UNDER	the Resource Management Act 1991 ("**RMA**")
IN THE MATTER	of the Proposed Waikato District Plan: Hearing 22 – Infrastructure.

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

NOISE AND VIBRATION

29 SEPTEMBER 2020

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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. I am providing noise and vibration evidence on behalf of Kāinga Ora-Homes and Communities ("**Kāinga Ora**") (formally Housing New Zealand Corporation) in relation to the submissions and further submissions[1] it made on the Proposed Waikato District Plan ("**PWDP**" or "**Plan**") (insofar as they relate to this hearing). Primarily, my evidence in this hearing relates to the request by KiwiRail and NZTA ("**the Submitters**") to introduce new permitted and restricted discretionary rules for development of noise sensitive activities adjacent to railway corridors and the state highway network.

1.2 In summary, the key points addressed in my evidence are:

(a) In fundamental terms, I agree with the Submitters that there is a need to manage the noise and vibration of effects of land transport on activities sensitive to noise where adverse effects would otherwise arise. The primary reasons are to ensure that the noise levels are reasonable for the people residing in and undertaking activities sensitive to noise near to the infrastructure, and to avoid or mitigate the potential reverse sensitivity effects on the Submitters.

(b) I consider that the management of the issue requires an integrated approach where the noise generators are required to mitigate their effects at the source and as far as is practicable. Any controls in the receiving environment are to deal with the effects that cannot be internalised following the adoption of the ("**BPO**").

(c) The PWDP does not contain any controls or standards that require the Submitters to manage their effects or adopt the BPO to minimise the effects as far as practicable.

[1] Submission No. 749 and Further Submission No. FS1269.

(d) The PWDP as notified, and the recommendations of the s42A Report place the burden of mitigating the effects onto the receiving environment.

(e) In my view, the controls proposed in the notified version of the PWDP were relatively blunt, and would not manage the potential adverse effects of land transport noise and vibration on people effectively or efficiently.

(f) The s42A report recommends the adoption of the Submitters' proposed acoustic insulation and vibration standards in preference to the building setbacks and North Island Main Trunk Line ("**NIMT**") controls in the notified PWDP.

(g) The Submitters' proposed standard assumes that all of the District's state highway and rail networks require the same spatial effects areas. It is my view that the effects can be so different that separate rules are required for the management of noise and vibration effects.

(h) The s42A report does not contain any assessment of the costs of implementing the relief sought by the Submitters. Whilst not an acoustical factor, I consider that the evaluation of the cost of the various mitigation options is an important aspect.

(i) **Road Noise -** Overall, I support the application of controls on the development of activities sensitive to noise near to land transport infrastructure, but only where the noise levels are high enough to warrant specific controls. However, I do not support the controls that the Submitters have suggested.

(j) The Submitters have not provided any evidence to demonstrate that the proposed 100m effects area reflects the required distance to manage the noise levels received beyond all parts of the Waikato's state highway networks. No information has been presented by the Submitters to demonstrate the actual or future level of noise exposure

generated beyond the state highway corridor after the BPO has been adopted to internalise the effects.

(k) Overall, whilst I support the intent of the Submitters' controls for road traffic noise, I consider that significant amendment is required before any version of it should be adopted.

(l) **Road Vibration -** 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 unusual.

(m) The Submitter 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 60m.

(n) There are many sections of the state highway network in the Waikato District 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.

(o) In my opinion, before any vibration controls are considered for the PWDP, the Submitter needs to produce evidence on the actual and likely effects of road vibration beyond the boundaries of its own road corridors. Accordingly, the controls sought by the Submitter should not be adopted.

(p) **Rail noise -** For similar reasons to that set out for road noise, I agree in principle that where it necessary, and following the adoption of the BPO to reduce the effects at source, there will likely be areas of land where the development of activities sensitive to noise should be controlled to manage the noise effects.

(q) I consider that the Submitter's proposed controls are inappropriate for the PWDP on the basis that no information

has been presented by the Submitter to demonstrate the actual or future level of noise exposure generated beyond the rail corridor after the BPO has been adopted to internalise the effects.

(r) **Rail vibration -** 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. However, I consider it extremely unlikely that there will be any effect at 60m that requires control. I consider that the effects area should be considerably smaller.

(s) The Submitter has not provided any evidence to suggest that vibration from rail traffic is an issue that requires control in the receiving environment to a distance of 60m.

