

**In the Environment Court
I Mua I Te Kōti Taiao O Aotearoa**

Under the Resource Management Act 1991

and in the matter of the direct referral of an application for resource consents by Meridian Energy Limited in respect of the proposed Mt Munro wind farm under section 87G of the Resource Management Act 1991 (**RMA**).

Meridian Energy Limited
Applicant

and

Tararua District Council, Masterton District Council, Manawatū-Whanganui Regional Council and Greater Wellington Regional Council (Councils)
Consent Authorities

and

s 274 Parties

Statement of Evidence of Michael Miklin Halstead on behalf of Meridian Energy Limited

24 May 2024

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QUALIFICATIONS AND EXPERIENCE

1. My full name is Michael Miklin Halstead. I am an Associate in the acoustical consulting practice of Marshall Day Acoustics Limited (**MDA**), and manage MDA's Wellington office.
2. I hold a Bachelor of Engineering from The University of Washington, USA. For the past 35 years I have worked in the field of acoustics, noise measurement and control in USA, France and New Zealand. My work over the past 24 years has included noise control engineering work for various major corporations and city councils within New Zealand. I have previously been engaged as an expert witness before the Environment Court and at council level in relation to this work.
3. I have worked throughout New Zealand on a wide range of acoustic assessment projects, for a wide range of clients. Many projects have involved preparing reports and hearing evidence that address the acoustics effects of proposed developments. I have been involved with major environmental impact assessments for applicants such as Genesis Energy, Meridian Energy, Contact Energy, Mighty River Power, Mercury Energy and Shell Todd Oil Services.
4. As well as Mt Munro Windfarm I have undertaken assessments of numerous other wind farm proposals including, Te Apiti, West Wind, Pohokura, Castle Hill, Te Rere Hau, Kaiwaikawa, Waipipi, Kaiwera Downs, Southland, Harapaki and Pahiatua wind farms.
5. I was the chairman of the committee to draft New Zealand Standards 6801:2008 *Acoustics – Measurement of environmental sound* and 6802:2008 *Acoustics – Environmental Noise*, and was on the committee to draft NZS 6808:2010 *Acoustics – Wind farm noise*, representing the New Zealand Acoustical Society.
6. In September 2021 I was engaged by Meridian Energy Limited (**Meridian**) to prepare a noise effects assessment for the proposed Mt Munro Windfarm (**Mt Munro** or **the Project**), covering both operational and construction sound sources. This assessment, which I completed

in May 2023, was included as Appendix H of the Assessment of Environmental Effects (**AEE**) for the Project.¹

7. I have also provided input into the further information responses to the Councils, including the Acoustics Letter dated 29 August 2023, attached as Appendix 8 to the 'Section 92 Response - 7 September 2023'.²; and a response to additional questions from the Councils, dated 20 January 2024. The responses to acoustic matters in these requests are included in **Appendices B** and **C** of this statement of evidence.

CODE OF CONDUCT

8. I confirm that I have read the 'Code of Conduct for Expert Witnesses' contained in the Environment Court Consolidated Practice Note 2023. I agree to comply with this Code of Conduct. In particular, unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

9. In my statement of evidence I discuss potential construction and operational noise effects due to the Project. I provide a summary of my assessment, but do not repeat the full details that are provided in the attached report. I also address comments made by submitters and the reporting officer with respect to noise effects, and provide my opinion on the proposed conditions of consent.

¹ Available at <https://www.horizons.govt.nz/HRC/Meridian-Energy-Limited/Appendix%20H%20-%20Noise%20Effects%20Assessment.pdf>

² Available at <https://www.horizons.govt.nz/HRC/Meridian-Energy-Limited/Appendix%208%20-%20Acoustics%20Letter.pdf>

SUMMARY OF NOISE EFFECTS REPORT

10. My report details the noise criteria applied for wind farm sound, other operational sound such as from the substation, and construction sound.
11. I have conducted a detailed acoustics assessment for this proposed wind farm. Predicted sound levels for all sources will comply with the relevant standards, which have been set to protect health and reasonable amenity. I therefore consider that the acoustics effects of the Mt Munro Windfarm are acceptable and reasonable.
12. For wind farm sound, rules in the Operative Wairarapa Combined District Plan³ require that the methods and limits of NZS 6808:1998⁴ are followed. In the proposed Wairarapa Combined District Plan⁵ this reference is updated to require the methods and limits of NZS 6808:2010.⁶ The Tararua Operative District Plan⁷ also references the methods and limits of NZS 6808:2010.
13. NZS6808:2010 sets a noise limit of 40 dB L_{A90} or the background sound plus 5 dB (whichever is higher), unless the District Plan rules or objectives identify the receiving area as having high acoustic amenity. As discussed in the Noise Report and confirmed by Council's reviewer, this area does not have high acoustic amenity, and thus the 40 dB L_{A90} noise limit described above applies to all noise sensitive locations in the area.
14. For other operational sound such as the substation, the operations and maintenance facility, and internal road traffic, I have applied the standard permitted activity District Plan noise limits. I have assessed construction noise in accordance with NZS 6803:1999⁸.
15. I carried out measurements of the existing background noise over a period of several weeks at three dwellings which are representative of

³ Wairarapa Combined District Plan - Rule 22.1.20 - Wind Energy Facilities

⁴ NZS 6808:1998: *Acoustics - The assessment and measurement of sound from wind turbine generators*

⁵ Proposed Wairarapa Combined District Plane - Rule NOISE-R7

⁶ NZS 6808: 2010 *Acoustics - Wind farm noise*

⁷ Tararua District Plan - Rule 5.3.7.4 (g)

⁸ New Zealand Standard 6803:1999 *Acoustics – Construction noise*

the dwellings inside the 35 dB L_{A90} noise contour of the proposed wind farm. I correlated these measurements with wind speed measurements taken at the wind farm as directed by NZS6808:2010, to understand the relationship between background noise levels and wind.

16. The Noise Report describes these noise characteristics, which generally can be divided between dwellings to the west of the subject site which are exposed to SH2 noise especially during daytime, and those on the east of the subject site which are somewhat protected from traffic noise by the hills. In both cases the existing night-time noise levels are typical of the rural environment, with noise levels of 20 – 30 dB L_{A90} in the absence of wind, with increasing noise levels as wind speed increases.
17. Calculations of wind turbine noise, and full details of the input parameters and method are detailed in the Report. This includes identification of all noise sensitive locations within 3 kilometres of a wind turbine. These calculations have been carried out for three different potential turbine models, the loudest of which has been used to consider the noise effects of turbine noise. I therefore consider that a conservative or worst-case approach has been taken to the acoustic modelling.
18. I have presented results of the acoustics modelling as noise contours and predicted levels at individual receivers. I have attached the modelled noise contour to this evidence as **Appendix A**. The predicted levels comply with the noise limits at all receivers. Wind turbine noise is calculated to be a dominant feature of the noise environment during moderately windy conditions. At higher wind speeds the turbine noise is overtaken by the natural sound of wind in the environment.
19. I have also assessed construction noise. Most activities will occur at distances of at least 600 metres from any dwelling and can easily comply with the daytime construction noise standards.
20. At Old Coach Road, significant levels of noise will be received by a number of dwellings as the road is improved. In most cases the construction noise standard will be met; and mitigations will be offered in cases where short term exceedances occur, for instance as the

construction activity occurs directly in front of a dwelling. Noise from construction traffic (including truck traffic) will occur over the construction period but in all cases the construction noise limits will be met.

21. I have recommended in my Report that certain matters relating to noise should be addressed in conditions should consent be granted. I have contributed to the conditions described in the evidence of Tom Anderson, and discuss this in more detail in a later section of this evidence.
22. On the basis that predicted sound levels for all construction and operational sources comply with the relevant standards (which have been set to protect health and reasonable amenity) and in consideration of my measurements of the existing ambient noise levels, I conclude that the acoustics effects of the proposed Mt Munro wind farm will be acceptable and that the changes to the noise environment will be reasonable.

METHODOLOGY AND LIMITATIONS

23. Data, assumptions, modelling and results that I have relied on in my assessment are detailed in the Noise Report. In addition to those details, I have prepared my evidence on the basis of:
 - (a) Discussions of questions raised by the Council and my response to that request dated 29 August 2023.
 - (b) Discussions of additional matters arising in the Section 92 request and my response to that request dated 20 January 2024;
 - (c) Attendance at several site visits relating to noise measurements and analysis at some properties;
 - (d) Experience assessing wind farm sound at other sites; and
 - (e) Review of New Zealand and international literature during the revision of NZS 6808 and subsequent research, as cited later in this evidence.

