HEGLEY ACOUSTIC CONSULTANTS

14 July 2015

Ross McDowell
Harrison Grierson
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TAURANGA 3140

Dear Ross

THE LAKES – STAGE 2P2

Thank you for the information on stage 2P2 of The Lakes development in Tauranga. The development consists of a residential subdivision adjacent to Takitimu Drive (SH36), comprising of Lots 931 – 944, 949 and 950. Figure 1 shows the proposal. As requested I have considered the mitigation required to control traffic noise to the proposed subdivision.

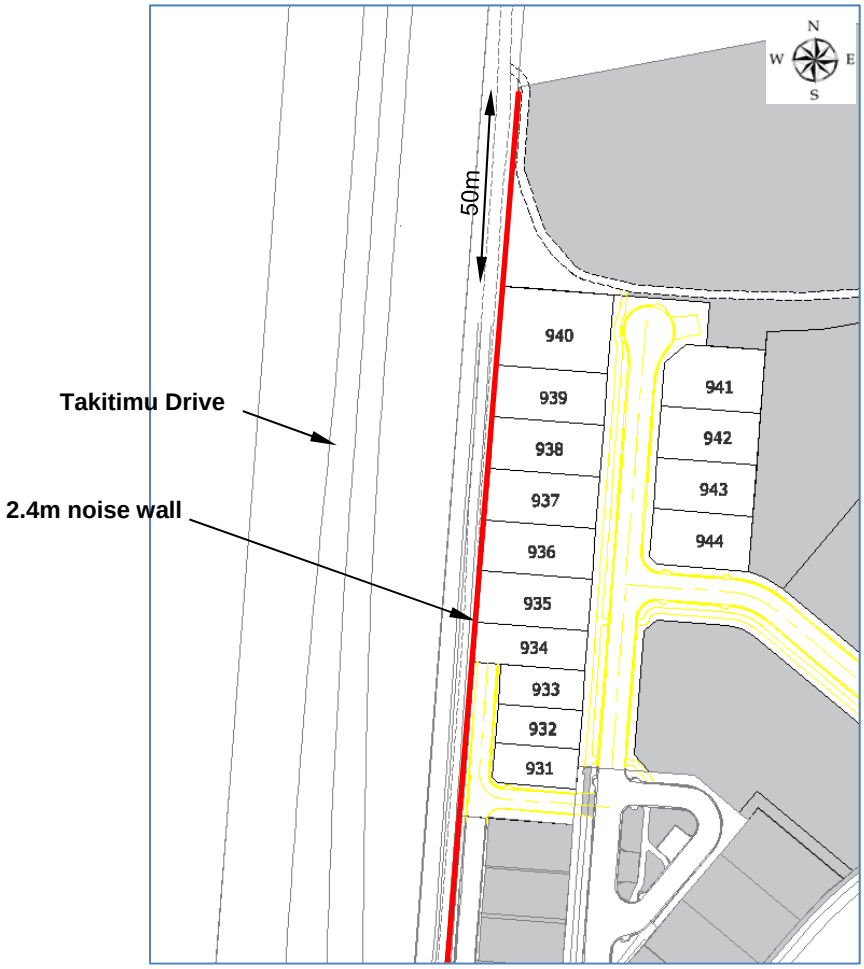

Figure 1. The Proposal

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Design Criteria

Rule 4E.2.5 of the District Plan provides criteria for new dwellings that are constructed next to busy roads. Strictly speaking, this rule relates to the person developing the residence rather than the subdivision. However, earlier stages of The Lakes development have all been designed to control road traffic noise to the subdivision, albeit to various rules. For consistency, Stage 2P2 has also been designed for road traffic noise through the adoption of the District Plan rule, part a) which requires:

> *For properties within the NZTA (New Zealand Transport Agency) Reverse Sensitivity Plan Area shown on the Plan Maps (Part B):*
>
> *i) Any new dwelling shall meet an internal road-traffic design sound level of 40dB $L_{Aeq(24h)}$ inside all habitable rooms with ventilating windows open.*

This report provides a method by which noise from road traffic on SH36 will be controlled to within the 40dB $L_{Aeq(24h)}$ requirement of the District Plan to habitable rooms whilst the rooms are being adequately ventilated.

Road Noise

Noise from road traffic has been predicted to the subdivision using the Predictor noise prediction program. Predictor uses the electronic files of the alignment and surrounding topography to build a full scale model of the road and adjacent sites. As there are no houses in the area currently being assessed, the analysis has been based on the most exposed facade of future houses being 2m from the road side boundary, which is typical of the houses that have already been constructed further north along Takitimu Drive.

Traffic noise has been predicted based on the understanding that the road has a medium grade chip seal surface. It is understood the traffic flow on SH36 adjacent to Stage 2P2 of The Lakes will be 15,337 vehicles per day. There will be 5% heavy commercial vehicles and the speed of all traffic will be 100km/hr.

