**BEFORE INDEPENDENT HEARING COMMISSIONERS**

**AT TAURANGA**

**I MUA NGĀ KAIKŌMIHANA WHAKAWĀ MOTUHAKE**
**KI TAURANGA**

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| **IN THE MATTER** | **of the Resource Management Act 1991** |
| **AND** | |
| **IN THE MATTER** | **of the hearing of submissions on Proposed Plan Change 92 (Ōmokoroa and Te Puke Enabling Housing Supply and Other Supporting Matters) (PC92) to the Operative Western Bay of Plenty District Plan (WBOPDP)** |

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# STATEMENT OF REBUTTAL EVIDENCE OF JON STYLES ON BEHALF OF KĀINGA ORA – HOMES AND COMMUNITIES

## (NOISE AND VIBRATION)

**6 SEPTEMBER 2023**

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## 1. INTRODUCTION

1.1 My name is Jon Robert Styles. I am an acoustic consultant and director and principal of Styles Group Acoustics and Vibration Consultants. I lead a team of 8 consultants specialising in the measurement, prediction and assessment of environmental and underwater noise, building acoustics and vibration working across New Zealand and internationally.

1.2 I have approximately 22 years of experience in the acoustics and noise control industry. For the first four years I was the Environmental Health Specialist – Noise at the Auckland City Council, and for the latter 18 years I have been the Director and Principal of Styles Group Acoustics and Vibration Consultants. I have a Bachelor of Applied Science (EH) majoring in Environmental Health.

1.3 I am the past-President of the Acoustical Society of New Zealand. I have completed two consecutive two-year terms as the President from 2016 to 2021. I have been on the Council of the Society for approximately 15 years. Styles Group is a member firm of the Association of Australasian Acoustical Consultants (AAAC) and I am on the Executive team of the AAAC. My role on the Executive is to oversee the development of guidelines for acoustical consultants to follow in their day-to-day work and to participate in the governance of the AAAC generally.

1.4 Most recently I have advised Kāinga Ora on similar noise-related issues (noise from road, rail and airports) in the review of the Wellington, Selwyn, Porirua, Waikato, New Plymouth, Waimakariri, Christchurch and Central Hawkes Bay District Plans. I advised the Whangarei District Council through the recent Urban and Services Plan Change process and appeal process that dealt with the District Plan provisions for managing exposure to road and rail noise.

1.5 I have worked on District Plan provisions relating to the management of road, rail and airport noise in a significant number of different processes around New Zealand.

1.6 I been directly advising the Gore District, Kaipara District, Napier City, Taupō District and Whangarei District Councils through comprehensive District Plan review processes. I assisted the Auckland Council through the development of the Auckland Unitary Plan and continue to provide advice to Auckland Council on both Council-initiated and private plan change requests. I have also assisted many private clients through plan change and review processes across New Zealand.

1.7 In preparing this evidence I have read the Section 42A reports and the evidence prepared by Dr Chiles, Mr Brown and Ms Heppelthwaite for KiwiRail.

1.8 I have worked with Ms Beneke and Ms Tait for Kāinga Ora in preparing this evidence.

**Code of Conduct**

1.9 Although this is a Council hearing, I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving evidence.

1.10 Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

**Scope of Evidence**

1.11 My evidence addresses the noise and vibration issues arising from the relief KiwiRail are seeking in respect of intensification in close proximity to the East Coast Main Trunk (**ECMT**), which passes through Ōmokoroa and Te Puke.

1.12 My evidence will address the following matters:

(a) The reasons why I generally support a requirement to acoustically treat activities sensitive to noise that locate near to the ECMT;

(b) The reasons why I support a much more refined and accurate approach for defining the extent of the rail noise controls by modelling the noise levels;

(c) The reasons why I disagree with the recommendations in the s42A Report; and

(d) The issues and costs associated with controls on rail vibration and why I support a rail vibration alert layer.

