

In the matter of the Resource Management Act 1991

And

In the matter A notice of requirement to designate land for educational purposes
at 9 Tawa Avenue, Kaiwaka by the Minister of Education

Statement of evidence of Lindsay Mary Leitch

Acoustics

7 November 2023

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Statement of evidence of Lindsay Mary Leitch

1 Executive summary

- 1.1 I was the author of the Acoustic Assessment report (the **Report**), which supports the Notice of Requirement (**NoR**). In my Report I described the site and proposed development, as well as the nearest noise sensitive receivers to the site. My assessment considered noise from Te Kura Kaupapa Māori o Ngāringaomatariki (**Kura**) and the effects of existing noise sources on the Kura (reverse sensitivity). Noise from the proposed Kura would comprise vehicle movements during pickup and drop off times, outdoor recreational activities, including children playing, and the noise from heating, ventilation and cooling equipment (building services).
- 1.2 The Minister of Education (**Minister**) has a standard noise condition for educational establishments, which is proposed to be applied here. The condition provides relevant noise limits for the day, evening and night-time periods. The noise generated by standard outdoor recreational activities between 8 am and 6 pm is excluded due to its variability and unpredictability and the fact that assessing compliance against a noise limit would in my opinion be extremely difficult. The condition also requires that construction of the Kura and day-to-day operational noise be assessed according to relevant New Zealand standards. Building services noise is likely to be well within the Minister's noise condition at night-time, which is the most conservative limit.
- 1.3 I understand that when assessing a designation under s171 particular regard must be had to the provisions of a District Plan, but there is no requirement to comply with them. Notwithstanding this, I have assessed the proposal against the permitted noise levels within the Kaipara District Plan. Prediction of noise from children playing indicates that there is the potential for average noise levels to exceed 50 dB LAeq (the Kaipara District Plan permitted daytime noise level) within 23 m of a group of children. As such a 'buffer zone' has been identified within the site where children can be discouraged from congregating, for example through dense planting, and no provision of play equipment or seating. This 'buffer zone' is within 23 m of the notional boundary of 178 Settlement Road and 18 Vista Lane and its implementation is expected to result in noise levels at the notional boundaries of these dwellings remaining below the Kaipara District Plan level of 50 dB LAeq. A 2 m high acoustic barrier along the boundaries with these properties would have the same result. However, I understand that the preferred solution is a buffer zone due to visual amenity issues, and the fact that the large majority of this 'buffer zone' is located within an area which is heavily bushed and subject to a QEII covenant.
- 1.4 No additional points relating to noise are raised in the s42A report. The report recommends the Minister's standard noise condition, which I support.
- 1.5 In my Acoustic Report I concluded that noise generated by the proposed Kura will be reasonable and having reviewed the various submissions and the Council planner's s42A report, I still reach the same conclusion.

2 Qualifications and experience

- 2.1 My full name is Lindsay Mary Leitch. I am a Senior Acoustic Consultant at Tonkin & Taylor Ltd (T+T).
- 2.2 I hold a Bachelor of Science degree with Honours in Acoustics and Music and a Post Graduate Diploma with Distinction in Planning. I am a Member of the Acoustical Society of New Zealand and a Member of the United Kingdom's Institute of Acoustics.
- 2.3 I have 10 years of full-time experience in acoustics, with an additional four years of professional experience in the wind energy industry where acoustics was only part of my role. I have worked as an acoustic consultant in New Zealand for T+T since 2020 and AECOM (2017-2020), and in the UK for Ardent Consulting Engineers (2016-2017) and Acoustic Technology Ltd (which became part of Bureau Veritas, 2002-2006).
- 2.4 I specialise in environmental noise, with a strong emphasis on noise assessments supporting consent applications and NoRs. I reviewed noise assessments in support of resource consent applications to Auckland Council for several years, which included numerous applications for childcare centres.
- 2.5 I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's Practice Note 2023. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