24. In preparing this evidence I have reviewed the draft statements of evidence of other experts relevant to my area of expertise including:
- (a) The statement of Mr Shields regarding traffic and transportation; and
 - (b) The statement of Mr Mills regarding civil design

RESPONSE TO NOISE RELATED ISSUES RAISED IN SUBMISSIONS

25. I have read the following submissions raising noise effects as being a matter of concern:

No.	Submitter	No.	Submitter
1	Rachel Taylor	41	Jodi Tomlin
3	David and Mary Cook	43	Josie Braddick
8	Chris Clarke	44	Brendon Braddick
9	Shelley Pender	45	Hamilton
11	Ian John Maxwell	47	Marc Braddick Santon Farm Ltd
13	Hastwell Mt Munro Prot Soc	48	Anne Braddick
15	John Murray	49	Jesse Braddick
16	Jenny Clarke	51	Mauriceville School BoT
17	Bruce Wallace	54	Gavin Osborne
21	Charmaine Jane Semmens	56	Janet McIlraith
22	Jehkobi Semmens	61	Teresa Bardella
23	Rhys Semmens	63	Amelia Boot
28	Nevayah Bell-Semmens	66	Cade, Wayne and Kim McDermott
29	Freedom Ward	67	Andrea Sutherland
30	Ian Robert Olliver	68	Deborah Gully
34	Glen Opel Ltd	70	Andrew and Brigitte Sims
35	Kaylene Duffell	72	John and Susan Barber
38	Carolyn and John Braddick	73	Gary Groombridge

26. Broadly speaking the comments can be grouped under the following twelve headings:
- (a) Turbine noise as nuisance noise
 - (b) Mental health effects

- (c) Inadequate Setback
 - (d) Low Frequency Vibrations
 - (e) Turbine noise out of character for the area
 - (f) Uncertainty in noise report
 - (g) Turbine noise impact on working or recreation environment and effects on animals
 - (h) Duration of construction noise
 - (i) Noise from crusher and concrete plant
 - (j) Noise from the use of Old Coach Road or Opaki Kaiparoro for development access
 - (k) Vibration effects related to road works at Old Coach Road
 - (l) Animals frightened by construction noise
 - (m) Noise from the existing meteorological mast
27. In the paragraphs that follow I will address comments made about the above-listed issues in turn.

Turbine Noise as Nuisance Noise

28. Many submitters have referred to sound from the turbines as “nuisance noise”, which they consider to be noise which complies with the noise rules but nevertheless is unacceptable to them.
29. In the context of the RMA, nuisance noise has been described as “that which causes annoyance and discomfort that is substantial and exceed[s] the bounds of the normal ‘give and take’ expected of neighbours”⁹. The ability of the wind farm to comply with the standards set in NZS6808:2010 is relevant to this distinction, because those limits

⁹ Besier, Antoinette --- "Leaving it all to the Resource Management Act 1991: The Demise of the Tort of Private Nuisance" [2004] VUWLawRw 23; (2004) 35(3) Victoria University of Wellington Law Review 563

are at least as stringent as the limits applied to other permissible activities such as heat pumps, spa pools, cool stores, or other non-residential activities in the Rural zone. Those limits describe the noise levels to be expected, and which are permitted to be undertaken on either side of a boundary.

30. The noise standards relating both to wind farm noise and noise measurement and assessment in general clearly state that audibility of a noise source is not a criterion by which its acceptability can be judged. Rather, it is the objective impact (relating to noise level and noise characteristics) that should be considered. In the less objective consideration of “nuisance noise” there may be broader factors to consider, but the standards (and extent of any claimed ‘nuisance’) should relate to the perception of noise by listeners with normal sensitivity, and without predispositions for or against the noise maker.

Mental or Physical Health Effects Relating to Noise

31. Concerns have been raised around the health effects of being exposed to construction and turbine noise. Construction noise during the night is controlled by the District Plan to provide reasonable noise levels for the sleeping environment, and for this reason the construction noise limits which apply at night are similar to those limits applying to permitted activity night-time noise levels.
32. Construction is not expected to occur at night, except for a series of nights near the end of construction when foundations are being poured and turbines erected. It is expected that one early-morning would be required for each of the 20 turbine platforms as the concrete is poured. Additionally, several nights of crane operation could be required for the erection of each turbine depending on wind conditions. These construction activities will occur within the site, and any associated vehicle movements which have potential to disturb sleep will be carefully controlled and communicated to neighbours. A draft Construction Traffic Management Plan has been prepared, and is attached to the evidence of Mr Shields. This sets out the kinds of controls on nighttime traffic movements which would be imposed during foundation pouring and other night-time activities.

33. Wind turbine noise does not intrinsically cause adverse health effects, but has been a topic raised at several windfarm applications that I have been a part of. The misinformation on adverse health effects has been widespread, and has been consistently disproved.
34. What is known is that there is potential for wind turbines to produce levels of noise which could elevate the noise environment beyond what is suitable for sleeping. This has been the primary driver for the establishment of the noise limits in NZS6808:2010 – which is aimed at achieving noise levels inside bedrooms (with windows partially open for ventilation) which meet World Health Organization recommendations for sleeping noise environments.
35. Those limits will be met, and in reliance upon that and my experience with windfarms I am confident that adverse health effects will not be caused by the project.

Inadequate Setback

36. Several submitters queried the proximity of turbines in this project to dwellings, which in some cases are as near as 670 metres. Setbacks in other jurisdictions were referenced (for instance the 1.5km ‘setback’ in Palmerston North which is used to trigger discretionary activity status around permitting new noise sensitive activities to be built).
37. Setbacks are a convenient means of defining a threshold for planning review, when the actual noise effects of a wind farm are not known – for instance when the planning rules have to be relevant to future wind farms, or to multiple wind farms with different noise emission characteristics. However, setbacks are a broad brush, as they do not take into account the cumulative effect of multiple turbines, or of the size of turbines, or of other mitigating factors like topography or wind characteristics.
38. When evaluating a specific wind farm design, it is much more accurate and effective to consider the actual noise contours when deciding whether noise effects will be reasonable. In the case of Mt Munro there are relatively few turbines, and they are primarily spread along one ridge, meaning that fewer turbines impact upon a given dwelling than

would be the case if there were a large cluster of turbines, each causing similar noise at a dwelling. The effective distance at which the 40 dBA noise limit can be achieved is less in this case than in other cases where more clustered layouts occur. A setback would therefore be an inappropriate and inaccurate mechanism by which to consider and manage noise effects.

Low Frequency Vibrations

39. Vibrations caused by wind farms have been mentioned as a concern by several submitters. The levels of vibration caused by wind turbines have been carefully studied, and determined not to be significant. A paper by Peter Styles (Styles, 2005) reviewed a number of studies which demonstrated that vibrations from wind turbines can be transmitted through the ground and detected by extremely sensitive equipment at distances of several kilometres from a wind farm. However, the levels of vibration that were detected were extremely low, in fact several orders of magnitude less than the threshold of human sensitivity.
40. Vibration from the wind turbines at Mt Munro is therefore not expected to be perceptible or to cause any adverse effects.

Turbine Noise Out of Character for the Area

41. Several submitters have stated that turbine noise will be out of character when compared to what exists in the area currently.
42. In general, the noise from a modern wind turbine is by design 'neutral' in character. Significant development effort has gone into making this so – resulting in changes to the shape of the blades and in active manipulation of the blade pitch to minimise noise. Mechanical noise relating to gears and generators has been minimised such that, in my experience, it is not commonly audible beyond the blade-span of the turbine, i.e. around 200 metres from the base.

