

20 August 2020

South Waikato District Council
Private Bag 7
Tokoroa 3444

Attention: Patrick McHardy

Dear Patrick

PLAN CHANGE 1 - KIWIRAIL SUBMISSION

Marshall Day Acoustics (MDA) has been retained to review and comment on the submission by Kiwirail regarding South Waikato District Council's Plan Change 1 (PC1). **Please note we have included a post script 'Update as of 25 September 2020' at the conclusion of this letter.**

PC1 proposes to rezone existing rural land, parts of which are adjacent to rail network, for residential use. In general, the Kiwirail submission seeks to eliminate the potential reverse sensitivity that may arise from residential use adjacent to rail network.

The potential reverse sensitivity effect is understood and should in our opinion be addressed through appropriate policy, objectives and rules being included within PC1. The policies and objectives, and any changes will be the responsibility of Council and our focus is the technical form the rules should take.

The responsibility of a new sensitive receiver to mitigate the potential [noise and vibration] effects they receive must be balanced with the noise and vibration generator (Kiwirail) fulfilling its obligation to ensure its own effects are avoided, remedied or mitigated. The balance is, in our opinion, a two-way proposition rather than being solely the responsibility of one party.

KIWIRAIL SUBMISSION

The Kiwirail submission seeks to address potential reverse sensitivity effects from the establishment of residential use adjacent to the rail network. We agree that appropriate rules should be included in PC1 that balance the PC1 policies and objectives, and also avoid, remedy or mitigate the potential reverse sensitivity effects with respect to Kiwirail and the rail network.

While we generally agree with the Kiwirail submission, we do have a number of concerns about the technical aspects of the rules sought.

The concerns raised by Kiwirail relate to noise and vibration received by new residential housing if PC1 is successful. The noise aspect relates to airborne noise received inside dwellings via the building envelope. The vibration aspect relates to felt vibration received within a dwelling due to ground borne energy that is transmitted via the ground into the house structure.

Airborne noise

It is common in NZ to require that dwellings be designed with sound insulation to mitigate noise from neighbouring activities.

There are examples relating to airports, seaports and adjacent to state highways. Accordingly, appropriate levels of noise for indoor noise amenity is well understood.

Vibration

Requirements that limit vibration levels in dwellings is less common than for airborne noise but is becoming increasingly common e.g. NZ Transport Agency's reverse sensitivity guidelines and the Auckland Unitary Plan.

The levels of ground borne vibration generated by the rail network will vary based on a number of factors including:

- the weight and speed of the train
- the condition of the train's wheels and suspension
- The condition of the track i.e. presence of joints or corrugations
- the ground conditions between the track and receivers

RESOURCE MANAGEMENT ACT

The RMA requires the management of effects as a result of reverse sensitivity to be considered. Hand in hand with this is understanding the actual or potential effects that the new activity will be exposed to. Sections 16 and 17 in particular must be considered. s16 of the Resource Management Act states:

16 Duty to avoid unreasonable noise

- (1) Every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level.
- (2) A national environmental standard, plan, or resource consent made or granted for the purposes of any of [sections 9, 12, 13, 14, 15, 15A, and 15B](#) may prescribe noise emission standards, and is not limited in its ability to do so by subsection (1).

Section 16(1): amended, on 7 July 1993, by [section 14](#) of the Resource Management Amendment Act 1993 (1993 No 65).

Section 16(2): replaced, on 1 October 2009, by [section 16](#) of the Resource Management (Simplifying and Streamlining) Amendment Act 2009 (2009 No 31).

Under s16 there is a responsibility on Kiwirail to adopt the best practicable option to ensure noise does not exceed a reasonable level. What is reasonable is not easily defined because there are no noise limits included in the designation over the rail network. As a starting point the typical operation of trains on the rail network is considered reasonable.

There is a responsibility of every land user that their effects on the environment must be understood and quantified to allow them to be avoided, remedied or mitigated. s17 of the Resource Management Act states:

17 Duty to avoid, remedy, or mitigate adverse effects

- (1) Every person has a duty to avoid, remedy, or mitigate any adverse effect on the environment arising from an activity carried on by or on behalf of the person, whether or not the activity is carried on in accordance with—
 - (a) any of [sections 10, 10A, 10B, and 20A](#); or
 - (b) a national environmental standard, a rule, a resource consent, or a designation.
- (2) The duty referred to in subsection (1) is not of itself enforceable against any person, and no person is liable to any other person for a breach of that duty.
- (3) Notwithstanding subsection (2), an enforcement order or abatement notice may be made or served under [Part 12](#) to—
 - (a) require a person to cease, or prohibit a person from commencing, anything that, in the opinion of the Environment Court or an enforcement officer, is or is likely to be noxious, dangerous, offensive, or objectionable to such an extent that it has or is likely to have an adverse effect on the environment; or
 - (b) require a person to do something that, in the opinion of the Environment Court or an enforcement officer, is necessary in order to avoid, remedy, or mitigate any actual or likely adverse effect on the environment caused by, or on behalf of, that person.
- (4) Subsection (3) is subject to [section 319\(2\)](#) (which specifies when an Environment Court shall not make an enforcement order).

