

## **Before the Hearings Panel at Porirua City Council**

### **Statement by Paul Botha (118) in support of submission on Porirua City Council Proposed District Plan.**

**1 February 2022 - (for Hearing Stream 4)**

#### **Background**

1. I made a submission on the Porirua PDP which included submission points on both the noise rules and the Renewable Electricity Generation Chapter. I address these in two separate Sections below, Section 1 – Noise Rules and Section 2 – Renewable Electricity Generation Chapter.
2. I acknowledge that my submission below cannot be taken as that of an expert witness, however given that I have practised in acoustics over the past 30 years and have worked on renewable energy projects for a similar period, I trust that the issues and questions I raise will be addressed by the appropriate experts.

#### **Section 1. Noise Rules**

##### **Introduction**

3. The main points I make with respect to the road and rail noise rules are as follows:
  - a. There is no restriction on NZTA / KiwiRail with respect to noise levels that they create.
  - b. The setback distance to protect Rail and Road corridors from reverse-sensitivity are excessively large and pose restrictions on the adjacent property rights.
  - c. Internal noise design levels appear to be the preferred mechanism to control reverse-sensitivity, despite no upper limit on the noise makers.
  - d. Mapping of the noise corridor is incorrect.

- e. The use of the Norwegian Vibration Standard is overly complicated and unnecessary.
4. The Statement of Evidence of Nigel Robert Lloyd on behalf of the Porirua City Council, dated 1 December 2021, addresses only 3 submissions, those by Waka Kotahi NZ Transport Agency, KiwiRail and New Zealand Defence Force. Furthermore, Mr Lloyd was only asked by PCC to address vibration matters from the railway line, not noise (para 45 of Mr Lloyds Evidence).
5. The Council Officers Report dated 3 December 2021 states at point 11 of Section 1.1 “Purpose”, that the recommendations in the S42A report are informed by both the technical evidence provided by Nigel Lloyd and the evaluation undertaken by the author (Rory Smeaton, Senior Policy Planner). On the basis that Mr Lloyds evidence only addresses 3 individual submissions and specifically not noise from the railway, I assume that all responses to my submission points in the S42A report are the views of Mr Smeaton.

**No Restriction on KiwiRail / NZTA on noise level that they create.**

6. In paragraphs 37 and 38 of the Section 42A Report “Proposed District Plan: Noise” dated 3 December 2021, the reporting officer states that the vehicles on the road and trains on the railway are exempt from the noise rules and standards in the plan.
7. If there is no absolute control over the source noise from the road and rail corridors, there is little point in having a reverse sensitivity rule requiring neighbours to design to an internal noise level. How is that design undertaken if there is no certainty on the input to the design? If for instance, the source noise doubles (increases by 3 dB) over time, the internal noise level will double too. This potentially means that greater levels of noise insulation will be required in the future while houses designed to the levels now, may not meet the requirement in the future. If there is no control on the level of the source of the noise there is no way to limit the internal design level to a fixed value.
8. There has been no data presented on the noise levels from road or rail in the Porirua District by PCC, Waka Kotahi NZ Transport Agency or KiwiRail. The Acousafe report to Council dated December 2018 includes some generic information however nothing specific to Porirua. For example, the rail noise figures included in the Acousafe report are KiwiRail Predictions for South Taranaki (Table 4) and are predictions for both the Main Line and minor branch lines. Below that table Mr Lloyd states that the figures appear to represent 2 trains per hour for the Main Line and 1 train per hour on a minor branch line. In Section 5.2, the Acousafe

report provides a figure of 10.5 freight trains per day (or one every 2.3 hours) in Porirua. This equates to 0.44 freight trains per hour and the report goes on to say that this is better represented by the higher figures in the table (Table 4). Given the number of freight trains appears to be half of the lower figures, it seems odd that the higher figure was referenced. This illustrates the lack of real information available for PCC all of which have led to the justification of 100 m set-back.

### **Setback distance to protect Road and Rail noise from Reverse sensitivity**

9. An aspect of the reverse-sensitivity rule I have submitted on is in relation to the 100 m setback from the Road and Rail corridors.
10. There is no New Zealand Standard for noise from railways and it appears that there is a lack of effort trying to get to a national position on the matter. In Appendix 1 I attach a paper titled “Managing reverse sensitivity noise & vibration effects of rail and road transport in New Zealand” by Malcolm Hunt. The paper was originally published at the 22nd Biennial Conference of the Acoustical Society of New Zealand in November 2014. The matters raised in that paper are very much alive to date despite it being published over 7 years ago. Many of the issues discussed in that 2014 paper remain the discussion of reverse sensitivity rules in plan change hearings in the absence of a national standard on these matters.
11. I would prefer that the 100 m noise corridor to be removed completely, however as PCC has introduced it as a way to manage reverse sensitivity effects on the road and rail corridors, I have simply proposed an alternative width for the corridor of 40 m. I note that there seems to be a lack of hard data to support the notion that reverse sensitivity on the road and rail corridors are actually material rather than simply perceived issues. Neither Waka Kotahi NZ Transport Agency nor KiwiRail have put forward the number of complaints that they receive on an annual basis from the neighbours to their road and rail corridors in the Porirua District.
12. I note that Council’s own acoustic advice (quotes included below from Pages 10 and 13 of, Acousafe, “Review of District Plan Noise Provisions for PCC”) suggests that reverse sensitivity corridors should not be included in the existing residential zone. Council appears to have ignored the advice provided to them on this matter.

