UNDER	the Resource Management Act 1991 ("**RMA**")
IN THE MATTER	of the Proposed Porirua District Plan
HEARING TOPIC	Hearing Stream 4 - Noise

STATEMENT OF EVIDENCE OF JON ROBERT STYLES ON BEHALF OF KĀINGA ORA-HOMES AND COMMUNITIES

NOISE AND VIBRATION

21 January 2022

ELLIS GOULD
LAWYERS
AUCKLAND

Level 17 Vero Centre
48 Shortland Street, Auckland
Tel: 09 307 2172 / Fax: 09 358 5215
PO Box 1509
DX CP22003
AUCKLAND

REF: Douglas Allan / Alex Devine

1. EXECUTIVE SUMMARY

1.1 My full name is Jon Robert Styles. I am an acoustic consultant, director and the principal of Styles Group Acoustics and Vibration Consultants.

1.2 I am providing noise and vibration evidence on behalf of Kāinga Ora-Homes and Communities (**Kāinga Ora**) in relation to the submissions and further submissions it made on the Proposed Porirua District Plan (**PDP** or **Plan**) (insofar as they relate to this hearing).

1.3 My evidence relates to the PDP standards relating to noise sensitive activities adjacent to State Highways and the North Island Main Trunk railway line (NIMT) (the **road and rail network**) and the relief sought in the submissions of KiwiRail and NZTA (**the Transport Authorities**).

1.4 The overarching objective of my evidence is to promote an integrated and tailored approach to managing land transport noise, to inform the development of District Plan provisions that accurately, effectively and efficiently respond to the management of effects from land transport.

1.5 It is well accepted and globally recognised that exposure to noise from road, rail and air transport infrastructure, industry, ports commercial activities and a variety of other sources has the potential to generate high levels of annoyance and adverse health effects if it is not managed carefully.

1.6 In 2018, WHO published the Environmental Noise Guidelines for the European Region[1] (**the 2018 Guidelines**). The 2018 Guidelines provide strong recommendations to implement measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. The 2018 Guidelines state[2]:

> *"For average noise exposure, the GDG[3] strongly recommends reducing noise levels produced by road traffic below 53 dB Lden[4], as road traffic noise above this level is associated with adverse health effects.*

---

1 https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

2 Section 3.1 of the 2018 WHO Guidelines.

3 The Guideline Development Group.

4 Day-evening-night equivalent sound level. This represents the average sound level over a 24 hour period, with a penalty of 5 dB added for the evening hours or 19:00 to 22:00, and a penalty of 10 dB added for the nighttime hours of 22:00 to 07:00. A level of 53dB L_{den} is approximately equivalent to a level of 48dB $L_{Aeq(24hr)}$

For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night time below 45 dB Lnight, as road traffic noise above this level is associated with adverse effects on sleep.

To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure."

1.7 In my opinion, the road traffic volumes, vehicle speeds and rail volumes in the Porirua district are such that noise levels are likely to exceed the WHO Guidelines for a significant number of existing noise sensitive activities that are close to the transport infrastructure. I expect that the WHO Guidelines will be exceeded by significant margins in some cases.

1.8 The most effective way of addressing noise and vibration effects is through the application of controls or requirements on the land transport infrastructure itself to reduce the effects at or near the source. That approach benefits the broader receiving environment and not just the indoor environment of new dwellings or other new buildings that are subject to specific controls.

1.9 I consider that there are three primary methods of reducing the effects:

(a) Reducing the effects at the source (and potentially in the existing receiving environment) as part of the construction of new or altered roads or rail

(b) Reducing the effects at the source (and potentially in the existing receiving environment) as part of a prioritised effort to reduce noise effects from existing roads and rail networks

(c) Requiring new and altered noise sensitive activities establishing close to roads and rail to be developed appropriately.

1.10 I consider that it is reasonable for the Transport Authorities to be required to mitigate their noise effects on the existing receiving environment, where:

(a) The noise levels are already unreasonable (i.e. above the WHO Guidelines) and

(b) Where practicable options exist to reduce noise levels.

1.11 Depending on context, the options can include:

(a) Changing the pavement to a low noise surface;

(b) Finding an alternate route for heavy vehicles, especially at night;

(c) Controlling engine braking by prohibition, especially at night;

(d) Reducing the speed limit or reducing the speed of freight trains;

(e) Installing noise barriers; and

(f) Offering to pay for acoustic insulation treatment for existing noise sensitive activities (in the same way that airports and ports are required to do).

1.12 In my view, the focus on mitigating transport noise effects in the receiving environment should only be applied where the noise effects extend beyond the designation boundaries at a level that is unreasonable after the BPO has been adopted at the source.

1.13 I do not support the use of Standard Effects Areas as they are adopted by the PDP. In my view, any controls applying to the receiving environment need to be drafted and applied based on a strong evidential basis of the effects.

1.14 I consider that the method for defining the extent of the effects beyond the designation boundaries should be accurately mapped and defined to minimise the burden on the receiving environment.

1.15 I am aware that Waka Kotahi holds noise contour information for the Transmission Gully project within the Porirua district, and I am aware that it holds noise contour information from the National Road Noise Mapping project. I consider that this information should be used to inform the extent of the road traffic noise provisions in the PDP.

1.16 In terms of rail noise, I consider that it would be a relatively simple task for KiwiRail to prepare and produce noise level contours for rail traffic through the Porirua network. The modelling process is relatively straightforward, with

topographical data, building data and rail centrelines available from a variety of sources.

1.17 The provisions sought by the Transport Authorities and as supported in-part by the s42A Report are focused heavily on avoiding reverse sensitivity effects on the transport networks. I have not been able to find any examples of reverse sensitivity effects arising in the submissions or in the S42A Report. I am not aware of any reverse sensitivity effects arising on transport networks of this nature anywhere in New Zealand. In my view, this focus is incorrect.

1.18 I consider that the focus of these controls should be to avoid exposing people to unreasonable levels of noise from the operation of the transport infrastructure. It is my experience that if the noise levels are managed to be reasonable, there can be no legitimate reverse sensitivity effect.

1.19 My reading of the s42A Report and Section 32 Evaluation Report (the s32 Report) is that the cost of the various assessments and treatments required by the proposed provisions have been considered only sparingly, and in some cases not at all.

1.20 I consider that no controls are necessary in respect of road vibration.

1.21 I consider that controls on rail vibration may be appropriate, but only if KiwiRail relevant and robust evidence to properly demonstrate the nature and extent of the adverse vibration effects extending beyond its own boundaries after the BPO has been adopted to internalise it as far as practicable. Once that information is available, a more tailored and efficient control can be developed for the PDP, if required.