3 Role in the project and scope of evidence

- 3.1 I was engaged by the Ministry of Education (**MoE**) in March 2022 to provide an acoustic assessment relating to the use of the site at 9 Tawa Avenue, Kaiwaka (the **site**) for education purposes. My report entitled Acoustics Assessment TTKM o Ngāringaomatariki Relocation and dated March 2023 was submitted to Kaipara District Council by the MoE in support of the Minister's NoR for the designation of the site.
- 3.2 In preparing this evidence, I confirm I have read the following documents:
 - (a) The section 42A report of the planning officer
 - (b) The submissions which raise issues relating to noise
 - (c) The statements of evidence of Tim Ensor (planning evidence for the Minister) and Colin Shields (transport evidence for the Minister)
- 3.3 The purpose of my evidence is to summarise my Report, and respond to matters raised by the submitters and the Council planner. My evidence is set out as follows:
 - (a) A description of acoustic terminology relevant to my evidence.
 - (b) A description of noise sensitive receivers.

- (c) A summary of the noise assessment criteria.
- (d) A summary of my assessment of noise.
- (e) An assessment of the submissions received relevant to my evidence.
- (f) An assessment of matters raised in the Council Planner's s 42A Report.

4 Acoustic terminology

4.1 The unit of noise measurement is the decibel (dB), which is a logarithmic scale. An A-weighting is applied to the decibel level, (dB(A)), to account for the frequency response of the human ear.

4.2 A range of typical sources of noise and their associated sound pressure (dB) level are shown in the following table:

Sound pressure level (dB)	Example
0	Hearing threshold
20	Still night-time
30	Library
40	Typical office room with no talking
50	Heat pump running in living room
60	Conversational speech
70	10 m from edge of busy urban road
80	10 m from large diesel truck
90	Lawn mower – petrol
100	Riding a motorcycle at 80 kph
110	Rock band at a concert
120	Emergency vehicle siren
140	Threshold of permanent hearing damage

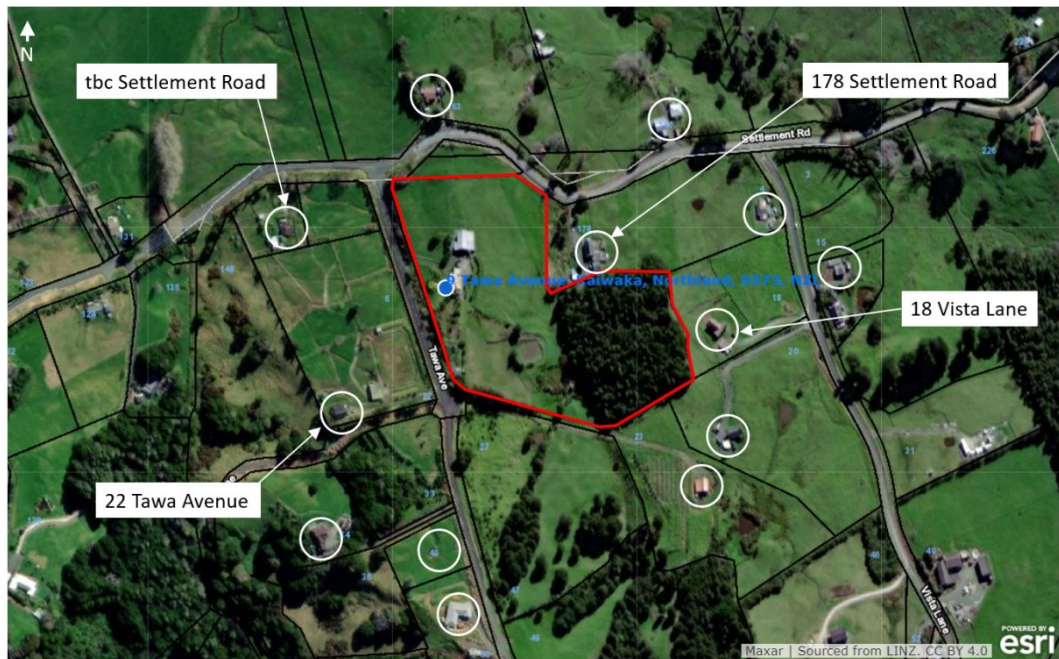
4.3 The loudness of a sound source can be described in terms of sound power level or sound pressure level. The sound power level is a measure of acoustic energy, while the sound pressure level is measured / calculated at a distance from the noise source. The sound power level of a source will always be higher than the sound pressure level from that source, and the sound pressure level will often specify a distance from the source.