*From Page 10*

*“Where significant development has already occurred in existing residential zones then we do not consider that providing for setback buffer controls are appropriate in the District Plan*

*(particularly where the speed limit is low e.g. less than 80km/hr). Such a buffer does not provide significant protection to the State Highways (as reverse sensitivity) because residential development has already occurred in an uncontrolled fashion.”*

*From Page 13*

*It is recommended that, given the restrictions and historical development that has already occurred in Suburban Areas, the railway noise control be applied only in the Rural Zone and Rural Residential Zone. These would be written as follows:*

13. Given that there is no national standard for dealing with reverse sensitivity from road and rail in New Zealand, I have investigated to see what has been done regionally. Hutt City Council passed a plan change in 2018 – Pan Change 39 – Transport. That plan change dealt with road and rail noise. I note that that plan change has been adopted and there are no outstanding appeals by either KiwiRail or Waka Kotahi New Zealand Transport Agency. That plan change adopted a 40 m road and rail corridor and the rules do not apply to existing dwellings.
14. The relevant points and similarities between the Hutt City Council and Porirua City Council are as follows:
  - a. The two council’s boarder on one another i.e. have a common boundary,
  - b. They both have a national highway and rail corridor through their districts,
  - c. The road and rail corridors are adjacent to one another in several places,
  - d. The rail corridor carries both freight trains and regular commuter trains,
  - e. They both have a significant number of houses in close proximity to both the rail and road corridors.
15. Given the number of similarities between the two councils, I would have thought that an approach similar to that taken in the Hutt City is a very reasonable approach given the absence of a national standard and that the Hutt City rule was agreed in 2018. The PCC plan change review process begun in that same year, as per Acousafe advice being reported to PCC on 7 December 2018.
16. As PCC have not undertaken any analysis to assess the number of landowners impacted by the introduction of a noise corridor of 100 m, I completed some high-level analysis which I included in my original submission. From that analysis I conclude that a 100 m noise corridor will impact about 7.8% of the building points in the PCC district. By reducing the noise corridor to 40 m it captures 3.3% of the PCC building points. While it may be argued that a 100 m corridor is the “gold standard”, the PCC district currently has many houses as close as

10 m. The RMA is about sustainable development and the property rights of neighbours to the rail and road corridors need to be considered too. If the reverse sensitivity issue is more of a perceived issue than a real one, why are PCC pushing for a gold standard which will further impact local rates and the development potential near transport routes?

17. I certainly believe that if PCC had directly notified the approximately 1667 owners of buildings, within the proposed 100 m noise corridor, of the impact on their properties there would have been significant opposition to the proposal. The fact that this change has been included in a complex plan change process results in many residents being unaware. The process is also very different to that adopted for the introduction of the SNA's where impacted landowners were written to.

### **Internal noise design level**

18. As stated in paragraph 7 above, I don't believe that one can design to a fixed internal noise level of 35 dB  $L_{A,eq(1hr)}$  unless the external source noise is known or quantified. Yes, a conservative approach can be taken which will increase building costs, however there is no guarantee that the 35 dB level won't be exceeded if the source noise is unrestricted.

19. As stated, there are numerous houses within 10 m of the rail corridor. KiwiRail has not stated the extent to which complaints are received from the existing neighbours in Porirua. If existing neighbours don't alter their houses by more than 50 m<sup>2</sup> the proposed noise reverse-sensitivity rules will never apply to those dwellings however modifications over 50 m<sup>2</sup> trigger a noise insulation requirement. What is the science or reasoning behind this?

20. An alternative approach to achieving desired internal noise levels is to control the noise source or propagation path to the receiver. Noise barriers are widely used in other countries to limit the road and rail noise levels received at neighbouring residents. There is also an example of a noise barrier adjacent to the railway line in Plimmerton (see Figure 1), which was installed after KiwiRail started running the "new" Matangi units. Noise barriers very close to the noise source have the ability to provide reduced noise levels to a large number of neighbours rather than each dwelling trying to meet a level individually. KiwiRail also has at its disposal a number of mechanisms to reduce rail noise through controls such as; speed limits, timetabling of freight trains, track condition, train condition etc.