1.22 I consider that the ideal set of controls for the PDP would include:

(a) A policy framework that recognises that managing adverse noise and vibration effects is a shared responsibility between the Transport Authorities and the occupiers of the receiving environment.

(b) Provisions that require the Transport Authorities to identify areas of their networks where the adverse noise effects on existing noise sensitive activities are unreasonable or above levels that are acceptable for health and amenity, and to prioritise the implementation of noise mitigation

measures at the source as the first priority, then in the receiving environment as the second priority;

(c) Acoustic insulation and mechanical ventilation controls for new and altered noise sensitive activities based on noise level predictions for the Porirua road and rail network, taking into account predicted traffic and rail volumes, topography, noise barriers that have been constructed and any other relevant local feature;

(d) Provisions that require the Transport Authorities to monitor and manage vibration effects arising from their network operations.

1.23 In my view, this arrangement is essentially the same as that applied to ports, airports and other significant noise-generating activities around New Zealand.

2. INTRODUCTION

2.1 My full name is Jon Robert Styles. I am an acoustic consultant and the director and principal of Styles Group Acoustics and Vibration Consultants. I lead a team of seven consultants specialising in the measurement, prediction and assessment of environmental and underwater noise, building acoustics and vibration.

Experience

2.2 I have approximately 21 years of experience in the industry, the first four as the Auckland City Council's Environmental Health Specialist – Noise, and the latter 17 as the Director and Principal of Styles Group.

2.3 I hold a Bachelor of Applied Science majoring in Environmental Health and I have completed the Ministry for the Environments' Making Good Decisions programme.

2.4 I am the immediate Past-President of the Acoustical Society of New Zealand having completed two full terms. Prior to being elected as the President I was the secretary and on the Council of the Society for 8 years.

2.5 I have extensive experience advising on the management of noise and vibration effects within and between land uses, including the construction, maintenance and operational noise effects of major and strategic transport infrastructure

(including port, road, air and rail) and the protection of strategic industry and transport infrastructure by achieving reasonable noise levels in the community.

2.6 I have been involved a significant number of plan reviews, plan changes and master planning processes across New Zealand. Specific assignments relevant to this evidence include:

(a) The Auckland Council's witness through the development of the High Land Transport Noise Overlay in the AUP, and all other noise-related topics in the AUP (except for airports).

(b) Advising Councils on several recent District Plan reviews, including the Whangarei Urban and Services Plan Change and whole of plan reviews for Taupō, Napier and Kaipara.

(c) Providing advice on numerous public and private plan changes involving land exposed to road and rail noise, including recommendations for appropriate acoustic mitigation response.

(d) Noise and vibration measurements, on a significant number of resource consent applications involving activities sensitive to noise (**ASN**) being established adjacent to various forms of transport infrastructure

(e) A large number of projects around New Zealand involving road traffic noise and the application of New Zealand Standard NZS6806:2010 *Acoustics – Road Traffic Noise – New and Altered Roads (NZS6806*). A number of these projects have been Roads of National Significance (**RoNS**) and include the Southern Corridor Improvements, Te Atatu Road widening, Lincoln Road Corridor Improvements, Ellerslie and Takanini Noise Walls, Mill / Redoubt Road, SH1 Whangarei Improvements, SH12 Matakohe Bridges, CSM2 & MSFRL (Christchurch Southern Motorway Stage 2 & Main South Road Four Laning), Mackays to Pekapeka, Waikato Expressway (numerous sections), Southern Links Hamilton, Central Motorway Junction, AMETI, Victoria Park Tunnel, Waterview Connection, St Lukes Interchange, SH16 Causeway, Puhoi to Warkworth, the East West Link, Penlink, Northern Corridor Improvements, Warkworth to Wellsford and many others.

(f) I have given evidence before several Boards of Inquiry on road traffic noise effects including providing advice direct to the Board.

2.7 I was an employee of the Porirua City Council working from their office in 2000. I have spent a considerable amount of time in the district, and I am familiar with the transport network.

2.8 I have, and continue to provide, acoustic advice to accompany Kāinga Ora's submissions to several other plan reviews and plan changes across New Zealand. These include Waikato, Selwyn, Palmerston North, Tauranga and Christchurch.

Involvement in the Porirua Plan Review

2.9 I have been engaged by Kāinga Ora to prepare this statement of evidence to address the PDP standards relating to noise sensitive activities adjacent to railway corridors and the state highway network, the recommendations contained in the s42A Report and the relief sought by the Transport Authorities.

2.10 The overarching objective of this input is to promote an integrated and tailored approach to managing land transport noise, to inform the development of District Plan provisions that accurately, effectively and efficiently respond to the management of effects from land transport.

Code of Conduct

2.11 I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving evidence. 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.

3. IMPORTANCE OF MANAGING NOISE EFFECTS

3.1 I have set out several sections in this evidence to provide context for the controls generally, to explain the effects that arise, the different methods available to mitigate effects and to explain what I consider to be the best options for the PDP controls.

4. ADVERSE HEALTH EFFECTS

4.1 I consider it important that the reasons for managing the community's exposure to transport noise are clearly understood.

4.2 It is well accepted and globally recognised that exposure to noise from road, rail and air transport infrastructure, industry, ports commercial activities and a variety of other sources has the potential to generate high levels of annoyance and adverse health effects if it is not managed carefully.

4.3 The World Health Organisation (**WHO**) has published many policies and studies documenting extensive investigations into the effects of noise exposure on people, estimating the burden of disease from environmental noise[5] and quantification of healthy life years lost as a result of exposure to environmental noise[6].

4.4 The 1999 WHO Community Noise Guidelines[7] was the first major international large-scale document addressing the effects of noise on large populations.

4.5 In 2011, WHO published the "Burden of Disease from Environmental Noise"[8] that quantified the healthy years of life lost in western European countries as a result of exposure to environmental noise[9]. The study identified that least 1 million healthy life years[10] are lost every year from exposure to transport noise in the western European countries[11]. The study provided sufficient evidence (from large-scale epidemiological studies) to link the exposure to environmental noise with adverse health effects, including annoyance[12], tinnitus, sleep disturbance, cognitive impairment in children and cardiovascular disease. The

---

5 WHO Regional Office for Europe (2012). Methodological guidance for estimating the burden of disease from environmental noise. Copenhagen,

6 WHO Regional Office for Europe (2011). Burden of disease from environmental noise: quantification of healthy life years lost in Europe. Copenhagen,

7 WHO, Geneva, (1999), Guidelines for Community Noise, Berglund B, Lindvall T, Schwela D H.

8 https://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf

9 WHO Regional Office for Europe (2011). Burden of disease from environmental noise: quantification of healthy life years lost in Europe. Copenhagen

10 This is measured in 'DALYs". DALYs are the sum of the potential years of life lost due to premature death and the equivalent years of "healthy" life lost by virtue of being in states of poor health or disability - WHO Burden of disease from environmental noise

11 Comprised of 61 000 years for ischaemic heart disease, 45 000 years for cognitive impairment of children, 903 000 years for sleep disturbance, 22 000 years for tinnitus and 654 000 years for annoyance.

