process, and agreed that this was a reasonable approach, and consistent with the NCTP.

Relevant WTGs for each reference receptor are provided in Appendix E of the Stage 2 Post-construction Noise Monitoring Report. When one or more wind turbines ‘relevant’ to the total noise level at each noise sensitive receiver were not operating, based on their predicted noise level contribution being < 0.1 dB at the sensitive receiver, this was deemed to be inconsequential to the assessment outcome (refer Section 5.3 of NCTP) (referred to as the NCTP method).

8.3.3 Objective assessment of tonality

An objective assessment of the tonality is provided in Section 8.3.2 of the Stage 2 Post-construction Noise Assessment Report. Key points noted in regard to the verification are as follows:

- The assessment was conducted on all intervals that were identified in the data screening process. This is a conservative approach since potential tonality was not observed at all locations.
- The objective assessment was carried out in accordance with the NCTP, Section 4.4.3. Specifically, the assessment was in accordance with Annex J of ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels and ISO/PAS 20065:2016 Acoustics – Objective method for assessing the audibility of tones in noise – Engineering method, and appropriate penalties applied to the

measurement data prior to the regression analysis. This approach is consistent with Section 5.8 of the NCTP and Appendix B of NZS 6806:2010.

- All intervals in which a tone of sufficient audibility was identified had the requisite K factor penalty arithmetically added to the measured LA90 for that interval (summarised in Table 7 of the Stage 2 Post-construction Noise Assessment Report).
- The assessment considered K factor penalties up to +6 dB as specified in the NCTP (Section 5.8) and NZS 6808:2010, and referred to in Condition 23(c) of the Planning Permit.

The auditor and his team consider that this approach is reasonable and is it consistent with the NCTP and NZS 6808:2010.

8.3.4 Subjective assessment of amplitude modulation

An objective assessment of the AM is provided in Section 8.3.3 of the Stage 2 Post-construction Noise Assessment Report. Key points noted in regard to the verification are as follows:

- Although AM was noted once and at only 2 locations (M29aa, L28aa), an AM assessment was conducted on all periods at all wind speeds, except for non-valid intervals (eg affected by rain).
- SLR has noted a disparity in the NCTP, with respect to the objective assessment of AM (auditor discussion below). SLR has chosen to use the procedure for assessment of AM is the publication from the UK Institute of Acoustics' Amplitude Modulation Working Group entitled Final Report – A Method for Rating Amplitude Modulation in Wind Turbine Noise, Version 1 dated 09 Aug 2016 (UK IOA AM Procedure).
- The assessment concluded that an AM penalty of +5dB being applied to intervals with an AM rating of 4.4 dB modulation depth, or higher. SLR state that they consider this approach *satisfies the interpretation of sufficient to warrant the application of a penalty in the NCTP*.

From an audit perspective, there is a challenge in defining what represents a threshold for triggering an adjustment of +5 dB. The following is noted:

- NZS 6808:2010 Appendix B3 states:

No appropriate objective test for amplitude modulation has been standardised. If a local authority enforcement officer or an acoustics advisor to a local authority considers that a wind farm creates sound with a clearly audible amplitude modulation at a noise sensitive location, an adjustment of +5dB shall be applied to the wind farm sound level at that location for the wind conditions under which the modulation occurs.

This statement does not allow any discretion of the adjustment (ie must be +5dB); however, does not define a threshold to trigger what is a *clearly audible amplitude modulation*.

- NCTP states:

A fixed value penalty of +5dB shall be added to the measured noise level when amplitude when amplitude modulation and/or impulsivity are identified at levels that are sufficient to warrant the application of a penalty (consistent with Appendix B4 of NZS 6808:2010) (Section 5.8).

Similarly to NZS 6808:2010, this statement does not allow any discretion of the adjustment (ie must be +5dB); however, does not define a threshold to trigger *levels that are sufficient to warrant the application of a penalty*.

However, Section 4.4.3 states that *if one or more SACs are identified during the attended observations, the identified SAC(s) shall be analysed using the procedures defined in Table 5*. Table 5 states that the objective assessment procedure for assessment of AM is UK IOA AM Procedure.

The auditor notes that the UK IOA AM Procedure referred to in Section 4.4.3 of the NCTP is not consistent with the fixed penalty of +5 dB in Section 5.8 of the NCTP. It uses a sliding scale penalty that starts at a 3 dB penalty for a 3 dB modulation depth, and increases to a 5 dB penalty at a 10 dB modulation depth. This matter is further discussed in the Stage 2 Post-construction Noise Assessment Report Section 8.3.3.2 and Appendix G.