43. For some dwellings which are relatively close to a small number of turbines some gentle periodicity (swishing) may be discernible. This differentiates wind farm noise from the noise of “wind in the trees”, but it is by no means comparable to that produced by an industrial activity such as a sawmill or fan or pump, or by transport noise such as cars, trucks, or aircraft.
44. It is likely that neighbours will be able to recognise wind turbine noise in their environment. Our experience is that for those who are not opposed to the turbines, this is not an adverse effect. For those who are unwelcoming towards the turbines, the noise may be a reminder of their presence and those neighbours may well form the opinion that this noise is out of character and inappropriate. This opinion may change over time, as wind turbines become an accepted (or at least established) part of the environment.
45. The presence of an audible sound, or the subjective response of individuals is not an appropriate basis for assessing the effects of the noise emissions from the Project. Rather, the objective measures of noise level, change in the noise level of the environment, and the objective character of the sound, are the measures against which a complete assessment is made.

Uncertainty in Noise Report

46. Several submitters have raised the issue of uncertainty around the noise level which would be produced by the turbines in the noise report. The noise assessment precedes construction by several years. The turbines which will be available at the time of construction may be different than those available at the time of the assessment, and so a range of typical turbines with different noise emission levels has been considered. The noise assessment is made on the basis of the loudest currently available turbines, and it is recommended in conditions that on selecting turbines for construction it is demonstrated through an additional report to Council that the preferred turbine will comply with the relevant noise rules or guidelines presented in the relevant New Zealand standard.

47. The trend over the past two decades is that turbines have become larger, but have not increased in noise output. As technology has improved, the noise character of the turbines has become less pronounced, and better able to fit within the natural environment. Because the turbines are becoming larger but not louder, the net noise output of sites has in fact typically decreased, as fewer turbines are needed to make full use of a site.
48. The uncertainty identified by submitters in the noise report, relating to the stated range of calculated turbine noise levels, is resolved in the report by basing its conclusions on the loudest turbine – demonstrating that even in this case compliance with the relevant standard is achieved. This ‘envelope approach’ is therefore conservative, and widely accepted – if the effects of the application as described are deemed acceptable, the actual effects of the project can be expected to be the same or less than assessed.

Turbine Noise Impact on Working or Recreation Environment and Effects on Animals

49. Several submissions raised concern that the working environment outside the notional boundaries of the dwellings would potentially be subject to higher levels of wind turbine noise. The working environment is not considered a noise sensitive activity – if it were, there would be restrictions on normal farming activities which could significantly impede productivity.
50. My experience observing animals in close proximity to wind turbines does not support concern that there are adverse effects from the noise. It is common to see sheep and cattle seeking shade from the turbine towers while the turbines are in full operation.

Years of Construction Noise

51. A common theme when discussing construction noise effects is the uncertainty around the length of the project, and the potential for this to last several years. Although the assessment is based on an envelope approach to retain flexibility around the construction methodology, I

understand that the anticipated construction timeline provides for 9 months for external road works to be carried out, after which the earthworks, internal roads and concrete work would be internalised to the site, apart from truck access. The overall project construction length is anticipated to be up to 32 months, with the heavy works complete by the end of the second year.

52. Although this is a long construction period, the construction methodology is continuing to be developed in a way that will offer more certainty to the community around the duration of different stages of works. In particular, it should be noted that most of the works will be limited to daytime hours only, excepting a series of concrete pours towards the end of the wind farm construction which may need to operate during early morning hours to correctly cure the concrete; and turbine lifts which may need to occur at night to take advantage of calm conditions. As noted earlier in my evidence, The construction noise management plan will spell out the communications and mitigation requirements around this or any other night works.

Noise from Crusher and Concrete Plant

53. Although my Noise Report describes the noise from the concrete batching plant and aggregate crusher in terms of their ability to comply with both daytime and night-time construction noise limits (with appropriate setbacks) the proffered conditions will limit the aggregate plant to daytime operation, and the concrete batching plant to operate only when necessary as part of the turbine base pour activities. Both of these activities will be moved to a location at least 250m from the site entrance, providing adequate setbacks.
54. These measures will ensure that noise from these activities will be reasonable and will not give rise to nuisance effects.

Noise from the Use of Old Coach Road or Opaki Kaiparoro Road for Development Access

55. I understand from the evidence of Mr Shields that all site access will be provided via Old Coach Road, and that it is proposed that this road be widened and sealed. This will provide a significant mitigation to the noise which could otherwise be generated by a poorly formed road, and will ensure that construction traffic can move at a steady controlled speed, reducing travel time and hence noise.
56. The widening and finishing of this section of road is expected to occur over a nine-month period. For parts of this period there will be significant noise effects to residents along this road as construction occurs directly in front of each dwelling. I understand that the construction is to be staged to allow continued access to residents, so the noise impact on each dwelling would likely be of the order of 3 – 4 weeks of significant noise (up to 78 dB L_{Aeq}) during sub-grade construction, and a noticeable increase of noise (60-65 dB L_{Aeq}) during the remainder of the nine-month construction period as activity shifts away from each dwelling.
57. Construction works associated with the road widening and sealing are to be carried out during daytime hours only.
58. Mitigations of noise from this activity will be proposed during the preparation of the Construction Noise Management Plan associated with these works, and will be determined in consultation with affected residents. Mitigations could include coordination of activities with residents' activities, noise barriers, provision of sound insulation and ventilation to houses where appropriate, or temporary relocation during nearby construction. Best practicable option to reduce noise could in some cases be focussed on completing the work quickly with higher noise levels, to reduce the overall impact on residents.

Vibration Effects from Roadworks on Old Coach Road

59. The submission of the Hastwell / Mt Munro Protection Society Inc cites concern that current traffic causes noticeable vibration effects at the old Bush Cottage along Old Coach Road, and on this basis, I have considered the effects of construction and traffic on this structure.
60. The vibration level of excavators, scrapers, trucks and bulldozers are not predicted to exceed the “cosmetic building damage” vibration limit¹⁰ for residential buildings of 5.0 mm/s PPV. High vibration activities such as vibratory compaction would not exceed the residential vibration limit cosmetic damage at distances greater than 14 metres from a building.
61. In order to relieve concerns about this structure it would nevertheless be appropriate to offer the owner a condition study prior to construction to inform any liability for rectification, and to monitor vibration levels and any cosmetic damage as works progress so that the work methods can be adjusted if unreasonable vibration levels are demonstrated. As this would require access to the property, this monitoring would be subject to landowner agreement. Where practicable, vibratory compaction should be minimised within 14 metres of this building.

Animals Frightened by Construction Noise

62. My experience of observing animals around construction machinery is that they generally have little regard for such activity, especially when acclimatised by normal farm and road traffic activities. Construction activities are generally more steady-state in their noise production than road traffic noise, and so less surprising and more predictable to animals.
63. An exception is blasting, where there is potential for significant surprise at high noise levels. I recommend in construction noise management plans where blasting is anticipated that a clear programme of communication and timing is followed, allowing ample time to relocate stock if necessary near blast sites. I note however that the type of blasting associated with underground material fracturing (“production

¹⁰ DIN 4150-3 “*Vibrations in buildings – Part 3: Effects of vibration on structures*”

blasting”) is usually well controlled by good blasting practice, resulting in relatively low peak noise levels, and that a Blasting Management Plan has been proffered by the Applicant to control such effects in accordance with best practice.

64. I have recommended that the hours of blasting are limited to daytime hours – specifically the 0730 – 1800 Mon – Sat for “production blasting” which will have very low levels of noise emissions; and 0900 – 1700 Mon – Fri for blasting activities with more exposed charges where noise emissions will be more significant.

Noise from Existing Meteorological Mast

65. I am aware that a complaint has been made about noise from the existing meteorological mast, and that there is concern that the new mast would encounter the same issues. I have not observed this noise at this site, but have seen and heard a similar issue at a different site. I have also seen many meteorological masts of similar design which do not cause noise issues even under high wind speeds.
66. While there are methods to reduce noise from stretched cables, they are difficult to implement and, in my experience, there is a low likelihood that such treatments would be required. I do however recommend that the applicant consider having mitigation measures available should whistles or tones be observed from the new mast, and should ensure that the mast and its components are designed and built with a mind to minimising the likelihood of such noises – avoiding holes, gaps, slots, and considering opportunities to incorporate flow spoilers in cables where practicable.
67. I have recommended that there be a specific advice note in the conditions that wind noise from the meteorological mast must comply with the “non-turbine operational noise” limits, to ensure that attention is drawn to achieving a reasonable noise level.