12 High annoyance is not classified as a disease in the International Classification of Disease (ICD-9; ICD-10), it does affect the well-being of many people and therefore may be considered to be a health effect falling within the WHO definition of health as being a "state of complete physical, mental and social well-being".

2011 study identifies road-traffic noise as the most prevalent source of environmental noise, with the largest contribution to the burden of disease due to noise.

4.6 The 2011 study found that sleep disturbance and annoyance, mostly related to road traffic noise, constitute the bulk the burden of disease. Available assessments place the burden of disease from environmental noise as the second highest after air pollution.

4.7 In 2018, WHO published the Environmental Noise Guidelines for the European Region[13] (**the 2018 Guidelines**). The purpose of the 2018 Guidelines are to provide robust public health advice to drive policy action to protect communities from the adverse effects of noise. The guidelines provide recommendations for protecting human health from exposure to environmental noise originating from various sources, including exposure to road-traffic noise.

4.8 The 2018 Guidelines provide strong recommendations to implement measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. The 2018 WHO Guidelines state[14]:

> *"For average noise exposure, the GDG[15] strongly recommends reducing noise levels produced by road traffic below 53 dB Lden[16], as road traffic noise above this level is associated with adverse health effects.*
>
> *For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night time below 45 dB Lnight, as road traffic noise above this level is associated with adverse effects on sleep.*
>
> *To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the*

13 https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

14 Section 3.1 of the 2018 WHO Guidelines.

15 The Guideline Development Group.

16 A level of 53dB L_{den} is approximately equivalent to a level of 48dB $L_{Aeq(24hr)}$. Day-evening-night equivalent sound level. This represents the average sound level over a 24 hour period, with a penalty of 5 dB added for the evening hours or 19:00 to 22:00, and a penalty of 10 dB added for the nighttime hours of 22:00 to 07:00.

GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure."

4.9 The 2018 WHO Guidelines also discuss the importance of interventions to reduce road traffic noise exposure. They conclude that:

"The GDG also considered the evidence for the effectiveness of interventions. The results showed that:

- *addressing the source by improving the choice of appropriate tyres, road surface, truck restrictions or by lowering traffic flow can reduce noise exposure;*
- *path interventions such as insulation and barrier construction reduce noise exposure, annoyance and sleep disturbance;*
- *changes in infrastructure such as construction of road tunnels lower noise exposure, annoyance and sleep disturbance;*
- *other physical interventions such as the availability of a quiet side of the residence reduce noise exposure, annoyance and sleep disturbance."*

4.10 In my opinion, based on my experience and review of the Porirua network generally, the road traffic volumes, vehicle speeds and rail volumes in the Porirua district are such that noise levels are likely to exceed the WHO Guidelines for a significant number of existing noise sensitive activities that are close to the transport infrastructure. I expect that the WHO Guidelines will be exceeded by significant margins in some cases. However, I have not carried out an full objective analysis to identify the spatial extent of the issue.

4.11 My expectation is that, in terms of the recommendations of the WHO Guidelines, noise exposure to some communities in the Porirua district should be reduced, and that consideration should be given to the full range of interventions available. This is likely to be necessary to avoid adverse effects on the health of the communities.

4.12 To avoid any ambiguity, I am not suggesting that the PDP contain controls that require the WHO Guidelines to be met in all cases. Instead, I consider that a

coordinated and efficient approach is required to reduce exposure to high levels of transport noise. The WHO Guidelines provide context to measure the magnitude and seriousness of the problem.

4.13 I consider that the WHO Guidelines should be achieved as often and as extensively as is practicable to avoid the adverse effects of exposing the community to high levels of transport noise.

4.14 I consider that there are several important factors when considering how the WHO Guidelines can be achieved in this context:

(a) Traffic on the roads and trains on rail lines are a significant source of noise;

(b) Parts of the Porirua community are likely to have been exposed to noise levels well over the WHO Guidelines from these sources for a long time

(c) If traffic and rail volumes increase, it is likely that the problem will get worse with time if there is no intervention

(d) The problem exists now and affects all existing noise sensitive activities close to noisy transport infrastructure

(e) The controls proposed by the Council and the Transport Authorities will only address the problem for noise sensitive activities that are new or undergoing additions.

(f) There is no proposal to apply any controls to busy local roads (that are not state highways) where the same problems are likely to exist.

(g) There is currently no proposal to address the problem for the existing noise sensitive activities. I understand that the number of existing noise sensitive activities exposed to transport noise levels over the WHO Guidelines is significantly greater than the potential new-builds or alterations that are likely close to transport networks for the life of the PDP.

5. THE EU ENVIRONMENTAL NOISE DIRECTIVE 2002/49/EC

5.1 Following the work of the WHO, the European Union has created policies aimed at reducing exposure to environmental noise across Europe.

5.2 I set out below a series of quotes from the official websites of the European Union (**EU**) and from the EU Environmental Noise Directive 2002/49/EC (the **END**). These quotes are intended to describe the steps that the EU is taking to reduce the adverse effects associated with exposing communities to unreasonable levels of noise from transport networks and other sources.

> *"According to the findings of the World Health Organisation (WHO), noise is the second largest environmental cause of health problems, just after the impact of air quality (particulate matter)."*[17]
>
> *"Directive 2002/49/EC relating to the assessment and management of environmental noise (the Environmental Noise Directive – END) is the main EU instrument to identify noise pollution levels and to trigger the necessary action both at Member State and at EU level.*
>
> *To pursue its stated aims, the Environmental Noise Directive focuses on three action areas:*
>
> - *the determination of exposure to environmental noise*
> - *ensuring that information on environmental noise and its effects is made available to the public*
> - *preventing and reducing environmental noise where necessary and preserving environmental noise quality where it is good"*[18]
>
> *"The Directive requires Member States to prepare and publish, every 5 years, noise maps and noise management action plans for:*
>
> - *agglomerations with more than 100,000 inhabitants*
> - *major roads (more than 3 million vehicles a year)* (approximately 8200 vehicles per day)
> - *major railways (more than 30,000 trains a year)*
> - *major airports (more than 50,000 movements a year, including small aircrafts and helicopters)"*[19]

Objectives (of the END)

---

17 https://ec.europa.eu/environment/noise/health_effects_en.htm

18 https://ec.europa.eu/environment/noise/directive_en.htm

19 https://ec.europa.eu/environment/noise/directive_en.htm

1. The aim of this Directive shall be to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. To that end the following actions shall be implemented progressively:

(a) the determination of exposure to environmental noise, through noise mapping, by methods of assessment common to the Member States;

(b) ensuring that information on environmental noise and its effects is made available to the public;

(c) adoption of action plans by the Member States, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.