## 2. VIBRATION CONTROLS FOR RAIL

2.1 In my experience, vibration effects extending beyond the rail corridor at a level requiring some degree of control is reasonably common. The movement of laden freight trains is generally responsible for the highest vibration levels. Passenger trains typically generate lower vibration levels due to their lower mass and better suspension (put simply). I understand that passenger trains are infrequent on the ECMT.

2.2 The vibration that is felt outside the rail corridor is highly variable and the attenuation of rail vibration over distance is very difficult to predict. The vibration levels are dependent on a wide variety of factors, such as rail and rolling stock condition, train speed and laden weight, ground conditions, topography, the type of building it is affecting, it's foundations and overall mass, and other factors.

2.3 The s42A Report recommends that no controls be adopted to manage the vibration effects. I note that the Council does not appear to have sought advice from a vibration expert on this issue.

2.4 The evidence for KiwiRail seeks the addition of specific rules and standards that require the receiving environment to manage the

potential and variable effects of vibration generated by the ECMT, without any provisions or controls that would require KiwiRail to minimise the generation of vibration at the source (inside their designations).

2.5 Importantly, the controls proposed by KiwiRail would only apply to any new development. The controls will not have any effect on the potential adverse health and amenity effects already experienced by the existing communities.

2.6 I consider that the adoption of the Best Practicable Option[1] (**BPO**) to manage vibration effects on existing communities could easily justify improvements to and changes in the operation of the network. This could include a range of measures including slowing freight trains down when they pass through residential communities at night. Vibration reduction measures might be the BPO if there was an existing vibration issue affecting the existing community.

2.7 The adoption of such measures could reduce the need for and extent of vibration controls in the receiving environment for new development, particularly where intensification is anticipated.

2.8 The controls sought by KiwiRail essentially require that vibration generated by rail traffic does not exceed a level of 0.3 mm/s $V_{w95}$ when measured inside a range of defined noise / vibration sensitive activities.

2.9 The controls sought by KiwiRail require the landowner / developer to carry out vibration measurements of at least 15 laden freight train pass-bys operating at normal speeds and under normal conditions to determine whether there is a vibration issue at the proposed building platform, and then to carry out whatever mitigation measures might be necessary to ensure that the design level is complied with on the floor of habitable spaces.

2.10 I consider that the highly dynamic nature of any potential issues means that dealing with the potential issue in the receiving

[1] As defined by the Resource Management Act 1991

environment becomes highly uncertain, expensive and potentially highly inefficient.

2.11 The design, construction and compliance costs of implementing the indoor vibration controls will be significant and have not been quantified by KiwiRail. The evidence from Dr Chiles and Ms Heppelthwaite mention cost and acknowledge that the vibration controls could create new costs, but they do not assess how significant those costs could be and how they might affect development.

2.12 In my experience, the costs of managing vibration in the receiving environment are generally significant.

2.13 I detail the costs of the various assessments in **Appendix A** of this evidence. These are based on my experience of working with similar controls elsewhere in New Zealand.

2.14 In my view, the potential for indoor rail vibration controls and design limits should only be considered if there is relevant and robust evidence on the actual and likely effects of rail vibration beyond the boundaries of KiwiRail's rail corridors and across land where intensification is anticipated. Such evidence would need to address:

(a) Whether the adoption of the BPO and KiwiRail's own policies for managing vibration effects (particularly in existing communities) would still result in vibration levels outside the rail corridor regularly or typically exceeding a level of 0.3mm/s $V_{w95}$ and if so why, at what level and at what distance;

(b) Whether or not it is typical for rail vibration levels to exceed 0.3mm/s $V_{w95}$ in buildings on land where the WBPDP provides for the development of noise sensitive activities, after the adoption of the BPO inside the corridor;

(c) If so, what are the typical vibration levels and adjacent to what parts of the rail network do they arise;

(d) Are different standards appropriate for different sections of the railway network, such as where train speeds are low; and

(e) Even if the evidence does demonstrate that vibration levels exceed 0.3mm/s $V_{w95}$ on land where intensification is anticipated, have the potentially significant costs and the benefits of the controls been properly assessed.