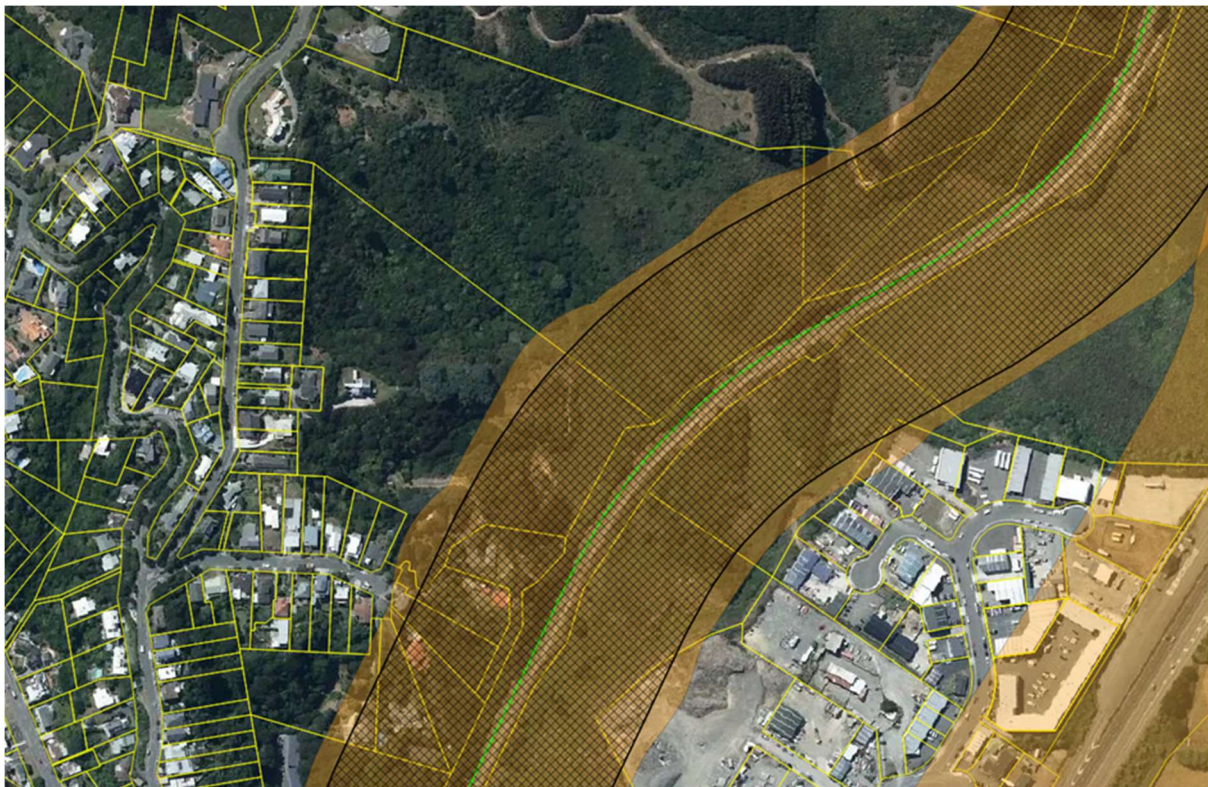
**Figure 1. Noise Barrier in Plimmerton**

21. The length of the rail line through the Porirua District is approximately 20 km. There are six stations in PCC along this route which an average distance of about 3.3 km between stations. While freight trains don't stop at these stations, clearly the speed of the freight trains will be reduced when compared to more rural parts of New Zealand, such as South Taranaki, having far greater distances between station platforms.

### **Mapping of the Noise Corridor**

22. The Reporting Officers Section 42A Report (paragraph 47) agrees that noise mapping for the NIMT has been drawn incorrectly from the property boundary rather than the railway centreline. The solution proposed by the reporting officer is that the Noise Corridor Map be referred to as "indicative". If this is Council's proposed solution, can the word "indicative" be added to all the other mapping layers that have been discussed at hearings to date, e.g. indicative SNA's etc? The task of mapping the noise corridor correctly is not difficult but there seems to be a reluctance from PCC to do so. LINZ have a GIS layer available titled "NZ-Railway-Centrelines-Topo-150k", alternatively council could digitise the rail lines, it is not a big job. There is a high probability that PCC could request more accurate information from KiwiRail.

23. I have downloaded the LINZ Railway Centreline file and buffered the rail centreline by 100 m. I have shown that output together with the Noise Corridor shown in the PDP in Figure 2 below. The area that I have shown is immediately north of Plimmerton Station in the vicinity of our property. The PDP noise corridor is shown in orange while the 100 m setback from the railway centreline is shown in hatched black. The Railway centreline is the green line. The differences between the two “zones” is up to 28 m in places on our property. Even if the map was going to be labelled “indicative”, PCC could do better than it has done in the PDP. It will not be difficult to do better.



**Figure 2. PDP noise corridor versus 100 m setback from rail centreline.**

24. I believe that all parties are in agreement that any noise setback zone from the railway should be based on a distance from the railway line, not the KiwiRail property. If a distance-based reverse-sensitivity buffer is going to be adopted, it should be more accurate than that currently shown, even if it is labelled “indicative”.

## The Norwegian Vibration Standard

25. As stated in my original submission, I don't believe that the Norwegian Vibration Standard should be used as an assessment tool for the determination of vibration levels prior to a building being constructed. My understanding is that the standard is for the measurement and assessment of vibration levels at buildings which already exist rather than the assessment prior to construction.
26. Acousafe's original advice to PCC was that the Norwegian Vibration Standard should not be used in the PCC plan. This is stated in their letter to PCC dated 10 June 2020 and I include an extract below:

### Vibration

*The Standard generally referred to in resource consents and Notices of Requirement is Norwegian Standard NS 8176.E:2005 "Vibration and Shock – Measurement of vibration in buildings from land-based transport and guidance to evaluation of its effects on human beings".*

*We did not recommend that any vibration standards be included in the District Plan instead relying on the set-back distances of dwellings from the road (and rail) to ensure that vibration is mitigated (which in our experience it will be with the recommended set-back distances).*

*The problem with vibration is that it depends on the level of maintenance of the road (number of potholes etc) and rail (maintenance of the railway line and the rolling stock), the local geomorphology, and is a specialist subject which I doubt Council (and most acoustical consultants) has the expertise to deal with.*

27. The Councils Section 42A report recommends the removal of the Norwegian Standard and I support that modification to the PDP.