5.3 I consider that the END demonstrates the importance of reducing the serious adverse effects of exposure to noise and a good example of a method to achieve meaningful reductions.

5.4 I consider that a similar objective would be appropriate for the PDP.

6. GOVERNMENT POLICY STATEMENT ON LAND TRANSPORT 2021

6.1 The WHO Guidelines are relevant to New Zealand's own strategic objectives under the Government Policy Statement on Land Transport[20] (**GPS 2021**) to reduce the number of people exposed to elevated levels of land transport noise by 2031.

6.2 GPS 2021 identifies that "*the purpose of transport system is to improve people's wellbeing, and the liveability of places*"[21]. To this end, the policy statement seeks to reduce the number of people exposed to elevated levels of land transport noise.

[20] https://www.transport.govt.nz/area-of-interest/strategy-and-direction/government-policystatement-on-land-transport/

[21] https://www.transport.govt.nz//assets/Uploads/Paper/GPS2021.pdf

6.3 GPS 2021 states that "*Reduced air and noise pollution*" is a short to medium term goal that will be delivered by 2031.

6.4 Ms Williams provides further comment on the relevance of the GPS in her evidence.

7. THE METHODS AVAILABLE FOR MITIGATING THE EFFECTS

7.1 Any controls on the development of new activities sensitive to noise or additions to them can at-most form only a small part of the overall approach to managing the effects of noise and vibration from land transport infrastructure.

7.2 At best, controls requiring acoustic treatment or design solutions such as those proposed can only reduce the noise or vibration effects of rail or road traffic inside the habitable rooms of new noise sensitive activities or additions to those that already exist. They do not address outdoor amenity and do not provide any mitigation for existing noise sensitive activities.

7.3 The most effective way of addressing noise and vibration effects is through the application of controls or requirements on the land transport infrastructure itself to reduce the effects at or near the source. That approach benefits the broader receiving environment and not just the indoor environment of new dwellings or other new buildings that are subject to specific controls.

7.4 I consider that there are three primary methods of reducing the effects:

(a) Reducing the effects at the source (and potentially in the existing receiving environment) as part of the construction of new or altered roads or rail

(b) Reducing the effects at the source (and potentially in the existing receiving environment) as part of a prioritised effort to reduce noise effects from existing roads and rail networks

(c) Requiring new and altered noise sensitive activities establishing close to roads and rail to be developed appropriately.

Managing the effects at the source

7.5 I understand that the duty imposed by s16 of the RMA to avoid generating unreasonable noise applies at all times to the operators of the transport networks.

7.6 In my experience the duty is observed mostly when there is a capital works project involving the construction of a new or altered road.

New and altered roads

7.7 The provisions of NZS6806:2010 *Acoustics – Road Traffic Noise – New and Altered Roads* (**NZS6806:2010**) are helpful in that, consistent with section 16 RMA, they require the road controlling authorities to adopt the BPO to minimise the noise effects for new roads and major upgrades to existing roads. This essentially requires that for any new road or road that undergoes an alteration that will result in an increase in effects (above a defined threshold) the road controlling authority must determine the BPO for the minimisation of noise and apply the mitigation.

7.8 However the requirements of NZS6806:2010 only apply to new roads or alterations to existing roads that will generate an appreciable increase in the noise level. NZS6806:2010 does not apply to existing roads where no changes are proposed, even where the noise effects might be much higher than reasonable and where practicable options exist to mitigate the noise levels and effects.

7.9 NZS6806:2010 also states that the noise sensitive activities existing at the first RMA authorisation of a new or altered road are the only noise sensitive activities that can ever be considered for any future alterations of the same piece of road. In my view this is a major issue with the standard, as it freezes the receiving environment in time, and means that NZS6806:2010 will never be capable of delivering a reasonable outdoor noise environment for any future development. I consider that this is a major limitation on the overall objective of reducing adverse health effects due to exposure to transport noise.

7.10 Paragraph 1.2.2(c) of NZS6806:2010 states that:

> *"For the purposes of noise mitigation, and subject to the need for road controlling authorities and developers to adopt the best practicable option:*

(i) The preferred mitigation method is structural mitigation measures within road corridors

(ii) The second preference is for external structural mitigation measures to be constructed on land outside road corridors, and

(iii) The least preferred option is acoustical insulation of habitable spaces in PPFs."

7.11 The proposed controls are only adopting the least preferred option of reducing effects according to NZS6806:2010.

New and altered rail

7.12 I am not aware of any standard or process for mitigating the noise or vibration effects of rail traffic for new rail or alterations to existing rail, other than the duties under s16 of the RMA.

Reducing the effects of existing road and rail noise

7.13 I understand that there is no standard, NES or other descriptive mechanism or requirement for reducing the effects of exposing existing communities to high levels of noise from existing road and rail networks.

7.14 I understand that GPS 2021 is applicable and the duties under s16 of the RMA remain relevant, and that these require (in general terms) that noise levels are 'reduced' and 'reasonable' (respectively). I am not aware of any limits or specific requirements or any specific strategy in place in the Porirua district to achieve these outcomes.

7.15 I consider that it is reasonable for the Transport Authorities to be required to mitigate their noise effects on the existing receiving environment, where:

(a) The noise levels are already unreasonable (i.e. above the WHO Guidelines); and

(b) Where practicable options exist to reduce noise levels.

7.16 I consider that specific provisions requiring the Transport Authorities to mitigate their effects is a reasonable proposition. Such provisions could involve a staged approach, where the worst of the noise effects are targeted first. The provisions could require the Transport Authorities to identify the worst affected areas and to identify a range of mitigation options that could reduce the noise levels as far as practicable. Depending on context, such options can include:

(a) Changing the pavement to a low noise surface;

(b) Finding an alternate route for heavy vehicles, especially at night;

(c) Controlling engine braking by prohibition, especially at night;

(d) Reducing the speed limit or reducing the speed of freight trains

(e) Installing noise barriers;

(f) Offering to pay for acoustic insulation treatment for existing noise sensitive activities (in the same way that airports and ports are required to do).

7.17 The BPO could then be selected and implemented and noise effects reduced. The WHO Guidelines may not be able to be practicably achieved in all cases, but the effects could be reduced significantly in many cases.

7.18 I am only aware of one example where Waka Kotahi introduced a noise mitigation measure in the absence of any associated road upgrade or alteration. I was involved in the Ellerslie Noise Walls project in Auckland in 2017 where Waka Kotahi constructed approximately 1km of three-metre-high noise walls alongside the Southern Motorway to reduce noise levels in the community. This is the only such example I am aware of.

