

2 June 2017

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Dear Ross

THE LAKES – STAGE 3JKL

Thank you for the information on Stage 3JKL of The Lakes development in Tauranga. The development consists of a residential subdivision adjacent to Takitimu Drive (SH36), comprising of Lots 589 – 779, as shown on Figures 1 and 2. As requested, we 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, all stages of The Lakes development have been designed to control road traffic noise to the subdivision, with the later stages all adopting the District Plan rule. For consistency, the current Stage 3JKL 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 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 approximately 6m from the site boundary facing the road.

Lots 711, 713, 714 and 718 all slope down away from the road. The following assessment is based on the assumption that future dwellings would be in the most exposed location at the top of the slope. Should the dwellings be positioned further down the slope, they would be exposed to lower levels of traffic noise due to the increased distance and screening from topography. In such cases,

the developer may wish to undertake a site specific noise study as the actual levels of road traffic noise could be considerably less than the worst case situation reported below.

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 3JKL of The Lakes will be 5,540 vehicles per day, 5% of which will be heavy commercial vehicles. The posted speed is 100km/hr for SH36. The analysis takes into account the proposed roundabout on SH36 adjacent to Lots 608 and 624.

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 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 decrease the effectiveness of the barriers.

Analysis showed that a 2.4m high barrier on the common site boundary with SH36 would achieve a façade level of 55dB $L_{Aeq(24h)}$ or below to the majority of the dwellings. The barrier locations are shown in Figure 1 below.

To achieve 55dB or below to additional dwellings would require barriers well in excess of 2.4m with higher barriers again to achieve below 55dB for upper floor receivers. The conclusion was therefore that while it was practicable to screen most Lots, 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 to achieve the required internal noise level was to use barriers where practicable and attenuation provided by the building façade for the remaining dwellings.

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.