(t) Before any rail vibration controls are considered for the PWDP, I consider that the Submitter should provide 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, and for this district. Once that information is available, a more tailored and efficient control can be developed for the PWDP.

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 nine consultants specialising in the measurement, prediction and assessment of environmental and underwater noise, building acoustics and vibration.

Experience

2.2 I have nearly 20 years experience in the industry, the first four as the Auckland City Council's Environmental Health Specialist – Noise, and the latter 16 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. I am currently in my second term as the president of the Acoustical Society of New Zealand and prior to being elected I was the secretary and on the committee of the Society for eight years.

2.4 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 through the effective management of reverse sensitivity effects. 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.

(b) Advice on several recent District Plan reviews, including Whangarei, Taupō and Napier.

(c) Providing advice on several 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 and the Northern Corridor Improvements and many others.

Involvement in the Plan Review

2.5 I have been commissioned by Kāinga Ora to prepare this statement of evidence to address matters raised by the s42A recommendation to accept the Submitters' request for a new permitted and restricted discretionary framework applying to noise sensitive activities adjacent to railway corridors and the state highway network.

Code of Conduct

2.6 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. THE BASIS OF THE CONTROLS

3.1 In fundamental terms, I agree with the Submitters that there is a need to manage the noise and vibration of effects of land transport on activities sensitive to noise where adverse effects would otherwise arise. The primary reasons are to ensure that the noise levels are reasonable for the people residing in and undertaking activities sensitive to noise near to the infrastructure, and to avoid or mitigate the potential reverse sensitivity effects on the Submitters.

4. THE PWDP PROVISIONS (AS NOTIFIED)

4.1 The PWDP (as notified) proposed to manage the effects of land transport noise on sensitive receivers primarily through the use of building setbacks[2], with additional noise and vibration standards for development adjacent to the North Island Main Trunk Line (NIMT).

4.2 Proposed standard 16.3.9.2 Building setback-sensitive land use required buildings to be a setback a minimum of: 5m from the designated boundary of the railway corridor; 15m from the boundary of a national route/ regional arterial and 25m from the designated boundary of the Waikato Expressway.

4.3 Proposed Rule 16.5.7.1 of the PWDP provided additional requirements to manage noise and vibration from the NIMT, including building setbacks (5m for non-habitable buildings and 10m for habitable buildings), internal design noise limits and mechanical ventilation requirements for buildings within 100m (from the centreline) of the NIMT. The proposed rule also included vibration design levels for sensitive activities/ buildings within 40m of the NIMT to be designed and constructed to achieve vibration levels not exceeding 0.3mm/s) and sensitive activities/ buildings within 20m of the NIMT to not exceed the criteria set out in British Standard BS 7385-2:1993.

4.4 I note that the PWDP (as notified) did not propose any controls to manage the construction, maintenance and operational noise effects of land transport at source.

4.5 In my view, the controls proposed in the notified version of the PWDP were relatively blunt, and would not manage the potential adverse effects of land transport noise and vibration on people

[2] Policy 4.4.2 of the PWDP proposes to minimise the adverse effects on residential amenity by "maintaining appropriate setback distances between high noise environment and sensitive land uses".

effectively or efficiently. They also had the potential to compromise the ability of owners and occupiers of sites to develop their land.

5. THE SUBMITTERS' REQUESTED RELIEF

5.1 The s42A report recommends the adoption of the Submitters' proposed acoustic insulation and vibration standards in preference to the building setbacks and NIMT controls in the notified PWDP.

5.2 The s42A report recommends amendments to Appendix I *Acoustic Insulation* to include permitted activity standards relating to:

(a) Indoor design noise levels (road and rail traffic noise)

(b) Mechanical ventilation (road and rail traffic noise)

(c) Indoor vibration (road and rail vibration)

The permitted activity standards regarding noise in proposed Appendix I would apply to any new or altered building for a sensitive land use within 100m of a state highway or legal boundary of a rail corridor. The proposed **vibration** standards would apply within 60m from the boundary of the rail or state highway network. I refer to the proposed 100m and 60m distances as the "**100m noise effects area**" and the "**60m vibration effects area**" throughout this evidence.

5.3 Compliance with the standards in proposed Appendix I is required to be demonstrated through the submission of an acoustic design report (submitted to Council as part of a building consent or resource consent application). Resource consent is required as a restricted discretionary activity where the acoustic insulation or vibration standards are not achieved. The matters of discretion include consideration of the outcome of any consultation with the Submitters.

