IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of applications by Meridian Energy Limited to Manawatū-Whanganui Regional Council, Greater Wellington Regional Council, Tararua District Council and Masterton District Council for resource consents to enable the construction, operation, and maintenance of a new wind farm on Mount Munro, located approximately 5km south of Eketāhuna

SECTION 87F REPORT OF NIGEL LLOYD – NOISE

MANAWATŪ-WHANGANUI REGIONAL COUNCIL, GREATER WELLINGTON REGIONAL COUNCIL, TARARUA DISTRICT COUNCIL AND MASTERTON DISTRICT COUNCIL

15 March 2024

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A. OUTLINE OF REPORT

1 This report, required by section 87F of the Resource Management Act 1991 (**RMA**), addresses the issues set out in sections 104 to 112 of the RMA, to the extent that they are relevant to the applications lodged with the Manawatū-Whanganui Regional Council (**Horizons**), Greater Wellington Regional Council (**GWRC**), Tararua District Council (**TDC**) and Masterton District Council (**MDC**).

2 The resource consents applied for, by Meridian Energy Limited (**Meridian or the Applicant**), are required to authorise the construction, operation and maintenance and improvement of a new wind farm on Mount Munro, located approximately 5km south of Eketāhuna. The project is known as the Mt Munro windfarm project (the **Mt Munro Project or the Project**).

3 In this report I address construction and operational noise in relation to the resource consent applications lodged with TDC and MDC (the **District Councils**). In doing so, I have reviewed, along with the other information I identify in this report, the Noise Effects Assessment[1] (the **NEA**).

4 While this report is pursuant to section 87F of the RMA, I have in accordance with section 42A(1A) and (1B) attempted to minimise the repetition of information included in the application and where I have considered it appropriate, adopt that information.

B. QUALIFICATIONS / EXPERIENCE

5 My name is Nigel Robert Lloyd. I am an acoustic consultant at Acousafe Consulting & Engineering Ltd. I have been in that position since 1985.

6 My role involves the review of the application and the noise impact assessment of construction and wind farm operation noise undertaken by Marshall Day Acoustics.

[1] Noise Effects Assessment – Mt Munro Wind Farm Project, Rp 002 R03 20210951, dated 11 May 2023.

7 I hold the degree in mechanical engineering from the University of Wales received in 1976.

8 My previous work experience includes five years as the noise control engineer with the New Zealand Department of Labour and three years with the Industrial Acoustics Company in the United Kingdom. I have assisted various Councils with noise reviews of information for different wind farms including Te Rere Hau (original, eastern extension and repowering project), Westwind, Mill Creek, Tararua 3, Turitea, Motorimu, Mahinerangi, Waitahora as well as others.

9 I am familiar with the surrounding area. I visited the area as part of the previous application for a wind farm in March 2012 and subsequently on Thursday 1 June 2023 as part of this review.

C. CODE OF CONDUCT

10 I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. This technical report has been prepared in accordance with that Code. Unless I state otherwise, the opinions I express are within my area of expertise, and I have not omitted to consider material facts that might alter or detract from the opinions that I express.

11 I have all the information necessary to assess the application within the scope of my expertise and am not aware of any gaps in the information or my knowledge.

D. EXECUTIVE SUMMARY

12 I have reviewed the relevant application documents for the Mt Munro Project in relation to noise. In my opinion, the NEA and the Applicant's responses to requests for further information represent a comprehensive assessment of construction and operational noise.

13 Overall, the assessment undertaken of construction noise and operational noise indicates that compliance can be achieved with reasonable noise standards. The exception to this is construction works on Old Coach Road

that takes place near to dwellings. I also agree that the construction traffic on Old Coach Road is a very significant increase during the construction period and the noise of this will impact on the amenity of residents.

14 Operational wind farm noise is controlled by reference to NZS 6808:2010. The Standard does not set limits that provide absolute protection for residents from audible wind farm sound, but the limits are considered reasonable for protecting sleep and amenity. In my experience at other wind farms, some residents remain dissatisfied with the resultant sound environment.

15 The NEA demonstrates that wind farm sound levels can comply with the recommended NZS 6808:2010 noise limits, assuming that the wind turbines are properly selected, located and operated. I agree with the NEA that the area does not qualify as "high amenity" when the level of noise protection provided by the District Plans is considered.

16 The application for the wind farm is based on an envelope approach for wind turbine placement. The NEA has not been undertaken on actual wind turbine sites but on a theoretical worst case scenario. The modelling has used examples of three different wind turbine characteristics. While this envelope approach indicates that the proposed wind farm can comply with wind farm noise standards, a robust suite of operational noise conditions and noise management plans is required to ensure that the selection and design process (for placement within the envelope) provides for the outcomes envisaged by the Noise Effects Assessment. I am of the view that those outcomes should be secured as part of the Project.

17 Additional (FIDOL) analysis has been provided in RFI#1 Response 1 in relation to the likely night-time durations when wind farm noise will be particularly audible. I find this useful in informing submitters as to what noise to expect of the proposed wind farm.

18 Further I note, specifically:

(a) Construction noise conditions should specify the long-term duration noise limits from NZS 6803:1999.

(b) Concrete batching plant and rock crushing plant noise is more appropriately controlled using the general noise limits (in NZS 6802) rather than those in the construction noise standard. I consider this particularly important given the envelope approach used in the Application, where no specific sites have been designated for this plant.

(c) The rock crushing plant should only operate during the daytime (7.00am to 7.00pm).

