Introduction

The NZ Transport Agency has commissioned measurements of noise levels generated from a range of different road surfaces. The measurements and results are detailed in:

- Opus Research. Low-noise road surface performance monitoring. 2014

- Opus Research. NZ Transport Agency Research Report 326 Road surface effects on traffic noise: stage 3 selected bituminous mixes. 2007
  http://www.nzta.govt.nz/resources/research/reports/326/

- Opus Research. NZ Transport Agency Research Report 292 Road traffic noise: Determining the influence of New Zealand road surfaces on noise levels and community annoyance. 2006
  http://www.nzta.govt.nz/resources/research/reports/292/


This technical memorandum summarises data from these sources for high performance low-noise surfaces:

- High voids porous asphalt (PA-HV)
- Twin layer porous asphalt (PA-TL)

Road surface adjustments

On the basis of the measured data, the adjustments used in noise models for common asphaltic mixes are shown in the following table. The first two columns give the corrections individually for cars and trucks, and the other four columns give the combined correction that is actually applied in noise models depending on the speed of the traffic and the percentage of heavy vehicles. This is calculated using the equation on page 37 of the Guide to state highway road surface noise.
<table>
<thead>
<tr>
<th>Surface</th>
<th>Adjustment (dB)</th>
<th>Combined adjustment (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cars</td>
<td>Trucks</td>
</tr>
<tr>
<td>AC</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>SMA</td>
<td>+1.5</td>
<td>-1.5</td>
</tr>
<tr>
<td>PA</td>
<td>0.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>PA-HV</td>
<td>-2.0</td>
<td>-3.0</td>
</tr>
<tr>
<td>PA-TL</td>
<td>-2.0</td>
<td>-4.0</td>
</tr>
</tbody>
</table>

It can be seen that in terms of the acoustics performance there are two groups of surfaces:

- Standard low-noise surfaces (AC, SMA, PA)
- High performance low-noise surfaces (PA-HV, PA-TL)

In general, the slight differences between the combined adjustments for different surfaces within each of these groups are not significant. The differences within either the group of standard low-noise surfaces or within the group of high performance low-noise surfaces are similar to or less than variations measured for individual surfacing options over time and between locations.

### Performance over time

The acoustics performance of twin layer and high voids porous asphalt has been measured each year for between 5 to 9 years at trial locations with 100 km/h speed limits. The measured levels each year are presented in the 2014 Opus report. From this data, the following observations can be made:

- All types of porous asphalt surface generally get slightly noisier over time.
- Twin layer porous asphalt (PA-TL) is initially the quietest surface, but with reduced performance measured over 5 years it becomes closer to standard porous asphalt.
- High voids porous asphalt (PA-HV) was measured to have a relatively consistent acoustics performance over 9 years.

### Comparison of twin layer and high voids porous asphalt

While this memorandum highlights differences between twin layer and high voids porous asphalt, in absolute terms these are small, and overall both surface types are high performance and provide similar noise outcomes. When assessing noise effects from a road and evaluating mitigation options under NZS 6806, twin layer and high voids porous asphalt can be considered acoustically equivalent.

On the basis of data currently available it appears that twin layer porous asphalt is marginally quieter than high voids porous asphalt when it is first laid, but the difference is not significant. The two surfaces have not been tested side-by-side at the same site, but comparing data from different sites, it appears that over time high voids porous asphalt will provide a more consistent benefit. The data on which these conclusions are drawn is limited and the Transport Agency currently (2014) has a research project underway (TAR 13/10) to more accurately measure the relative performance of different surfaces over time.

### Other factors

Noise measurements for high voids porous asphalt have been for surfaces with polymer modified bitumen. For future applications epoxy would be used rather than polymer, to maximise the life of the surface. The structure of the high voids porous asphalt surface, and in particular the air voids, would remain the same, and the acoustics performance should also remain the same. The same acoustics data should be used for epoxy high voids porous asphalt as has been measured for polymer modified high voids porous asphalt.

While twin layer and high voids porous asphalt can generally be considered acoustically equivalent, it is noted that high voids porous asphalt is in the order of half the cost of twin layer porous asphalt. This is primarily due to the increased depth of material for twin layer porous asphalt.