The auditor and his team consider that the UK IOA AM Procedure used by SLR is a reasonable compromise approach in establishing an AM trigger; however, the issue needs to be further discussed with the regulators (EPA/DTP).

Whilst it is understood that this verification is not against compliance with the EP Regulations, the auditor recommends that SLR and RES discuss this issue with EPA before proceeding with additional assessment of this site for compliance with the EP Regulations.

9. Compliance with noise limits

The second objective of the verification process was to assess whether the Stage 2 post-construction noise assessment confirmed compliance with the noise limits in the Planning Permit. SLR provide a summary of the compliance issues in Sections 10.0 and 11.0 of the Stage 2 Post-construction Noise Assessment Report, with extended data for each location provided in Appendix B.

Key SLR findings are summarised as follows:

- The overall approach to compliance assessment is provided in Section 9.0.
- The summary tables in Section 10.1 indicate that the LLWF is compliant with the applicable noise limits at the selected monitoring locations. Noise levels have been reported to one decimal place.

The following comments are made by the auditor concerning these results:

- The level of compliance at several sites (N31ab, M29aa, and K34aa: all at Yendon) at certain wind speeds during the night time period is marginal. Comparison with the Stage 1 monitoring outcomes (refer to reports noted in Section 1, point 3 of this report) indicates that the marginal compliance at these locations at Yendon has been validated. Nevertheless, as indicated in Appendix C of NZS 6808, where compliance is marginal and contested, further steps may be required to reduce uncertainty. In this case, while compliance is not contested, LLWF may consider adopting further on-off testing at these locations, for example, in accordance with Section 7.7 of NZS 6808.
- The Stage 1 assessment utilised an additional turbine screening method, the so-called 0.5 dB method, in addition to the NCTP (0.1 dB) method. Specifically, SLR also evaluated compliance based on an alternative method adopting a noise level contribution from 'relevant' turbines of 0.5 dB (rather than 0.1 dB), which results in far less data exclusion, and allows for a much more reasonable number of data points. The auditor notes that this additional method has not been adopted in Stage 2, and questions whether this would have generated additional useful data.

10. Cumulative impacts

The Stage 2 Post-Construction Noise Assessment Report states that the *WTGs of Elaine and Yendon sections of the LLWF are separated by over 10km, and that there are no compliance critical receptors located in the intervening land which would be influenced by cumulative noise from both portions* (Section 1.0). Review of the site plan of the area indicates that there are various sensitive receivers in the intervening land; however, the distances involved support this statement in that these locations would be affected by only one portion due to distance and wind directions.

The auditor accepts that this conclusion is appropriate, based on this separation distance.

11. Risk assessment

The EPA Guidelines identify a number of requirements in the EP Regulations, to monitor, report and respond to noise generated by a WEF, including:

- Post-construction noise assessment (Regulation 131D)
- Noise Management Plan (NMP), verified by an EPA appointed Auditor (Regulation 131E)
- Provision of an annual statement detailing the actions that have been taken to ensure compliance (Regulation 131F)
- Noise monitoring every 5 years (Regulation 131G)

The NMP is to include an evaluation of likelihood and consequence of risk, development of a risk matrix and risk management approach. It also needs to include consideration of control measures to address noise related hazards and determination of residual risks. It is understood that LLWF has prepared an NMP for consideration by an EPA appointed Environmental Auditor.

The implementation of an NMP that includes assessment and management of these elements of risk is considered appropriate.

The EP Act introduced a General Environmental Duty (GED) to take reasonable steps to minimise risks of harm to human health and the environment, as well as “unreasonable noise” provisions. A risk of noncompliance with NZS 6808:2010 is taken to be a risk to the beneficial use of the environment, specifically with respect to the amenity of residents in the noise sensitive locations. Based on the predicted sound levels, it is expected that the risk to this beneficial use will be low due to compliance with NZS 6808:2010.

12. Compliance with NZS 6808:2010

A full checklist addressing the specific requirements of NZS 6808:2010 is attached in Appendix A.

As noted in Section 7.4, the noise limits have been determined in accordance with Condition 23 of the Planning Permit. These are consistent with NZS 6808:2010 except for the following:

- NZS 6808:2010 provides operational noise limits for a 24 hour (all-time) period. Condition 23 of the Planning Permit also requires compliance based on an all-time period; however, it also requires compliance to be assessed separately for the night-time period (10pm – 7am)
- NZS 6808:2010 does not differentiate between involved and non-involved receivers in regard to the noise limits. Condition 23 of the Planning Permit represents a modification in that *the limits specified in this condition do not apply if an agreement has been entered into with the land owner waiving the limits.*

13. Inspection of the LLWF site and surrounding area

An inspection of the area surrounding the LLWF site was undertaken by the auditor on 28 October 2021 for the verification process involved with the Stage 1 post-construction noise assessment. The intent of the site inspection was to ascertain the turbine placements in relation to the location of identified noise sensitive receiver locations, and the locations used for noise monitoring. The scope of the verification did not include confirming GPS locations of individual turbines. The verification of the Stage 2 Post Construction Noise Assessment Report did not warrant a further site inspection.