(d) Noise management plans should be provided for construction and construction traffic – particularly for the five dwellings on Old Coach Road where construction noise levels will be exceeded, and construction traffic will have a particular noise impact. If construction traffic is to use Opaki-Kaiparoro Road (between Mt Munro Road and the northern end at SH2) then this requires further information to be provided by the applicant to ensure the noise effects are assessed and understood.

(e) Village construction at the end of Old Coach Road and internal road construction are proposed to be constrained to weekday daytime operations I agree with this recommendation, which should be a condition of consent.

(f) I recommend that a condition be included requiring transport on public roads of material and machinery for concrete pours to be restricted to daytime (7.00am to 7.00pm).

(g) I recommend that a condition be added to control blasting vibration and airblast noise levels, and that blasting be restricted to between 9.00am and 5.00pm Monday to Friday. I also agree that a blasting noise management plan should be provided for by way of conditions.

(h) The operational wind farm noise conditions should:

i. State the specific noise limits recommended by NZS 6808:2010;

ii. Ensure that special audible characteristics are penalised;

iii. Provide for an Operational Noise Management Plan;

iv. Require a Compliance Testing Report.

(i) I recommend that a condition be included that requires an investigation into how to ensure the wind mast is designed so that it does not whistle (including use of aerodynamic spoilers such as spiral wrappings around guy wires to minimise aerodynamic noise) and, in addition, that the solution resulting from that investigation be installed.

E. SCOPE OF REPORT

19 My report focuses only on issues related to construction and operation noise associated with the Mt Munro Project. In preparing my report, I have considered the existing environment, construction and operation noise, including performance standards, predictions, management and mitigation, and assessment of effects.

20 I have reviewed and relied on the following information provided by Marshall Day Acoustics:

(a) The Noise Effects Assessment;

(b) S92 Additional Information Request – Noise, dated 29 August, which was Appendix 8 of the 7 September 2023 response from Incite (**RFI#1 Response 1**); and

(c) S92 Response – Acoustics, dated 30 January 2024, which was Appendix 3 of the 31 January response from Incite (**RFI#2 Response 1**) (including a report from Meridian – Mt Munro – Assessment of Noise from Anemometer Mast, 18 August 2014).

21 I had input into the requests for further information on behalf of the Regional Councils and District Councils. In particular, the additional information request dated 6 July 2023 (**RFI#1**), the further request dated 20 September

2023 (**RFI#1 Clarification Request**), and the additional information request dated 20 December 2023 (**RFI#2**).

22 I have also reviewed the proffered District Resource Conditions included in the Assessment of Environmental Effects dated 22 May 2023.

23 In preparing this report, I have relied on the expert reports from Ms Harriet Fraser (traffic) and Mr James Lambie (ecology), both technical advisors for the Councils.

F. BACKGROUND

24 The Mt Munro Project involves the construction and operation of a wind farm, consisting of 20 new turbines, each with blade diameters of up to 136m and a ground level to tip height of up to 160m, with an approximate capacity of 4.5 MW each.

25 Turbine placement will be within a designated design envelope (**the envelope approach**). The identified envelope is located in a rural environment. The envelope approach allows flexibility for turbine placement with the 20 turbines being located within an identified design envelope. No decision has yet been made on the exact make or type of the turbines that will be installed or exactly where they will be located.

26 Marshall Day Acoustics has modelled the wind farm noise based on a 'conservative approach' using the highest noise levels of five possible layouts within the envelope and on the manufacturer's noise data from three different potential types of wind turbine (from two manufacturers) which meet the general wind turbine specifications. Wind farm noise has been assessed using NZS 6808:2010 Acoustics – Wind farm noise.

27 The NEA identifies thirty-three dwellings in the general vicinity of the proposed wind farm, five of which are contracted to the project. A wind farm noise assessment has been undertaken for the twenty-eight dwellings that are not contracted to the Project. The nearest of those dwellings (MTMH 02) is approximately 650 metres from the closest (southernmost) assumed wind turbine location.

28 Construction noise has been assessed against a range of standards – principally NZS 6803:1999 Acoustics – Construction noise, but also NZS 6802:2008 Acoustics – Environmental noise for the proposed concrete batching plant associated with the construction works. Traffic noise cannot be managed by reference to District Plan noise limits and needs to be assessed separately.[2]

G. ASSESSMENT OF APPLICATION – NOISE

29 The NEA contains a description of the project and the general area. I identify where I agree with the approach taken in the NEA and where I have concerns.

Noise Performance Standards

30 The noise performance standards and background comments regarding the rural environment are discussed in Section 2.0 of the NEA. Section 2.0 explains why the wind farm noise conditions should apply at the notional boundary of dwellings in the rural zone. In my view, care needs to be taken with the use of the notional boundary because it only protects areas near (within 20 metres) of an existing dwelling. There are times when wider property areas are deserving of protection from noise pollution such as if noise sensitive activities take place on that land (horse training for example) or if land is identified as a future dwelling site. There is a future dwelling site (according to submissions) immediately north of the site on Old Coach Road. Consideration should be given to whether this site should qualify for protection from the wind farm noise.

31 Various submissions talk about adverse effects on them when they are outside working. Aside from the temporary and transient nature of construction noise it is also inevitable that the aural environment will change because of wind farm noise. However, I am of the opinion that the impact of wind farm noise should not make any difference to the approach taken in the NEA in this respect, and I also agree that it is appropriate to apply the

[2] The New Zealand Standard for traffic noise (NZS 6806:2010 Acoustics – Road traffic noise – New and altered roads) only applies to new or altered roads.

noise conditions at the notional boundary of dwellings (either existing, consented or able to be constructed as a permitted activity).