Noise Level at 152 Opaki Kaiparoro Road

68. In addition to the grouped topics of concern above, I would like to offer clarification to submission 61 from Teresa Bardella. She has expressed concern that her dwelling would receive noise in excess of the allowed 40 dB L_{A90} .
69. I understand that this dwelling is the one referred to as MTMH02 in my Noise Report. Based on worst case modelling, this house is calculated to receive 38 dB L_{A90} , and to experience the relationships between existing noise and turbine noise described in Figure 15 of the Noise Report.
70. This noise level complies with the limits in both NZS6808:2010 and the District Plan, and so is a reasonable noise level which would provide a reasonable level of amenity. The wind farm would be the dominant noise source during night-time when moderate wind is present, but at other times noise levels from the wind farm would be similar to noise presently experienced at this property.

RESPONSE TO SECTION 87F OFFICER'S REPORT

71. I have reviewed the acoustics aspects of the Section 87F report prepared by Damien McGahan, with expert noise advice provided by Nigel Lloyd in his report attached as Appendix 13. In this section of my evidence I comment on noise matters raised in Mr Lloyd's report and the s 87F Report.
72. I note that in general the s 87F Report author considers that most noise effects can be suitably managed via the conditions recommended by Mr Lloyd. The exception to this is that further information is sought on the duration and mitigation of construction traffic noise, particularly for Old Coach Road.
73. The s 87F Report identifies construction noise associated with the upgrade of Old Coach Road, and construction traffic noise generally for the residents of Old Coach Road as significant or more than minor

adverse effects that have not been sufficiently addressed.¹¹ The s 87F report also seeks further information on how the effects of construction traffic noise along Old Coach Road will be mitigated to the extent practicable.

74. The applicant has proposed to make improvements to Old Coach Road including widening of the road where necessary for safe and unimpeded passing of truck and trailer units, and safe management of turns. The road will be sealed for its full length between SH2 and the site entrance. These works will be carried out over a 9-month period, and can be staged such that the noise impact of the road upgrade works themselves are of limited duration to each dwelling along the road. When completed this improvement will reduce the noise impact of trucks on residents of Old Coach Road by:
- (a) Directly reducing the tyre noise which would occur from a loose gravel surface;
 - (b) Permitting a smooth (restricted) travel speed without the need for braking and acceleration to accommodate poor road conditions;
 - (c) Avoid situations where stopping and manoeuvring could be required for trucks to pass each other;
 - (d) Reducing the travel time and hence the noise exposure relating to each truck movement.

Construction Noise Management

75. I understand that additional widening along Old Coach Road has been suggested by the Council traffic engineer, but that Mr Shields does not consider this necessary. If this additional widening were required, staging to limit the duration of the widening works in front of each dwelling along the road would limit duration of the activity, and hence the noise effects. The proximity of the widening to each dwelling would

¹¹ [678] of the s 87F Report

need to be considered as the construction noise and vibration management plan is developed, to determine whether additional mitigations (such as barriers or temporary relocations) are appropriate.

76. The officer's report recommends that the Construction Noise Management Plan (**CNMP**) should be broadened to include noise from construction of the entire project, including management of construction traffic noise. I agree with this recommendation and have recommended that vibration effects also be incorporated into the plan and so refer to it as a Construction Noise and Vibration Management Plan (**CNVMP**).
77. I also agree that the management of traffic associated with concrete batching and turbine component delivery should be a specific focus of the CNVMP to accommodate requirements to complete these tasks during night works.

Concrete Batching and Aggregate Crushing

78. I have covered this matter in the preceding section of this evidence. I disagree that these activities should be managed under the permitted activity noise limits, although I note that the night-time construction noise limit is the same as the night-time permitted activity noise limit, and that the proffered conditions would set these activities far enough away from dwellings to enable compliance with the daytime permitted activity noise limits.

Operational Noise

79. The Officer's Report agrees with my assessment that turbine noise will be reasonable, although may be dominant under some circumstances. An additional condition is proposed to limit special audible characteristics (SAC) of turbine noise. I note that a penalty regime is an integral part of the compliance assessment process in NZS6808:2010, and do not consider that a separate condition is necessary to ensure that the applicant is incentivised to avoid SAC.

Meteorological Mast Noise

80. I have discussed noise from the existing met mast and the potential for a new mast to produce similar noise, in paragraphs 65–66 in this statement of evidence. I agree that a condition requiring the design of the mast to be revisited should such noise occur is an appropriate means of managing this risk.

Protection at the Notional Boundary

81. I agree with the Officer's Report conclusion that protection from wind farm noise is appropriately limited to land within the notional boundary of dwellings or consented dwelling sites.

Noise Related Conditions

82. I have reviewed the consent conditions proposed by the Councils in as attached as Appendix 23 of the 87F Report and comment as follows.
- (a) I disagree that concrete batching and aggregate crushing should be controlled by District Plan permitted activity limits rather than by the provisions of NZS6803:1999 – Construction Noise. Both these activities would operate only for a limited time, and only to process material used in the construction of the wind farm – in the same way that an excavator would only produce noise on the site while it is moving material used in the construction of the wind farm. I recommend that these activities are recognised as part of construction activities and controlled by the requirements described in NZS6803:1999. However I agree with the specific conditions proffered relating to the location and times of operation of these activities, as this offers assurance that the relevant noise limits will be met.
 - (b) I disagree that it is useful to offer the Operational Noise Management Plan for public comment prior to Council certification. The methods of determining compliance are well established in NZS6808:2010 and it would not be helpful to invite alternative means of compliance assessment. I recommend that

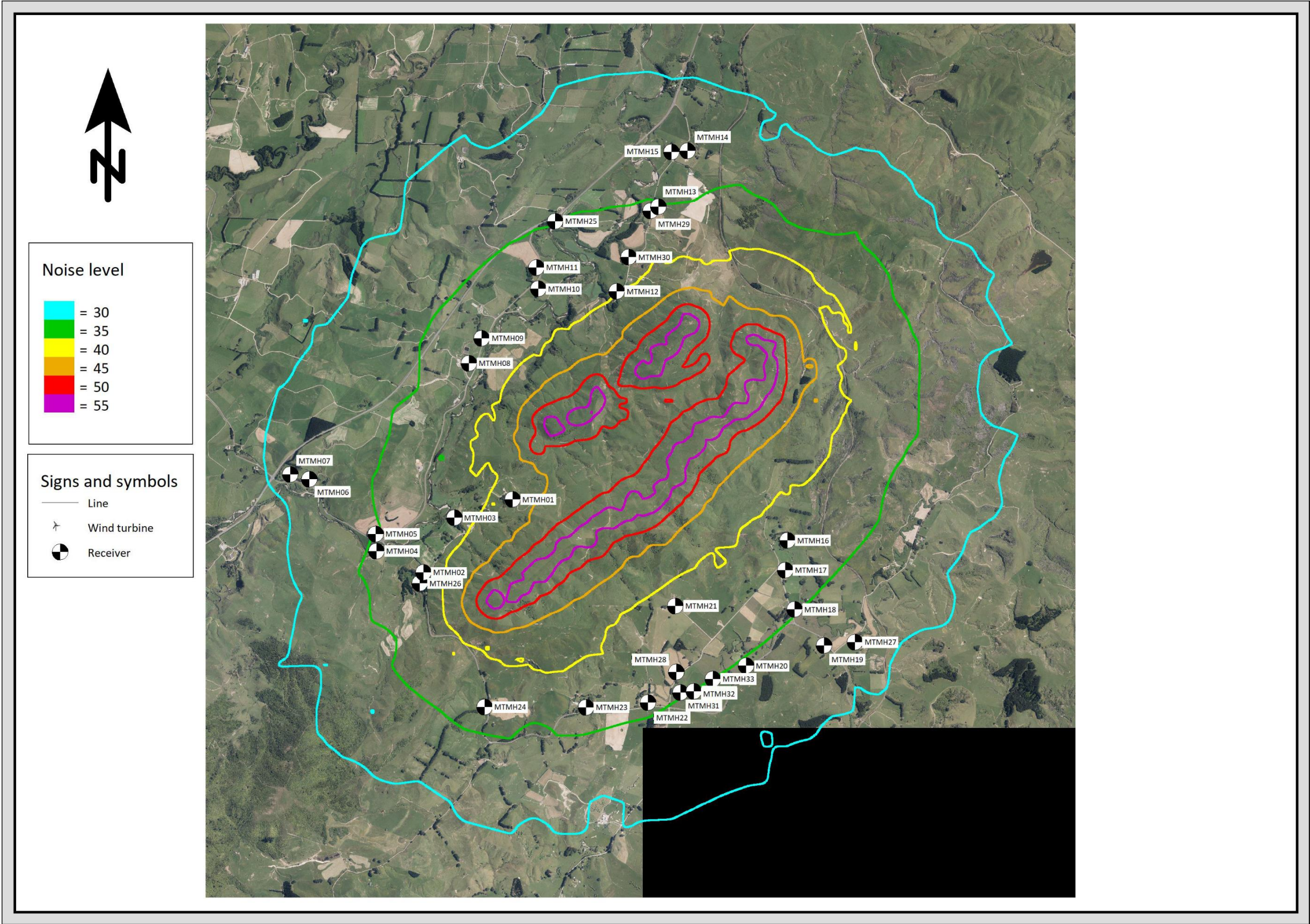
the qualified noise experts advising the Councils are invited to review and comment on the ONMP.