## Conclusions – Noise Rules.

28. I request the following remedy:
29. That a maximum noise limit be placed on road and rail corridors.
30. If a reverse sensitivity noise corridor is to be included, it be no more than 40 m from the rail centre lines. It should not apply to the residential zone.
31. The noise corridor mapping be updated to be represent a distance from the rail line not the property boundary and also be labelled "indicative".
32. That reference to the Norwegian Vibration Standard be removed from the PDP.



## Section 2. Renewable Energy

### Introduction

33. I was a bit underwhelmed by the Renewable Electricity Generation Chapter included in the PDP. With the background of PCC declaring a Climate Emergency and recent publications by the Productivity Commission<sup>1</sup>, Interim Climate Change Committee<sup>2</sup> and the Climate Change Commission<sup>3</sup>, I would have expected policies that were more supportive or at least less restrictive.

### Using NZS6808:2010 as a trigger for Activity Status.

34. I stated in my submission that I don't believe that non-compliance with NZS6808:2010 (Acoustics wind Farm Noise), should be used to trigger the activity status of a wind farm development. I have been involved with many wind farm resource consents all of which involve consultation well before a consent being lodged. One such application included a neighbour which lodged a building consent for a house on the property boundary after consultation on the wind farm began. While the wind farm would still have to comply with the Noise Standard assuming the existence of a new house, having the activity status change for the assessment of the application, seems to be unnecessary.

35. Just about all wind farm operating in New Zealand, have a condition of consent requiring them to comply with the NZS6808. If the wind farm has to comply with that standard, why would it need to be assessed any differently if it were a non-complying activity rather than a discretionary activity? Ultimately the wind farm has to comply with the appropriate noise rule and compliance or otherwise with the standard would be assessed during the process. There are instances where the landowners on whose land the wind turbines are placed agree to higher limits than those set out in NZS6808. What happens to the activity status in that instance?

36. I have been involved in a wind farm application where the Council believed that the high amenity noise limit, as outlined in the NZS6808:2010 Standard should apply. The wind farm applicant didn't believe that the High Amenity Limit should apply in that instance and that

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<sup>1</sup> New Zealand Productivity Commission. (2018). Low-emissions economy: Final report. Available from [www.productivity.govt.nz/low-emissions](http://www.productivity.govt.nz/low-emissions)

<sup>2</sup> Interim Climate Change Committee (2019). Accelerated Electrification. Available from [www.iccc.mfe.govt.nz](http://www.iccc.mfe.govt.nz).

<sup>3</sup> He Pou a Rangi, Climate Change Commission. 2021 Draft Advice for consultation.

was ruled as such in the Environment Court. If there is disagreement between the applicant and council on whether the noise limits were met, there would also be uncertainty on the activity status. This same issue would exist if there were minor exceedances of the standard, especially where such exceedances are due to different interpretations.

### **Comments on other REG standards**

37. REG-S7 on vegetation clearance of Significant Natural Areas seems restrictive. For existing wind turbine or solar installations, the output from such generation facilities could be significantly reduced by vegetation at 2m from the installation, solar through shading and wind energy through wind speed reduction. It is not clear how the 2 m has been derived but could be very restrictive, depending on the site configuration. This distance should be increased.
38. REG-S3 has been titled “Small-scale freestanding wind turbines” while REG-S5 has been labelled “Community-scale wind turbine towers (either freestanding or supported by guyed ropes)”. The titles raise two questions; does REG-S3 exclude guyed tower options and does REG-S5 apply to just the tower or is the turbine (generator and blades) included too? I suggest changing the title of REG-S3 to “Small-scale wind turbines (free standing or guyed)” and REG-S5 to “Community-scale wind turbines (freestanding or guyed)”.
39. For a small-scale renewable electricity generator to be permitted, it needs to comply with REG-S1, REG-S2 and REG-S3. For a wind turbine this means it requires the turbine to be the greater of 60 m from an inhabited building on adjacent property or 10 times the tower height from any site boundary. Given that small scale domestic turbines are unlikely to have a tower height of less than 10 m, a domestic wind turbine would need to be sited in the order of 100 m from a boundary. This requires a property of at least 3.2 ha, providing the property centre is a suitable location for a wind turbine installation. Given these requirements, I believe that in the vast majority of potential small wind turbine installations are likely to be treated as restricted discretionary rather than permitted. Put differently, I believe the requirements to meet a permitted activity status are too onerous and really don't believe that REG-S3 is of much benefit.
40. REG-S4 at (5) requires “Investigation activities must not be undertaken on a site for a total period of more than five years.” It is unclear whether a site that was investigated in the past would meet this requirement and be allowed permitted activity status. Given that REG-S4 appears to apply to wind monitoring towers I assume that what is intended is that the tower

needs to be removed 5 years after installation. The word “Investigation” is misleading too as this will capture activities beyond that of a wind monitoring tower. Perhaps REG-S4, point 5 can be changed to “5. Wind monitoring towers shall be removed within 5 years after initial installation.”

41. REG-R4 is included below in Figure 3. As written, it appears that for a community-scale renewable electricity generation activity to be Restricted Discretionary, the activity has to comply with REG-S5 and REG-S6. I believe that the “and” needs to be replaced with an “or” as REG-S5 applies to wind and REG-S6 applies to solar.