7.19 This is not an example of a reverse sensitivity effect to which Waka Kotahi was responding, as the receivers were all existing. In my opinion, it is an example of Waka Kotahi implementing mitigation (in the absence of a road upgrade or alteration) to meet its duties under s16 of the RMA.

7.20 Overall, I consider that the adverse noise and vibration effects from land transport needs to be managed at the source as the priority. Any development controls imposed on activities sensitive to noise in the surrounding environment should only be imposed when they are necessary to address adverse effects on receivers and where the noise and vibration cannot be reduced to an acceptable level, after the Transport Authorities have adopted the BPO.

Managing the effects in the receiving environment

7.21 In my view, the focus on mitigating transport noise effects in the receiving environment should only be applied where the noise effects extend beyond the designation boundaries at a level that is unreasonable after the BPO has been adopted at the source.

7.22 I consider that the method for defining the extent of the effects beyond the designation boundaries should be accurately mapped and defined to minimise the burden on the receiving environment.

7.23 The controls proposed for the PDP only require that the effects are mitigated for new and altered noise sensitive activities.

7.24 Traffic on the roads and trains on the rail lines will continue to generate high levels of noise into the existing community and there are no controls proposed to address these effects on existing noise sensitive activities.

8. COST OF ACOUSTIC AND VIBRATION TREATMENTS

8.1 My reading of the s42A Report and Section 32 Evaluation Report (the **s32 Report**) is that the cost of the various assessments and treatments required by the proposed provisions have been considered only sparingly, and in some cases not at all.

8.2 In my experience, the costs of complying with the various controls may include:

(a) Sound level measurements over a day or several days and / or noise modelling work to demonstrate that the noise level is less than 57dB and no treatment is required. This could range from approximately $750 +GST to over $3k +GST depending on the complexity of the work.

(b) Acoustical design work to ensure that the internal noise levels are no greater than the standards required. This is generally straightforward and for a typical dwelling the cost would generally be between $500 +GST and $1000 +GST.

(c) Additional or more expensive building materials, 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 to reduce the internal noise levels. Based on my experience of working on these types of projects, 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.

(d) Vibration measurements for rail traffic[22]. This requires specialised equipment that would need to be left in place for several days to capture

[22] The s42A report recommends the deletion of the vibration standards for road and rail, however activities requiring resource consent under NOISE-R5 will be subject to a vibration assessment via the matters over which control is reserved in NOISE-P4(5) and (8).

at least 15 freight train pass-bys. This would be likely to cost between $1500 +GST and $4000 +GST.

(e) Base-isolating a single-level timber-framed dwelling if the vibration level is over a reasonable level, (normally this is 0.3mm/s V_{w95}). I have recently investigated the cost of applying such mitigation based on discussions with the suppliers of the base-isolation products and taking into account the engineering and process costs that I am already familiar with from experience. I estimate that the cost would range from approximately $50,000 +GST to $100,000 +GST.

(f) Providing 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 system 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.

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

9. THE NEED FOR AN EVIDENCE-BASED APPROACH

9.1 In my view, any controls applying to the receiving environment need to be drafted and applied based on a strong evidential basis of the effects.

9.2 Other major noise generators that have effects extending into the community where treatment in the receiving environment is required include airports and ports, and some other major industries (such as dairy factories).

9.3 These noise generators are almost universally required to map their noise emissions across the surrounding land, including a reasonable and demonstrable allowance for future growth. The noise modelling is conducted

using noise modelling software and would normally be corroborated by noise measurements.

9.4 This modelling process generates one or more contours or noise control boundaries that are shown in the District Plan. These would normally inform a set of land-use controls that manage development of noise sensitive activities within the contours. The land-use controls typically require acoustic treatment to buildings containing noise sensitive activities, and sometimes limit the density of development and the nature of the development generally.

9.5 The noise modelling is always conducted based on the BPO for minimising the noise at the source having been defined and implemented. The contours do not extend any further into the community than is absolutely necessary, while allowing the noise generator to function efficiently.

9.6 The noise modelling process takes into account the local circumstances, including topography, permanent screening, noise barriers and other features that can heavily influence the propagation of noise.

9.7 This refined approach ensures that only the parts of the community that are or will be affected by the noise are captured by the controls. It provides a clear and certain set of controls for the noise-generator and the affected parts of the community.

9.8 I consider that there is no reason why the same approach cannot be taken in this case.

9.9 I am aware that Waka Kotahi has conducted noise modelling of significant parts of the State Highway network in the Porirua District for the Transmission Gully project. The noise level predictions were based on traffic flows in the year 2031 and they included the traffic flow increases and decreases on the new and existing parts of the state highway.

9.10 The noise modelling undertaken for the Transmission Gully project took into account the specific noise mitigation that was proposed for the project, including specific low-noise road surfaces and noise barriers that have been implemented.

9.11 The effect of these specific noise mitigation measures on the propagation of noise into the community and the extent of land that is affected are likely to be

significant. In my view it is critical that these are taken into account in this process.

9.12 I note that the Waka Kotahi submissions do not mention either the noise modelling process undertaken for Transmission Gully or the National Road Noise Mapping project[23].

9.13 I am aware that Waka Kotahi holds noise contour information for the Transmission Gully project within the Porirua district, and I am aware that it holds noise contour information from the National Road Noise Mapping project. I consider that this information should be used to inform the extent of the road traffic noise provisions in the PDP.

9.14 In terms of rail noise, I consider that it would be a relatively simple task for KiwiRail to prepare and produce noise level contours for rail traffic through the Porirua network. The modelling process is relatively straightforward, with topographical data, building data and rail centrelines available from a variety of sources.

9.15 KiwiRail would be able to forecast a busy hour of freight and commuter rail traffic for the network for the model to be based on. The noise model would take into account the local train speed environments, signalling constraints and any other local and specific features of the network that might affect the generation of noise, as well as the topographical and other physical features in the environment.

9.16 In my view, this task is relatively straightforward and not particularly costly. I estimate that the cost of the modelling process would be no greater than the cost of insulating one or two houses for rail noise.

9.17 Overall, I consider that it is entirely practicable and reasonable for the Transport Authorities to have provided an up-to-date, evidence-based approach to define the extent of the road and rail noise controls using readily available mapping technology.

---

[23] https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Research-and-information/Other-research/national-land-transport-road-noise-map-2019-05-16.pdf

10. THE IDEAL SET OF CONTROLS

10.1 Overall, it is my view that the PDP should contain controls on the development of new and altered noise sensitive activities where they are affected by road and rail noise, and potentially rail vibration.