5.4 I provide a summary of the Submitters' proposed acoustic insulation standards as follows:

The internal design noise levels (road and rail)

5.5 The proposed standard requires buildings containing an ASN to be designed and constructed to achieve the internal noise levels, which are prescribed according to the building type/ occupancy/ activity.

5.6 Residential use exposed to railway or state highway noise is required to be acoustically insulated to achieve noise levels no greater than 35dB $L_{Aeq(1hr)}$ in sleeping spaces and 40dB $L_{Aeq(1hr)}$ in all other habitable rooms.

5.7 As an alternative means of achieving the internal design noise levels, the proposed standard provides for the establishment of a noise barrier (at least 50m from the carriageway of the state highway/ rail network) that completely blocks line of sight from all doors and windows to all points 3.8m above the carriageway or railway tracks. Or as further alternative, a single story residential building with habitable rooms can be designed, constructed and maintained in accordance with the construction schedule provided in proposed Schedule Y.

5.8 To achieve the internal design noise levels, the proposed standard assumes that State Highway or railway noise is 70 dB $L_{Aeq(1h)}$ at a distance of 12 metres from the road or track, and must be deemed to reduce at a rate of 3 dB per doubling of distance up to 40 metres and 6 dB per doubling of distance beyond 40 metres.

Mechanical ventilation and cooling

5.9 The Submitters' mechanical ventilation controls seek to ensure noise sensitive spaces are provided with adequate air ventilation[3] and cooling. The proposed mechanical ventilation requirements apply to any new or altered building containing an ASN within 100m of a State Highway or rail corridor boundary, where windows must be closed to achieve the prescribed indoor noise levels, or where the building has been constructed in accordance with Schedule Y.

[3] In accordance with clause G4 of the NZBC and providing for at least 6 air changes per hour.

Indoor vibration (road and rail)

5.10 The vibration controls recommended in the s42A report will require any new building (or alterations to existing buildings) containing an ASN within 60m of the boundary of the rail or state highway network to be designed, constructed and maintained to achieve vibration levels not exceeding 0.3mm/s V_{w95}[4]. An alternative compliance pathway (for single story residential buildings only) enables compliance to be demonstrated by constructing the building on a constant level floor slab on a full surface vibration isolation bearing with natural frequency not exceeding 10Hz, with vibration isolation separating the sites of the floor slab from the ground; and no rigid connections between the building and the ground. Compliance is required to be demonstrated through the provision of an acoustic design report, thereby requiring the applicant to engage an experienced vibration expert.

6. MANAGING THE EFFECTS OF LAND TRANSPORT NOISE

6.1 This section of my evidence sets out my overall views on the acoustic issues associated with developing activities sensitive to noise close to land transport infrastructure that generates noise. Following this section, I set out my views on the recommendations made in the S42A Report.

Integrated management

6.2 Any controls on the development of activities sensitive to noise can at most form a part of the overall approach to managing the effects of noise and vibration from land transport infrastructure. At best, they reduce the audibility of the rail or road traffic within activities sensitive to noise. 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 noise and vibration at or near the source. That approach benefits the

[4] V_{w95} is the frequency-weighted statistical maximum RMS vibration level with a 95% probability of occurrence.

broader environment and not just the indoor environment of dwellings or other buildings that are subject to specific controls.

6.3 I note that 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. Compliance with this standard is only mandatory where a rule or standard in a District Plan specifies it, and it is typically only triggered where a new road is proposed or where there are significant alterations to existing roads.

6.4 Notwithstanding the requirements of NZS6806:2010, I note that the duties under section 16 RMA apply to the Submitters at all times and in all circumstances.

6.5 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 Submitters have adopted the BPO[5].

A tailored approach

6.6 In my experience of dealing with rules and standards relating to the management of noise and vibration effects from land transport, there is often a large gap between the simplest rule set and the most effective rule set.

[5] The Best Practicable Option is defined in section 2 of the Resource Management Act

6.7 For example, the easiest way to specify the extent of the noise or vibration effects areas would be to assume a 'Standard Distance' from the nearest lane or track along the full length of all road and rail in the district. This approach is simple and easy to map.