32 The NEA relies mostly on the recommendations of NZS 6808:2010 to assesses and control wind farm noise elements. I consider that approach to be appropriate, along with the other current NZ Noise Standards identified in section 2.2 of the NEA.

33 The Operative Tararua and Masterton District Plan provisions are set out in 2.4 and 2.5. The NEA produces a faithful rendition of the provisions.

34 Section 27 of the Wairarapa Combined District Plan also includes additional provisions and I consider a) to be pertinent:

> The assessment of the activity shall not be made in isolation. The assessment shall be made with all other uses and activities in the area in normal operation and the cumulative effect taken into account. Assessment using "permitted baseline" tests will need to be based on realistic estimates of permitted and consented activity levels. The anticipated environmental outcomes of this Plan do not include scenarios where noise emissions would increase up to the full utilisation of all available noise limits in the Plan.

35 The Wairarapa Combined District Plan considers that activities should not increase noise levels up to the full utility of all the available noise limits in the District Plan – rather, other activities also need to be considered.

Assessment Methodology

36 Section 2.6.3 of the NEA discusses the different versions (1998 and 2010) versions of NZS 6808. I agree it is appropriate to apply the latest 2010 version for setting noise limits and compliance monitoring. The NZS 6808 criteria are based on a limit of 40 dB L_{A90} or the background sound level plus 5dB, whichever is the greater at a specific location. The Standard recommends that background sound level measurements be carried out where predicted sound levels of 35dBA or higher are calculated for the relevant locations.

37 Section 3.0 of the NEA discusses the assessment methodology.

38 Alternative limits are provided for in NZS 6808:2010 in special circumstances where the local amenity is considered to be high. A high amenity area would be where the District Plan promotes a higher degree of protection. Neither the Tararua nor the Combined Wairarapa Plans do this. The NEA does not consider that the high amenity criteria should apply to the Mt Munro Windfarm for the reasons it sets out in 2.6.3 and I agree.

39 The NEA identifies that the noise levels allowed by NZS 6808 will be audible and notes the standard *"seeks that any resulting noise levels will not be unreasonable*". I concur with this but would warn that, in my experience, wind farm noise can cause a significant reaction from neighbours even when there is compliance with the recommended noise limits.

40 Section 3.2.1 of the NEA explains how the UK Institute of Acoustics published a "best practice" document setting out limits on the degree of shielding terrain may provide in the modelling. I understand this has been adopted in the modelling described in the NEA. I consider this to be appropriate.

41 The remainder of Section 3 describes how wind farm noise is modelled and assessed and I agree with the approach as described.

42 I note Figure 3 in the NEA which is the assessment of background sound levels. This figure shows how a regression line is determined to define what the noise limit is when the line exceeds 35 dB L_{A90}. It is important that the spread of the measurements around this line is reasonably contiguous. Otherwise, there will be times when the background sound levels will be low but the wind farm noise levels will be significantly higher. It is at these times that the wind farm noise will become more noticeable.

43 In the example given in Figure 3, the noise limit would be allowed to rise above 40 dB $L_{A90(10\ mins)}$ at times when background sound levels are less than 30 dB $L_{A90(10\ mins)}$. It then becomes important to assess the extent to this exceedance and how often this is likely to occur. This assessment has been undertaken by MDA in the RFI#1 Response 1. I discuss the assessment undertaken by MDA later in this report.

Construction Noise

44 Section 4 of the NEA deals with construction noise. The section seeks to address construction of turbine foundations and platforms, operation of the concrete batching plant, construction of internal roads and construction traffic noise on internal roads.

45 As I note above, the application has adopted a turbine design envelope for location of the turbines (to provide flexibility). The NEA otherwise indicates (with reference to Figure 2)[3] that all relevant infrastructure and activities will be established within the turbine design envelope.

46 The main issue with the envelope approach is that it is impossible to peer review a proposal when the location of plant is unknown. RFI#1 sought further information about the location of the plant,[4] for this reason.

47 For example, 4.1.3 of the NEA deals with the noise from the concrete batching plant which will be '*within the turbine envelope (or exclusion zone)*'. An assessment is then made against the daytime recommended construction noise limit of 70 dB L_{Aeq} and the conclusion made that the concrete batching plant could be located within 35 metres of a dwelling. In my opinion the noise level from a concrete batching plant would be untenable at a dwelling at this distance for the length of the construction programme. This is an example of how the recommended noise limits in NZS 6803 are not appropriate for concrete batching noise.

48 I have always considered that concrete batching plants are not strictly construction activity and, on a large site such as a wind farm, they should be designed to meet the District Plan NZS 6802 noise limits e.g. 55 dB $L_{Aeq(15\ mins)}$ during the daytime.

49 The concrete batching plant is discussed in the RFI#1 Response 1 which, in my opinion, oversimplifies the status of construction activity. It states that

[3] Noise Effects Assessment, Marshall Day Acoustics, 11 May 2023, pg 6.
[4] Additional Information Request for Application APP-2022203902, 6 July 2023, Q41.

the construction noise standard noise limits are not based on the noise character, but on whether the activity is temporary.