10.2 I consider that no controls are necessary or appropriate in respect of road traffic vibration.

10.3 I consider that the emphasis of the controls should be on avoiding adverse health and amenity effects arising from exposing people to unreasonable levels of noise from the transport network.

10.4 I consider that the ideal set of controls for the PDP would include:

(a) A policy framework that recognises that managing adverse noise and vibration effects is a shared responsibility between the Transport Authorities and the occupiers of the receiving environment.

(b) Provisions that require the Transport Authorities to identify areas of their networks where the adverse noise effects on existing noise sensitive activities are unreasonable or above levels that are acceptable for health and amenity, and to prioritise the implementation of noise mitigation measures at the source as the first priority, then in the receiving environment as the second priority;

(c) Acoustic insulation and mechanical ventilation controls for new and altered noise sensitive activities based on noise level predictions for the Porirua road and rail network, taking into account predicted traffic and rail volumes, topography, noise barriers that have been constructed and any other relevant local feature;

(d) Provisions that require the Transport Authorities to continually monitor and manage vibration effects arising from their network operations.

10.5 In my view, this arrangement is essentially the same as that applied to ports, airports and other significant noise-generating activities around New Zealand.

11. THE FOCUS OF THE PDP PROVISIONS AND RELIEF SOUGHT BY THE TRANSPORT AUTHORITIES

The focus on managing reverse sensitivity

11.1 I note that the provisions sought by the Transport Authorities and as supported in-part by the s42A Report are focused heavily on avoiding reverse sensitivity effects on the transport networks.

11.2 I have not been able to find any examples of reverse sensitivity effects arising in the submissions or in the S42A Report. I am not aware of any reverse sensitivity effects arising on transport networks of this nature anywhere in New Zealand.

11.3 In my view, this focus is incorrect.

11.4 I consider that the focus of these controls should be to avoid exposing people to unreasonable levels of noise from the operation of the transport infrastructure.

11.5 I consider that this is the most important aspect of the controls being sought. It is my experience that if the noise levels are managed to be reasonable, there can be no legitimate reverse sensitivity effect.

11.6 I accept that the provisions could mention reverse sensitivity effects as a potential consequence of not addressing unreasonable noise levels but I consider that they should not be the focus.

The reliance on Standard Effects Areas

11.7 The PDP controls rely on the use of Standard Effects Areas to identify the areas of land within specified distances from State Highways and the NIMT that require acoustic treatment.

11.8 The PDP proposes indicative Noise Corridor Overlay maps to indicate the areas where the noise standards "may apply". The S42A Report notes the reliance on indicative areas, rather than actual mapped effects areas is to allow for "*potential for changes to State Highways and (to a lesser degree) the NIMT railway line in*

the future and therefore for an accurately mapped Noise Corridor overlay to become out-of-date"[24].

11.9 As set out earlier in this evidence, I consider that the Transport Authorities are likely to have a good understanding of their asset management programme for the next 10 years (i.e. the life of the Plan) to inform an accurate noise mapping exercise.

11.10 Standard Effects Areas rely on the worst-case potential noise and vibration emissions at maximum distances from the corridors.

11.11 In my view this approach is coarse and is likely to extend the effects areas onto land that is not be affected by noise or vibration to the extent that any development control is needed.

11.12 For example, there will be sections of road where the traffic volumes and speeds are low, where the road could be paved with a relatively quiet surface, or where there is natural or man-made screening that significantly reduces the noise levels. In such cases, the effects area could be as little as 20m or less. On other more open sections of road, the effects area could be larger.

11.13 Waka Kotahi and KiwiRail's submissions do not provide any information to demonstrate that the Standard Effects Areas in the PDP controls or sought in their requested relief reflect the actual distances to manage noise and or vibration effects from their Porirua networks.

11.14 If the Standard Effects Area is bigger than it actually needs to be, it will lead to potentially significant and unnecessary costs being incurred for noise sensitive activities that are not unreasonably affected by road and/ or rail noise and/ or vibration.

12. GENERAL COMMENTS ON THE PDP CONTROLS

12.1 I have undertaken a review of the PDP controls in conjunction with Ms Williams. These comments have informed the table in Appendix Two of Ms William's evidence.

[24] Para 49, S42A Report.

13. COMMENTS ON THE RELIEF SOUGHT BY WAKA KOTAHI

13.1 In its submission, Waka Kotahi seeks the following effects areas:

(a) A 100m noise effects area for any noise sensitive activity exposed to road-traffic noise levels greater than 57dB $L_{Aeq(24hr)}$.

(b) A 40m road vibration effects area.

13.2 As I have already stated, I consider that these effects areas need to be accurately predicted and mapped to take into account the specific local circumstances, topography, noise barriers and other important features.

Road noise

13.3 Waka Kotahi's proposed amendments to NOISE-R5 would result in it administering[25] NOISE- R5 and the determination of those sites subject to road-traffic noise levels greater than 57dB $L_{Aeq(24hr)}$. This approach is not discussed in the S42A Report however Mr Lloyd notes that it is not appropriate for a third party to determine whether a resource consent is required. I agree with Mr Lloyd.

13.4 I also consider that the advice by Waka Kotahi that it holds information to determine the noise level at any particular location is a clear indication that it has the capability to calculate noise levels for the Porirua district.

Road vibration

13.5 Waka Kotahi's proposed vibration controls would apply to any activity sensitive to noise within 40 metres from the legal boundary of the State Highway network.

13.6 The proposed controls require either:

(a) A very expensive base-isolation solution that is only provided for single storey dwellings; or

---

[25] Waka Kotahi Submission Appendix Four: Proposed advice note to NOISE-R4: *Waka Kotahi holds information which can confirm whether the proposed location of noise sensitive activity will receive more or less than 57 dB $L_{Aeq(24h)}$. Where Waka Kotahi confirms that the proposed location of a noise sensitive activity will be less than 57 dB $L_{Aeq(24h)}$, the following rules do not apply.*"

(b) The engagement of a consultant to measure and predict vibration levels on the subject site to determine whether any treatment is required, and if so, what that treatment might be.

13.7 In my experience, occurrences of significant vibration extending beyond the State Highway boundary at levels requiring investigation at distances where built development could be reasonably anticipated are very unusual. This accords with Waka Kotahi's [26] own technical guidance on vibration from the State Highway network which states *"Vehicles on new and altered state highways generally cause negligible adverse vibration effects"*[27].

13.8 I have never seen a situation where vibration from road traffic has been an issue at a distance of 40m. I consider that this distance is far too large.

13.9 District Plan standards relating to building vibration from operational road networks are extremely unusual in District Plans throughout New Zealand. I am aware of only one District Plan (the Lower Hutt District Plan) that includes building vibration controls.