14. Conclusion

David Spink, an Environmental Auditor appointed under the EP Act, has completed an independent verification of the Stage 2 noise monitoring assessment of the LLWF. The objective was to provide an auditor's opinion (verification) on the methodology and results contained in the Stage 2 Post-construction Noise Assessment Report.

The verification process concluded that the post-construction noise assessment of the LLWF, as provided in the Post-construction Noise Assessment (Revised Report):

- Has been conducted in accordance with the approved NCTP, with the exception of comments regarding the inconsistency in the NCTP's process for the assessment of AM, as discussed below,
- Demonstrates that the LLWF complies with the noise limits set out in Condition 23 of the Planning Permit.

It is noted that the verification process undertaken by the auditor was specifically for assessment of compliance with the conditions of the Planning Permit (Conditions 23 and 25). LLWF must also comply with the verification requirements of Regulation 131D.

The auditor further notes the following:

Assessment of Amplitude Modulation

The UK IOA AM Procedure referred to in Section 4.4.3 of the NCTP is not consistent with the fixed penalty of +5 dB in Section 5.8 of the NCTP. It uses a sliding scale penalty that starts at a 3 dB penalty for a 3 dB modulation depth, and increases to a 5 dB penalty at a 10 dB modulation depth. This matter is further discussed in the Stage 2 Post-construction Noise Assessment Report Section 8.3.3.2 and Appendix G.

The auditor and his team consider that the UK IOA AM Procedure used by SLR is a reasonable compromise approach in establishing an AM trigger; however, the issue needs to be further discussed with the regulators (EPA/DTP).

Whilst it is understood that this verification is not against compliance with the EP Regulations, the auditor recommends that SLR and RES discuss this issue with EPA before proceeding with additional assessment of this site for compliance with the EP Regulations

Marginal noise level compliance

The level of compliance at several sites (N31ab, M29aa, and K34aa: all at Yendon) at certain wind speeds during the night time period is marginal. Comparison with the Stage 1 monitoring outcomes (refer to reports noted in Section 1, point 3 of this report) indicates that the marginal compliance at these locations at Yendon has been validated. Nevertheless, as indicated in Appendix C of NZS 6808, where compliance is marginal and contested, further steps may be required to reduce uncertainty. In this case, while compliance is not contested, LLWF may consider adopting further on-off testing at these locations, for example, in accordance with Section 7.7 of NZS 6808.

Appendix A

New Zealand Standard NZS 6808:2010 Acoustics Wind Farm Noise – Checklist

A.1 NZS 6808:2010 – Checklist

Information Source:

Lal Lal Wind Farm. Post-construction Noise Assessment – Stage 2 (SLR Consulting Australia Pty Ltd, Report Ref 640.11872-R17 Revision 1.2, dated 20 September 2024 (Stage 2 Post-construction Noise Assessment Report)).