Mitigation

The analysis began by considering the practicability of noise barriers to control the internal levels to within the 40dB $L_{Aeq(24h)}$ criterion. This approach is based on a façade with a top hung window that is open for ventilation providing a 15dB reduction. This being the case, to achieve 40dB internally the level at the most exposed facade must be controlled to within 55dB $L_{Aeq(24h)}$. As the dwellings are yet to be constructed, it has been assumed they may be of two storey construction. This is an important consideration, as increasing the receiver heights will have an effect on the height of the barriers.

Analysis showed that a continuation of the 2.4m high barrier that was adopted for the Stage immediately to the south of the current proposal would achieve a façade level of 55dB $L_{Aeq(24h)}$ or below to the ground floor of approximately a third of dwellings within Stage 2P2. To achieve 55dB to the remainder of the ground floors would require barriers of up to 4.0m in places with higher barriers again to achieve 55dB to all upper floor receivers. These relatively large barriers are due to the fact that the terrain rises from the road so that the dwellings will be elevated. The conclusion was therefore that while it was practicable to screen some ground floors, it was not practicable to use barriers to achieve the internal design criterion in all situations. This finding is common to most of the other Stages of The Lakes development where the approach taken by the design team was to use barriers where practicable and attenuation provided by the building façade for the remaining dwellings. This same approach will be adopted for the current Stage 2P2.

The design is based on a 2.4m high barrier on the boundary of the Lots facing Takitimu Drive. The barrier should begin at the same height as the Stage 2P barrier immediately to the south of the proposal and extend approximately 50m past the point at which the Lot 940 boundary intersects with the barrier. Figure 1 shows the barrier location. The barrier could be constructed as a wall, a bund or a combination of each. If the wall option is selected the wall must be constructed from a material with a surface density of 10kg/m^2 or greater. Suitable materials consist of 20mm pine palings, 9mm fibre cement sheet or 20mm plywood. Concrete and masonry are also suitable. There must be no untreated openings in the wall, including at the base and if timber palings are used, they must be butted together with battens placed over the joints to control openings forming as the palings dry and shrink. Suitable construction details are shown on Figure 2 below.

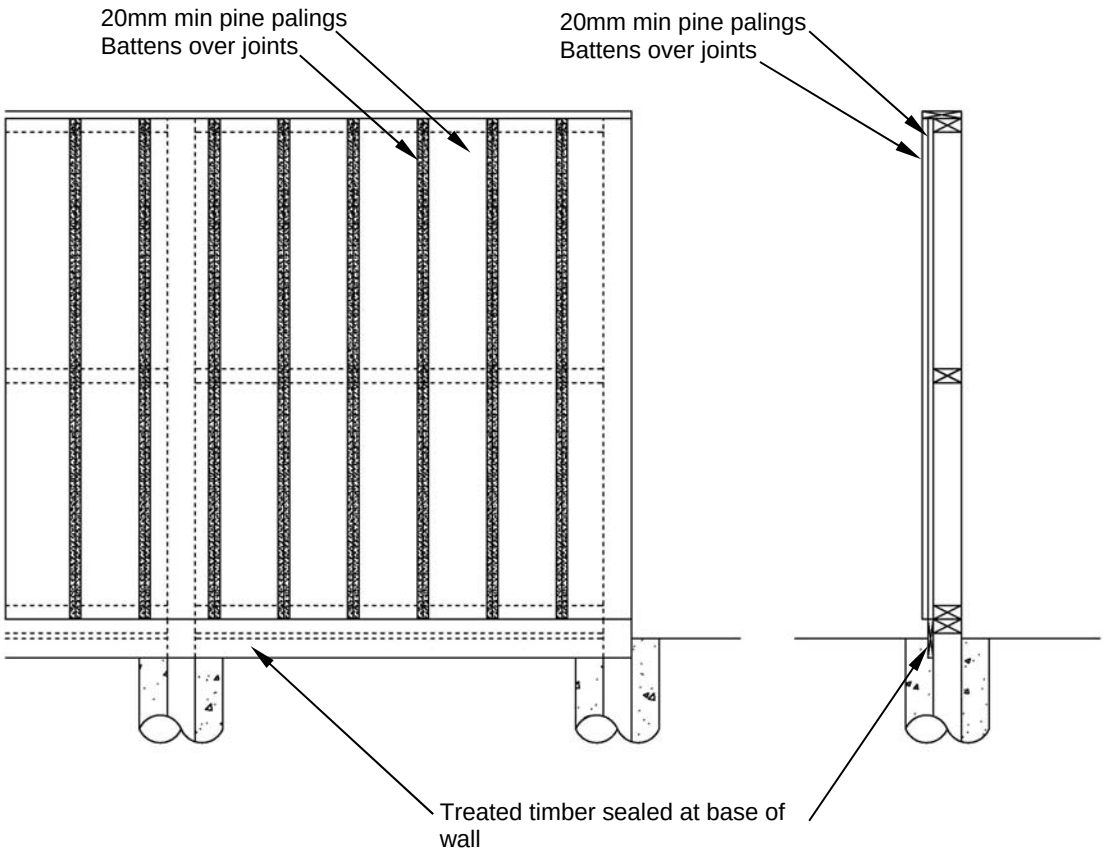


Figure 2. Suitable Timber Wall Detail

With the barrier in place, the predicted road traffic levels are shown in Table 1.