6.8 However, this approach is also likely to extend the effects areas onto land that may not be affected by noise or vibration to the extent that any development control is needed. For example, there will be sections of road where the traffic volumes and speeds are low, and where the road could be paved with a relatively quiet surface. In such cases, the effects area could be as little as 20m. On other more open sections of road, the effects area could be larger. This is an important issue in Waikato District given the major improvements in the state highway network and the likely consequential reductions in traffic through the townships and the noise generated by that traffic.

6.9 Having the Standard Distance much bigger than it needs to be will lead to potentially significant and unnecessary costs being incurred for activities sensitive to noise that are outside the actual effects area, but captured in the Standard Distance. The costs are incurred by the requirement for resource consent, consultancy fees, design fees, potential delays and possibly even insulation, and all for no effects-based reason.

6.10 Similarly with vibration, the effects often only occur intermittently alongside the road or rail network at distances where development could occur. Having the Standard Distance applying to all sections of the road and rail network is going to result in the requirement for numerous assessments, measurements and resource consents where there will not likely be an issue.

6.11 I consider that it is vital that that any controls applying to the surrounding environment are carefully mapped and understood so that they are no greater in spatial extent and degree of control than necessary. That involves identifying the level of noise generated by the infrastructure and the extent, if any, to which that generates adverse effects that warrant a regulatory response.

7. THE SUBMITTERS' WAIKATO NETWORKS

7.1 Before commenting on the Submitter's proposed acoustic insulation and vibration standards, it is appropriate to provide an overview of the Submitters' Waikato networks. This provides context to the extent of the networks within the Waikato District, and the receiving environments in which they operate.

7.2 In terms of road traffic noise, the Waikato District's state highway network is extensive, including SH1 (including the Waikato Expressway), SH1B, SH2, SH23, SH26 and SH39. These state highways run through or adjacent to several residential settlements and rural communities, including Huntly, Raglan, Ngaruawahia, Tuakau, Pokeno, Te Kauwhata, Maungatawhiri and Te Kowhai.

7.3 In terms of rail noise, the Waikato district's rail network includes the North Island Main Trunk Line and the East Coast Main Trunk Line. The Hautapu and Rotowaro Branch Lines also run within the Waikato district. Like the District's state highway network, these rail lines also run through or adjacent to several rural and residential settlements.

7.4 The noise output of the road and rail network will be highly variable and influenced by a number of fixed variables, such as the speed environment, pavement surfaces, the condition of the road and rail, traffic and train volumes and types.

7.5 The state highway network in the Waikato has undergone significant change in recent years, with a number of sections of the Waikato Expressway being completed. A number of projects have routed significant traffic volumes away from towns and settlements, although some of these towns and settlements remain adjacent to state highways controlled by the Submitters. The effect of these recent and any known future improvements, bypasses or significant alterations on the noise and vibration effects should be considered when developing the controls.

8. THE SUBMITTERS' REQUESTED RELIEF

Separation of standards

8.1 The amalgamation of the Submitters' nationwide rail and road reverse sensitivity policies has resulted in the development of a plan standard that seeks to collectively manage noise and vibration levels and effects from both the rail and State Highway networks. In most circumstances, a receiver will be affected by one or the other network, but there will be some receivers who are located in proximity to both networks.

8.2 The Submitters' proposed standard assumes that all of the District's state highway and rail networks require the same spatial effects areas (100m for noise and 60m for vibration), and that all of the District's state highway or rail networks generate a noise level of 70 dB $L_{Aeq(1h)}$ at a distance of 12 metres from the road or track.

8.3 Based on my experience of measuring and assessing operational noise and vibration effects from rail and state highway networks, I consider that the noise and vibration effects of road and rail can be quite different.

8.4 It is my view that it is extremely difficult and potentially impossible to develop a plan standard that accurately, effectively and efficiently responds to the actual and potential noise and vibration effects of both road and rail, without imposing onerous restrictions across the receiving environment to allow for a worst-case scenario from either network.

8.5 It is my view that the effects can be so different that separate rules are required for the management of noise and vibration effects.

8.6 For this reason, I discuss road noise, road vibration, rail noise and rail vibration effects separately throughout this evidence.

Road noise

8.7 Overall, I support the application of controls on the development of activities sensitive to noise near to land transport infrastructure, but

only where the noise levels are high enough to warrant specific controls.

8.8 However, I do not support the controls that the Submitters have suggested.

Extent of effects area

8.9 The proposed 100m noise effects area[6] from the Submitter's nationwide reverse sensitivity policy which recognises that (emphasis added) "*the effects area <u>may be up to</u> 100 metres from a state highway"*[7].

