

Transport noise

Noise effects



NZ TRANSPORT AGENCY
WAKA KOTAHI

NOISE BARRIER CASE STUDY 12

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The Kamo Bypass is a new state highway built through an existing residential area. Noise barriers were part of the noise mitigation solution to comply with the designation conditions

Kamo Bypass

The Kamo Bypass stage 2 project (2011) in Whangarei is a new four-lane state highway. The bypass moves traffic away from the town centre and residential areas surrounding Kamo Road, and provides improved traffic management to the northern suburbs of Whangarei. It is one of six projects planned in Whangarei to manage traffic growth, improve safety and make travel easier for locals and visitors.

This case study considers the use of older noise criteria under the existing designation conditions, and the resulting noise barriers. It also examines the effectiveness of the noise barriers in respect to noise effects such as reflection of railway noise and truck noise. Graffiti and property boundary issues are also discussed.

Designation conditions

The designation conditions for the Kamo Bypass (confirmed in 1993) require the road to be designed and constructed so road-traffic noise does not exceed $60 \text{ dB L}_{A10(18h)}$ at neighbouring houses.

In order to comply with the designation conditions, the noise mitigation implemented for the Kamo Bypass includes open graded porous asphalt low-noise road surfacing and four sections of noise barrier (total length of 750 metres), ranging in height from 0.9 metres to 2.7 metres. The cost of the noise barriers was approximately \$480 per linear metre (average height 1.8 metres). The barriers are 120 mm thick, 4 metre long precast concrete panels in steel I section posts.

An interesting feature of this project is the noise criteria from the 1993 designation conditions. If noise had been assessed under the Transit Guidelines (1999)¹ a significant reduction in the length of noise barriers would have resulted. Under the current New Zealand Standard NZS 6806 (2010)² where best practicable option is assessed, alternative mitigation would also have been likely, eg a reduction in the height and length of the barriers.

Noise effects

The Kamo Bypass passes through a pre-existing residential area. 46 houses in the direct path of the bypass were acquired and demolished under the Public Works Act. The bypass has resulted in increased traffic noise for the remaining houses adjacent to the new road. The existing North Auckland railway line (freight only) runs alongside half of the new road, and operates on weekdays only between Whangarei and Otiria/Kauri. Other noise sources include Kamo Road, although this is over 100 metres from residents adjacent to the new road.

Since the opening of the new bypass, residents at five properties have complained of noise effects including increased truck noise, reflected railway noise, as well as a general increase in road-traffic noise. Post-construction noise monitoring showed the noise levels at all five properties satisfy the $60 \text{ dB L}_{A10(18h)}$ criterion set by the designation conditions. However, this single number criterion does not capture all reported noise effects.



Noise barriers placed between the road and the railway

⁰¹ NZTA Planning policy manual 'Appendix 6: Guidelines for the management of road traffic noise – state highway improvements' (1999)

⁰² NZS 6806:2010 Acoustics – road-traffic noise – new and altered roads



Truck noise can cause disturbance for residents close to roads with steep gradients

At one location the new road has a gradient of 5% close to an intersection. A resident living 10 metres away from this section of the road has complained about increased noise from truck engine braking and acceleration. There is a 2.1 metre high noise barrier in this location, but truck exhausts are often above this height. The reduction of general (tyre/road) traffic noise by the noise barriers might even accentuate perception of truck exhaust noise.

Specific noise criteria to control individual vehicle noise such as truck engine braking was not included in the designation conditions and is not included in the current standard NZS 6806, as these noise sources are generally outside the control of the road controlling authority. However, this is an issue which causes disturbance in a number of places around New Zealand and the Transport Agency is currently exploring strategies to better manage the issue (2013). This case study illustrates that the effects of individual vehicles (eg trucks) should be considered in noise assessments for roads with steep gradients close to residents. Noise barriers to control general traffic noise may not be the most appropriate form of mitigation in cases where noise from high truck exhausts is significant. In these cases, the effects of road gradients on engine braking, and proximity to residents should be considered as part of the road geometric design.

A resident adjacent to the railway has complained of increased railway noise due to sound reflections from the rear of the road-traffic noise barrier. Acoustic modelling has shown that the noise barrier is unlikely to have increased railway noise levels for the residents. However the residents are still experiencing a *change* in noise environment since the noise barriers were installed. This effect is difficult to quantify. A similar situation, with reported reflections of railway noise from the rear of state highway noise barriers, occurred for residents in Hamilton (refer Noise Barrier Case Study 3). For future state highway projects adjacent to railway lines, consideration should be given to actual or perceived reflected noise when placing barriers between the road and railway. Barriers are potentially more effective if placed adjacent to residential properties, so as to screen both road and rail noise. However, as that location may be outside the Transport Agency designated road corridor, access, land ownership and maintenance issues would need to be addressed. Other considerations could be sound absorptive surfaces on the noise barriers.

03 NZTA guide 'Guide to assessing road-traffic noise using NZS 6806 for state highway assessment improvement projects' (2011)

Graffiti/property boundaries

Tagging has been an ongoing issue on the Kamo Bypass noise barriers since they were installed. The noise barriers have been coated with anti-graffiti paint, and maintenance crews have been quick to remove tagging. Landscaping has been undertaken adjacent to both sides of the noise barriers, which has discouraged graffiti once established.

In some locations, large areas of Transport Agency owned land up to 45 metres wide have been left between property boundary fences and the noise barriers. This is due to the acquisition of whole properties to build the bypass, even though only parts of the properties were required for the road itself. These strips of land are accessible to the public and due to limited surveillance, graffiti is occurring on both the property fences and noise barriers. More intensive landscaping, including the use of climbers and painting of the residential fences would help to deter this vandalism.



Tagging/graffiti is evident on property fences that can be accessed through NZTA

Lessons learnt

- For new works the appropriateness of old designation conditions should be considered in relation to traffic noise. There may be a case to alter conditions to use current noise assessment standards (NZS 6806). Refer to the Transport Agency NZS 6806 guide³ for information on this process.
- A noise assessment should include consideration of the effects of truck noise where there are significant gradients near to both intersections and residents.
- Reflected noise should be assessed where barriers are placed between road and railway corridors. Alternative barrier locations or designs could be used.
- The use of anti-graffiti coating and planting can prove effective in areas of heavy tagging.
- Crime Prevention Through Environmental Design (CPTED) principals should be applied to noise barrier design to prevent the creation of land that may facilitate anti-social behaviour in communities. For example, landscaping, painting property fences or providing gated access to Transport Agency land behind noise barriers.

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