REG-R4 Community-scale renewable electricity generation activities	
General Rural Zone	1. Activity status: Restricted discretionary
Rural Lifestyle Zone	Where:
General Industrial Zone	a. Compliance is achieved with:
Māori Purpose Zone (Hongoeka)	i. REG-S5; and
	ii. REG-S6; and
	b. Compliance is achieved with NZS 6808:2010 Acoustics - Wind farm noise for any proposal involving wind generation.
	Matters of discretion are restricted to:
	1. The matters in REG-P1; and
	2. The matters in REG-P6.
	Notification:
	An application under this rule is precluded from being publicly notified in accordance with sections 95A of the RMA.

Figure 3. REG-R4

Paul Botha.

1 February 2022

## Appendix 1. Reverse Sensitivity Noise Paper

# Managing reverse sensitivity noise & vibration effects of rail and road transport in New Zealand

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### Abstract

*District and Regional Plans in New Zealand are a tool that can assist the functioning of a safe and efficient transport systems and assist in managing the environmental effects generated at transport nodes, and along transport corridors. This paper discusses reverse sensitivity measures intended to address noise and vibration from road and rail sources. The paper discusses whether applying land use restrictions beyond the designation corridor to address reverse sensitivity effects best serves the purpose and principles of the Resource Management Act if there are little or no efforts made by transport agencies to adopt the best practicable option to avoid, remedy or mitigate transport noise or vibration effects. Differences are highlighted between road and rail noise in this regard. The paper discusses the benefits of implementing planning measures that directly address effects of noise and vibration effects of land transport noise on people and communities for health and amenity reasons as a means of also dealing with reverse sensitivity effects on transport systems (if any). Finally, the paper outlines difficulties likely to be experienced by Council's implementing reverse sensitivity rules requested by the country's rail operator and by the state highway agency. Improvements are recommended that engender a balanced approach to managing direct and reverse sensitivity effects, based the relevant guidance from published New Zealand Standards and relevant international Standards.*

Originally published at the 22<sup>nd</sup> Biennial Conference of the Acoustical Society of New Zealand, November 2014

### 1. Introduction

Transportation noise can cause a range of impacts on people and communities from general interference with everyday activities through to more significant health impacts. Action to reduce environmental noise has had a lower priority than many other environmental issues, such as air, biodiversity and water, as noise has previously been regarded as an acceptable result of development [1]. As the impacts of noise are better understood transportation noise has now become a key environmental and social issue

Noise emissions are one of the more important impacts of Land Transport alongside other effects such as emissions to air, reduced water quality, landscape impacts, community severance and visual intrusions. Managing land Transport noise in New Zealand has been previously examined [2]. That report contains an evaluation of the total costs of Land Transport noise in New Zealand which has a value between 0.25% and 3.1% of GDP [2]. This estimate of the cost of Land Transport noise in New Zealand indicates the increasing importance of Land Transport noise in terms of outcome for the environment.

### 2. Effects of transport noise

The impact of noise on human health have been widely researched [3,4,5 & 6]. Noise affects people in different ways and creates various reactions depending on the level of noise and the activities individuals are engaged in.

Noise in the environment, including from transport systems, creates stress-type responses in humans. No significant impacts on health are thought to occur at noise levels under 40 dBA during the day or 20 dBA at night. The effects rise with the level of noise and length of exposure. It is widely accepted that noise above 65 dBA is highly undesirable.

Sleep disturbance is a common complaint from people affected by noise. Sleep deprivation can have cumulative effects due to impairment of the rest and recovery functions of sleep [4].

### 3. Land use planning and noise

In New Zealand, land use planning is primarily implemented through the Resource Management Act, 1991 (RMA).

Part IV of the Act mandates territorial local authorities (Councils), through District Plans, to ensure the noise environment is managed in a sustainable manner and that adverse effects of noise generating activities are avoided, remedied or mitigated. The District Plan is therefore a key instrument for the control of adverse environmental effects, including noise.

Apart from District Plans, Council can control noise effects through such methods as:

- Conditions attached to resource consents or designations;

- Enforcement proceedings including: Abatement notices, enforcement orders and; excessive noise direction notices.

Apart from Council's, other key players in the management of the effects of transport noise include:

- The noise producers (RMA S16. Imposes a general duty on all landowners to avoid unreasonable noise);
- The receivers of noise (Developers and builders and designers are free to adopt methods that reduce noise received from transport corridors, although this on its own would not be likely to be a successful policy measure).

The over-riding requirement is for the noise-maker(s) to recognise the general duty to avoid unreasonable noise.

## 4. Mangaing land transport noise

### 4.1 Noise from road traffic

For road vehicles, the New Zealand Transport Agency (NZTA) determines certification requirements for new vehicles, including noise emissions. These requirements are based on 'type approval' testing for each vehicle model released in New Zealand. The allowable noise limit is based on a drive-by noise test (ISO 362). Land Transport (Road User) Rule 2004 provides for on-road enforcement of noise from vehicles in use. The police have a role enforcing these in-service vehicle noise requirements. Regarding exhaust noise, the requirement is for the vehicle to be "less than, or similar to" the noise output from the vehicle's original exhaust system at the time of the vehicle's manufacture". If necessary, the vehicle may be required to undergo a stationary exhaust noise test using a measurement procedure based on ISO 5130 in order to prove a vehicle's exhaust noise levels are acceptable. Land Transport (Road User) Rule 2004 makes it illegal to operate a vehicle in a noisy manner, including noise from audio systems installed in vehicles.

Overall, New Zealand has a comprehensive suite of road vehicle noise controls that govern the output of new vehicles, the noise output of vehicles "in service" and controls over persons operating vehicles on a public road.