8.10 The extent of the effects area appears to be based on the worst case scenario, without recognising that it may be much smaller in some areas.

8.11 The Submitter has not provided any evidence to demonstrate that the proposed 100m effects area reflects the required distance to manage the noise levels received beyond all parts of the Waikato's state highway networks.

8.12 I note that the Submitter holds this information in two forms.

8.13 The most basic of the information sources is the biennial noise mapping of the state highway network buffer and effects areas, which is available online[8]. This method is based on a relatively simple calculation and does not take into account topography, gradient, intersections, noise barriers or any other physical screening.

[6] The effects area reflects the distance where operational road traffic noise levels are likely to result in external noise levels of 57dB $L_{Aeq(24h)}$ or higher.

[7] Page 18, https://www.nzta.govt.nz/assets/resources/effects-on-noise-sensitive-land/effects-on-noise-sensitive-land-use.pdf

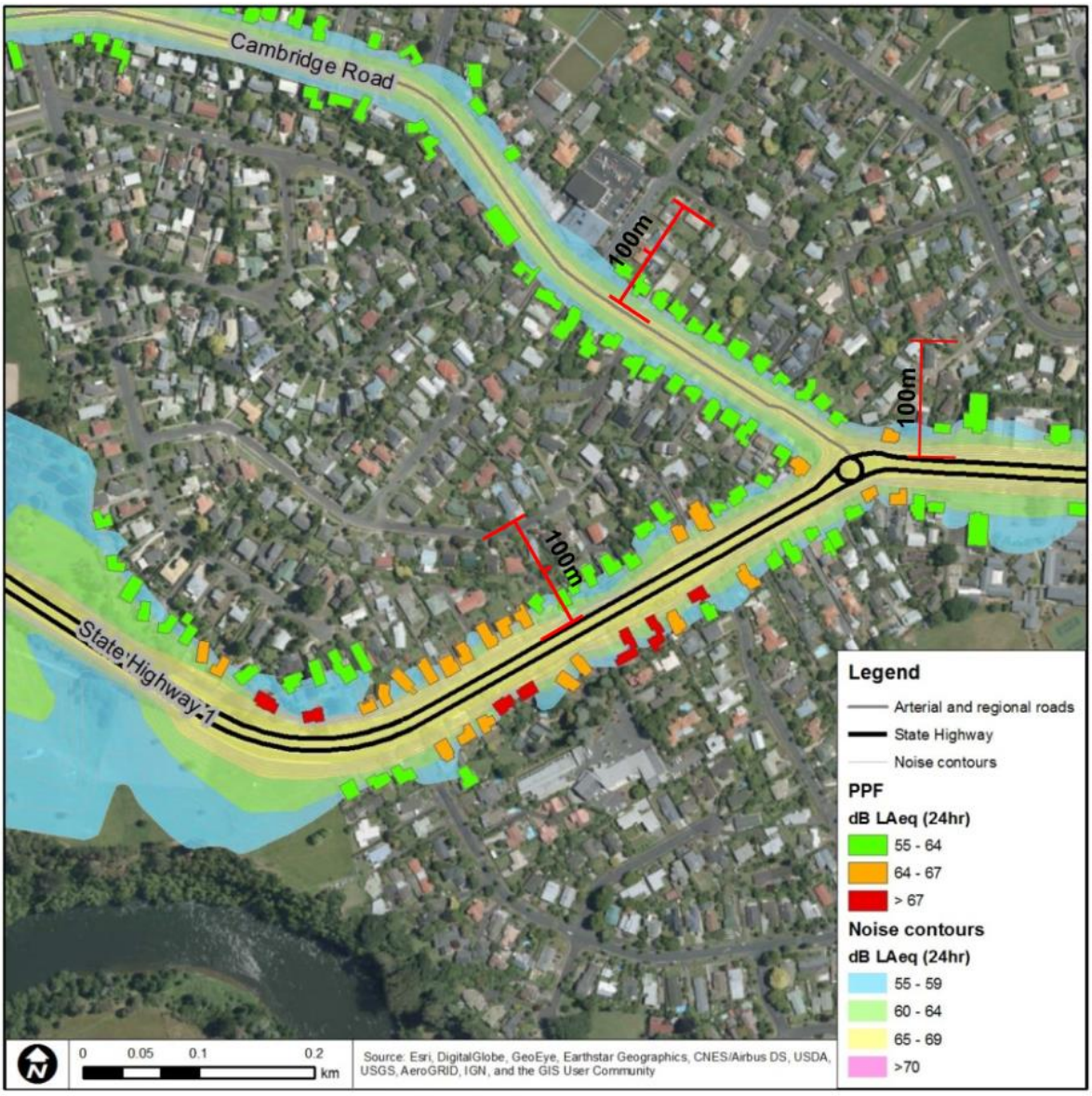
[8] https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/noise-and-vibration/planning/reverse-sensitivity-buffer-and-effects-areas/.