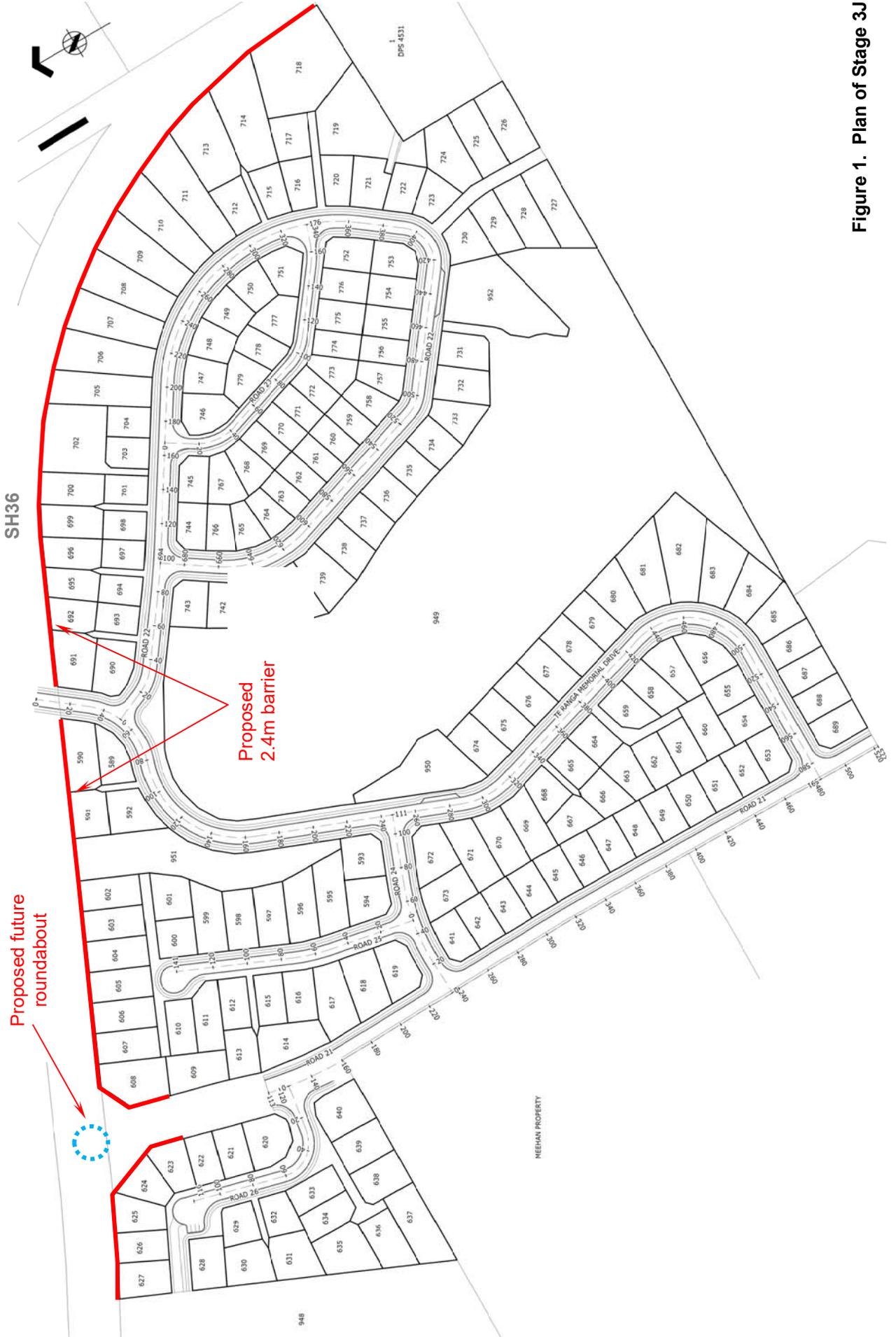


Figure 1. Plan of Stage 3JKL

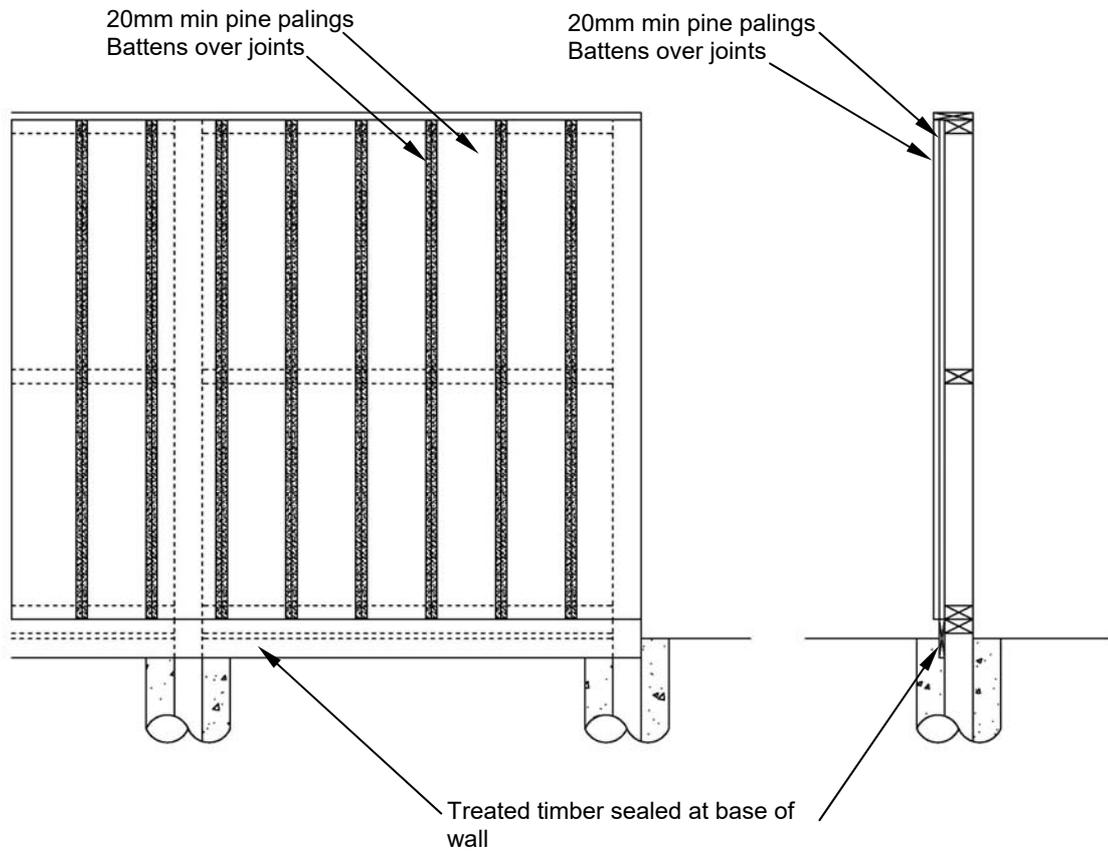


Figure 2. Suitable Timber Wall Detail

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

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

Lot	Façade Noise Levels (dB L _{Aeq} (24hr))		Lot	Façade Noise Levels (dB L _{Aeq} (24hr))	
	Ground Floor	First Floor		Ground Floor	First Floor
589	63	64	626	60	67
590	63	67	627	62	66
591	60	67	628	60	60
592	61	63	629	58	59
593	56	56	630	59	59
594	56	56	631	58	58
595	56	57	632	57	57
596	57	57	633	56	57
597	57	58	634	56	56
598	58	58	635	56	57
599	59	59	636	55	55
600	59	60	637	54	55
601	60	61	638	55	55
602	63	67	639	55	55
603	62	67	640	56	57
604	62	67	641	54	55
605	62	67	642	54	54
606	61	67	643	53	54
607	61	67	644	53	54
608	60	67	645	53	53
609	57	60	646	52	53
610	57	59	647	52	52
611	56	58	648	52	52
612	56	58	649	51	52
613	58	59	650	51	52
614	58	59	651	51	51
615	56	58	652	51	51
616	57	58	653	51	51
617	57	57	654	51	51
618	56	57	655	51	51
619	55	56	656	51	52
620	57	58	657	52	52
621	57	59	658	52	52
622	57	60	659	52	52
623	57	63	660	51	52
624	57	66	661	51	52
625	59	66	662	51	52

