HEGLEY ACOUSTIC CONSULTANTS

22 May 2015

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Harrison Grierson
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Dear Ross

THE LAKES – STAGE 3CD

Thank you for the amended information on stage 3CD of The Lakes development in Tauranga which now includes the amended Lots and ground contours. The development consists of a residential subdivision adjacent to Takitimu Drive (SH36), as shown on Figure 1. As requested I have considered the mitigation required to control traffic noise to the proposed subdivision.

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 3CD 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 they 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 3 of The Lakes will be 5,540 vehicles per day. There will be 5% heavy commercial vehicles and the speed of all traffic will be 100km/hr.

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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 that 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 while a 2.0m high barrier would achieve a façade level of 55dB $L_{Aeq(24h)}$ or below to the ground floor of most dwellings within Stage 3CD, there are a number of dwellings where barrier heights would need to be up to 4.0m to provide the necessary reductions. Due to their elevation, the barriers needed to screen any future first floors would be both longer and higher than those required for the ground floors. The relatively large barrier heights required for the ground floor are due to the fact that terrain rises from the road across the subdivision so that the dwelling will be elevated with respect to the barrier. In recognition of this, the design team investigated re-grading the site, but concluded that this was not practicable.

The conclusion of this analysis was that while it was practicable to screen the ground floors of most dwellings, it was not practicable to use barriers to screen all ground floors and a number of any future first floors. The fact that it would not be practicable to screen all possible first floors is common to all stages of The Lakes development. In previous stages, the approach taken by the design team was that the best solution for the development was not to try and screen the upper floors but rather treat the facades to control the internal levels of traffic noise. This same approach will be adopted for the current Stage 3CD. Where the current stage differs from previous stages was the decision to adopt the same approach to the ground floors where it was found that excessive barrier heights were necessary to achieve the required façade level of 55dB $L_{Aeq(24h)}$. For consistency with the other Stages, the barrier height was limited to 2.0m meaning some ground floors will receive levels greater than 55dB $L_{Aeq(24h)}$. The effects of this are discussed below.

The selected barrier was based on a 2.0m high barrier on the southern boundary of the Lots at finished ground level, as shown on Figure 1. The height of the top of the barrier is important to the design. Should this finished ground level be altered, the top of the barrier must remain at least as high as the current design. If necessary, the coordinates of this barrier can be provided in electronic form. Analysis has included the noise wall proposed for stage 3AB of The Lakes, which is immediately to the north of Stage 3.

