

Innovative Weather-Activated Variable Speed Sign Trial – a first for road safety in New Zealand

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Abstract

Linking the Waikato and Bay of Plenty is the nationally strategic State Highway 29 (SH29) over the Kaimai Range. Between 2007 and 2015 there were 267 crashes and data identified 70% were in wet weather with 40% driving too fast for the conditions. This prompted development of a system which encourages people to drive at speeds appropriate to the road and conditions. The system is New Zealand's first weather-activated road signs with adjustable speed limits commissioned in November 2015. The objective of the innovative two year trial is to educate drivers to better understand speed limits in adverse weather.

Background

The development and implementation of the Weather Activated Variable Speed Limit signs (WAVSL) trial is part of the Government's *Safer Journeys* road safety strategy, to reduce the number and severity of crashes. Managing speeds is crucial as the outcome of all crashes is strongly influenced by the impact speed. The *Safer Speeds Programme* promotes helping people increasingly understand what travelling at safe speeds means.

The SH29 Kaimai Range has a poor crash history, with unpredictable, and at times dangerous, weather at the summit. The 100km/h speed limit did not take into consideration adverse weather and studies show that drivers did not adjust their speeds, attempting to travel 100km/h in poor conditions, compromising their and others' safety.

As the existing static reflective signs were not able to show temporarily reduced speed limits another solution was sought.

Innovative thinking

The WAVSL system aims to encourage drivers to drive at safe and appropriate speeds during adverse weather conditions.

It does this through an operational system for varying the speed limits on a road where significant changeable conditions result in increased risk, initiating the variable speed limits only during the time of the adverse conditions. Once activated, the speeds are enforceable by Police.

The 12km trial site has two zones; the eastern flank is 8km and the western flank is 4km. Following comprehensive consultation with the community, Transport Agency safety advisors and NZ Police it was agreed that the speed reductions for adverse weather would be set for 80km/h for the eastern flank and 60km/h on the western flank.

A MetService weather station located near the summit captures most of the weather data relevant for WAVSL. Existing sensors in the station measure rain, wind, ice and surface water on the road. A visibility sensor was installed to capture fog and visibility information.

The weather station collects data which is transmitted to the team at the Auckland Transport Operations Centre (ATOC) at one-minute intervals. When predetermined weather thresholds are reached an alarm is triggered whereby an ATOC controller can monitor web cameras to ensure the

alert is correct and if so, which zones are affected. The WAVSL response is triggered by rain, ice, wind and fog.

Effectiveness and results

From activation in November 2015 to end of January 2016 (12 weeks) the WAVSL signs had been activated 97 times.

Results showed when the signs were activated (due to rain or poor visibility) traffic speeds have reduced significantly. A strong link between reduced travel speed and improved road safety is commonly accepted in road safety literature and so it is expected that WAVSL will lead to reduced crashes and fatalities.

While there was a moderate increase in travel time when the signs were activated, the overall travel time impacts were negligible as 86% of the traffic flow was not impacted by the activated signs.

Ongoing monitoring and further tweaking of the innovative WAVSL system will optimise the trial and ensure the system has a positive impact on drivers’ speed and safety.



Figure 1 WAVSL Trial in operation on SH29 Kaimai Range

Table 1. Example of data gathered from WAVSL eastern flank – downhill speeds

	Eastern flank downhill Baseline Sign off	Eastern flank downhill Baseline Sign would be on	Eastern Flank Downhill System Off speeds	Eastern Flank Downhill Slippery Road speeds	Eastern Flank downhill Limited visibility speeds
Mean	88	89	87	80	80
Mode	90	93	93	79	79
85th%tile	98	99	99	91	90
St dev	10	11	13	13	10
Effect size				0.54	0.54
Count	68,343	5,852	235,506	30,483	10,414
% of Vehicles	92%	8%	85%	11%	4%

Results for both uphill and downhill on the Kaimai eastern flank show that WAVSL has been very effective at reducing speeds to an operating speed of approximately 80km/h during adverse weather events. The baseline speeds in wet weather show the inadequate driver response to wet weather conditions, which may help to explain the high crash rate in wet weather, and reinforces the justification for WAVSL.