50 The construction noise standard does not recommend noise limits based on an assessment of the impact of the noise on people. In the foreword of NZS 6803 there is an explanation of the need for relaxed noise limits for construction works:

> The generally acceptable level of intrusive noise in the community is assessed under the provisions of NZS 6802:1999. However, construction noise is outside the scope of NZS 6802:1999 because it usually cannot be kept within the specified limit. Although this may mean that the noise is undesirable, it is not necessarily unreasonable when all the relevant factors are taken into consideration. Construction noise is an inherent part of the progress of society.

51 The NEA considers that the construction noise standard provides an acceptable limit for the concrete batching plant (70 dB L_{Aeq} in daytime) and that this should determine the separation distance to dwellings. With a concrete batching plant alone, this separation distance could be 35 metres from a dwelling or 50 metres if combined with an aggregate plant. There is presently no specificity in terms of location of the activities, given the envelope approach. The result would be that the dwelling would be exposed to 70 dB L_{Aeq}. I do not consider this to be appropriate for noise from the concrete batching and aggregate plant. I note that the RFI#1 Response 1 recognises the level of effect and considers that these activities should be located further from dwellings as part of the best practicable option.

52 RFI#2 Response 1 identifies that the concrete batching plant is expected to operate for a total of approximately 30 days over the course of construction and the mobile aggregate plant operating '*at times*' during the first 15 months of construction. I understand the total construction programme is expected to take 32 months (depending on various factors). It is difficult to peer review this given the uncertainty presented with the envelope approach and this results in my recommendations for a robust set of noise conditions setting out appropriate noise limits and noise management plans.

53 For this reason, I consider that the general NZS 6802 noise limits should apply rather than the construction noise limits (as presently set out in condition 18 of the Applicant's draft conditions) for the following reasons:

(a) Concrete batching (and aggregate plant) is a manufacturing process;

(b) These activities are flexible as to location (as opposed to internal/external road construction or turbine location which must take place in certain locations);

(c) The construction noise limit of 70 dB L_{Aeq} is too high if the concrete batching plant can be located elsewhere;

(d) If the concrete batching plant needs to operate at night-time for the wind turbine foundation pour for example, then it will need to meet the 45 dB L_{Aeq} night-time construction noise limit (no assessment is made for this); and

(e) It is poor practice (and in my view, inappropriate) to set noise conditions and then rely on BPO to provide adequate protection against noise.

54 The night-time limit in the construction noise standard is similar to the District Plan general limits. To operate the concrete batching plant at night and meet the 45 dB L_{Aeq} night-time noise limit in the construction noise standard, the NEA states that concrete batching would need to be 560 metres from a dwelling.[5] This is one example where the envelope approach does not provide sufficient transparency to allow a peer review to be undertaken with confidence. I emphasise the need to rely on a robust set of conditions to control the adverse noise effects and for those conditions to ensure that the future siting of the concrete batching plant allows noise limits to be complied with.

[5] Noise Effects Assessment, Marshall Day Acoustics, 11 May 2023, pg 19.

55 I therefore consider that concrete batching plant noise should be required to comply with the general noise limits (not the construction limits) through consent conditions. I discuss this further when I comment on submissions.

56 I note (from Table 5 of the NEA) that village construction and internal road construction will exceed night-time noise limits. The RFI#2 Response 1 (to Question 9) states that these construction activities will be constrained to weekday daytime operations. This will be important to ensure compliance. In addition, the turbine pad construction will need to be undertaken carefully at night if compliance is to be achieved with night-time noise limits. This compliance would be achieved by the application of a Construction Noise Management Plan.

57 The application also contemplates aggregate crushing. In RFI#2 Response 1,[6] the applicant predicts that the crushing plant would produce 52 dB L_{Aeq} or less (for dwellings with a clear view to the crushing plant). Given these predictions, it is my opinion that the crushing activity/plant would also only be suitable for operation during daytime. There is discussion in RFI#1 Response 1 around the location of aggregate crushing, which will largely be undertaken within the road alignments where earthworks are undertaken. This could be at the concrete batching plant, or at another location within the site with a setback distance of 50 metres providing a construction noise Standard 70 dB L_{Aeq} compliant noise level with respect to dwellings. That response suggested it may occur either in the turbine exclusion zone or turbine envelope zone. In my opinion, noise conditions should not provide for aggregate crushing to be undertaken within 50 metres of a dwelling and this activity should also be controlled by reference to the general noise limits in the same manner (and for the same reasons) as concrete batching. Moving these operations as far away as practical (or screening them) from dwellings is likely to represent the best practicable option to control the noise in this instance.[7]

58 Section 4.4 deals with construction traffic on external roads. The NEA identifies that additional construction traffic will be "*very significant*".

6 Specifically, Question 10.
7 RMA, s 16.

However, there was no assessment made of the resultant noise or of any mitigation measures other than managing noise through the CEMP or similar "*such as controlling the hours*" of construction traffic movement. As I discuss below, there is presently little information as to how the CEMP will appropriately manage noise.

59 The NEA considers that 8 months of construction traffic represents a temporary effect which is more readily tolerated. My concern is that 8 months is a long time for this level of activity and the total construction period is expected to be 32 months. It is also anticipated that Old Coach Road will require a significant upgrade to be suitable for wind farm deliveries and construction traffic and the noise of this should also be factored in.

60 This issue was raised in RFI#1 and discussed in RFI#1 Response 1. On page 10 of the covering letter, Incite proffered a condition in respect of the road upgrade works along Old Coach Road. However, my concerns are with both the noise of the road upgrade and then the use of the road by construction traffic accessing the site, which will be substantial. I consider that it is important the conditions manage construction and construction traffic noise and identify what steps are required to protect residents.