Table 1. Summary of Façade Traffic Noise Levels with Barrier Mitigation only

Lot	Façade Noise Levels, (dB $L_{Aeq(24hr)}$)	
	Ground Floor	First Floor
Lot 931	56	62
Lot 932	56	63
Lot 933	56	63
Lot 934	57	65
Lot 935	57	66
Lot 936	57	66
Lot 937	57	66
Lot 938	57	66
Lot 939	57	66
Lot 940	58	65
Lot 941	55	59
Lot 942	54	58
Lot 943	54	58
Lot 944	54	57

<= 55dB $L_{Aeq(24hour)}$
> 55dB $L_{Aeq(24hour)}$

Table 1 shows that the predicted facade levels would exceed the 55dB $L_{Aeq(24hour)}$ criterion for:

- ground floor dwellings on Lots 931 to 940; and
- Any upper level constructed on Lots 931 – 944.

For dwellings on these Lots it is proposed that façade mitigation be used to control internal levels of noise to within the required 40dB $L_{Aeq(24hour)}$. This mitigation is discussed in the following section.

It should be noted that while not a requirement of the District Plan, the façade mitigation will do nothing to control the external noise levels in any outdoor amenity areas.

Façade Mitigation

Table 1 shows that the maximum level of noise that any dwelling can expect is 66dB $L_{Aeq(24hr)}$ (the upper floors of Lots 935 - 939). These facades must be capable of achieving a reduction of at least 26dB to achieve the required internal level of 40dB $L_{Aeq(24hr)}$.

To demonstrate that it is practicable to achieve this reduction, conventional façade construction has been investigated.

Conventional 6mm float glass will provide approximately 28dB reduction, depending upon its size, when closed and is therefore suitable. A standard roof construction consisting of 0.4mm profiled metal cladding, blanket and a 10mm Gib Board ceiling will provide a greater reduction at approximately 30dB. Timber framed walls with a fibre cement sheet cladding, cavity absorption and a 10mm Gib Board lining will provide a similar reduction to the roof. From the above constructions, it can be seen that even the most basic forms of construction can achieve the required reductions meaning that there are ample construction options available that will meet the District Plan criterion.

Proposed Conditions

A suitable condition for the subdivision that would ensure the barrier adopted by this assessment is included could read:

> *A noise wall shall be constructed along the western site boundary to screen the Lots from road traffic noise. The barrier shall be a minimum of 2.4m high, constructed in the location described by Figure 1 of the letter by Hegley Acoustic Consultants to Harrison Grierson dated 6 July 2015. The noise wall will be constructed from a material with a surface density of 10kg/m^2 or greater. There must be no untreated openings in the wall, including at its base and if timber palings are used, they must be butted together with battens placed over the joints to control openings forming as the palings dry and shrink.*

To ensure the appropriate houses are designed to control traffic noise to all floors where barriers are not practical, the following condition could be placed on the titles of Lots 931 - 940:

> *Any dwelling shall meet an internal road-traffic design sound level of 40dB $L_{Aeq(24h)}$ inside all habitable rooms with ventilating windows open. Where windows must remain closed to achieve the required internal noise level, alternative ventilation must be supplied that provides ventilation in accordance with the building code. Noise from the ventilation system must not exceed 35dB $L_{Aeq(30s)}$ when measured 1 metre from any grille or diffuser.*

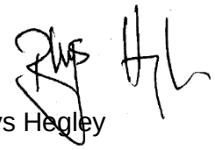
To ensure the appropriate houses are designed to control traffic noise to the upper floor only where barriers are not practical, the following condition could be placed on the titles of Lots 941 - 944:

> *The first floor of any dwelling shall meet an internal road-traffic design sound level of 40dB $L_{Aeq(24h)}$ inside all habitable rooms with ventilating windows open. Where windows must remain closed to achieve the required internal noise level, alternative ventilation must be supplied that provides ventilation in accordance with the building code. Noise from the ventilation system must not exceed 35dB $L_{Aeq(30s)}$ when measured 1 metre from any grille or diffuser.*

I note that previous conditions for other Stages of The Lakes development provided additional requirements for the ventilation system. While these appear sensible I have not commented on them as they are outside of my area of expertise. It may, however, be reasonable to add these ventilation requirements to any final condition.

Should you have any questions regarding the above please do not hesitate to contact me.

Yours sincerely
Hegley Acoustic Consultants



Rhys Hegley