83. The conditions which I recommend and consider useful are set out in the revised condition set attached to Mr Anderson's planning evidence.

CONCLUSIONS

84. I have conducted a detailed acoustics assessment for this proposed wind farm. On the basis that predicted sound levels for all sources comply with the relevant standards, which have been set to protect health and reasonable amenity, I consider that the acoustics effects of the Mt Munro Wind Farm are acceptable and reasonable.
85. I have reviewed all submissions made relating to noise effects. I have also reviewed the Officer's Report. I have clarified many of the issues raised by submissions in my evidence, but none of the issues raised in any of the submissions alter the conclusions I previously reached in my Report.
86. I have contributed to the review of conditions relating to noise, and consider that those proffered adequately control noise effects related to the construction and operation of the Mt Munro Wind Farm.

APPENDIX A – OPERATIONAL NOISE CONTOUR



APPENDIX B – MARSHALL DAY ACOUSTICS RESPONSE TO JULY 2023 S92 REQUEST

29 August 2023

Meridian Energy
Level 2
55 Lady Elizabeth Lane
Wellington 6011

Attention: Gene Sams

Dear Gene

S92 ADDITIONAL INFORMATION REQUEST - NOISE

I have reviewed the noise matters contained in the s92 request from the combined councils and offer the following responses.

OLD COACH ROAD CONSTRUCTION

38. *Construction traffic on Old Coach Road is discussed in 4.4 of the Noise Effects Assessment. The Noise Effects Assessment identifies that additional construction traffic will be “very significant”. However, there is no assessment made of the resultant noise or of any mitigation measures other than managing noise through the CEMO or similar “such as controlling the hours” of construction traffic movement. The Noise Effects Assessment considers that the 8 months of construction traffic represents a temporary effect which is more readily tolerated. 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 factor in.*
- A. *What are the construction noise impacts relating to the upgrades to Old Coach Road that are necessary to accommodate wind farm construction and delivery traffic?*
 - B. *What is the noise impact of the windfarm construction and delivery traffic on residents of Old Coach Road?*
 - C. *What noise mitigation measures are available?*

Five external dwellings located on Old Coach Road will experience noise initially and briefly from improvements to the road, and later and for a much longer period, from vehicle movements – particularly trucks delivering aggregate and turbine components to site. Typical dwelling setbacks are between 20 and 35 metres from Old Coach Road. We discuss the matters raised in point 38 below.

Road Improvement

Widening will occur along Old Coach Road to accommodate construction traffic. This will generally occur at distances of at least 100 metres from a given dwelling, with shorter periods (several days) of activity directly in front of each dwelling.

When activity occurs directly in front of a dwelling 20 metres from the road, noise levels of up to 78 dB L_{Aeq} may be experienced at the façade at times. When the activity is further from the property, the longer-term noise level will be around 60 – 65 dB L_{Aeq} .

Construction and Delivery Traffic

There may be up to 150 heavy vehicles per day at the peak of construction works while earthworks and platform construction are carried out.

During the peak construction period there will typically be up to 5 truck movements per 15-minute period during daytime hours Monday - Saturday. The calculated sound level for this traffic is 59 dB L_{Aeq} for a dwelling with a 20-metre setback from Old Coach Road.

Noise Effects

The context of this noise can be estimated from measurements taken at Dwelling 9 during daytime hours. This dwelling is on Falkner Road but shares a similar proximity to SH2 as the Old Coach Road dwellings. At this property the typical daytime background noise level is between 40 and 50 dB L_{A90} . Although the ambient L_{Aeq} noise levels are not shown in this data set, they are expected to be around 5 dB higher than the L_{A90} values, or 45 - 55 dB L_{Aeq} .

In this context:

- Road construction directly in front of a given dwelling would represent an increase in noise level of 25 dB, a very significant increase lasting several days;
- Road construction along the more distant portions of the road relative to a given dwelling would represent a doubling of loudness – a substantial increase;
- Aggregate truck traffic represents a substantial increase in noise level during daytime hours for these dwellings over the limited construction period.

Mitigation Options

The noise levels emitted by the activities described above comply with the construction noise guidelines in NZS6803:1999 by a comfortable margin, with the exception of roadway widening when directly in front of a dwelling. The details of these noise levels are described in sections 4.2 and 4.3 of the Mt Munro Noise Effects Assessment report, Rp 002 R03 20210951.

The degree to which noise from roadway widening will exceed these guidelines will depend on the particular works required at each portion of the road. As described above, the highest noise levels from road construction are calculated to reach 78 dB L_{Aeq} for short-term road construction activities when dwellings are within 20 metres of the road. Although this would comply with the “short term” construction noise limits, we recognise that these residents will be exposed to “long term” construction activities. This 8 dB exceedance then becomes the subject of mitigation options.

The actual noise effect will also depend on the particular circumstances of each resident, and so mitigations of this activity noise should be decided in consultation with these neighbours. Suggested mitigations are as follows:

- At a minimum, works should be coordinated with the neighbours, in case there are particular accommodations around scheduling that can alleviate the noise effects. For instance, if the house is unoccupied during the day, no actual effect would occur. Limitations on hours of operation within the construction noise management plan should be used to ensure that residents have certainty about when noise effects would arise.
- For the brief periods when activity noise exceeds the noise trigger levels of 70 dB L_{Aeq} , more significant mitigations may be warranted. This could include assisting in the temporary relocation of residents during daytime activity periods.
- To limit noise effects, the normal suite of recommendations included in construction noise management plans should be implemented – avoiding unnecessary shouting or external radio use, using non-tonal reversing alarms, maintaining equipment and particularly engine exhausts, watering equipment tracks to reduce squeaking, etc.
- If significant activity is required directly in front of a dwelling for a period longer than can be mitigated by scheduling discussions, temporary barriers can be erected to reduce the noise level received at the dwelling by up to 10 decibels.
- Minimising the noise effects can be aided by ensuring the works are carried out efficiently and quickly, to minimise the amount of time spent in front of a given dwelling.

DETAILS OF NOISE MONITORING

39. *Wind farm sound monitoring is shown in Figures 8 to 13 inclusive of the Noise Effects Assessment. The (purple) line of best fit in the night-time results is the most critical. There are often times when the background sound levels are significantly below the line of best fit showing that the areas are regularly quieter when the wind farm hub height wind speed are less than 10 m/s. Because of the spread of background sound levels, the line of best fit is not representative of these quieter times and the assessment of wind turbine noise effects in 6.2 of the Noise Effects Assessment does not reflect the true picture. To clarify the situation:*
- A. *Please justify where higher than normal background sound levels were measured at night-time or remove them from Figures 9, 11, and 13 (and subsequent charts).*
 - B. *Please advise whether the monitoring equipment used can measure sound levels below 20dBA and, if not, whether this influences the charts in 6.1 of Appendix H and/or truly describes how quiet the area is.*

The procedure for assessing “preconstruction” background noise at a wind farm site is well established in NZS6808:2010. The measurement is intended to include both natural and man-made noise received over a representative period of several weeks, but does require that “unusual” events are removed. Examples of these sounds are rainfall, cicadas or other insects, and animal noise. These events have been removed in the presented data set – by excluding daytime measurements and by manually removing events with significant rainfall.

