RURAL CYCLING SAFETY

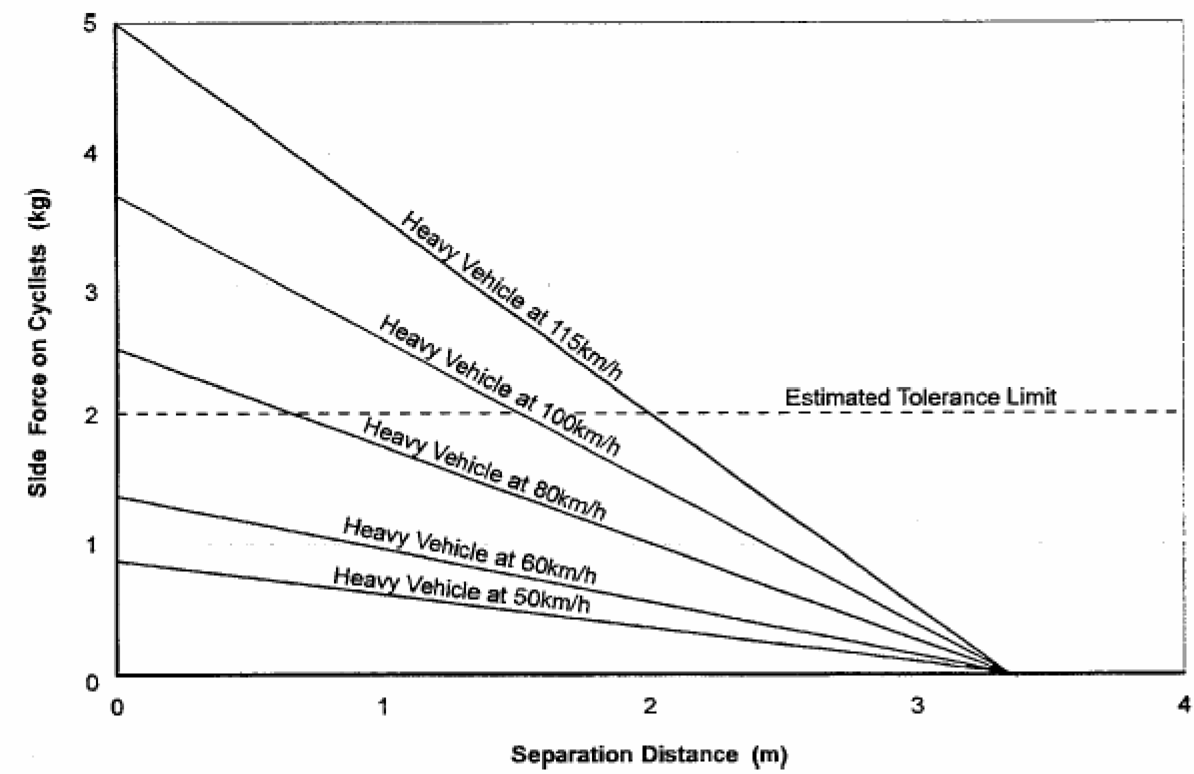
How much of a problem is cycle safety on rural roads? And how can we justify the costs to improve those roads for cyclists?

First, let's look at some crash statistics for New Zealand in recent times. During 1997-2001 there were 276 recorded cycle injury crashes on rural (80-100 km / h) roads; relatively minor compared with the 17,000 rural vehicle crashes over the same period. What is of concern however is the likely severity of these crashes; 11% were fatal, which is more than that for other rural crashes and ten times higher than for urban cycle crashes.

Local authority rural roads, which are generally narrower than State Highways, also feature in more (53%) of the crashes, despite having lower traffic volumes. Accurate travel data is hard to come by but, based on 1994 National Traffic Database information, the typical incidence of cycle crashes on rural local roads is currently about 0.6 crashes per 100 million vehicle-km (an estimation based on cycle-km is even harder to pin down).

Rather like their urban counterparts, the biggest problem is in fact intersections; making up 29% of all rural cycle crashes. "Rear-end / obstruction" crashes also contribute 29%, with overtaking crashes at 24%, head-on / lost-control crashes on curves 13%, and the balance at 5%. Looking more closely at the non-intersection crash types we can see that the predominant movements involve vehicles coming up behind cyclists and either not being able to avoid hitting them or causing a crash when passing them. Interestingly only 4% had "limited visibility" recorded as a factor, although admittedly only the same proportion of sites was noted as having "severe" curvature.

Collisions aren't the only concern for rural cyclists; the lateral forces when a large vehicle passes closely by at speed can cause considerable discomfort and handling difficulties, if not a loss of control. The level of under-reporting here for cyclists may well be greater than for other rural crashes too, particularly if by the time they lose control, topple over, and pick themselves up again, the motor vehicle in question has long gone. The figure below (from Transit New Zealand, 2002) shows the effect of such forces on cyclists caused by heavy vehicles. When you consider that most rural roads have less than 1.5m of shoulder, it's easy to see what cyclists think of the situation!



Widening sealed shoulders in New Zealand generally has to be justified on a cost-benefit basis. Fortunately this work also provides considerable safety and maintenance benefits for motorists too, and Transfund New Zealand (2001) has typical crash rates for different combinations of lane and shoulder width. It would be fair to say that generally the motorist benefits will far outweigh the cyclist benefits, so if a project is not viable on the former basis, it would be difficult to justify on cyclist considerations as well. The exception is that motorists generally derive benefits from long continuous sections of seal widening, whereas cyclists may get the most benefit out of isolated pinch-point treatment.

An interesting attempt to quantify the potential benefits of providing widened shoulders for cyclists was done by Khan & Bacchus (1995). Starting with mean speeds and volumes of cyclists and motor vehicles, the average density along the road of each group (i.e. vehicles per km) could be determined. For the typical sight distance required for a motorist to identify and avoid a cyclist ahead, the probability of both a cyclist and a vehicle being in that same length can be calculated. Providing a widened shoulder can minimise the probability that this will cause a conflict (although there is still the possibility that a "run-off-road" vehicle will hit a cyclist on the way).

As an example, assume that on a winding section of road there are 100 vehicles/hour (one-way) averaging 80 km/h and 10 cyclists/hour doing 15 km/h. At 80 km/h, a safe stopping sight distance of ~120m is required. The traffic densities for each group are 1.25 vehicles/km and 0.67 cycles/km respectively or 0.15 vehicles and 0.08 cycles per 120m. At any given point and time therefore, there is a 0.012 probability of there being both a cyclist and motor vehicle within 120m of each other. Hence the number of likely conflicts along a route without a shoulder could be estimated.

One thing missing from the potential benefits so far is the additional economic benefit to the area if cycle tourists are encouraged to come because of the good cycle facilities. This may require some further local research to determine people's "willingness to pay" for these…

References

- Khan A. & Bacchus A. 1995, " Bicycle Use of Highway Shoulders". *Transportation Research Record 1502*.
- Transfund New Zealand 2001. *Project Evaluation Manual*, Appendix A6 (Accidents). Manual no. PFM2, 1st revision (1997), amendment no.5 (Aug 2001). Wellington.
- Transit New Zealand, 2002. *State Highway Geometric Design Manual*, Part 6 (Cross-Section) Web: http://www.transit.govt.nz/technical_information/index.html.