61 The construction noise and construction traffic noise impacts are further assessed by the applicant in the RFI#1 Response 1. I note the following conclusions from that assessment:

(a) Road construction noise directly in front of a given dwelling is assessed as '*a very significant increase lasting several days*';

(b) Road construction along the more distant portions is assessed as '*a substantial increase'*; and

(c) Aggregate truck traffic *'represents a substantial increase in noise level during daytime hours for these dwellings over the limited construction period'*.

62 I am concerned that the Old Coach Road is currently quiet and the cumulative increase in noise is substantial. I also note that the '*limited*' peak construction

period for traffic on Old Coach Road stated as 8 months in the NEA, while the construction timeframes in the application stretch out to 32 months. I consider that 8 months is a long time for the residents of these five dwellings to be exposed to this level of construction activity and that the noise should be managed to minimise the impacts. This type of management will be critical for construction activity lasting 32 months. I discuss the general construction noise management plan and specific plans for controlling the construction and construction traffic noise on Old Coach Road under '*conditions*' below.

Operational Wind Turbine Noise

63 The basis for the modelling used for wind turbine noise is discussed in Section 5.0 of the NEA.

64 The modelling has been done for each of three potential wind turbine models identified. The Vestas Turbine is appreciably quieter than the Siemens and potentially quieter again than implied by the A-weighted sound levels listed in Table 7 of the NEA. However, the predicted levels for each turbine in Appendix D of the NEA do not reflect this fundamental difference. This highlights the importance of establishing set noise limits and for the applicant to be undertaking pre-installation acoustic assessments, which I discuss further under '*conditions*' below.

65 Appendix D predicts that each turbine will comply with the baseline 40 dB $L_{A90(10min)}$ recommended baseline criterion in NZS 6808:2010, except at dwelling MTMH01. My understanding (from Table 14 of the NEA) is that MTMH 01, 03, 04, 12 and 21 are '*internal to the project and are therefore not to be considered*'.

Operational Noise Effects

66 Section 6.0 of the NEA assesses the wind farm operational noise effects.

67 The charts show the measured background sound levels which are usefully separated out into '*all data*' and '*night-time only*'. Background sound levels

are normally less at night, and this is when the wind farm sound is most noticeable (and measurable).

68 As I discussed above, when there is a wide spread of background sound levels, recognition needs to be given to times when the background sound regression line is not representative of times when the background sound levels are particularly quiet. For example, Figure 11 shows results for night background sound levels at MTMH21. Observation of the chart shows there is a cluster of results below the regression curve with the curve seemingly influenced by fewer but higher sound levels. A smaller number of higher sound levels (possibly the dawn chorus) would make little difference to the appreciation of wind farm noise at quieter times.

69 Night-time background sound levels were raised in RFI#1 at question 40. RFI#1 Response 1 included a useful FIDOL (frequency, intensity, duration, offensiveness and location) assessment. I consider the FIDOL assists with assessing the wind farm operational noise impacts notwithstanding that the noise is predicted to comply with the baseline recommended limit of 40 dB $L_{A90(10min)}$.

70 A significant point made in RFI#1 Response 1 was that the turbine manufacturers are designing modern turbines "*to minimise the tonality and low-frequency noise associated with older designs*". In my experience adverse community reaction has been greatest where wind farms have exhibited *special audible characteristics* such as audible tones. NZS 6808:2010 directs that wind farms shall be designed so that wind farm sound does not have special audible characteristics at noise sensitive locations.[8] However, as special audible characteristics cannot always be predicted, consideration must be given to penalising the wind farm noise if special audible characteristics are present at the receivers. This provides a strong incentive for the applicant to avoid special audible characteristics as part of the design process and a safety net where wind farm sound levels would be reduced to accommodate any penalties that are applied. The more modern turbines should have less of a noise impact in this respect, but I

[8] NZS 6808:2010 Acoustics – Wind Farm Noise section 5.4.

recommend that conditions specifically provide for avoidance of special audible characteristics throughout the design, commissioning and testing process.

71 The summary of the FIDOL assessment is that, while the overall noise level would be consistent with expectations from the application of the District Plan and will meet WHO recommendations for sleep, at the dwellings considered in the NEA assessment, the wind farm would be the dominant background sound for about two thirds of the time – 57% for Dwelling H26 and its neighbours, and around 66% for others.

72 I consider that is useful information for submitters, and helping them understand the level of noise they can expect from the wind farm.

Wind Farm Non-Turbine Noise

73 The NEA assessment is that non turbine activity such as the substation and operations and maintenance facility can comply with general District Plan noise limits. These limits would be the subject of conditions of consent. I agree with this assessment.

74 Internal road traffic wind farm noise is predicted to be negligible after the construction period.

H. SUBMISSIONS

75 I have read the summary of submissions and individual submissions that raise specific noise issues. I summarise the noise concerns raised by submitters as follows:

(a) Noise effects of wind turbines on people.

(b) Noise effects on animals.

(c) Traffic noise.

(d) Construction noise:

(i) Traffic

(ii) Rock crusher – hours of operation

(iii) Excavation

(iv) Machinery

(v) Concrete batching

(e) Completeness of Noise Impact Assessment.

(f) Mast whistle.

76 I comment on submissions below.

Noise effects of wind turbines on people.