13.10 In my view, their rarity is because it is generally accepted that:

(a) Significant levels of vibration extending beyond the state highway network are unusual; and

(b) In the unusual circumstances where effects do arise, the vibration can and should be remedied at source (i.e., by the roading authority).

13.11 I refer to Waka Kothi's own technical guidance on the cause and remedy of significant vibration levels from road corridors:

> *"Generally, when significant vibration can be felt inside a house this is a result of a nearby road-surface defect such as a pothole, rutting, or a manhole with an abrupt transition to the surrounding road surface.*
>
> *If such a defect is confirmed, the Transport Agency will review the significance of the vibration concern, the condition of the road, and any*

[26] Waka Kotahi NZTA

[27] https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Standards/Technical-memoranda/Tech-memo-NV3-State-highway-noise-and-vibration-management-v1.0.pdf

programmed road maintenance/re-surfacing work in the area and develop a plan to repair/correct the defect, if required.

In some cases, there may be issues with the road pavement (the engineered 'soil' layer that provides a strong and stable base for a smooth road surface) which can cause vibration to travel farther from the road and/or be more noticeable. In such cases, the Transport Agency will review the requirement to re-construct the road pavement. This is a major undertaking, and if required, would likely be programmed in at the time of the next major road rehabilitation/resurfacing work in the area.[28]

13.12 In my experience, a well-maintained road network should not give rise to a level of vibration likely to cause annoyance or complaints at distances where built development in the receiving environment could reasonably be anticipated.

13.13 Waka Kotahi has not provided any evidence to suggest that vibration from road traffic is an issue that requires control in the receiving environment at all, let alone to a distance of 40m.

13.14 In my opinion, before any vibration controls are considered for the PDP, Waka Kotahi needs to produce evidence on the actual and likely effects of road vibration beyond the boundaries of its own road corridors. This evidence should be sufficiently detailed to confirm:

(a) Whether or not it is typical for vibration levels to exceed 0.3mm/s V_{w95} beyond the boundaries of the corridor;

(b) If so, what are the vibration levels and under what circumstances do they arise;

(c) Would the adoption of the BPO and Waka Kotahi's own policies for reducing the problem still result in vibration levels outside the road corridor regularly or typically complying with a level of 0.3mm/s V_{w95} and if so why; and

[28] https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/noise-and-vibration/frequently-asked-questions/road-traffic-vibration-faqs/

(d) If the vibration levels are found to typically exceed 0.3mm/s V_{w95} beyond the road corridor, at what rate does the vibration attenuate over distance and how large does the effects area need to be.

13.15 Waka Kotahi's Technical Memorandum No. 3[29] states:

"Vehicles on new and altered state highways generally cause negligible adverse vibration effects. The Transport Agency does not routinely assess vibration for specific new and altered state highway projects, unless, for example, there are PPFs immediately adjacent to a new traffic lane[30]..

"Most vibration complaints are related to road surface condition, which is addressed in the draft Guide to state highway road surface noise. In response to complaints, the Transport Agency will investigate and, if appropriate, seek to mitigate road-traffic vibration in PPFs found to be exceeding Class D in NS 8176"[31]

13.16 I am aware of several operational vibrations assessments for new or altered state highways that include consistent statements that Waka Kotahi's standard maintenance procedures provide appropriate control of road-traffic vibration effects.

13.17 Examples include:

13.18 Transmission Gully:

"*The assessment has shown that there is no requirement for additional controls of road-traffic vibration. The NZTA has an established and comprehensive national system to monitor and maintain road surface conditions. Therefore, no project specific designation conditions related to road-traffic vibration are recommended*"[32]

---

29 https://nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Standards/Technical-memoranda/Tech-memo-NV3-State-highway-noise-and-vibration-management-v1.0.pdf

30 Page 2, https://nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Standards/Technical-memoranda/Tech-memo-NV3-State-highway-noise-and-vibration-management-v1.0.pdf

31 Page 3, https://nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Standards/Technical-memoranda/Tech-memo-NV3-State-highway-noise-and-vibration-management-v1.0.pdf

32 Page 70 of https://www.nzta.govt.nz/assets/projects/transmission-gully-application/docs/technical-report-12.pdf

13.19 Northern Corridor Improvements:

"*Traffic vibration is generated when the road surface is not smooth and has bumps and or dips (e.g. potholes, surface changes etc.). Traffic vibration does not generally cause adverse effects when roads are well maintained. The NZ Transport Agency has a comprehensive road maintenance policy that ensures that roads remain smooth and any defects are fixed within short timeframes*[33]*.*

"*With the implementation of the NZ Transport Agency road maintenance policy, it is unlikely that the Project road surface will ever degrade significantly so effects are predicted to be negligible for all receivers"*[34]*'*

13.20 Pepa Peka to North Otaki Expressway Project:

"*Vibration from road traffic has not historically been assessed on road projects in New Zealand, however it has recently been assessed for the Waterview Connection, Transmission Gully, and MacKays to Peka Peka Projects. In all three cases, the results confirmed that a vibration assessment was not actually warranted"* [35].

13.21 Waterview Connection:

"*The effects of vibration from road traffic, in particular heavy vehicle movements, are expected to be less than minor provided the Project road surface is monitored and maintained in accordance with the NZTA policy for road roughness. It is noted that there is a significant safety margin here, as significant road surface degradation (in excess of the NZTA controls) would be required to generate an adverse effect.* [36]

13.22 Puhoi to Warkworth:

"The traffic vibration effects from the motorway are expected to be negligible (i.e. very unlikely to cause annoyance), provided the road surface is monitored

---

33 Ibid,

34 Page 37, https://www.nzta.govt.nz/assets/projects/auckland-northern-corridor/EPA/Assessment-of-Environmental-Effects/Assessment-of-Operational-Noise-and-Vibration.pdf

35 Page 3 of https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Construction-and-maintenance/Example-report-and-management-plans/PP2O-Operational-noise-and-vibration.pdf

36 Pages 43-44 of https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Construction-and-maintenance/Example-report-and-management-plans/Vibration-Assessment-Waterview-connection.pdf

and maintained in accordance with the NZTA policy. This policy is the primary mitigation tool, and the BPO for avoiding and mitigating operational vibration effects"[37]There are many sections of the state highway network in Porirua where there have been significant improvements, upgrades or new roads constructed where vibration issues are extremely unlikely to arise. Issues are also unlikely to arise in low-speed environments, and especially where the pavement is maintained appropriately.

13.23 Overall, it is my view that an effects area for road vibration is very unlikely to be required at all if a tailored and integrated approach to managing vibration is adopted. If it is required, I expect that its application would be very localised and would require an effects area significantly less than 40m.

