Effect of Train Speed on wayside noise levels in EWR Section H

Following my previous comments on aspects of the Noise Scheme of Assessment and related consultation correspondence, I have been asked to provide further advice on the above subject.

Below is a chart showing how the night LAeq in Section H varies as a function of train speed. The train speed refers to the speed of travel of each train e.g. the data points for 100km/h (62mph) have been produced assuming that all trains will be travelling at 100km/h.

The speed relationship for rolling noise LAmax is taken as 30 log (V/V0) where V is the train speed and V0 is a reference train speed, thus LAmax increases by 9 dBA for every doubling of train speed. As speed increases the duration of the event reduces and the LAeq increases by a lower amount than LAmax of 6dBA for every doubling of train speed. In Section H down freight train locomotives (Class 66) will be "On Power". LAmax for "On Power" noise is independent of train speed thus noise energy for this noise source reduces as speed increases due to the reduction in pass by duration, so LAeq actually reduces by 3 dBA for every doubling of train speed.

The effect of train speed on total noise depends on the balance between rolling noise and on power noise. If rolling noise dominates the normal 6dBA for doubling/halving of train speed is evident but when "on power" noise dominates reductions in train speed can actually increase the total railway LAeq. For the current higher speed in Section H (112km\h) (70mph) rolling noise LAeq from passenger and freight vehicles is much higher than the "on power" noise from the Class 66 locomotive especially before barriers are introduced as mitigation. This is shown by the curves below for "w/o barrier" where total LAeq and rolling noise LAeq show the 20 log (V/V0) relationship for rolling noise for speeds between 28 and 120 km/h.

At the lower speeds the LAeq from the "On Power" locomotive become more important, thus since the barrier is less effective at reducing the "On Power" noise (since it's source is located 4m above the level of the rail head), the barrier will be less effective in reducing total LAeq at these speeds as is demonstrated by the "w barrier" curves in the graphs below.

Thus, caution should apply if large reductions in train speeds are considered especially in areas where the freight locomotives are on power. The lowest maximum speed will need to be chosen so that it is higher than the speed at which the total noise starts to increase as speed is reduced. The figure below suggests that as a first approximation it would be counter productive to reduce the speed of trains to below about 50 km/h (31mph) especially if barriers are to be used as part of mitigation.

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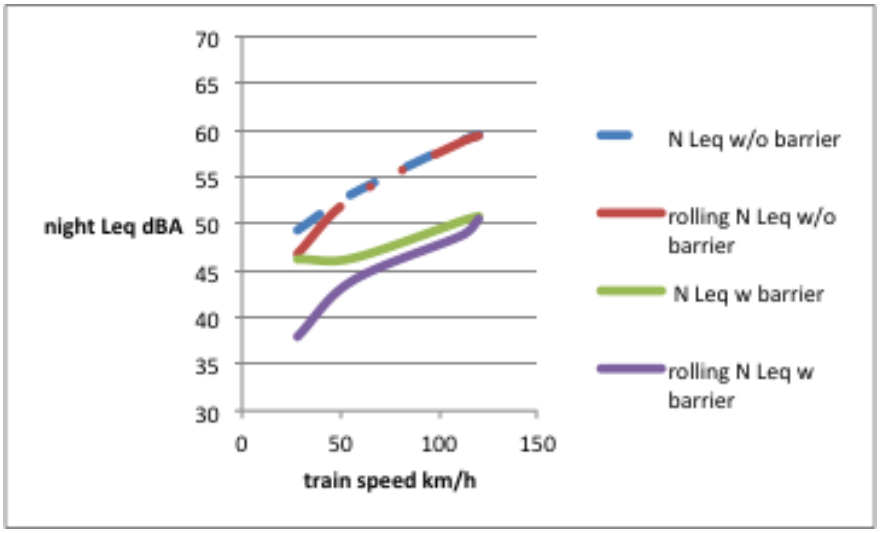
70
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night Leq dBA 50
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train speed km/h
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