77 Submission 61 identified that the home was on the 'orange' line and therefore exposed to wind farm noise that exceeds 40 dBA. The dwelling in question is called MTMH02 in the NEA. This dwelling is shown outside (less than) the yellow 40 dB L_{A90} contour in Appendix E Contour Maps E1 and E2 (the Siemens turbines) and close to the green 35 dB L_{A90} contour in E3 (the Vestas turbines). The table in Appendix D confirms these predictions for this dwelling.

78 Other submitters express their concerns about wind farm operational noise and the impacts on the peacefulness of the area and their wellbeing and on sleep. In some cases, reference is made to other wind farms where noise issues have occurred. Some of the noise issues from these earlier wind farms were cause by special audible characteristics. This has been covered in the application and modern turbines have been designed to avoid the generation of tones and low frequency sounds. I recommend that a condition be included to ensure that special audible characteristics will be penalised in the unlikely event they are present. The penalty that would apply is the addition to samples where tonality is present of between 1 and 6dB, depending on the tone assessment.[9]

[9] Section B4 of NZS 6808:2010 Acoustics – Wind Farm Noise.

79 The NEA assessment is that the turbine sound levels will be less than 40 dB L_{A90} at all dwellings (not internal to the project) and this will meet the recommendations of NZS 6808:2010. The wind turbines will be heard though, and the FIDOL assessment (in RFI#1 Response 1) describes how often the turbine sounds will be heard and to what degree. The assessment[10] shows the frequency of occurrence of different degrees of noise level increase over the measured background sound levels for three different locations.

80 The FIDOL assessment summarises that the wind farm will be the dominant night-time noise source for about two-thirds of the time (57% for dwelling H26 and its neighbours (to the east of the site), and around 66% for others. The dwellings to the north (represented by H09) and south (represented by H21) will experience a noticeable or substantial change in night-time noise levels for 36% of the time, and dwellings to the east (represented by H26) for 24% of the time. Dwellings will receive a very significant change in night-time sound levels for between 5% and 9% of the time. Sound levels are greater during the daytime and consequently the difference between daytime background sound levels and wind farm sound levels will be significantly less.

81 In its summary, the MDA report identifies that the overall noise levels would be consistent with the noise levels anticipated by the District Plans and will comply with NZS 6808, and will meet the WHO sleep criteria. MDA are confident that the wind farm noise will not be penalizable for special audible characteristics and do not consider the noise will be unreasonable. Assuming that to be the case then I agree with the MDA assessment.

82 Many submitters commented on the 1.5km separation distance between wind turbines and dwellings that is present in the Palmerston North District Plan. I drafted that provision, which is intended to manage reverse sensitivity effects from new dwellings on existing wind turbines, in particular relating to noise. The distance of 1.5km was determined from two main factors including:

[10] Pages 5 to 7 of the Marshall day Acoustics response dated 29 August 2023.

(a) The distances between complainants and existing wind farms, and

(b) The topography of the Tararua Range in the Manawatū which tends to favour this distance.

83 The circumstances are different with this proposed wind farm both in respect of the noise characteristics of the proposed wind turbines, and the topography of the area.

Noise effects on stock/animals.

84 No assessment has been undertaken of the noise impacts on stock/animals. I have read the s 87F report of Mr Lambie who considers construction noise will have a low or lesser level of ecological effect for birds and bats.[11] He also considers the effect of construction noise will be low on lizards.[12] I am not an expert on the impacts of noise on animals, but I am not aware of such issues arising at other wind farms in New Zealand.

Traffic noise

85 On-site traffic noise should not be an issue once the construction phase has ended.

Construction Noise

Construction Traffic

86 Submissions raise the issue of construction traffic noise. Construction traffic on Old Coach Road will cause significant noise issues during the (8-month peak) 32 month construction period. I have discussed the impacts on Old Coach Road earlier in my report and I recommend that construction and construction traffic noise conditions provide for the management of these impacts. Impacts may occur elsewhere if construction traffic uses the quieter rural roads. There will be less of an issue if construction traffic uses the busier

[11] Section 87F Report of James Lambie – Terrestrial Ecology (15 March 2024) at 75(a).
[12] At 75(b).

State highway and then accesses the site via Old Coach Road where the noise impacts can be properly managed.

87 Construction traffic using Opaki-Kaiparoro Road (between Mt Munro Road and the northern end at SH2) will require further information to be provided by the Applicant to ensure the noise effects are assessed and understood.

Rock crusher

88 Submissions (67/68/72) identify the noise of the rock crusher as an issue and seek information on the hours of operation.

89 RFI#2 Response 1[13] predicts that the crushing plant would produce 52 dB L_{Aeq} or less (for dwellings with a clear view to the crushing plant). As I have discussed earlier in this report, I am of the view this activity would only be suitable for operation during daytime. I recommend that a condition constrains the plant to this time period (7.00am to 7.00pm).

Excavation and Construction

90 Submissions are concerned about the noise effects from excavation and construction.

91 This matter was raised in the RFI#2 (Question 9) and discussed in the RFI#2 Response 1, which identifies the various sources of construction noise. Aside from the construction of internal project roads and the project Village, the noise levels are predicted to generate less than 45 dB L_{Aeq} and can take place at night. RFI#2 Response 1 goes on to explain that night-time construction works at wind farms are generally limited to those that are necessary, such as concrete pours for turbine foundations and turbine erection (both of which may need to take advantage of night-time weather conditions).

92 The construction of internal project roads and the project Village will be constrained to weekday daytime operation. I support this restriction, which should be the subject of a condition.

[13] Specifically, question 10.