2.15 Ms Heppelthwaite proposes the 'rail vibration alert overlay' as an alternative method for managing vibration effects. This option would alert development to the potential adverse effects of rail vibration but does not impose any requirement to measure, predict and mitigate vibration effects in the receiving environment. This option creates awareness of the issue but avoids the potentially significant costs of achieving a set vibration level.

2.16 I support the alert overlay in this instance.

## 3. NOISE CONTROLS FOR RAIL

3.1 I generally support the concept of rail noise controls in the receiving environment as proposed by KiwiRail.

3.2 The s42A Report states that no change to the ODP provisions is required and that no specific rail noise controls should be adopted. I disagree with the s42A report. I consider that specific rail noise controls should be adopted and that the ODP provisions are unclear and uncertain and will not adequately deal with the effects of rail noise.

3.3 Even though I support the concept of rail noise controls, I consider that the controls proposed by KiwiRail are blunt and inefficient. I consider that a considerable level of refinement is required to ensure that the controls are efficient and will not apply to land where the effects are too low to justify controls.

**Recommendations in the s42A Report**

3.4 The s42A Report does not include any assessment by an acoustics expert.

3.5 The s42A Report recommends that no specific rules for managing rail noise are required and that the provisions of the operative Rule 4C.1.3.2(c) will adequately manage the issue.

3.6 I disagree with the s42A Report's recommendations.

3.7 I agree with Dr Chiles and Ms Heppelthwaite that the provisions of Rule 4C.1.3.2(c) are problematic in many ways and are not suitable for the control of rail noise effects.

3.8 I consider that many of the specific issues with Rule 4C.1.3.2(c) make it inefficient and unworkable for situations other than rail noise as well. I therefore disagree with the recommendations for Topic One in the s42A Report as well.

3.9 My specific concerns with using Rule 4C.1.3.2(c) for the management of rail noise effects are:

(a) Rule 4C.1.3.2(c) does not specify what the external level of noise is, how it should be derived and on what basis. The controls for managing rail noise should be specific and contained in the rule to avoid the need for measurement and dispute about train speed, length and noise level. I consider that this is probably the most significant issue.

(b) The spatial extent that the rule covers is not specified. It would not be possible for a plan user or the Council to determine whether acoustic treatment for rail noise would be required or not for any particular situation, and if so, to what degree.

(c) Rule 4C.1.3.2(c) contains unclear and uncertain terms such as "potentially noise-sensitive activities" and "such as".

(d) The table of sound levels not to be exceeded is unclear and ambiguous. The reference time interval for the application of the noise levels is not clearly specified. If it were time-averaged over the day and night periods respectively (as it appears they are) these timeframes and levels are inappropriate for the management of rail noise effects.

(e) The rule applies to a range of potentially noise sensitive activities, but the sound levels in the table only apply to offices and residential units. These are inconsistent and it makes the rule unworkable for anything other than offices and residential units.

(f) Rule 4C.1.3.2(c) also requires that where windows and doors need to be closed to achieve the internal noise levels, the rooms only need to be ventilated to meet the requirements of clause G4 of the New Zealand Building Code. It is well-accepted in New Zealand that this is insufficient for allowing people to remain cool, comfortable and healthy. I consider that current best-practice would see the ventilation and cooling requirements upgraded considerably to ensure they are fit for purpose and will achieve appropriate outcomes.

3.10 For these reasons, I disagree with the recommendations in the s42A Report and I consider that controls more like those sought by KiwiRail are appropriate.

**KiwiRail's proposed controls**

3.11 KiwiRail seek a set of noise controls that are specific to managing the effects of rail noise. I agree with KiwiRail that a specific set of controls is appropriate in this case.

3.12 However, I consider that the controls proposed by KiwiRail are inefficient and relatively blunt.

3.13 I consider that the main issue is the standard setback distance of 100m where the controls will apply. I consider that this will apply the controls to land that is not affected by noise to the degree that controls are necessary. This will force developers and homeowners through a process that will be unnecessary. Such a process would be even more complicated and inefficient if the recommendations in the s42A Report are adopted.