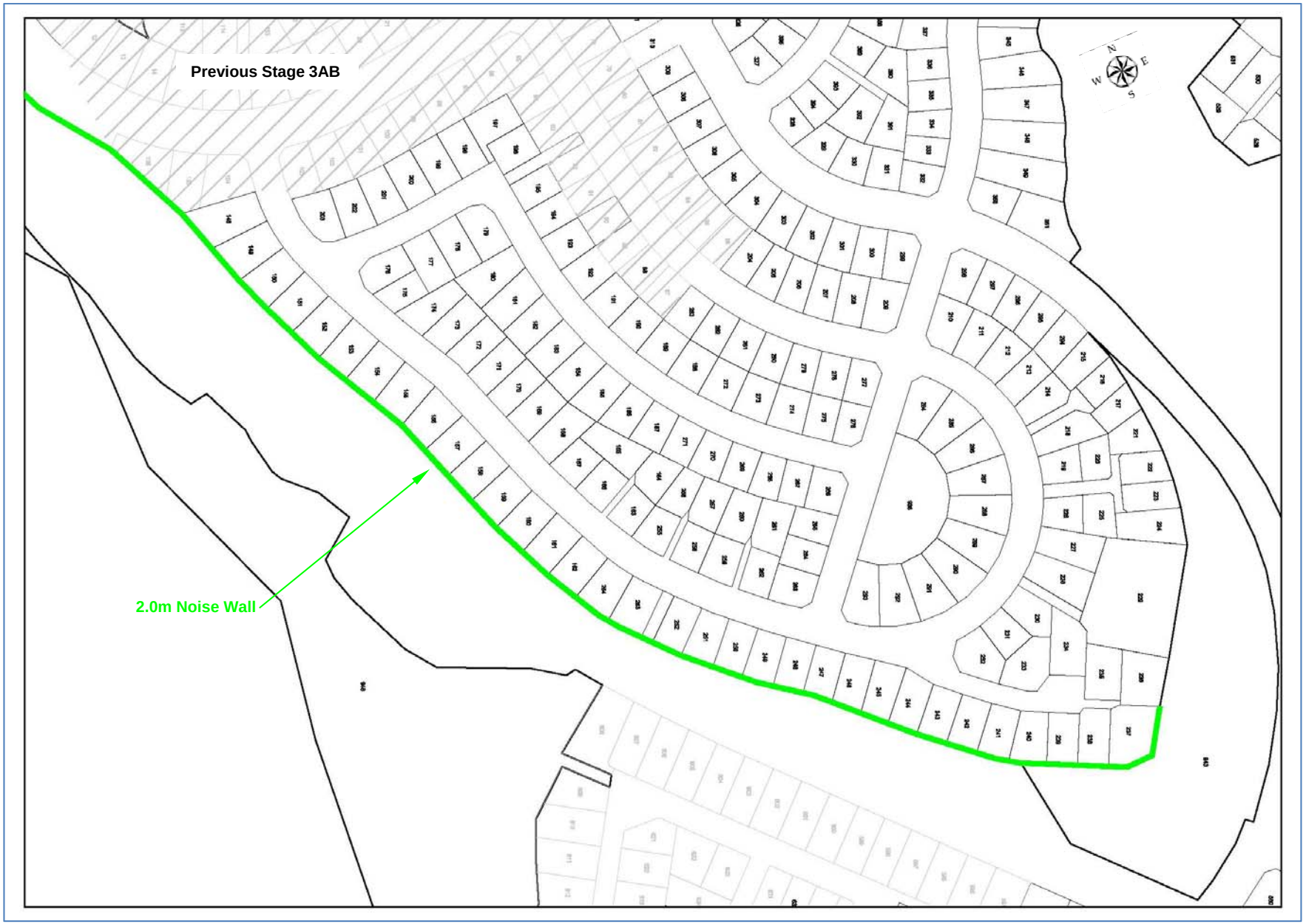

Figure 1. Lot Plan of Stage 3CD showing Barrier

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.