Section 17(1): replaced, on 1 October 2009, by [section 17](#) of the Resource Management (Simplifying and Streamlining) Amendment Act 2009 (2009 No 31).

Section 17(3)(a): amended, on 2 September 1996, pursuant to [section 6\(2\)\(a\)](#) of the Resource Management Amendment Act 1996 (1996 No 160).

Section 17(3)(b): amended, on 2 September 1996, pursuant to [section 6\(2\)\(a\)](#) of the Resource Management Amendment Act 1996 (1996 No 160).

Section 17(4): inserted, on 7 July 1993, by [section 15\(2\)](#) of the Resource Management Amendment Act 1993 (1993 No 65).

Section 17(4): amended, on 2 September 1996, pursuant to [section 6\(2\)\(a\)](#) of the Resource Management Amendment Act 1996 (1996 No 160).

In our opinion, Kiwirail has a clear duty to avoid, remedy or mitigate its effects on the environment under s17(1)(b). With respect to PC1, we consider that once Kiwirail demonstrates that they satisfy s17(1)(b), the management of any remaining effects may be passed onto the future receivers by way of rules in PC1. This means it will be the developer's responsibility to avoid, remedy or mitigate the effects they will be exposed to, avoiding a reverse sensitivity issue.

KIWIRAIL EFFECTS

The potential effects from the Kiwirail activity are the generation of noise and vibration.

Any rules relating to mitigation of effects by the receiver must be based on fact and be practical, reasonable and enforceable. Additional information from Kiwirail regarding the vibration generated by their activity is needed to quantify the potential vibration effects and determine appropriate mitigation, if any.

We do not consider the use of 'no-complaint' covenants to be a viable option. They do not mitigate the potential adverse effects, rather they prevent steps being taken against Kiwirail operations by legal means. Casual users of sites within PC1 would not be bound by any no complaints covenant imposed through the adoption of PC1.

Kiwirail Noise

Train noise is generally well known and understood. It is straightforward to measure, quantify and mitigate at the receiver. We agree that 70 $L_{Aeq(1h)}$ at 12 metres as a reference noise level, and the stated attenuation over distance are reasonable.

In order to make better calculations of potential noise levels inside dwellings, we recommend the "on time" per hour of noise from the rail network, and octave band noise levels (that make up the 70dB $L_{Aeq(1h)}$) be provided. We suggest a 5 minute per hour on time be used for calculation purposes.

The Kiwirail submission includes a requirement that *"a noise barrier completely blocks line of sight from all parts of doors and windows, to all points 3.8metres above railway tracks"*.

We consider the requirement for noise barriers that achieve the Kiwirail requirements is they will need to be at *least* the height of any windows and external doors, which in our experience are themselves at least 2.2-2.4m above ground level for a single storey dwelling. Assuming space between any house and noise barrier is provided, the *minimum* barrier height would be 2.5m. If the railway track is elevated even a small amount above the PC1 area, we consider perverse outcomes in terms of noise barrier heights could result in order to comply with Kiwirail submission.

We anticipate that widespread erection of 2.5m high noise barriers throughout a residential development would be counter to the policies and objectives of the South Waikato District Plan. Noise barriers (fences) over 2m in height are deemed to be structures and will also require resource and building consent for each site.

Kiwirail Vibration

The prediction of ground borne vibration is more complicated than for sound, and requires a case by case analysis, but it can be done.

The ground borne vibration received at a dwelling can be predicted once the vibration level of the train, information about the intervening soil type, and the building foundation type is known.

The Kiwirail submission currently requires that any floor slab of a house within 60m of boundary of the railway network be designed to have a natural frequency of less than 10Hz. In addition, vibration isolation separating the sides of the floor slab from the ground is required, without detail about the degree of vibration isolation required.

Furthermore, the Kiwirail submission requires "no rigid connections between the building and ground". We consider these requirements to be unreasonable. The level of vibration at 60 metres from a track will vary

widely and may in some cases be acceptable. And we consider that requiring full structural isolation is heavy handed and undermines the vibration prediction process.