In addition, noise from land transport noise is controlled from new or altered roads via design measures through the application of NZ Standard NZS 6806:2010 Acoustics - Traffic Noise - Noise from New & Altered Roads. This Standard is often referred to within planning proceedings when designations are sought for new or altered roads as this Standard is only relevant to those situations.

There is no similar Standard applying to noise from existing roads. The 2008 Transit New Zealand Environmental Plan [7] and previous Transit documents recognise that outdoor noise levels above 65 dB LAeq(24

hr) are unacceptable. Section 2.1 of that Plan notes that if noise levels are above this threshold a noise improvement programme is available to fund retro-fitting of road noise mitigation. The fund for this is limited however and very few roading projects have been initiated to reduce noise from the existing network.

In addition, NZTA have developed "reverse sensitivity" noise guidelines to assist with managing noise from the existing state highway network. Developers and land owners seeking access to the state highway network are commonly requested by NZTA in return to agree to reverse sensitivity clauses where the development involves establishing noise sensitive activities such as residential subdivisions or apartments near state highway. An example of such a clause is set out as follows:

The design and construction of the development shall;

- (a) Ensure that the following criterion is met in relation to noise from traffic on the road allowing for increases in noise arising from increased traffic growth during a period up to the year 2014 (Noise Performance Criterion);
  - i. Noise from traffic on the road shall not exceed 35 dBA Leq(24 hour) in any bedroom and 40 dBA Leq(24 hour) in other Habitable Rooms (AS/NZ 2107:2000) within any Building.

Comments and observations on this approach to dealing with reverse sensitivity noise effects of the state highway network are discussed below.

### 4.2 Noise from rail activities

KiwiRail Holdings Limited (KiwiRail) is the State Owned Enterprise responsible for the management and operation of the national railway network. This includes managing railway infrastructure and land, as well as rail freight and passenger services within New Zealand. KiwiRail Holdings Limited is also the Requiring Authority for land designated "Railway Purposes" in District Plans throughout New Zealand. KiwiRail Network (ONTRACK) owns and manages New Zealand's rail network on behalf of the Crown, maintaining 4,000 kms of railway track, bridges and tunnels

KiwiRail operates around 100 diesel-electric locomotives, 22 electric locomotives, 3 railcars, and 103 shunting locomotives (Wikipedia). There are also 19 diesel multiple units in Auckland operated by Auckland Transport and 71 electric multiple units owned by the Greater Wellington Regional Council. The author understands around 57 electric multiple units under construction for Auckland Transport.

The author has been unable to identify any rules or

guidelines relevant to the control of noise from locomotives or rail vehicles in New Zealand. An ISO Standard (ISO 3095:20051) is available to guide on the procedures for obtaining reproducible noise levels emitted by all kinds of vehicles operating on rails, however there are no relevant rail noise limits applying in New Zealand.

KiwiRail has submitted on many District Plans to discourage "sensitive receivers" near rail corridors. This is to address so-called "reverse sensitivity" effects. As an example, the following wording of a reverse sensitivity rule was agreed among the parties to be inserted into the Tauranga District Plan (see *NZ Railways Corporation v Tauranga City Council: ENV:2011-AKL-00072*):

Rule 4E.2.6 - The Rail Network - Managing Reverse Sensitivity Effects  
(a) For noise sensitive activities within the KiwiRail Reverse Sensitivity Plan Area shown on the Plan Maps (Part B):  
i. Any new dwelling shall meet an internal rail traffic design sound level of 40 dB LAeq(1hr) inside all habitable rooms except for bedrooms which shall achieve an internal rail traffic design sound level of 35 dB LAeq(1 hr)  
ii. All other noise sensitive activities shall meet an internal rail traffic design sound level of 40 dB LAeq(1 hr).

Below we set out observations and comments on the approach advocated by KiwiRail that require Councils and land owners and developers to implement measures ostensibly to protect the operation of the rail network.

## 5. Reverse sensitivity as an "effect"

Often Councils are asked by road and rail authorities to include within District Plans land use planning measures to address noise and vibration effects to address what are termed "Reverse Sensitivity" effects on the operation of the transport system. The measures sought in respect of both road and rail reverse sensitivity measures involve recommending no noise sensitive development take place within a land corridor adjacent to the transport corridor, with a recommendation for developers and landowners implementing mitigation within a wider "effects" corridor to ensure the levels of noise within habitable rooms in new buildings established within these areas are within what are considered reasonable limits recommended by the World Health Organisation (for example).

Existing case law establishes reverse sensitivity as an "effect" under the RMA. However, our search of the relevant databases has not been able to provide examples where a road or rail corridor has been affected by reverse sensitivity effects such as complaints by individuals or communities living within areas affected by noise from

land transport noise.

Although the reverse sensitivity effect is widely touted at planning hearings as being a core concern of road and rail authorities, there are no examples evidencing where this effect has actually negatively impacted on the operation of any part New Zealand's transport system. While there are fears of such an effect, no actual effects of this nature appear to have surfaced.

## 6. Misuse of AS/NZS 2107:2000

NZTA's Reverse sensitivity guidelines have adopted the Australian and New Zealand internal noise standard AS/NZS 2107:2000 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors. This Standard is said to have been adopted by NZTA because it is "an accepted industry standard" however there are some technical issues which remain unanswered regarding reliance on this Standard.