8.14 The second and most accurate source of information is held by the Submitter in its National Land Transport (Road) Noise Map project[9]. This project has used computer modelling software to map the spatial extent of noise effects across the national state highway network. The mapping takes into account all relevant variables such as topography, screening by noise barriers and other built form, the speed environment, road surface, traffic flows and other physical attributes. It is a far more accurate tool than the mapping of the effects and buffer areas noted above.

8.15 The outputs of this project are not currently available online. However, the National Land Transport (Road) Noise Map report prepared by AECOM contains some useful figures that demonstrate the nature of the outputs and extent of effects. Figure 2 from the report shows an example of the outputs for Hamilton. Although Hamilton is not in the Waikato District, it is nearby and will be indicative of the situation existing in low speed environments in the Waikato District.

8.16 I have overlaid some 100m dimensioning figures onto Figure 2 of the National Land Transport (Road) Noise Map report below:

[9] Available at 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



8.17 My overlaid dimensions clearly demonstrate that for this part of the network, and any other parts like it, the standard 100m effects area is far too large. Applying a 100m effects area through this part of the state highway network would result in significant and unnecessary consenting and design costs for large areas where there is no demonstrable noise effect that requires control.

8.18 The Submitter's own *Guide to the management of effects on noise sensitive land use* recognises that the spatial extent of the effects area will vary based on the specific network:

> *"The buffer area and effects are for the entire state highway network have been determined and are shown on a web based*

> *map. The Transport Agency will provide digital exports from these maps if required to be inserted into district plan maps... The maps will be updated nationwide biennially. Additional updates will be made for localised areas if required to reflect altered designations or significant changes to traffic volumes, road surfaces or speed limits.*
>
> *The extent of the buffer areas and the effects area depend on the noise levels from the highway, with dominant factors being the traffic flow, vehicle speed and percentage of heavy vehicles"*[10]

8.19 In my view, it is critical that the extent of the effects areas is no greater than is necessary to manage the problem at-hand. The application of a simple maximum of 100m is an inefficient method and will result in many properties and dwellings being captured by the controls when they need not be. I consider that the controls should be based on the effects areas that the Submitter has carefully calculated for each section of the state highway network, as set out above, with a margin for future growth included where appropriate.

8.20 I note that while acoustic insulation controls are relatively commonplace in New Zealand, I have identified only one District Plan (the Hamilton City District Plan) that includes a 100m effects area (from the Waikato Expressway). State highway effects areas of between 40m-80m are much more common.

8.21 No information has been presented by the Submitter to demonstrate the actual or future level of noise exposure generated beyond the state highway corridor after the BPO has been adopted to internalise the effects. Additionally, there is no assessment of whether other parts of the PWDP are likely to give rise to further intensification pressures within existing or future settlements. This could identify whether there could be a localised and significant increase in the development of vacant land parcels resulting in an additional

[10] Page 9, https://www.nzta.govt.nz/assets/resources/effects-on-noise-sensitive-land/effects-on-noise-sensitive-land-use.pdf

reverse sensitivity effect on the Submitters network, and the need for additional or customised policy.

8.22 Overall, whilst I support the intent of the Submitter's controls for road traffic noise, I consider that significant amendment is required before any version of it should be adopted.

Road vibration

8.23 The Submitter's proposed vibration controls would apply to any activity sensitive to noise within 60 metres from the legal boundary of the State Highway network. This is a significant distance.

8.24 The proposed controls require either:

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

(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.

8.25 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 the Submitter's[11] 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"*[12].

8.26 I have never seen a situation where vibration from road traffic has been an issue at a distance of 60m. I consider that this distance is far too large.