4.4 Sound radiates out as pressure waves from sources of noise. Propagation of sound will be affected by absorption from hard or soft ground, reflections (for example from surrounding buildings), air attenuation and screening of the noise source or receiver. As a rule of thumb, there will be a 6 dB reduction in the level of sound from a source each time the distance doubles.

- 4.5 A change in sound level of less than 3 dB is not usually discernible, while an increase of 10 dB is perceived as a doubling of the sound level. A sound level of 70 dB is subjectively twice as loud as a sound level of 60 dB, and a sound level of 80 dB is perceived as four times as loud as a sound level of 60 dB.
- 4.6 There are different metrics for describing sound. Most common is the Leq or LAeq, which is the energy averaged sound pressure level. The LAFmax is the maximum sound pressure level, measured with a fast time weighting (F) and the A frequency weighting applied. Night-time noise limits are often specified as both LAeq and LAFmax, as maximum levels (affected by impulsive or short-term events) can cause sleep disturbance. In some cases a time period is specified, such as LAeq(15min). This is an average level over the time period specified, in this case 15 minutes. If a time period is not specified, for example an LAeq limit for the 12-hour daytime period, this is taken to mean an average level over the entire 12-hour period. In practice, noise levels within this longer time period will not be able to exceed the level by more than 5 dB, as this would affect the overall noise level. Hence 55 dB LAeq(15min) is roughly equivalent to 50 dB LAeq specified for the full daytime period.
- 4.7 In a rural zone, where dwellings may be a significant distance from the property boundary, noise is typically assessed at the notional boundary. This is 20 m from the façade of the receiving dwelling, or at the property boundary, whichever is closest to the dwelling.

5 Noise sensitive receivers

- 5.1 My report identifies the nearest noise sensitive receivers to the site using available information sources. This was limited to the properties within 200 m of the site as noise effects will normally be lower for properties further away, and therefore the receivers most likely to be affected have been taken into account. All receivers close to the site are residential. The closest receivers are 178 Settlement Road and 18 Vista Lane, where the dwellings are approximately 5 m and 20 m from the site boundary as shown in the figure below. The QEII covenanted bush is the closest part of the site to these dwellings which is likely to act as a natural restriction to the movement of children. Other dwellings are at least 60 m from the site boundary.
- 5.2 Figure showing nearest noise sensitive receivers:



6 Assessment criteria

The Minister's standard noise condition

6.1 The Minister has a standard noise condition to manage noise effects from school sites. This is proposed as a condition on this NoR. The Minister's standard condition applies the following noise limits at the notional boundary in rural zones:

- (a) 7 am to 7 pm: 55 dB LAeq(15min)
- (b) 7 pm to 10 pm: 50 dB LAeq(15min)
- (c) 10 pm to 7 am: 45 dB LAeq(15min) and 75 dB LAFmax

6.2 The Minister's condition requires that noise levels shall be measured and assessed in accordance with NZS 6801: 2008 "Measurement of Environmental Sound" and NZS 6802: 2008 "Environment Noise", and noise from construction shall not exceed the limits recommended in NZS 6803:1999 "Acoustics – Construction Noise".

6.3 The Minister's noise limits do not apply to noise from standard school outdoor recreational activities occurring between 8 am and 6 pm Monday to Saturday. I explain why this is the case later in my evidence.

Kaipara District Plan

6.4 While I understand that a designation does not have to comply with the provisions of a district plan, the noise rules within the Kaipara District Plan (**KDP**) are a relevant consideration for a decision maker assessing a designation under s171 RMA and they provide a useful comparison for assessment. As such, I consider them below.

6.5 Under the KDP, the site and all surrounding receivers are within the rural zone and the following noise levels are permitted under Rule 12.10.14:

- (a) 7 am to 7 pm: 50 dB LAeq
- (b) 7 pm to 10 pm: 45 dB LAeq
- (c) 10 pm to 7 am: 40 dB LAeq and 70 dB LAFmax

6.6 The KDP requires that noise is measured according to NZS 6801:2008 and assessed according to NZS 6802:2008. It also requires that construction noise is assessed using NZS 6803:1999.