It is expected and required that natural and anthropogenic sound which is normally present in the area – including wind in trees, noise from water, traffic, etc – are included in the data set. It would not be reasonable to select only the quiet time periods to establish an artificially low average across the measurement period. The statement of noise effects is meant to relate to the average noise environment, which in the case of these sites does include a significant number of periods where the noise level is higher or significantly higher than the quietest periods.

The monitoring equipment used (01dB Cube) has a rated self-noise of 16 dBA – meaning that the microphone contributes this level of noise to the measured values. This is typical of all noise measurement equipment used in the industry, and is well below the noise levels at which judgements of noise impacts are made.

The quietest values shown in the Figures of the noise assessment report are around 21 dBA. The quietest of these data points will have been slightly influenced by this noise floor – a reading of 21 dBA will likely represent a noise environment of 20 dBA; however, data points higher than 24 dBA will not be numerically affected by this self-noise. The overall influence of sound level meter self-noise is very small and will not materially affect the average noise levels shown by the regression curve.

This equipment (01dB Cube) is therefore fit for purpose, can measure sound levels below 20 dBA, and has accurately captured the background sound environment in the area.

OPERATIONAL NOISE EFFECTS UNDER QUIET CONDITIONS

40. *The predictions are that the night-time background sound levels are often low at wind farm wind speeds of 10m/s and less. The Noise Effects Assessment relies on compliance with NZS 6808:2010 without assessing the actual impacts of wind farm noise on the residents.*

Please undertake a FIDOL (frequency, intensity, duration, offensiveness and location) analysis of wind farm noise predicted in 6.2 of the Noise Effects Assessment against the (commonly quieter) background sound level in Figures 9, 11 and 13, including an assessment of how often the different conditions would apply and the possible noise impact on residents.

The noise effects assessment report contains a summary of the conditions under which the wind farm is a dominant or significant noise source, and describes the noise effects in terms of the reasonableness of the noise. By way of addressing the concerns of this query, a more granular approach to summarising the noise effects can be made by considering the FIDOL properties of the noise.

Of the FIDOL parameters, intensity and offensiveness may be considered in relatively simple terms. *Intensity* is reflected in the predicted turbine noise levels in Table 8 of the report. All of the “external” properties will receive noise levels of less than 40 dBA at full turbine power, which is a noise level that produces a reasonable indoor sleeping environment with respect to World Health Organisation recommendations.

The *offensiveness* of the noise is related to the character of turbine noise. Modern turbines such as provided by Siemens and Vestas are designed to minimise the tonality and low-frequency noise associated with older designs – such as exhibited by downwind rotors, active stall speed control, and turbines with poorly designed gearboxes. The character is similar to the sound of surf or wind in trees and can be described as neutral in character. Safeguards around noise character are contained in the consent conditions requiring that special audible characteristics (SAC) are tested and mitigated.

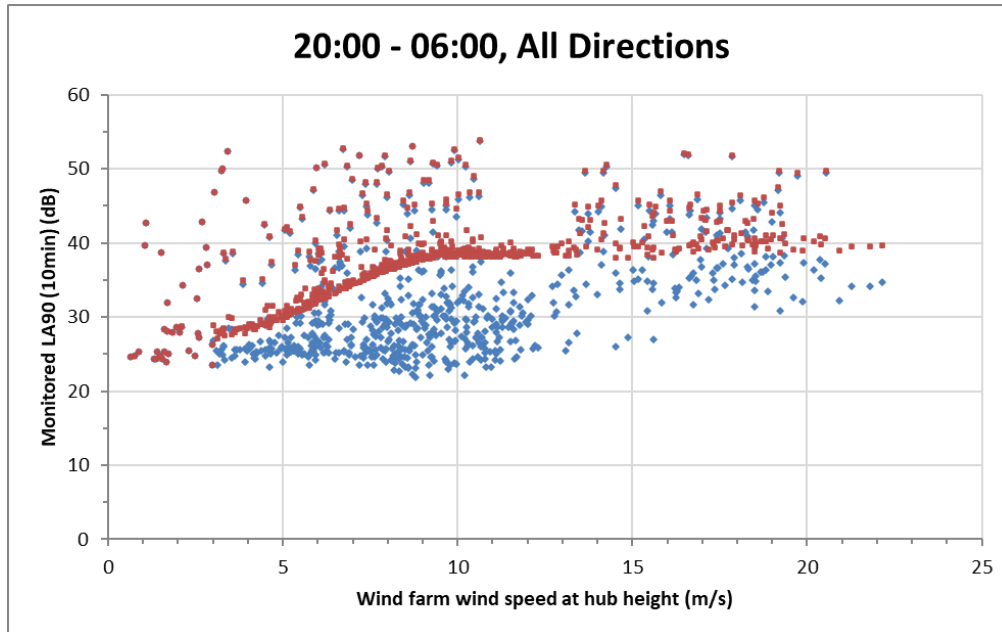
The *location* may be considered broadly in terms of the use of NZS6808:2010 and its recommendations to satisfy the objectives and policies of the District Plan. It is anticipated that some noise will arise from wind farms as a consequence of achieving renewable energy objectives, and the assessment procedure and noise limits contained in the standards has been chosen to afford that particular degree of protection in this location. More details of the *location* are incorporated into the assessment as discussed below.

Frequency and *duration* of turbine noise, and their relationship to the context specific to the *location* are wrapped into the scatter plots presented in Figures 9, 11 and 13 of the Report. These plots contain information about the range of existing background noise levels present (defining the *location*), and by comparing the predicted noise level of the turbines it is possible to describe how often the existing environment is changed (frequency of an ‘event’) by the operation of the turbines.

To provide a more complete picture of these matters, we have calculated, for each of the 10-minute background noise samples, the expected noise level that would have occurred had the turbines been in operation during these measurements, and described how frequently different ranges of noise level increase would have occurred.

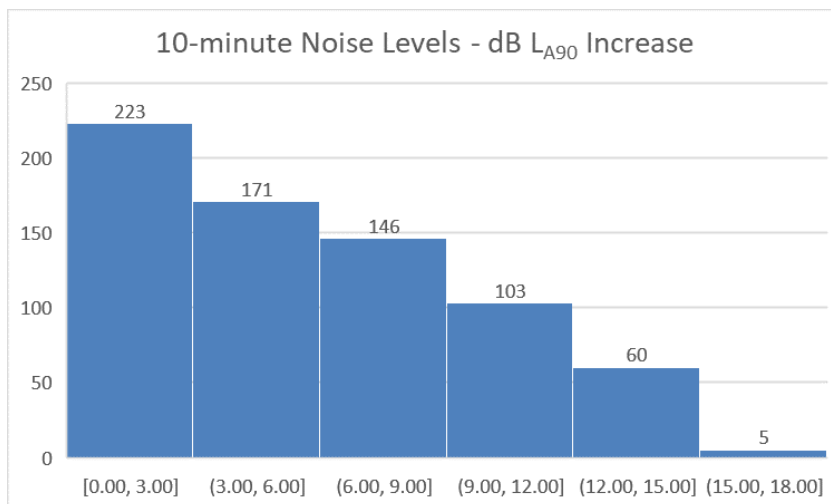
Dwelling H09

The calculated noise level at dwelling H09 is 38 dBA for the DD120 turbine running at full power. In the following figure, the background noise measurements (shown in blue) are accompanied by the calculated total background noise, plus turbine noise, that would have occurred with the wind farm constructed.



In general, the noise increase is slight at low wind speeds when the turbine output is low, and also slight when the background sound level is already high. The noise increase is significant when the turbine is operating near full power under quieter background conditions.

The following figure shows the frequency of occurrence of different degrees of noise level increase – grouped into 3 dB intervals.