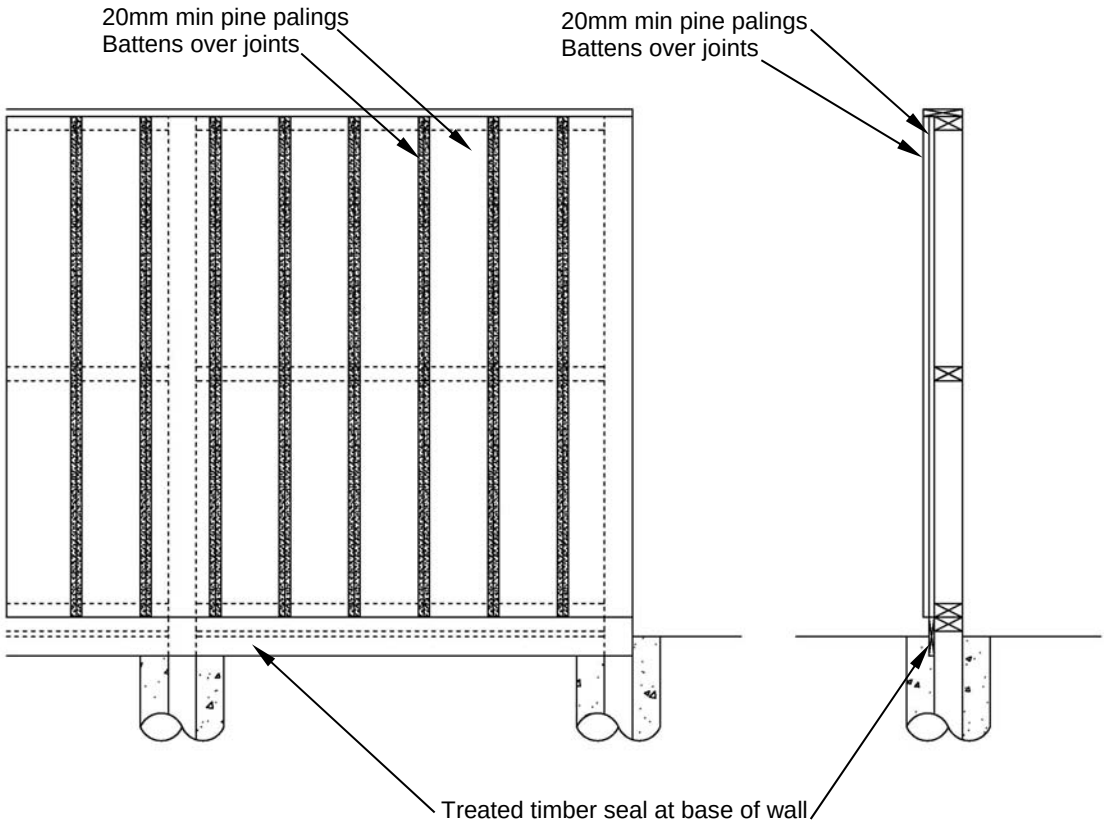

Figure 2. Suitable Timber Wall Detail

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

Table 1. Summary of Façade Traffic Noise Levels

Lot	Façade Noise Level (dB $L_{Aeq(24hr)}$)		Lot	Façade Noise Level (dB $L_{Aeq(24hr)}$)	
	Ground Floor	First Floor		Ground Floor	First Floor
Lot 148	52	60	Lot 234	48	51
Lot 149	53	60	Lot 235	49	52
Lot 150	53	60	Lot 236	49	53
Lot 151	53	60	Lot 238	51	57
Lot 152	53	61	Lot 239	53	58
Lot 153	53	60	Lot 240	51	58
Lot 154	53	59	Lot 241	52	60
Lot 155	53	59	Lot 242	51	58
Lot 156	54	60	Lot 243	51	58
Lot 157	54	60	Lot 244	52	59
Lot 158	55	61	Lot 245	52	59
Lot 159	57	63	Lot 246	52	59
Lot 160	58	63	Lot 247	53	60
Lot 161	59	63	Lot 248	54	61
Lot 162	59	64	Lot 249	56	62
Lot 163	55	57	Lot 250	57	63
Lot 166	54	57	Lot 251	57	64
Lot 167	54	56	Lot 252	58	64
Lot 168	53	55	Lot 253	58	63
Lot 169	52	54	Lot 254	59	64
Lot 170	52	54	Lot 255	55	57
Lot 171	52	54	Lot 258	55	56
Lot 172	51	53	Lot 259	54	56
Lot 173	51	53	Lot 262	53	55
Lot 174	50	52	Lot 263	50	52
Lot 175	49	52	Lot 289	44	46
Lot 176	49	51	Lot 290	48	49
Lot 203	49	51	Lot 291	49	50
Lot 224	52	58	Lot 292	49	51
Lot 232	47	50	Lot 293	50	52
Lot 233	47	51			

<= 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:

- The ground floor dwellings on Lots 159 – 162, 234, and 249 – 254, all of which face Takitimu Drive.

- Any upper level constructed on Lots 148 – 167, 224, and 238- 259).

In these locations 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 64dB $L_{Aeq(24hr)}$ (Lots 162, 251, 252, and 254). The facades of any upper floor on these Lots must be capable of achieving a reduction of at least 24dB 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 4mm float glass will provide approximately 25dB 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 2.0m high, constructed in the location described by Figure 1 of the letter by Hegley Acoustic Consultants to Harrison Grierson dated 22 May 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 the barrier will not, the following condition could be placed on the titles of Lots 159 – 162 and 250 - 254:

> *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 the barrier will not, the following condition could be placed on the titles of Lots 148 – 158, 163,166, 167,238 – 248, 255, 258, and 259:

> *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