The Kiwirail submission cites a vibration limit of 0.3mm/s $v_{w,95}$, but not the standard it should be measured and assessed by. We assume Kiwirail are referencing Norwegian Standard NS 8176.E 2017. This standard is considered appropriate but must be referenced in any subsequent rule.

RECOMMENDATIONS

Prior to adopting final design guidance for noise and vibration from rail network with respect to PC1 we recommend Kiwirail demonstrate they satisfy s17(1)(b) with regard to noise emission and ground borne vibration.

In table 1 we have provided the Kiwirail submission and a marked-up version which incorporates the following recommendations.

- An octave band spectrum be included from 63Hz-4kHz representative of 70dB $L_{Aeq(1h)}$
- The on-time of trains within a one-hour period is provided
- Outdoor design noise limit be included
- Kiwirail to provide the amount of ground borne vibration they generate in terms of a $v_{w,95}$ vibration level, at reference distances of 15 and 30m for simultaneous train movements over representative areas of the proposed development area – the number of measurements to be agreed with and confirmed by Council
- Indoor vibration limit to be achieved, citing appropriate vibration standard

Table 1: Suggested alternative wording

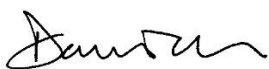
Submission Number	Relief Sought (as stated or similar to achieve the requested relief)						
4.	<p>Amend new Rule 8.3.4(u)(iv)</p> <p>The extent to which consent notices and other measures will be effective to minimise future reverse sensitivity concerns on the boundaries identified on the Planning Maps, between future occupants residents and existing adjoining land uses. This will usually consist of no-complaints covenants, but alternatives such as construction of solid fencing at the subdivision stage, or greater setbacks for new habitable buildings than required by Rule 23.4 may be considered by Council.</p>						
5.	<p>Amend Chapter 15</p> <p><u>Noise Sensitive Activities within 100m of a Rail Network Boundary</u></p> <p><u>Indoor railway noise</u></p> <p><u>1. Any new building or alteration to an existing building that contains an activity sensitive to noise where the building or alteration:</u></p> <p><u>(a) Shall be designed, constructed and maintained to achieve indoor design noise levels resulting from the railway do not exceeding the maximum values in the following Table</u></p> <p><u>XX:</u></p> <p>Table XX: Internal noise limits</p> <table border="1"> <thead> <tr> <th>Building Type</th> <th>Occupancy/activity</th> <th>Maximum railway noise level, dB $L_{Aeq(1h)}$</th> </tr> </thead> <tbody> <tr> <td>Residential</td> <td>Sleeping spaces</td> <td>35</td> </tr> </tbody> </table>	Building Type	Occupancy/activity	Maximum railway noise level, dB $L_{Aeq(1h)}$	Residential	Sleeping spaces	35
Building Type	Occupancy/activity	Maximum railway noise level, dB $L_{Aeq(1h)}$					
Residential	Sleeping spaces	35					

	<p><i>All other habitable spaces</i> 40</p> <hr/> <p><i>Education</i></p> <p><i>Lecture rooms/theatres, music studios, assembly halls</i> 35</p> <hr/> <p><i>Teaching areas, conference rooms, drama studios, sleeping areas</i> 35</p> <hr/> <p><i>Libraries</i> 45</p> <hr/> <p><i>Health</i></p> <p><i>Overnight medical care wards</i> 40</p> <hr/> <p><i>Clinics, consulting rooms, theatres, nurses stations</i> 45</p> <hr/> <p><i>Places of worship, marae</i> 35</p> <hr/>
	<p>of</p> <p>(b) is at least 50 metres from any railway network, and is designed so that a noise barrier completely blocks line of sight from all parts of doors and windows, to all points 3.8 metres above railway tracks</p> <p><u>Mechanical ventilation</u></p> <p><u>2. if windows must be closed to achieve the design noise levels in clause 1(a), the building is designed, constructed and maintained with a mechanical ventilation system that</u></p> <p><u>(a) For habitable rooms for a residential activity, achieves the following requirements:</u></p> <p><u>i. provides mechanical ventilation to satisfy clause G4 of the New Zealand Building Code; and</u></p> <p><u>ii. is adjustable by the occupant to control the ventilation rate in increments up to a high air flow setting that provides at least 6 air changes per hour; and</u></p> <p><u>iii. provides relief for equivalent volumes of spill air;</u></p> <p><u>iv. provides cooling and heating that is controllable by the occupant and can maintain the inside temperature between 18°C and 25°C; and does not generate more than 35 dB LAeq(30s)</u></p>
	<p><u>when measured 1 metre away from any grille or diffuser.</u></p> <p><u>(b) For other spaces, is as determined by a suitably qualified and experienced person.</u></p> <p><u>Indoor railway vibration</u></p> <p><u>3. Any new buildings or alterations to existing buildings containing an activity sensitive to noise any of the activities in Table XX above, closer than 60 metres from the boundary of a railway network:</u></p> <p><u>(a) is designed, constructed and maintained to achieve so that rail vibration levels do not exceed Class C as defined in Table 1 of NS8176:2017. 0.3 mm/s v_w, 95 or</u></p> <p><u>(b) is a single storey framed residential building with:</u></p>