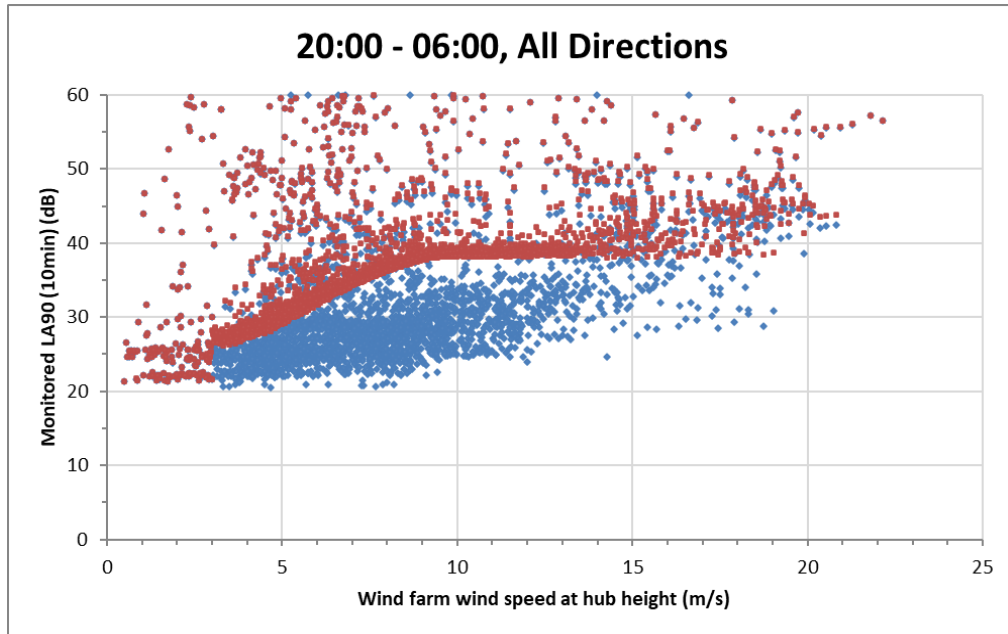


From the 708 night-time noise samples:

- 223 (31%) exhibit an undetectable increase in noise level
- 171 (24%) exhibit a discernible change
- 146 (21%) exhibit a noticeable change
- 103 (15%) exhibit a substantial change
- 65 (9%) exhibit a very significant change

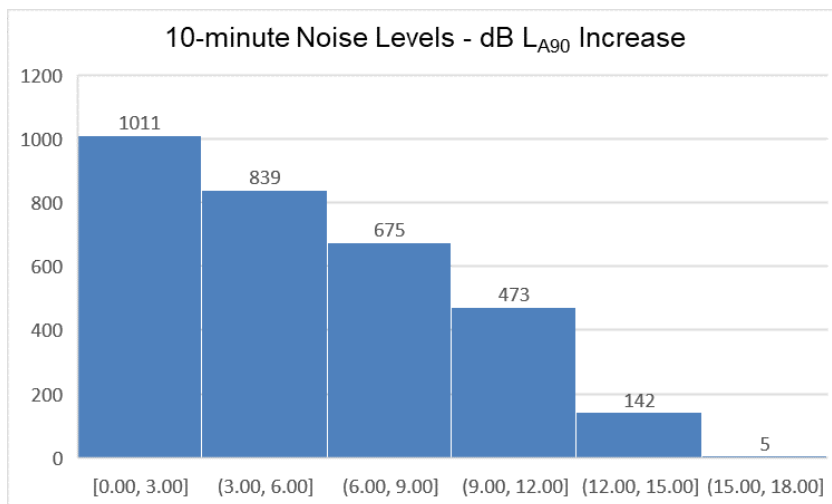
Dwelling H21

The calculated noise level at dwelling H21 is 38 dBA for the DD120 turbine running at full power. In the following figure, the background noise measurements (shown in blue) are accompanied by the calculated total background noise plus turbine noise that would have occurred with the wind farm constructed.



In general, the noise increase is slight at low wind speeds when the turbine output is low, and also slight when the background sound level is already high. The noise increase is significant when the turbine is operating near full power under quieter background conditions.

The following figure shows the frequency of occurrence of different degrees of noise level increase – grouped into 3 dB intervals.

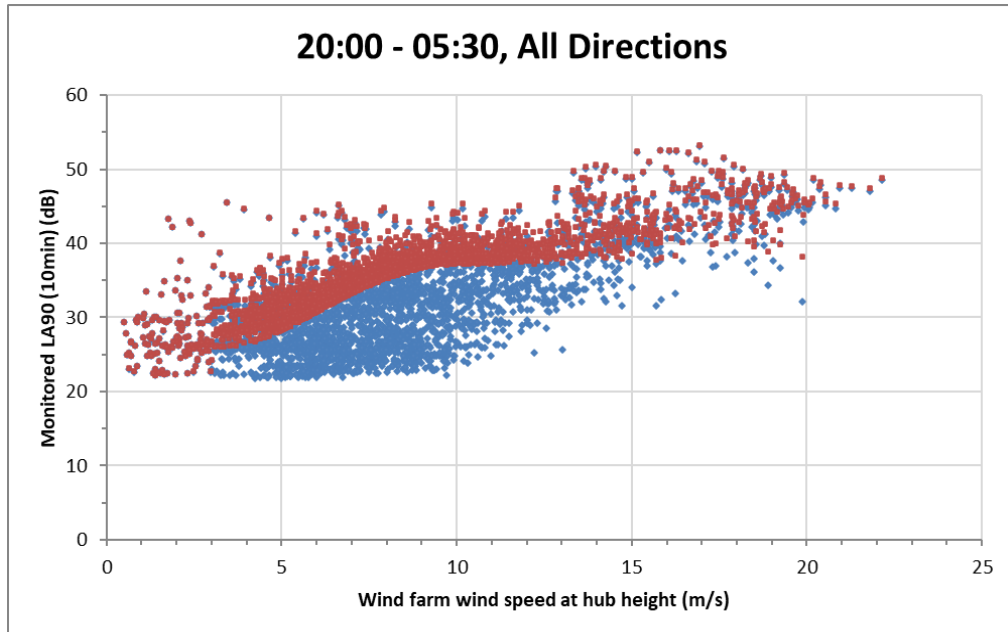


From the 3145 night-time noise samples:

- 1011 (32%) exhibit an undetectable increase in noise level
- 839 (27%) exhibit a discernible change
- 675 (21%) exhibit a noticeable change
- 473 (15%) exhibit a substantial change
- 147 (5%) exhibit a very significant change

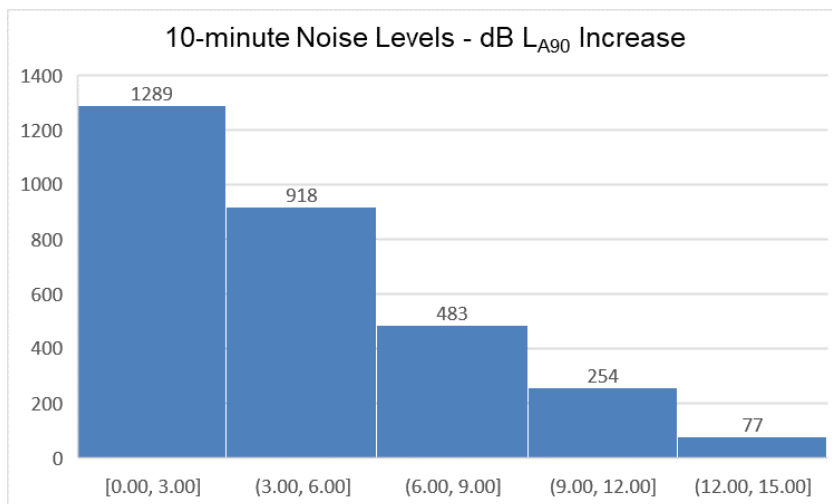
Dwelling H26

The calculated noise level at dwelling H26 is 37 dBA for the DD120 turbine running at full power. In the following figure, the background noise measurements (shown in blue) are accompanied by the calculated total background noise plus turbine noise that would have occurred with the wind farm constructed.



In general, the noise increase is slight at low wind speeds when the turbine output is low, and also slight when the background sound level is already high. The noise increase is noticeable when the turbine is operating near full power under quieter background conditions.

The following figure shows the frequency of occurrence of different degrees of noise level increase – grouped into 3 dB intervals.



From the 3021 night-time noise samples:

- 1289 (43%) exhibit an undetectable increase in noise level
- 918 (30%) exhibit a discernible change
- 483 (16%) exhibit a noticeable change
- 254 (8%) exhibit a substantial change
- 77 (3%) exhibit a very significant change

Summary of Effects

At the dwellings considered in this assessment, the wind farm would be the dominant background noise source for about 2/3 of the time – 57% for Dwelling H26 and its neighbours, and around 66% for others.

The overall noise level during these times would be consistent with noise levels anticipated by the District Plan, NZS 6808, and would meet WHO sleep criteria. We are satisfied that the noise character will not be penalizable for SAC under the criteria of NZS6808:2010. Taking these factors into consideration we do not consider the noise will be unreasonable.