Concrete Batching

93 Submission 34 expresses concerns that a mobile crusher and concrete batching may operate over lengthy hours and periods in the southeast of the wind farm 'envelope'. The submission considers that even if the noise from these activities was somehow acceptable, the nuisance value would interfere with any enjoyment of the previously rural character of the area. The submission is concerned that crushing and concrete batching noise seems to be more allowable as a temporary effect.

94 I agree with this submission for the reasons I discussed above in paragraphs 47 to 55.

Completeness of Noise Impact Assessment

95 Submission 34 describes the current aural amenity in the area where residents can "*hear people talking above them on the Mt Munro ridge, less than 2km away, and the operation of equipment such as farm bikes spraying*". The submission considers that the wind farm noise modelling may not accurately reflect the reality of the situation.

96 Quiet background sound levels were raised in RFI#1 (Question 40) and discussed in RFI#1 Response 1. The NEA usefully describes the frequency of occurrence of different degrees of noise level increase along with the percentage of the time the night-time noise will be noticeable, substantial, or very significant. The wind farm will be designed to comply with the NZS 6808 recommended noise limits, but this is a useful additional assessment that describes what the actual perception of wind farm noise will be for the community. I have covered this in detail above in paragraphs 78 to 81.

Mast whistle

97 RFI#2 sought information regarding an issue with disturbance caused by the previous wind mast that "whistled" in certain winds (question 13). This reflected concerns raised by submissions regarding the mast whistle. RFI#2 asked the applicant to confirm the background to these complaints and any

steps taken by Meridian in response, and to identify any proposed mitigation measures given a taller wind mast is to be constructed.

98 RFI#2 Response 1 included an assessment of noise for the mast in 2014. This report attempted to justify the whistling noise on a number of grounds – mostly because the noise was generated by the wind in the cables and the relevant noise Standards did not allow noise to be measured in windy conditions. This assessment considered the noise met the permitted baseline without any consideration of any practicable options to control the whistle.

99 RFI#2 Response 1 included advice from Marshall Day Acoustics regarding technical means of reducing noise. It indicates that that the technical means is *"likely related to turbulence around guy wires supporting the mast"*.[14] The advice recommends using the best practicable option to reduce noise, and recommends investigating the use of aerodynamic spoilers such as spiral wrappings around guy wires to minimise aerodynamic noise.

100 This approach only goes part of the way to solving this issue which needs to be dealt with proactively. I recommend that a condition be included that requires an investigation into how to ensure the mast does not generate undesirable special audible characteristics (including use of aerodynamic spoilers such as spiral wrappings around guy wires to minimise aerodynamic noise) and, in addition, the installation of the solution arrived upon.

Construction and Operational Noise Management Plans and Assessment Report.

101 I consider a Construction Noise Management Plan (**CNMP**) and an Operational Noise Management Plan (**ONMP**) are essential components of the suite of conditions. The CNMP would be submitted for certification prior to construction commencing under the umbrella of the Construction Environmental Management Plan. The ONMP is focused on managing effects during the operational phase. Compliance testing is also necessary.

CNMP

[14] RFI#2 Response 1 – Acoustics, Marshall Day Acoustics, 20 January 2024, page 3.

102 The Te Rere Hau Windfarm Repowering Decision (**TRHR Decision**)[15] establishes a framework for the matters to be included in a CNMP (in Condition NO2) which requires the construction methodologies and procedures to ensure compliance with the relevant Standards – in this case, NZS 6803:1999. I would prefer to see an explicit statement in the conditions that construction noise must comply with the noise limits in NZS 6803:1999 (and the inclusion of the long-term limits in NO1 for example as recommended by 7.3 of NZS 6803:1999).

103 In RFI#1 Response 1, question 38, the Applicant proffered a Construction Noise Management Plan specific to upgrade works on Old Coach Road. I agree that it is necessary to identify the times when the construction works will cause a significant impact for the residents of the Old Coach Road (and residents along Opaki-Kaiparoro Road between State Highway 2 and Mount Munro Road) and a CNMP is necessary. Where a significant noise impact is identified for residents, I agree that offering temporary relocation of residents could represent the best practicable option. I note with the proposed CNMP the relocation would only be offered during daytime activity periods, which could be inconvenient for residents, and that it would only apply to dwellings within 20 metres of any work. This is an arbitrary number. There are five dwellings on Old Coach Road and any offer should apply to each of them.

104 The noise mitigation is only offered for construction works when it takes place close to the dwelling. I consider that the dwellings have been built with no consideration given to road noise and that the impacts of construction traffic itself is also likely to be significant and mitigation of that aspect of the noise should also be considered as part of the CNMP. I set out the matters I consider should be considered in a CNMP in paragraph 113.

[15] https://www.epa.govt.nz/assets/Uploads/Documents/Fast-track-consenting/Te-Rere-Hau/Te-Rere-Hau-Windfarm-Repowering-Decision-report-including-minor-corrections.pdf

ONMP

105 An example of the matters that should be included in a suitable ONMP is Condition NO6 in the TRHR Decision. The purpose of an ONMP is to ensure the operation of the wind turbines complies with the noise limits in the relevant conditions and to ensure the wind farm meets the duty of s 16 of the RMA – to adopt the best practicable option to ensure noise does not exceed a reasonable level.

106 The ONMP needs to include:

(a) An assessment of the background sound levels;

(b) The wind turbine selection having regard to the sound power levels of the chosen wind turbines a check on (the absence of) special audible characteristics;

(c) Procedures for ensuring compliance with conditions;

(d) Procedures for dealing with any malfunctions;

(e) Procedures for adopting the best practicable option to ensure noise does not exceed a reasonable level;

(f) Requirements for post-construction noise monitoring and assessment;

(g) Review provisions; and.