Lot	Façade Noise Levels (dB L _{Aeq} (24hr))		Lot	Façade Noise Levels (dB L _{Aeq} (24hr))	
	Ground Floor	First Floor		Ground Floor	First Floor
663	52	52	703	56	56
664	52	53	704	55	56
665	52	53	705	58	61
666	52	53	706	58	62
667	53	53	707	58	63
668	52	53	708	58	63
669	53	54	709	57	62
670	53	54	710	57	61
671	54	54	711	56	60
672	54	55	712	52	53
673	54	55	713	56	60
674	54	54	714	56	60
675	54	54	715	52	52
676	53	53	716	51	52
677	53	53	717	52	53
678	53	53	718	56	61
679	52	53	719	51	52
680	52	52	720	51	51
681	52	52	721	50	51
682	52	52	722	50	50
683	50	51	723	50	50
684	50	51	724	50	51
685	51	51	725	50	51
686	51	51	726	50	52
687	50	51	727	52	52
688	50	50	728	50	51
689	50	50	729	50	50
690	63	63	730	50	50
691	65	68	731	50	50
692	60	65	732	50	51
693	60	62	733	50	51
694	59	60	734	51	51
695	59	65	735	52	52
696	59	65	736	52	52
697	58	59	737	52	53
698	57	58	738	53	53
699	59	64	739	54	54
700	59	64	740	54	55
701	56	57	741	55	56
702	59	65	742	56	57

Lot	Façade Noise Levels (dB L _{Aeq(24hr)})		Lot	Façade Noise Levels (dB L _{Aeq(24hr)})	
	Ground Floor	First Floor		Ground Floor	First Floor
743	57	58	762	53	54
744	55	56	763	54	54
745	55	55	764	54	55
746	54	55	765	55	55
747	54	54	766	55	56
748	53	54	767	55	55
749	53	53	768	54	54
750	52	53	769	53	54
751	52	52	770	53	53
752	51	51	771	53	53
753	51	51	772	52	53
754	51	51	773	52	52
755	51	51	774	52	52
756	51	51	775	51	52
757	51	52	776	51	52
758	52	52	777	52	53
759	52	52	778	53	53
760	52	53	779	53	54
761	53	53			

	<= 55dB L _{Aeq(24hour)}
	>= 55dB L _{Aeq(24hour)}

For dwellings on Lots with levels exceeding 55dB L_{Aeq(24hour)} 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 68dB L_{Aeq(24hr)}. These facades must be capable of a reduction of at least 28dB 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.

Double glazing consisting of 6mm float glass, a 12mm cavity and a further layer of 4mm float glass will provide approximately 29dB reduction, depending upon its size, when closed and is therefore suitable. A standard roof construction consisting of 0.4mm profiled metal cladding, insulation blanket and a 10mm Gib Board ceiling will provide in excess of a 30dB reduction. Timber framed walls with a brick cladding, cavity absorption and a 10mm Gib Board lining will provide well in excess of the necessary reductions. From the above constructions, it can be seen that typical 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:

Noise walls shall be constructed along the site boundaries with SH36 to screen the Lots from road traffic noise. The barriers shall be a minimum of 2.4m in height and be constructed in the location described by Figure 1 of the letter by Hegley Acoustic Consultants to Harrison Grierson dated 19 May 2017. The noise walls will be constructed from a material with a surface density of 10kg/m² 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 increased barrier heights are not practical, the following condition could be placed on the titles of all Lots shown in Table 2:

Table 2. Lots with noise condition to all floors

589	590	591	592	593	594	595	596	597	598
599	600	601	602	603	604	605	606	607	608
609	610	611	612	613	614	615	616	617	618
620	621	622	623	624	625	626	627	628	629
630	631	632	633	634	635	640	690	691	692
693	694	695	696	697	698	699	700	701	702
703	705	706	707	708	709	710	711	713	714
718	742	743							

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 increased barrier heights are not practical, the following condition could be placed on the titles of Lots shown in Table 3:

Table 3. Lots with noise condition to upper floors only

619	704	741	744	766
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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.

Previous conditions for other Stages of The Lakes development provided additional requirements for the ventilation system. While these appear sensible we have not commented on them as they are outside our area of expertise. It may, however, be reasonable to include these ventilation requirements in any final condition.

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

Yours faithfully
Hegley Acoustic Consultants

A handwritten signature in black ink, appearing to read 'MAB', with a long horizontal flourish extending to the right.

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