13.24 I raise the following additional concerns in terms of Waka Kotahi's proposed road vibration standard:

(a) The design, construction and compliance costs of implementing the indoor vibration controls will be significant. This cost has not been quantified by Waka Kotahi.

(b) The level of ground vibration will be influenced (almost entirely) by the degree and timing of network maintenance. A dwelling that has been designed and constructed to meet the indoor vibration design controls may not achieve ongoing compliance due to deterioration or lack of maintenance to the network over the following years.

(c) Conversely, if in the unlikely event there is a vibration issue that requires a developer to implement isolation measures, the vibration issue may disappear completely when Waka Kotahi undertakes the next round of routine maintenance on the road. The issue may have been caused by a simple defect such as rutting, potholes or pavement transition that could be very easily rectified.

(d) As vibration effects are generally localised around a defect in the pavement, it is not possible to characterise the vibration levels in an area with only a few vibration measurements. It is not possible to objectively

[37] Page 24 of https://www.nzta.govt.nz/assets/projects/puhoi-to-warkworth-application/docs/assessment-report-vibration.pdf

determine whether any unreasonable vibration effects are currently being generated by traffic flows on the Site, without undertaking several hours of attended vibration measurements in several position across the platform of all proposed buildings containing a noise sensitive activity.

13.25 For the reasons outlined above, I do not support the inclusion of Waka Kotahi's recommended controls for road vibration. It is my view that an adequately or well-maintained road and rail network (where the BPO is adopted) should not give rise to a level of vibration likely to cause annoyance or complaints. Occurrences of significant levels of vibration are relatively unusual, generally localised (rather than systemic across the networks), and can be remedied through standard network maintenance.

13.26 I agree with the recommendations in the s42A Report to reject the road vibration controls sought by the Submitter.

14. COMMENTS ON THE RELIEF SOUGHT BY KIWIRAIL

14.1 KiwiRail seeks a 100m rail noise effects area. KiwiRail supports the notified PDP 100m rail vibration effects area, however its submission seeks mitigation to be applied at distances up to 70m from the NIMT.

14.2 As I have already stated, I consider that these effects areas need to be accurately predicted and mapped to take into account the specific local circumstances, topography, noise barriers and other important features.

14.3 The S42A Report recommends the deletion of the vibration controls entirely, except by reference to the matters of control in P4.

Rail noise

14.4 The assessment of rail noise effects is relatively complex owing to the nature of use of the rail corridors and variability in the frequency and type of trains. The noise generated by the use of a rail line can vary considerably depending on the topography surrounding the line, the speed environment, the type of train (freight or passenger or both) the condition of the track and rolling stock and the time of day that the line is most often used.

14.5 KiwiRail's proposal assumes a single noise level of 70Db $L_{Aeq(1hr)}$ at 10m from any rail line. This does not allow for variations in any of the above factors, and is likely to capture a worst-case scenario.

14.6 Additionally, there is no proposed rule anywhere in the PDP that requires KiwiRail to manage or minimise the noise effects within the rail corridor itself. The absence of any controls on the noise source does not reflect the balanced approach that is appropriate.

14.7 Instead, KiwiRail's proposed controls shift the burden of mitigation entirely on to the receiving environment.

14.8 I consider that the actual rail noise effects can be easily calculated and mapped for the Porirua district. I recommend that the PDP controls are based on the actual predicted rail noise levels.

Rail vibration

14.9 KiwiRail's proposed vibration controls would apply to any activity sensitive to noise within 70 metres from the legal boundary of the railway network, or 100m based on their support of the notified version of the PDP.

14.10 In my experience, vibration effects extending beyond the rail corridor at a level requiring some degree of control is more common than for State Highway networks.

14.11 Based on my previous investigations, occurrences of unreasonable levels of vibration from the rail corridor are directly attributed by the condition of the track and rolling stock in the localised area, whereby vibration effects can be largely avoided (or significantly reduced) through regular and effective network maintenance. This aligns with KiwiRail's online guidance on managing vibration effects from the rail network which states:

> *"We work hard to minimise the impacts of our operations, including noise and vibration.*
>
> *We do this by inspecting our tracks, locomotive and wagons regularly and maintaining them in good condition so that train wheels can move over our tracks as safely and smoothly as possible.*

We are continuing to invest in the network to update our infrastructure and rolling stock and using new technology to ensure trains run smoothly.[38]

14.12 I am not aware of any evidence that suggests that vibration from rail traffic is an issue that requires control in the receiving environment to distances of between 70m and 100m.

14.13 I consider that rail vibration controls should only be considered for the PDP, if there is relevant and robust evidence on the actual and likely effects of rail vibration beyond the boundaries of KiwiRail's rail corridors in Porirua. Such evidence would address:

(a) Whether or not it is typical for vibration levels to exceed 0.3mm/s V_{w95} beyond the boundaries of the corridor;

(b) If so, what are the typical vibration levels at a selection of nominal distances, and under what circumstances do they arise;

(c) Would the adoption of the BPO and KiwiRail's own policies for reducing the problem still result in vibration levels outside the rail corridor regularly or typically complying with a level of 0.3mm/s V_{w95} and if so why, at what level and at what distance; and

(d) If the vibration levels are found to typically exceed 0.3mm/s V_{w95} beyond the rail corridor, at what rate does the vibration attenuate over distance and how large does the effects area need to be.

14.14 Overall, it is my view that an effects area as large as 70m or 100m for rail vibration is very unlikely to be required if a tailored and integrated approach to managing vibration is adopted.

14.15 I raise the following additional concerns in terms of the proposed rail vibration standard:

38 https://www.kiwirail.co.nz/how-can-we-help/report-something/noise-and-disturbance/vibration/

(a) The design, construction and compliance costs of implementing the vibration controls will be significant. This cost has not been quantified by KiwiRail or in the s42A Report.

(b) The level of ground vibration will be influenced by the degree and timing of network maintenance. A dwelling that has been designed and constructed to meet the indoor vibration design controls may not achieve ongoing compliance due to deterioration or lack of maintenance to the network or rolling stock over the following years.

(c) Conversely, if in the unlikely event there is a vibration issue that requires a developer to implement isolation measures, the vibration issue may reduce or disappear when KiwiRail undertakes the next round of routine maintenance on the rail line or rolling stock. The issue may have been caused by a simple defect such as excessive wheel flats, deteriorated track beds, old or worn rails and could be very easily rectified.

14.16 For the reasons outlined above, I do not support the inclusion of the s42A's recommended controls for rail vibration.

14.17 I consider that KiwiRail should provide relevant and robust evidence to properly demonstrate the nature and extent of the adverse vibration effects extending beyond its own boundaries after the BPO has been adopted to internalise it as far as practicable. Once that information is available, a more tailored and efficient control can be developed for the PDP, if required.

Jon Robert Styles

21 January 2022