	<p><u>i. a constant level floor slab on a full surface vibration isolation bearing with natural frequency not exceeding 10 Hz, installed in accordance with the supplier's instructions and recommendations; and</u></p> <p><u>ii. vibration isolation separating the sides of the floor slab from the ground; and</u></p> <p><u>iii. no rigid connections between the building and the ground.</u></p> <p>4. A report is prepared by a suitably qualified and experienced acoustic consultant and is submitted to the council demonstrating compliance with clauses (1) to (3) above (as relevant) prior to the construction or alteration of any building containing an activity sensitive to noise and vibration. In the design:</p> <p>(a) Railway noise is assumed to be 70 LAeq(1h) at a distance of 12 metres from the 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; and</p> <p>(b) Railway noise spectrum at 12 m shall be assumed to be:</p> <p>Table YY: Train noise octave band data for calculation</p> <table border="1" data-bbox="411 949 1171 1115"> <thead> <tr> <th colspan="8">Octave Band Centre Frequency (Hz)</th> </tr> <tr> <th>63</th> <th>125</th> <th>250</th> <th>500</th> <th>1000</th> <th>2000</th> <th>4000</th> <th>dBA</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>70</td> </tr> </tbody> </table> <p>and</p> <p>(c) The on time of the train shall be taken as 5 minutes per hour.</p> <p>(d) The ground borne vibration shall be taken as:</p> <p>[Data at 15 and 30m to be provided by Kiwirail; number of measurements to be agreed with and confirmed by Council]</p>	Octave Band Centre Frequency (Hz)								63	125	250	500	1000	2000	4000	dBA								70
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6.	<p>Amend Planning Maps:</p> <p>Amend planning maps 18 and 20 to include reverse sensitivity mitigation along the Growth Cell 1 Overdale Road boundary.</p> <p>Amend planning maps 20, 21 and 22 to include reverse sensitivity mitigation along the Growth Cell 4 boundary shared with the rail corridor.</p>																								

Yours faithfully

MARSHALL DAY ACOUSTICS LTD



Damian Ellerton
Associate

UPDATE AS OF 25 SEPTEMBER 2020

In order to make the process as efficient as possible, we suggested the following matters were highlighted as areas that required further consideration:

1. Additional information from Kiwirail regarding the vibration generated by their activity is needed to quantify the potential vibration effects and determine appropriate mitigation, if any.
2. In order to make better calculations of potential noise levels inside dwellings, we recommend the “on time” per hour of noise from the rail network be provided. We suggest a 5 minute per hour on time be used for calculation purposes.
3. Octave band noise levels (that make up the 70dB $L_{Aeq(1h)}$) should be provided. An octave band spectrum should be included from 63Hz-4kHz representative of 70dB $L_{Aeq(1h)}$
3. The Kiwirail submission cites a vibration limit of 0.3mm/s $v_{w,95}$, but not the standard it should be measured and assessed by. Please confirm whether KiwiRail are referencing Norwegian Standard NS 8176.E 2017.
4. Outdoor design noise limit be included.
5. Kiwirail to provide the amount of ground borne vibration they generate in terms of a $v_{w,95}$ vibration level, at reference distances of 15 and 30m for simultaneous train movements over representative areas of the proposed development area – the number of measurements to be agreed with and confirmed by Council.

We received a preliminary response from Sheena McGuire (Kiwirail) with regard to items 1, 2, 3, 4 and 6 that did not in our opinion answer those matters.

Kiwirail confirmed they do not seek outdoor noise limits for properties, and we concur with this position, and confirm Table 1 above reflects this position.

We have subsequently discussed the Kiwirail response to items 1, 2, 3, 4 and 6 and it was agreed that a discussion between myself and Stephen Chiles (Kiwirail technical advisor). Unfortunately, we have not been able to have a technical discussion with Stephen Chiles as of 25 September 2020. However, we are optimistic that a discussion may occur prior to the meeting on 14 October before the Hearings Panel.