Comparison of noise standards

- 6.7 The KDP noise limits have the same day, evening and night-time periods as the Minister's standard noise condition, with the same times specified for each.
- 6.8 The KDP noise limits are numerically 5 dB lower than the Minister's standard condition in all cases. This applies to both the LAeq and LAFmax values for all time periods.
- 6.9 The Minister's condition has an averaging period of 15 minutes, whereas the KDP rule is not specified, and is therefore assumed to be averaged over the entire assessment time period, i.e. over a 12-hour day or 3-hour evening. The Minister's limits are therefore more sensitive to short periods of noise, for example during drop off and pickup times. The implications of this are explained in Paragraph s4.6.
- 6.10 The Minister's standard condition excludes noise from outdoor recreational activities.

7 Assessment of noise

Traffic noise

7.1 As Mr Shields sets out in his evidence, the Kura is estimated to generate 111 trips during each of the peak drop-off and pick-up hours. In my Report I predicted that road-traffic noise levels on Settlement Road during each of the peak hours (8 am to 9 am and 2.30 pm to 3.30 pm) will increase by 4 dB from 48 dB LAeq(1hour) to 52 dB LAeq(1hour), which is a perceptible increase in noise level, as explained in Paragraph s7.1. A larger increase in road-traffic noise level of 15 dB is predicted along Tawa Avenue from 29 dB LAeq(1hour) to 42 dB LAeq(1hour), due to the very low levels of existing traffic (four vehicle movements in each peak hour). While this increase may be clearly perceptible for Tawa Avenue residents, the overall noise levels will remain low. A daytime sound level of around 40 dB LAeq is likely to be equivalent to the ambient noise environment generated by other traffic, natural sounds and rural activities.

Noise from children playing

7.2 The Minister's standard condition specifically excludes noise from children playing outdoors as this is highly variable and would be difficult to assess or to demonstrate compliance, as well as being problematic to enforce. Outdoor play is an inherent noise generating school activity which occurs during the least sensitive part of the day and for limited times. I support the exclusion of noise generated by outdoor play for these reasons.

- 7.3 Nonetheless, my Report makes an assessment of likely noise levels from groups of children outdoors. The assessment uses a sound power level of 90 dB LwA, which is the upper level of the range stated in the Association of Australasian Acoustical Consultants (**AAAC**) Guideline for Child Care Centre Acoustic Assessment 2.0 for a group of 10 children aged three to six years. This was used as there is no guidance around noise levels for older children and is likely to represent a worst-case noise level. This equates to a sound pressure level of 55 dB LAeq at 23 m, and 50 dB LAeq at 40 m.
- 7.4 As noise from children playing is likely to be a short-term noise event, when averaged over the 7-hour school day noise levels can be reduced by 5 dB (this is the maximum reduction due to time averaging that is allowable under NZS 6802; it is possible that actual noise levels will be lower than this.) Therefore, a setback distance of 23 m from the notional boundary of adjacent dwellings should result in 7-hour average noise levels below the Rural zone daytime limit of 50 dB LAeq.
- 7.5 A buffer zone of 23 m from the notional boundary of dwellings at 178 Settlement Road and 18 Vista Lane was calculated using GIS software. If groups of children are within this zone it is possible that average noise levels may exceed 50 dB LAeq(7hour) at the notional boundaries of these properties. Potential measures to mitigate this risk could include discouraging children from congregating within these buffer zones, for example through dense planting (such as that which already exists QEII covenanted bush) and no provision of play equipment or seating, or alternatively installation of a 2 m high noise barrier along the boundary with 178 Settlement Road and 18 Vista Lane. Either solution is expected to result in noise levels from children playing remaining below 50 dB LAeq(7hour) at all properties, however, the preferred solution is a buffer zone due to visual amenity issues, and its location relative to the existing QEII bush.
- 7.6 Figure showing buffer zone, with the large majority being located within an area which is already heavily bushed and subject to a QEII covenant:



Building services noise

- 7.7 Building services noise can be readily controlled at the outline plan stage and detailed design stage and will be designed such that it does not interfere with Kura activities. This is expected to result in very low noise levels for surrounding properties.

Construction noise

- 7.8 Construction noise is subject to higher noise limits than other noise sources during normal daytime hours. Temporary noise effects from construction are expected to be well within the daytime construction noise limits in NZS 6803:1999 and can be managed in accordance with this standard, as required by both the Minister’s standard condition and the KDP rural noise rule. In my opinion, noise effects from construction are therefore reasonable.