3.14 I consider that the standard setback distance incorporates potentially significant inefficiencies by ignoring a range of factors that can influence the rail noise level at any particular property. These factors include:

(a) Train speed on each part of the network;

(b) Screening by topography (which is significant in some parts of the Western Bay of Plenty District);

(c) Screening by buildings;

(d) The effects of tunnels, bridges and other structural features.

3.15 For example, the ECMT passes through Ōmokoroa in a significant cutting. This will significantly reduce noise levels from the rail pass-bys, and especially from the rolling stock at the bottom of the cut. However, it may not screen the exhaust noise from the locomotive very well.

3.16 These factors will reduce the extent of land affected by rail noise but may complicate the application of KiwiRail's proposed compliance pathway where an applicant can demonstrate that their site is screened from the railway line up to a height of 3.8m.

3.17 I consider that the most efficient and appropriate way of defining the extent of the rail noise controls is to model the propagation of noise using computer sound modelling.

3.18 My experience is that this will have the effect of significantly reducing the spatial extent of the controls overall, and especially where there is more complex topography and screening effects.

3.19 I consider that the noise from the entire corridor should be modelled in this way to define the extent of the controls.

3.20 I consider it likely that most applicants seeking to develop more than one property (say for a subdivision) would engage an acoustic expert to conduct the modelling if it is not completed now. I therefore consider that not completing it now is simply passing on the cost to developers to demonstrate that the controls might not be reasonable or required across the land they want to develop. This would incur costs for the applicants and the Council at each occurrence, and it would create unnecessary uncertainty in the process arising from differing interpretations of the rules and modelling requirements, and different approaches by different consultants.

3.21 I consider that the computer noise modelling exercise should be undertaken now. It could be limited to the areas where intensification is being provided for.

3.22 I consider that such modelling is relatively straightforward given the easily accessed and reliable LIDAR terrain and other digital spatial data.

3.23 I consider that relying on modelled noise level contours prepared and incorporated into PC92 now, rather than a standard metric setback distance, ensures the burden of assessment mitigation does not extend any further into the community than is absolutely necessary.

3.24 Other than the fact that i do I do not support the standard setback distances, I generally support the provisions and definitions proposed by KiwiRail.

3.25 However, I consider that some minor amendments should be made to the controls proposed by KiwiRail. These include:

(a) The level of rail noise is not specified, and it should be;

(b) The methods for determining the rate of noise level attenuation over distance is not specified, and it should be;

(c) The requirements for mechanical cooling and ventilation to allow people to remain cool, comfortable and healthy in closed rooms are not specified, and they should be.

## 4. CONCLUSION

4.1 I have considered the application of rail noise and vibration controls for the Western Bay of Plenty district. My overall views are:

(a) The cost and complexity of the rail vibration controls and indoor vibration limit sought by KiwiRail are significant;

(b) I generally support the 'rail vibration alert layer' as proposed by KiwiRail;

(c) I disagree with the s42A Report that rail noise controls are not necessary;

(d) I consider that the recommendation in the s42A Report to maintain the operative provisions is quite problematic. I consider that Rule 4C.1.3.2(c) has a number of issues that make it inappropriate for managing rail noise (and any other noise sources in the District);

(e) I generally support the application of separate rail noise controls as sought by KiwiRail, with some important caveats:

(i) The spatial extent of the controls needs to be defined by noise modelling now – especially in areas where intensification is anticipated;

(ii) The source levels of rail noise need to be defined in the rule;

(iii) The methods for defining the attenuation of noise over distance need to be specified; and

(iv) The performance standards for mechanical cooling and ventilation should be specified for situations where the indoor noise levels can only be achieved where windows and doors need to be closed.

**Jon Styles**

**6 September 2023**

## APPENDIX A – Brief note on the cost of noise and vibration mitigation

In my experience, the costs of complying with the proposed noise standards may include:

1) Acoustical design work to achieve the specified internal noise levels. This is generally straightforward and for a typical dwelling the cost would generally be between $500 and $1000 +GST.