[11] Waka Kotahi NZTA

[12] 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

8.27 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. In my view, this is because it is generally accepted that (1) significant levels of vibration extending beyond the state highway network are unusual; and (2) In the unusual circumstances where effects do arise, the vibration can and should be remedied at source (i.e.: by the roading authority). I refer to the Submitter'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 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.*[13]

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

8.29 The Submitter 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 60m.

8.30 In my opinion, before any vibration controls are considered for the PWDP, the Submitter 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 the Submitter'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

(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.

8.31 The Submitter routinely confirms (in their acoustic assessments for new or altered roads) that standard maintenance procedures provide appropriate control of road-traffic vibration effects. Examples include the assessment for Puhoi to Warkworth, Warkworth to Wellsford, the Waikato Expressway and many more.

8.32 There are many sections of the state highway network in the Waikato District 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.

8.33 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 60m.

8.34 I raise the following additional concerns in terms of the 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 the Submitters' or in the s42A report.

(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 the Submitter 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 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 roughly the centre of the floor of at least two rooms in every proposed building containing an ASN across the Site.

8.35 For the reasons outlined above, I do not support the inclusion of the s42A's recommended controls for road vibration. It is my view that an adequately or well-maintained road 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.

Rail noise

8.36 The Submitter's proposed noise controls would apply to any activity sensitive to noise within 100 metres from the legal boundary of the railway network.

8.37 For similar reasons to that set out for road noise, I agree in principle that where it necessary, and following the adoption of the BPO to reduce the effects at source, there will likely be areas of land where the development of activities sensitive to noise should be controlled to manage the noise effects.

8.38 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.

8.39 The Submitter's proposal adopts 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.

8.40 Additionally, there is no proposed rule anywhere in the PWDP that requires the Submitter 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.

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

8.42 I consider that the Submitter's proposed controls are inappropriate for the PWDP on the basis that no information has been presented by the Submitter to demonstrate the actual or future level of noise exposure generated beyond the rail corridor after the BPO has been adopted to internalise the effects. Additionally, there is no assessment of whether other parts of the PWDP are likely to give rise to further intensification pressures within existing or future settlements. This could identify whether there could be a localised and significant increase in the development of vacant land parcels resulting in an additional reverse sensitivity effect on the Submitters network, and the need for additional or customised policy.

Rail vibration

8.43 The Submitter's proposed vibration controls would apply to any activity sensitive to noise within 60 metres from the legal boundary of the railway network.

8.44 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. However, I consider it extremely unlikely that there will be any effect at 60m that requires control. I consider that the effects area should be considerably smaller.

8.45 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 the Submitter'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.*[14]

8.46 The Submitter has not provided any evidence to suggest that vibration from rail traffic is an issue that requires control in the receiving environment to a distance of 60m.

8.47 Before any rail vibration controls are considered for the PWDP, the Submitter needs to produce evidence on the actual and likely effects of rail vibration beyond the boundaries of its own rail 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 the Submitter'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; 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.

8.48 Overall, it is my view that an effects area as large as 60m for rail vibration is very unlikely to be required if a tailored and integrated approach to managing vibration is adopted.

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

(a) The design, construction and compliance costs of implementing the vibration controls will be significant. This

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

cost has not been quantified by the Submitters' or in the s42A report.

(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 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 disappear completely when the Submitter 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.

8.50 For the reasons outlined above, I do not support the inclusion of the s42A's recommended controls for rail vibration. It is my view that an adequately or well maintained rail network (where the BPO is adopted) will result in the effects area being considerably smaller than 60m for much or all of the rail network.

8.51 I consider that the Submitter should provide 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 PWDP.

9. THE RECOMMENDATIONS OF THE SECTION 42A REPORT

9.1 The s42A Report appears to have adopted the Submitters' relief based on a relatively light analysis of the issues. For the reasons set out earlier in this evidence, I disagree with the findings of the s42A report and consider that significantly more evidence of the

actual and potential effects and customisation and possible deletion of some of the controls is necessary.

9.2 As a starting point, I consider that the controls for road and rail need to be separated wholly or in part, especially in respect of vibration.

Whether the controls are required to avoid undue restrictions on the Submitters

9.3 The s42A report considers that the Submitters' acoustic insulation and vibration standards are required to avoid "*undue restrictions*"[15] on the Submitters. This is reflected in the following statements (emphasis added):

> "*Appropriate mitigation, installed to ensure that the health and wellbeing of those living near to the rail network are not adversely affected, is pivotal to ensuring that* ***undue restrictions*** *are not placed on the operation of the rail network"*[16]

And

> "*Appropriate mitigation is critical to ensuring that* ***undue restrictions*** *are not placed on the operation of these transport networks and the health and wellbeing of those residing or otherwise occupying nearby sites is protected"*[17].