KiwiRail's reverse sensitivity guidelines typically seek insulation of buildings establishing within 40 metres from the rail track Dwellings so that rail noise does not exceed 40 dB LAeq(1hr) inside bedrooms or 45 dB LAeq(1hr) in other habitable spaces. The Guidelines seek rail noise levels within all other developments be "no greater than 5 dB above the recommended maximum design guidelines given in NZS 2107:2000".

Both road and rail reverse sensitivity guidelines rely on the recommendations of NZS 2107:2000. However, the author considers this to be a misuse of this Standard.

For example, NZS 2107:2000 refers to noise levels quantified using the Leq unit, however there is no reference within that Standard to the use of LAeq(24hr) or LAeq(1hr) units which have been adopted as the units within road and rail reverse sensitivity guidelines. Section 2 of the Standard specifically states the Standard was not developed to deal with rail noise and yet this Standard is quoted extensively within justifications provided for reverse sensitivity measures address rail noise. The Standard was developed to be used by architects and room designers and does not have a focus on recommending noise standards for land use planning purposes (which seems to be its main use in New Zealand over recent years).

According to enquiries undertaken by the author, no New Zealand transport agencies, environmental authorities or the Ministry of Health were consulted in the development of NZS 2107:2000. The author considers NZS 2107:2000 is being mis-applied to some extent from its original intended use as a guide to architects and building designers. This Standard appears to be currently misused to plug a void. It is clear to most of us involved that what is really needed is a purpose-developed NZ Standard which would be developed among all key stakeholders and

would represent a “whole of government” approach, not simply the wishes of the agencies responsible for noise-making activities.

## 7. Acoustic insulation requirements

Acoustic insulation requirements contained within NZTA and KiwiRail requests for reverse sensitivity protection rely upon compliance with a stipulated limit of road or rail sound measured indoors. In practice, checking compliance on behalf of Council’s or affected parties has proven very problematic. Relying on achieving a stipulated indoor sound level leads to unpredictable outcomes because:

- (a) Acousticians and designers are not provided with guidance on expected outdoor sound levels against which to design the acoustic insulation of the building. This will often lead to an inconsistent design approach as different designers may assume (quite legitimately) differing levels of outdoor sound. Rail noise guidelines are said to be based on 65 dB LAeq(1hr) at 12 metres from the closest rail track. KiwiRail’s submission on the Hauraki District Plan KiwiRail proposed that train noise shall be deemed to be 70 dB LAeq(1hr) at 12 metres from the closest rail track. The request to assume a certain outdoor sound levels for the purposes of calculation and design means the actual noise level occurring on the site is never known. This means an objective assessment of noise effects on the (such as Council’s may undertake) cannot realistically be undertaken as no site specific information is provided.
- (b) It is unclear how growth in noise levels is taken into account. The objective (to achieve adequately protected indoor environments) may be undermined if growth in noise levels in the long run is not adequately accounted for.
- (c) The amount of noise reduction to be achieved by the building design may never be known and cannot therefore be tested or evaluated by Council’s who are charged with implementing District Plans and overseeing enforcement (where required) with resource consent conditions.
- (d) Should compliance need to be checked, measuring road or rail noise indoors within insulated rooms brings with it a host of problems. Simply measuring a 24 hour sound level to check traffic noise levels within insulated habitable rooms caused difficulties which have been outlined in evidence to the High Court in *Invercargill (P & J Tompkins v Wensley Developments 2011)*. Not only was it not possible to avoid extraneous sounds (such as aircraft noise), but the speed limit was adjusted up-wards and road surface type changed after the insulated apartments were built and before they could be tested. For road noise, deviations in the normal percentage heavy vehicles and effects of

a wet road surface can significantly alter measured sound levels within nearby rooms. For rail noise, the following questions arise for Council’s when attempting to assess compliance with KiwiRail’s reverse sensitivity measures:

During which 1 hour period should compliance measurements be conducted?

Measure compliance during daytime or night time?

What about non-rail noise occurring during the measurement period?

It is worth noting that NZS 6806:2010 refers to insulation requirements for protecting against road traffic noise at clause 5.2.3.2 where it states the acoustic insulation performance of buildings should be rated using the ‘standardised level difference’ methods of ISO 717, not based around the “indoor LAeq(24 hr)” approach of the NZTA reverse sensitivity guidelines.

## 8. An issue of “Equity”?

While concerns raised above are important because it appears acoustic performance based on a received indoor sound level cannot be easily or simply checked by Council as consent authority, a further substantial issue is one of equity - Who would be responsible if a reverse sensitivity insulation rules was proven not have been properly complied with?

Quite clearly in this circumstance, the roading authority and rail agency (who are responsible for managing the transport noise at source) will not be around to assist. The Council would simply be trying to implement and assess compliance with the rule or resource consent condition and could not be blamed for the non-compliance. The building owner or developer would have taken appropriate acoustic advice at the time the building was designed (and all being equal, the builder built the building to specification), however any of the variables (a) to (d) above could easily cause non-compliance so that the owner or developer is left with a non-compliance which was really none of his or her making.

With these experiences in mind, the author considers it is inappropriate for councils and imposes unnecessary costs and risks for the building designer and owner where the outcome is based on the uncertain result of an indoor sound level measurement to determine the effectiveness of acoustic insulation.