2) Additional construction costs to achieve the specified internal noise levels, such as thicker glass or double-glazing, a heavier façade materials, sarking under the roof, additional layers of plasterboard, solid core doors in the façade. Based on my experience, the extra costs of building materials and labour can be significant (>$50,000 +GST) for dwellings very close to major roads or dwellings close to railway lines. The cost is typically less for a new-build compared to retrofitting insulation to an existing building.

3) Installing mechanical cooling (air conditioning) and a mechanical fresh air supply to enable people to keep their windows and doors closed to keep the noise out. In my experience the cost of this ranges considerably based on the size of the building and the number of rooms. For a typical single-level dwelling, it is my experience that either a ducted heat pump system would be required, or a system comprising at least two indoor high-wall or cassette units, as well as a one or more small, silenced fans to provide an exchange of fresh air. In my experience, the cost of these systems can range from approximately $1000 +GST for the supply and install of a fresh air fan, (or fans) where air conditioning is already proposed, or $10k to $20k +GST for an air conditioning system and silenced fans where none were otherwise proposed.

4) Resource consent processes. The estimation of these costs is beyond my area of expertise.

The cost of meeting the proposed vibration standards is generally much greater than for noise.

If a new noise sensitive activity or an alteration to an existing noise sensitive activity is proposed within the vibration effects area where vibration limits must be complied with, the following procedure would generally be necessary:

1) The applicant would need to engage a suitably qualified vibration expert to carry out vibration measurements at the location of the proposed noise sensitive activity.

2) The vibration measurements would need to capture at least 15 pass-bys of the vibration source of interest. If it were for road vibration, the measurements could probably be conducted in a few hours (to capture 15 trucks in the lane(s) of interest).

3) If it was rail vibration, the seismograph would need to be set up and left for several days to capture 15 freight train pass-bys. The time and cost of this work would be significant. The instrument would need to be secured and a power source arranged for the week or two of measurements required. This may include solar power, and in some instances additional secure enclosures if the site is otherwise open.

4) The rail network would need to be operating normally with no temporary speed restrictions for maintenance or other reasons in place, and the trains being measured would need to be laden. These factors can be difficult to determine.

5) The pass-by data would need to be analysed against the requirements of NS8176E and a brief report prepared that sets out the measured vibration levels and confirming whether the vibration levels in the proposed noise sensitive activity would be less than 0.3mm/s $V_{w95}$.

Based on my experience, the cost of an initial vibration assessment would be in the order of $3k to $4k +GST. There are few consultants with the necessary equipment and expertise to do this work in New Zealand, so it is likely that many assessments would be completed by consultants from outside the region.

The cost of a rail vibration assessment would be considerably greater given the likelihood that the assessment period would be for at least several days or a week and potentially longer. I estimate that the cost of a rail vibration assessment would be in the order of $5k to $8k +GST, and possibly more if security, solar panels and extensive travel is required.

If the vibration assessment demonstrates that the vibration level in the proposed noise sensitive activity will be greater than 0.3mm/s $V_{w95}$, the options for the applicant would generally be:

1) Isolate the building from the ground vibration by using base isolation techniques. My experience is that the cost of this treatment would typically be $100k +GST for a single-level dwelling on top of the cost of the build itself.

2) Build a larger building from heavy masonry construction. The additional mass of the structure (compared to a lightweight structure) would assist in reducing the vibration level inside the noise sensitive activity. This option is high-risk and, in my experience, high-cost compared to normal dwelling construction methods and materials.

3) Abandon the proposal due to cost. In my experience, this option is commonly adopted when applicants find out the true cost and difficulty of dealing with the vibration issues. Often this happens when the design of the building is well-advanced and considerable time and cost has already been expended.

In my experience, option (3) above is often found to be the only viable option.

In some cases, the applicant has only found out the implications of the vibration controls after resource consent has been granted. The vibration assessment might be required by a condition of consent to be addressed before the building is occupied. By the time the vibration survey has been undertaken and results provided, plans to build are well underway and construction has started in some cases. My experience is that this has led to the abandonment of the development in some cases and significant financial losses.