9.4 The word "undue" (as defined by the Cambridge dictionary) refers to "*a level that is more than is necessary, acceptable or reasonable*"[18]. No evidence has been presented by the Submitters to demonstrate that unreasonable noise vibration effects on the Waikato receivers are occurring (or likely to occur), or that the absence of noise and vibration controls will result in "undue restrictions" to the network operations.

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[15] Paragraph 281 of the s42A report.

[16] Paragraph 280 of the s42A report.

[17] Paragraph 283 of the s42A report.

[18] https://dictionary.cambridge.org/dictionary/english/undue

9.5 State highways and rail networks are noise generators that have the potential to generate significant adverse effects if they are not managed appropriately and where they pass through sensitive environments. In my view, it is entirely reasonable that the Submitters face at least some pressure to manage their effects at source as far as practicable.

The Submitters' duties to manage unreasonable levels of vibration

9.6 I consider that a requirement to regularly perform network maintenance to address unreasonable levels of vibration extending beyond the network corridors does not reflect an "undue restriction" on the Submitters. Instead, it reflects the Submitter's general duty under section 16 RMA to avoid unreasonable noise. Furthermore, that the tension between operating noise and vibration generating infrastructure in noise sensitive environments is a tension that forms part of the existing receiving environment, and must be managed appropriately.

9.7 The s42A report states that the vibration design controls are "*necessary to ensure potential adverse effects (including conflicts between incompatible activities and associated reverse sensitivity effects) are mitigated (where they cannot be avoided*)"[19]. This statement recognises that measures to avoid the effect should be considered in the first instance; however the s42A report fails to evaluate or consider whether a vibration effect would still need to be mitigated (by the receiver), if the Submitters conduct regular and proactive network maintenance.

9.8 In the complete absence of any PWDP controls that require the management of the effects at source, the s42A report recommends that the receiving environment should be designed to allow for worst-case noise and vibration emissions, regardless of whether they currently exist, or are likely to in the future. The s42A report

[19] Paragraph 281 of the s42A report.

does not provide an evaluation of the Submitter's duties to manage unreasonable levels of vibration from the networks.

Evaluation of alternative options

9.9 In terms of alternative options, the s32AA evaluation[20] in the s42A report identifies only the following "other reasonably-practicable options":

(a) Retain the PWDP provisions as notified; or

(b) Do nothing "while allowing noise and vibration from road and rail vibrations"[21.]

9.10 In terms of (i), the s42A report considers that the notified PWDP setbacks "*do not manage the reverse sensitivity effects*"[22] and in terms of (ii), the s42A report states that "the '*do-nothing' option would rely on users of adjacent land to make their own provision for noise attenuation*".[23]

9.11 I consider that there are several more options beyond the 'do nothing' or retention of the notified PWDP provisions.

9.12 In my view, there is an option which explores a set of controls that are tailored to the Waikato district, with careful consideration of the actual and reasonably potential adverse noise and vibration effects on the land surrounding the network after the BPO has been adopted to minimise the effects at the source.

9.13 There may be different controls for new or near-new roads or rail, different speed environments, zoning provisions and physical attributes of the environment that all have an influence on the level of effect beyond the corridor boundaries. There is no option that

[20] Section 18.4 of the s42A

[21] Paragraph 295 of the s42A

[22] Paragraph 295 of the s42A

[23] Paragraph 295 of the s42A

explores the possibility of managing the effects as far as practicable at the source.

Analysis of the costs

9.14 The S42A report does not contain any assessment of the costs of implementing the relief sought by the Submitters.

9.15 Whilst not an acoustical factor, I consider that the evaluation of the cost of the various mitigation options is an important aspect.

9.16 The standard base-isolation option for mitigating the vibration effects is a particularly expensive option that has not been evaluated. The significant cost of this option is likely to preclude it from ever being used. I have not seen a single storey house isolated in the way that the proposed control provides for. I see no point in including a rule or design solution in a District Plan that will probably never be adopted.

9.17 The S42A report would likely have reached the same conclusion had it assessed the costs of the different options and requirements.

Jon Robert Styles

29 September 2020