There appears an inherent inequity in a system that enables the noise-making agency to request insulation rules based around an uncertain method for managing indoor effects of road or rail noise yet do not share in the technical and design risks in attempting to achieve compliance with the requested standards. This is aside from the difficulties

Councils must face in assessing compliance.

This is in addition to the questionable need for reverse sensitivity setbacks and insulation requirements where there are no known examples in New Zealand where the operation of a road or rail corridor has been adversely affected due to noise or vibration complaints from people living in high noise effects areas.

That is not to say there is no evidence of complaints. Most local authorities at one time or another will have fielded complaints regarding road or rail noise, however any organisation with an "embedded" network emitting noise 24 hours a day can expect to receive complaints and will be obliged to deal with them. The mere receipt and need to investigate complaints is often mistaken as a need to implement reverse sensitivity measures. However this seems to defy logic. The reverse sensitivity measures will not address the generation of noise or vibration complaints per se. It is normal for a transport organisation to have to investigate and report on noise and vibration complaints from time to time. Despite what some officials may say, this is not a policy driver for implementing reverse sensitivity measures.

The lack of any operational noise or vibration emission limits coupled with the enabling provisions of the RMA (and inherent powers of any designations held) mean the road or rail agency will always prevail where any complaints or further actions arise. Realistically it is unlikely any individual or community has the ability to shut down or interfere with the operation of a road and rail corridor as often claimed as a rational basis for adopting reverse sensitivity measures within District Plans or resource consent conditions.

Granting rail noise reverse sensitivity measures in District Plans or resource consents worded as often sought within submissions by KiwiRail is particularly iniquitous. This is because this agency appears to make no attempt to manage noise from its rail and locomotive fleet in a manner consistent with the best practicable option requirement of the RMA. Rail noise has a large low-frequency component and can affect wide tracts of land, yet there appear to be no guidelines, rules or regulations in New Zealand requiring this noise to be managed at source.

For road traffic and vehicle noise it is clear a suite of controls are in place in New Zealand that (within reason) ensure cumulative noise from a road is no louder than necessary (setting aside for the moment improvements that could be achieved via introducing a noise-aware re-surfacing policy in residential areas). Rail noise is, and has always been, unfettered at source with KiwiRail continuing to be able to generate as much noise as it likes without impunity it seems.

## 9. Recommended insulation standard

There are inherent advantages in acoustic insulation rules or consent conditions that stipulate the amount of acoustic insulation required of the building. This is achieved by specifying an acoustic rating of the building envelope using methods based on ISO 717-1:2013<sup>2</sup> such as stipulating  $D_{tr,2m,nTw} + C_{tr} > 30$ . This means the building envelope or facade must reduce the outdoor sound level by 30 dB when tested in accordance with the prescribed (normalised) test method. Such an approach is superior in a number of ways because:

- (a) Such rules provide greater guidance for architects and engineers to design to, and will result in a more certain outcome; and
- (b) The performance standard to be achieved by the building fabric is established at the time the Plan or designation/consent hearing takes place (within a public process and being subject to scrutiny), or at the time the resource consent is decided. This can satisfactorily deal with issues such as how noisy the site is, how future growth in noise is to be taken into account and what sound spectrum to be assumed. Quite clearly, the "one size fits all" approach based on complying with a stated indoor noise limit does not work and leads to an imbalance between those whom benefit from measures that are said to protect road and rail corridors and those that must implement and administer the requested measures.
- (c) While the use of an indoor sound level as a design target can be useful when setting the insulation standard to be achieved by the building, the actual process designing to achieve a stated indoor sound limit entails a great number of assumptions and can lead to uncertainty (not to mention the difficulties in determining compliance, as discussed above).
- (d) For consent authorities and Council's, rules based on ISO 717-1:2013 are preferred because they can be readily checked using a simple test using a handheld sound level meter. The performance of a building can be estimated by simply measuring the difference between the sound level outdoors and the sound level measured indoors.

A full field test of facade transmission loss using ISO 16283-1:2014<sup>3</sup> can be conducted where an "evidential" type test result is desired.

## 10. Discussion and Summary

Council have a duty to manage noise effects in the district. This can often involve deciding upon submissions received that deal with reverse sensitivity noise and vibration effects from road and rail corridors.

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We question whether the need for such methods have ever been properly investigated in a "whole of government" approach that examines the full societal costs and benefits of adopting measures commonly requested. There appears to be no evidence of the operation of any road or rail corridor having been adversely affected by complaints from the public.

The primary need to manage the noise and vibration effects of road and rail activities are surely those based around protecting the health and well-being of exposed populations. It is a curious and disappointing observation that calls to protect the operation of roads and rail corridors due to reverse sensitivity concerns are more commonly raised within RMA proceedings compared to the relatively few submissions received from the Ministry of Health or primary health care agencies regarding the need to protect human health and welfare in these situations.

Councils may also be involved with compliance checking of acoustic insulation of dwellings and habitable rooms established within "noise affected" corridors adjacent to state highways or rail tracks. The above discussion establishes that acoustic insulation performance requirements based around meeting a stated limit of road or rail noise indoors has in practice to be neither practical nor workable. While indoor sound levels are important

for ascertaining the appropriate standard of acoustic insulation to be implemented, as above, the actual acoustic performance standard should be based around the units set out within ISO 717:2013.

Setting acoustic insulation standards on a maximum level of road or rail noise to be received indoors is uncertain for Councils to enforce and impose unnecessary costs and risks for the building designer, builder and/or owner.

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### Publication Dates and Deadlines

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