CONCRETE BATCHING PLANT NOISE

41. *The Noise Effects Assessment (section 4.1.3) envisages locating the concrete batching plant at a distance of 35 metres from a dwelling when there is opportunity to maximize this separation distance. Concrete batching is a manufacturing activity with characteristics that are different to construction works e.g., it does not change its location or noise generating characteristics during the construction period.*

Is the proposed concrete batching plant noise more appropriately controlled using the relevant district plan (NZS 6802) noise limits in favour of the Construction Noise (NZS 6803) Standard given concrete batching is a manufacturing process and generates noise that is different to construction activities? If not, then what would the noise impact be on a dwelling located 35 metres from a concrete batching plant as identified in 4.1.3 of the Noise Effects Assessment?

The distinction between activities which are controlled by the construction noise standard, and those which are controlled under the permitted activity limits in the District Plan is not made on the basis of noise character, but rather on whether the activity is temporary (for the duration of the construction) or permanent. A construction activity may well retain the same location and character throughout a construction duration – for example a generator or dewatering pump which runs continuously.

In the case of concrete batching, the batching plant would only operate for a portion of the period of wind farm construction, and so is clearly a construction activity. If the batching plant were intended to continue operating after the completion of construction, for instance to service other projects, then it could be considered a permanent manufacturing activity. This is not the case.

The mention of the batching plant being able to be located as closely as 35 metres to a dwelling was only made to illustrate the setback associated with the applicable noise limit. The requirement to adopt best practicable option would still apply, and so it would be mandatory to consider alternative locations further from dwellings, which would reduce the noise received below that of the construction noise limit.

The noise effects of a concrete batching plant 35 metres from a dwelling would be significant, although they would be consistent with what is anticipated in the District Plan which uses NZS 6803:1999 to establish reasonable construction noise levels.

Similarly, if aggregate crushing were also to occur at the batching plant, or at another location within the site, a setback distance of approximately 50 metres would produce a compliant noise level of 70 dB L_{Aeq} . As with concrete batching, moving this activity further from dwellings would constitute best practicable option.

Yours faithfully

MARSHALL DAY ACOUSTICS LTD



Miklin Halstead

Associate

**APPENDIX C – MARSHALL DAY ACOUSTICS RESPONSE TO DECEMBER 2023 S92
REQUEST**

30 January 2024

Meridian Energy
Level 11
157 Lambton Quay
Wellington 6011

Attention: Lynley Fletcher

Dear Lynley

S92 RESPONSE - ACOUSTICS

I have reviewed the additional questions posed by the reviewing Council and respond as follows. In this response I refer to my Noise Effects Assessment report Rp 002 R03 20210951 as “my report”, and also to letter Lt 001 R02 20210951 as “letter Lt 001”, in which I provide some initial additional information around noise effects.

9. Many submissions raised concerns about the timing of construction noise, and the submitted noise assessment shows that some construction works would infringe the 45 dba limit for night works, Sundays and public holidays. Please confirm the proposed timing of construction works and explain if/what nightworks are anticipated and why.

The construction activity noise levels summarised in Table 5 of my Report show that most construction activities are calculated to produce less than 45 dB L_{Aeq} (the night-time / Sunday / Holiday noise limit) at most dwellings. As noted in this query, several activities exceed this limit, although all are less than the daytime construction noise limit.

There are two activities which are calculated to produce more than 45 dB L_{Aeq} – construction of internal roads and establishment of the project Village. Both of these activities relate to the initial establishment of the site, and are expected to be of limited duration (around 6-months).

Both of these activities will be constrained to weekday daytime operation. Aside from the requirement to comply with noise rules, safety and efficiency factors are relevant to this decision.

As a general comment around night-time works, there are significant costs and difficulties associated with night works and in my experience with wind farm construction these are generally only undertaken when absolutely necessary. Most notably, it is often necessary to complete the pouring of concrete in turbine foundations as a single continuous pour, and it may be necessary to do much of this at night to take advantage of lower temperatures. Turbine erection also must be completed as a single continuous activity, and may need to take advantage of still conditions at night.

Concrete pours and associated works at the 20 proposed individual turbine sites are calculated to produce less than 40 dB L_{Aeq} at all dwellings; even if all turbine sites were active simultaneously this activity would produce less than 45 dB L_{Aeq} at all dwellings. This work would therefore be in compliance with the night-time noise standard, should the work occur at night or at other times controlled by the 45 dBA noise limit.

To ensure that noise from vehicles on public roads is minimised during concrete pours, it is reasonable to require in conditions that material and machinery involved in these pours is brought to site during daylight or evening hours as best as practicable – aggregate, water, mixers – in preparation for night works.



Turbine erection produces very little noise – it is generally limited to the operation of cranes and wrenches, which I have previously observed to be inaudible at distances relevant to residential locations at Mt Munro.

10. Submissions also raised concerns around noise from the proposed concrete batching plant and aggregate crushing. Please provide an updated assessment that includes the likely location, duration of the activity in that location, and hours of operation for these activities to determine potential effects, noting these activities will not meet the definition/standard of a temporary activity under the Tararua District Plan and the Wairarapa Combined District Plan.

I have discussed the use of the concrete batching plant and the mobile aggregate crushing plant with the applicant. I understand that the mobile aggregate crushing plant would be used only to process material found on site, and that this would occur at times during the first 15 months of construction, while earthworks are underway. Most notably, this crushing operation would be limited to daytime hours.

I have measured noise from coarse and fine crushing plants used at the Harapaki wind farm site. The operation of this plant at the Mount Munro site would produce levels of 52 dB L_{Aeq} or less at dwellings – 52 dBA is calculated for dwellings with a clear view to the crushing operation, but where the view is obscured the noise level would be significantly less. This is consistent with normal daytime activities in this area, and with the daytime permitted activity noise limit, and would not cause adverse noise effects.

The concrete batching plant is expected to operate for a total of approximately 30 days over the course of construction, and would only operate during times that turbine or anemometer platforms are being constructed.

11. Conditions offered as part of the application include a Controlled Blasting Management Plan, but rock blasting has not been assessed as part of the application. Please confirm if there will be any rock blasting as part of the proposal and if so, provide an assessment of this activity.

I understand that blasting is proposed as a fallback method if discovered rock is harder than can be managed by rippers. I have observed this type of blasting at the Harapaki wind farm site, and note that noise can be very well controlled by good blasting practice, to the point that noise at 1 – 2 km from the blast site was inaudible. At Mount Munro, with dwellings around 1km from working areas, it is possible this type of blasting would be just audible, but unlikely to be easily discernible.

Blasting can be very loud when carried out in open air – for example clearing rocks from hillsides facing noise sensitive activities. The proposal does not anticipate this type of blasting.

It is prudent to require that a blasting noise management plan is required if and when the need for blasting is known. This critically requires good means of communication with neighbours around the timing and duration of blast events.

12. If the Operations & Maintenance building is proposed to be placed on the terminal substation site, please provide an assessment of its likely noise effects (noting the submitted acoustic assessment currently only assesses this building at the entrance to the core wind farm site).

I understand that the applicant is no longer considering the option of siting the O&M building at the substation.

13. Many submissions identify an issue with disturbance caused by the previous wind mast that “whistled” in certain winds. Some submissions stated that Meridian ignored complaints in relation to this. Please confirm the background to these complaints and any steps taken by Meridian, and identify any mitigation measures proposed given a taller wind mast is to be constructed.

Although I am not familiar with this issue at this site, I have observed similar noise at a different site. I also have reviewed a report prepared by Paul Botha regarding noise emissions from the mast in question.

The Botha report correctly points out that there are difficulties with measuring this type of noise during windy conditions, and draws conclusions about the likely noise level of the mast noise based on background sound measurements carried out in the area.

I note that noise from the met mast is required to comply with District Plan permitted activity noise limits, including any penalties for tonality, and it is also required that BPO is employed to reduce noise if practicable. There are technical means of reducing such noise, which likely relates to turbulence around guy wires supporting the mast. As part of taking the best practicable option to reduce noise, it is recommended to investigate the use of aerodynamic spoilers such as spiral wrappings around guy wires to minimise aerodynamic noise.

Yours faithfully

MARSHALL DAY ACOUSTICS LTD



Miklin Halstead

Associate