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment	Compliance
5.2	Noise Limit	Section 5	<p>Noise limits based on measured background noise level analysis.</p> <p>The noise limits have been determined in accordance with Condition 23 of the Planning Permit. These are consistent with NZS 6808:2010 except for the following:</p> <ul style="list-style-type: none"> ○ NZS 6808:2010 provides operational noise limits for a 24 hour (all-time) period. Condition 23 of the Planning Permit also requires compliance based on an all-time period; however, it also requires compliance to be assessed separately for the night-time period (10pm – 7am) ○ NZS 6808:2010 does not differentiate between involved and non-involved receivers in regard to the noise limits. Condition 23 of the Planning Permit represents a modification in that the limits specified in this condition do not apply if an agreement has been entered into with the land owner waiving the limits. ○ Noise limits for K15aa have been established separately (discussed in Section 7.0) ○ Section 5.0 notes the transposition errors from the MDA background monitoring assessment report into the NCTP. 	Comply
5.4.3	Assessments for Special Audible Characteristics conducted in Accordance with Appendix B.	Section 8	Planning Permit Condition 24 requires an NCTP that provides methodology based on Appendix B.	Comply
Appendix B1	Subjective assessment can be sufficient in some circumstances to assess special audible characteristics	Section 8.3.1 Appendix C	Subjective assessment indicated some tonality and AM – SLR assessment was that subjective assessment was not sufficient in this case	Comply
Appendix B2	Tonality: Reference test method shall be that prescribed as Annex C to ISO 1996-2:2007 or an equivalent method	Section 8.3.2	ISO1996-2:2017 Appendix J and ISO/PAS 20065:2016 adopted for objective assessment of tonality.	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment	Compliance
Appendix B3	Amplitude Modulation:	Section 8.3.3 Appendix G	<p>The UK IOA AM Procedure referred to in Section 4.4.3 of the NCTP is not consistent with the fixed penalty of +5dB in Section 5.8 of the NCTP. It uses a sliding scale penalty that starts at a 3dB penalty for a 3dB modulation depth, and increases to a 5dB penalty at a 10dB modulation depth. This matter is further discussed in the Stage 2 Post-construction Noise Assessment Report Section 8.3.3.2 and Appendix G.</p> <p>The auditor and his team consider that the UK IOA AM Procedure used by SLR is a reasonable compromise approach in establishing an AM trigger; however, the issue needs to be further discussed with the regulators (EPA/DTP).</p> <p>Whilst it is understood that this verification is not against compliance with the EP Regulations, the auditor recommends that SLR and RES discuss this issue with EPA before proceeding with additional assessment of this site for compliance with the EP Regulations</p>	Recommendation provided
S7.5.1	Post-installation sound level, shall, where practical, be measured at the same locations where the background sound levels were determined	Appendix B	Post-installation sound levels measured at same locations where background sound levels were determined	Comply
S7.5.2	Scatter plots of post installation sound levels against wind speed.	Appendix B	Scatter plots are shown	Comply
S7.5.3	Contribution of background sound removed from regression curve at each integer wind speed	Appendix B	Background sound has been subtracted from regression curve at each integer wind speed	Comply
S7.5.4	Assessment for SACS shall be undertaken covering range of operational wind speeds	Section 8.3.2 Tonality Section 8.3.3 AM	Subjective assessment has been undertaken. Objective measurement of tonality and AM have been undertaken covering an adequate range of operational wind speeds.	Comply
S7.6.2	Conformance with limits by comparing best fit regression of background sound and wind farm sound levels adjusted for SACS	Appendix B	Regression curves shown in appendices include background sound curves and wind farm sound levels adjusted for SACS	Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment	Compliance
S8.3	Report of post-installation wind farm sound level measurements shall provide;			
	(a) Description of sound monitoring equipment including any ancillary equipment	Section 6.0, Table 5 Section 7.0, Table 6		Comply
	(b) Statement confirming the use of A-frequency weighting	Section 6.0, Table 5		Comply
	(c) The location of sound monitoring positions	Section 6.0, Table 5 Appendix B		Comply
	(d) Description of the anemometry equipment including the height AGL of the anemometer	Section 6.0, Table 5		Comply
	(e) Position of wind speed measurements	Section 6.0, Table 5		Comply
	(f) Make and model of the wind turbines	Section 1		Comply
	(g) Number of operational wind turbines	Section 1		Comply
	(h) Time and duration of monitoring period	Section 7.0, Table 6		Comply
	(i) Averaging period for both sound and wind speed measurements	Section 6.0, Table 5		Comply
	(j) Atmospheric conditions: the wind speed and direction at the wind farm position and rainfall shall be recorded.	Section 6.0, Table 5 Table 7.0, Figures 2 and 3		Comply
	(k) Number of data pairs measured	Section 7.0, Table 6		Comply
	(l) Description of the regression analysis	Section 9.0		Comply

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment	Compliance
	(m) Graphical plots showing the data scatter and the regression lines	Appendix B		Comply
	(n) Graphical plots showing the data scatter and the regression lines for both the background and the wind farm in operation	Appendix B		Comply
	(o) Assessment of special audible characteristics	Section 8.0 Appendix G		Comply
	(p) A statement that the wind farm complies with relevant limits – or not – as determined from the results of the measurements	Section 11.0	<p>The assessment strictly demonstrates that the LLWF complies with the noise limits set out in Condition 23 of the Planning Permit.</p> <p>However, the level of compliance at several sites (N31ab, M29aa, and K34aa: all at Yendon) at certain wind speeds during the night time period is marginal. Comparison with the Stage 1 monitoring outcomes (refer to reports noted in Section 1, point 3 of this report) indicates that the marginal compliance at these locations at Yendon has been validated. Nevertheless, as indicated in Appendix C of NZS 6808, where compliance is marginal and contested, further steps may be required to reduce uncertainty. In this case, while compliance is not contested, LLWF may consider adopting further on-off testing at these locations, for example, in accordance with Section 7.7 of NZS 6808.</p>	Recommendation provided