(h) A summary of feedback from consultees, changes that are made and the reason if changes are not made.

Compliance Testing Report

107 Compliance testing needs to be undertaken within three (3) months of commissioning of the last turbine (of each stage of the construction if this is to be staged). A compliance testing report needs to demonstrate compliance or what measures need to be implemented to achieve compliance. The report needs to be provided to the Councils for certification.

108 Condition NO7 in the TRHR Decision is an example of such a condition.

I. CONDITIONS

109 The draft conditions relevant to noise commence at Condition 17.[16]

110 Condition 17 should include the long-term duration noise limits from Table 2 of NZS 6803:1999 (as recommended by 7.3 of that Standard).

111 I consider that construction and operational noise can be suitably managed using appropriate standards but that the draft conditions as currently framed are insufficient to do this. In particular:

(a) Condition 18 does not contain the noise limit descriptor (L_{Aeq} or L_{A10}) which is different in the Combined Wairarapa and the Tararua District Plans;

(b) Condition 18 – night-time needs to be defined i.e. (7pm – 7am);

(c) Condition 18 – Reference to NZS 6801 and NZS 6802 1991 versions does not correspond to those in the Combined Wairarapa and the Tararua District Plans (which have now been superseded);

(d) Condition 19 part one should refer specifically to the noise limits. NZS 6808:2010 recommends optional noise limits for different circumstances e.g. stricter limits for high amenity areas. The condition does not adequately address these differences;

(e) Condition 19 does not set out how compliance is to be demonstrated. An example of how to do this would be Condition NO4(b) in the TRHR Decision;

(f) Condition 20 does not set out the parameters required by the Final Operational Noise Assessment Report. In my experience, any issues with the wind farm noise need to be identified as soon as possible to ensure that the community does not suffer while those issues are identified and corrected. An example of a suitable condition to

[16] At page 124 of the Assessment of Environmental Effects.

achieve compliance monitoring and reporting is NO5 of the TRHR Decision (although there is no need for NO5.b)ii because these will be new turbines only and there is also no need for a cumulative assessment with other wind farms); and

(g) There are no conditions for an operational noise management plan or for compliance testing. Examples of these are NO6 and NO7 of the TRHR Decision. I consider the compliance testing to be particularly important.

112 Condition X proffered by Incite (on page 10 of RFI#1 Response 1) only refers to Old Coach Road upgrade noise and not the use of Old Coach Road by construction traffic. While I consider there is a need to protect the residents of Old Coach Road from the construction and construction traffic noise, this should extend to Opaki-Kaiparoro Road depending on the level of works/construction traffic intended for that route (see also, paragraph 86–87 above).

113 A CNMP should include all the relevant matters raised in NZS 6803:1999 and the relevant Annexures and should provide for:

(a) Operating hours of construction works and time restrictions on construction traffic or machinery;

(b) Details of machinery and equipment and prediction of noise levels from that equipment;

(c) Any feasible mitigation including:

(i) reduced speeds for heavy vehicles;

(ii) road sealing and maintenance (to avoid potholes);

(iii) driver/operator education;

(iv) noise barriers;

(v) offers of noise insulation and ventilation of dwellings; and

(vi) offers of relocation of residents for the period of construction or for respite.

114 Village construction and internal road construction will be constrained to weekday daytime operations. RFI#2 Response 1[17] also recommends that conditions be included to restrict material and machinery for concrete pours to be brought to the site on public roads during daylight or evening hours "*as best as practicable*". I consider such a condition should be more certain in its application e.g. restricting these activities to daytime hours i.e. 7.00am to 7.00pm. I note as well that there is no definition of '*evening hours*' in the District Plans.

115 I recommend that concrete batching plant and aggregate plant noise be controlled by reference to the Applicant's draft condition 18. The location of the concrete batching plant (and rock crushing plant) should be constrained to a known location to allow noise to be assessed. If the location for the concrete crushing plant does not permit night-time operation, then this needs to be identified. There is a separate need for a concrete batching plant noise management plan to ensure that the plant is appropriately located and that it will meet the noise limits in condition 18 (including night-time limits to supply concrete to the wind turbine bases). The information that is provided is confusing because the concrete turbine bases need to be poured on a continuous basis (including night-time) but there is no assessment for the concrete batching plant to work at night. To operate at night and meet the 45 dB L_{Aeq} night-time noise limit in the construction noise standard, the NEA states that concrete batching would need to be 560 metres from a dwelling (I discuss this in paragraphs 47 to 55).

116 The crushing plant would produce 52 dB L_{Aeq} or less (for dwellings with a clear view to the crushing plant). A condition should also restrict the crushing plant operation to daytime.

117 I recommend that blasting activity airblast noise and vibration be measured and assessed in accordance with Appendix J of Australian Standard AS 2187-2:2006 "Explosives – Storage and use Part 2: Use of explosives". RFI#2

[17] MDA Letter dated 30 January 2023 answer to question 9.

Response 1 considers it is prudent to require that a blasting noise management plan is required, and I agree.

118 Finally, I recommend that a condition be included that requires an investigation into ensuring the wind mast does not generate undesirable special audible characteristics (including use of aerodynamic spoilers such as spiral wrappings around guy wires to minimise aerodynamic noise) and, in addition, that the solution resulting from that investigation be installed.

Nigel Lloyd

15 March 2024