External noise – effects for Kura

- 7.9 The learning spaces within the Kura will be required to comply with the Minister’s Designing Quality Learning Spaces (**DQLS**) requirements, which include indoor ambient noise design levels and consideration of outdoor learning spaces. The detailed design of the Kura will need to comply with these requirements.
- 7.10 In my Report I used traffic count information provided to me by Mr Shields. I have read Mr Shields’ evidence which contains the same numbers and does not

change my assessment. The existing daily traffic flows are low, with 44 vehicle movements on Tawa Avenue and 748 vehicle movements on Settlement Road. I consider that this low level of vehicle movements is unlikely to cause any adverse noise effects within the site, especially as the Kura will need to comply with the DQLS.

8 Submissions

8.1 Submissions have been made on the following matters:

- (a) Concerns around noise from the Kura negatively impacting residents' quiet rural way of life.
- (b) Noise from traffic.
- (c) Noise from after-hours events at the Kura.
- (d) The effect of noise on livestock.
- (e) Reverse sensitivity from farm machinery.
- (f) Queries around noise propagation to dwellings further from the site.

8.2 Several submissions raise concerns around noise from the school negatively impacting residents' quiet rural way of life, with different noise sources to the existing rural noise sources. I remain of the opinion that the overall scale of noise effects will be reasonable for surrounding residents.

8.3 I have addressed noise from traffic in paragraph 7.1. Although there will be a perceptible increase in traffic noise during the morning and afternoon peak hours, overall noise levels remain low and will not affect residential amenity.

8.4 There may be after hours activities on the site at times, as is typical for a school site. Noise levels from occasional events will need to comply with the Minister's standard condition and I do not anticipate any difficulty in them doing so. Accordingly, I do not consider that noise effects from events will be unreasonable for receivers.

8.5 Concerns were raised around the effects of noise on livestock being stressed by noise from the school, in particular when animals walk past the site and from traffic noise. Although there is no guidance on levels of noise suitable for avoiding stress in livestock, in my opinion the relatively low level of noise from the site activities is unlikely to adversely impact livestock.

8.6 Other rural noise sources may include background noise from State Highway 1, animals, farm vehicles and machinery. Various submissions describe the surrounding area as a quiet rural area, which is in line with my desktop assessment. No reverse sensitivity effects are expected from existing rural noise sources due to low levels of ambient noise and the requirement for learning spaces to comply with DQLS.

8.7 Although the noise assessment focusses on the closest dwellings to the site, dwellings further away would normally experience lower levels of noise effects. Noise propagation is explained in Paragraph s4.4. Noise effects for dwellings further from site are expected to be lower than those close to the site.

Substantial screening of building services plant is unlikely to be required. Surrounding receivers may hear children playing at times, but since this will typically occur during the least sensitive time of day, and noise levels are predicted to be below the KDP noise limits, I consider the effects of noise from children playing to be reasonable for all surrounding dwellings.

9 Section 42A report

- 9.1 The s42A report does not raise any additional matters relating to noise. The Minister's standard noise condition is recommended, which I support.

10 Conclusions

- 10.1 A buffer area of 23 m (preferred solution) or a 2 m high noise barrier along the boundary with 178 Settlement Road and 18 Vista Lane are recommended to ensure that noise from children playing remains below the KDP daytime noise limit of 50 dB LAeq. The 'buffer area' is almost entirely contained within the existing QEII bush.
- 10.2 Building services noise can be readily controlled at the outline plan stage and detailed design stage.
- 10.3 Traffic from the Kura will be concentrated in the morning and afternoon peak hours. The increase in traffic will be perceptible for residents along Tawa Avenue and Settlement Road due to the very low levels of existing traffic but overall noise levels are still relatively low. Overall noise effects are expected to be reasonable for residents.
- 10.4 No reverse sensitivity effects are expected from existing rural noise sources due to low levels of ambient noise and the requirement for learning spaces to comply with DQLS.
- 10.5 I conclude that the Minister's standard noise condition is appropriate to control noise from the Kura, and overall noise effects are expected to be reasonable for all surrounding receivers.

Lindsay Mary Leitch

7 November 2023