Noise barriers Noise bunds from surplus fill

CASE STUDY

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WAIKATO EXPRESSWAY, TE RAPA SECTION

The Waikato Expressway will provide 102 km of four-lane highway from the Bombay Hills, south of Auckland, and extending south of Cambridge. The Te Rapa bypass is a spur off the Expressway and is located to the north-west of Hamilton City. It opened in December 2012 following design and construction by the Te Rapa Alliance comprising Fulton Hogan, Opus International Consultants and the NZ Transport Agency. This case study discusses the use of excess fill material to construct earth bunds beside the bypass together with the associated benefits to immediate neighbours and the Alliance.

Prior to construction, as required by the designation conditions for the project, the road-traffic noise levels were assessed under the 'Transit Guidelines' (now superseded by NZS 6806). Design noise levels for houses along the route were established by noise modelling, with verification undertaken by measurements. Mitigation was designed to meet the design noise levels and the process documented in a Noise Mitigation Plan. Several sections of the highway required mitigation in the form of a low-noise road surface and noise barriers/bunds were also required at some locations.

This case study focusses on the section of the bypass which bisects Ruffell Road. Two properties are situated on either side of the new alignment and the project involved some acquisition of land and relocation of a number of buildings associated with these properties. In terms of noise mitigation on this section of the highway, a low-noise road surface was implemented and sufficient to meet the noise requirements of the designation conditions.



Predicted change in noise as a result of the bunds



During earthworks near this location, surplus fill was available. The original plan was to remove this fill from the site but as the width of the designation at this location provided sufficient space, the Alliance consulted with the property owners as to whether the material should be used to make bunds on either side of the road. Although the low-noise road surface specified in the Noise Mitigation Plan provided the required noise reduction at these two properties, these bunds provided additional noise mitigation and visual screening of the road. Not only did this offer benefits in terms of amenity for the two property owners but it also reduced the project costs for the removal of the surplus fill. Additionally it provided material to assist in the construction of the Waikato Expressway Cycle Path directly adjacent to the highway.

The bunds were constructed up to 2 metres in height, with tapers at either end and planted with native species. Noise modelling has shown the predicted noise reduction provided by the bunds is up to 2.4 dB at Property A and 1.1 dB at Property B (see contour plot on first page). This is not a significant reduction and the bunds would not be justified in the absence of the surplus fill. However, in this situation the bunds do provide an incremental improvement in noise together with visual screening. The visual effects of the project were particularly important to the residents and the bunds went some way to alleviating these concerns.



PROFILED LINE MARKINGS

Audio Tactile Profiled (ATP) line markings, are designed to generate a distinctive noise inside vehicles as a warning to drivers that their vehicle is straying out of the traffic lane. However, they can also cause significant noise outside the vehicle, with a 6 dB increase relative to road noise, together with a distinctive low frequency tonal character (rumble). More information on the noise from ATPs can be found in the Agency's *Guide to state* highway road surface noise. The current guidelines suggest that ATP line markings should not be laid closer than 200 metres from residences or other noise sensitive properties, although this may be reduced to 100 metres where ATP is unlikely to be frequently trafficked.

For road safety reasons ATP was applied to this section of the bypass, and the occupants of these two properties then complained about the noise of vehicles driving over the ATP. The ATP should not have been installed adjacent to the properties. Unfortunately, this potentially negates some of the positive effects of the bunds. Whilst removal of the ATP is possible, there is an associated risk of damaging the road surface, leaving a series of indentations that may cause similar noise to the ATP. Therefore, the ATP has been left in place.

LESSONS LEARNT

- Surplus fill can sometimes be used to improve the noise environment of neighbouring properties by creating noise bunds and may provide cost savings to projects.
- Noise mitigation over and above that required by a project's designation conditions can provide positive outcomes and foster good relationships with neighbours.
- Unless there is a specific safety issue ATP should not be located near to houses.
- Care is needed throughout all stages of a project to ensure that noise outcomes are not undermined, such as by installation of ATP near houses.



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