

TRIAL EVALUATION OF WIDE, AUDIO-TACTILE, CENTRELINER CONFIGURATIONS ON THE NEWELL HIGHWAY

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1. Introduction

1.1 Background

While advances have been made in reducing the number of fatal crashes on metropolitan roads, the number of fatal crashes on rural roads remains relatively steady. Recent statistics in NSW showed that 66% of all fatalities and 35% of injury crashes occur on rural roads, and 44% of fatal crashes and 13% of injury crashes occur on roads with a speed limit of 100 km/h or more.

The NSW Centre for Road Safety (CRS) undertook the Newell Highway Safety Review in 2009 (Roads and Traffic Authority 2009). On the Newell Highway, heavy vehicles comprise 38% of involvements with fatal crashes and 30% of the traffic. The largest proportion of fatal crashes were off-path crashes or rollover crashes. Almost 30% of these fatal crashes were head on crashes, with heavy vehicles being involved in 92% of them. Fatal head-on crashes do not usually involve an overtaking manoeuvre.

This trial focused on measures to address out of lane to the right crash types, which can include drift to the right, off to the left then overcorrect to the right, and failure to stay in lane due to inappropriate speed.

Head-on crashes on the Newell Highway typically include drift to right and drift to the left and then overcorrect to the right crash types – these can result in vehicles passing over the centreline into the oncoming traffic lane(s) where the margin for error is small, because errant vehicles enter the opposing lane very quickly. In off-left-and-overcorrect crashes the margin for error is slightly greater as errant vehicles have extra space to recover before they cross the centreline.

Whilst audio-tactile road markings have been used for some time to alert drivers who are overrunning edge lines or centrelines (Hatfield *et al* 2009), studies into crashes on rural roads (Levett *et al* 2009) have also shown that the installation of a wide audio-tactile centreline may be effective in reducing head-on (not overtaking) and run-off-road crashes, by providing more room for drivers to correct errors. These two crash types on open rural highways may be caused by driver distraction, speed or impairment (fatigue, drugs or alcohol).

The RTA Newell Highway Safety Review concluded that the use a wide, audio-tactile centreline and edge line may be beneficial in improving road safety along the highway as it would allow drivers more time and room to recover as well as alerting them if they started to drift out of their travel lane.

In order to allow overtaking opportunities, it was important that the treatment was able to separate the traffic streams but permit traffic to overtake where safe to do so. Consequently, breaks in the centreline marking would be valuable, similar to the traditional broken centreline markings, together with signage which explained the markings and which highlighted the overtaking opportunities.

1.2 Aims of the Study

This study evaluated new wide centreline delineation configurations on the Newell Highway. These markings cater for overtaking manoeuvres but also prohibit overtaking in the same way as normal centreline markings.

1.3 Site Location

The two selected sites for the study are at the following locations:

- **Parkes:** From a point 0.6km south of Goobang Rd Intersection with the Newell Highway, North of Parkes to a point 4.4km north of the intersection, and
- **West Wyalong:** From a point 1.4km South of the intersection of Newell Highway and Bodell's Lane (Southern Point) to a point 16.5km South of Mid Western Highway (Northern point) on Newell Highway, north of West Wyalong.

Both sites are around 5km in length.

1.4 Line Marking

The wide centreline markings, unlike those used elsewhere, allow overtaking where it is safe to do so. The marking has audio-tactile properties along both the centre line and edge line, aimed at alerting drivers if they are drifting outside their lane.

Specifically, this was a 100-mm wide, solid line abutted by a 100-mm wide audio-tactile line, an 800-mm gap to another 100-mm wide audio-tactile line abutted by a 100-mm wide solid line. In total this results in a 1.2m gap (800-mm + 200-mm + 200-mm) provided between the opposing directions of travel.

A distance of 1.2 metres was chosen for three main reasons:

- I. Allowed for the retrofitting of Wire Rope Safety Barrier (WRSB) if required
- II. Provided enough space for an entire light vehicle wheel to sit between the lines
- III. Was readily achievable with the current road, pavement and seal construction configurations along the highway.

The line markings configurations are shown below in **Figure 1**.

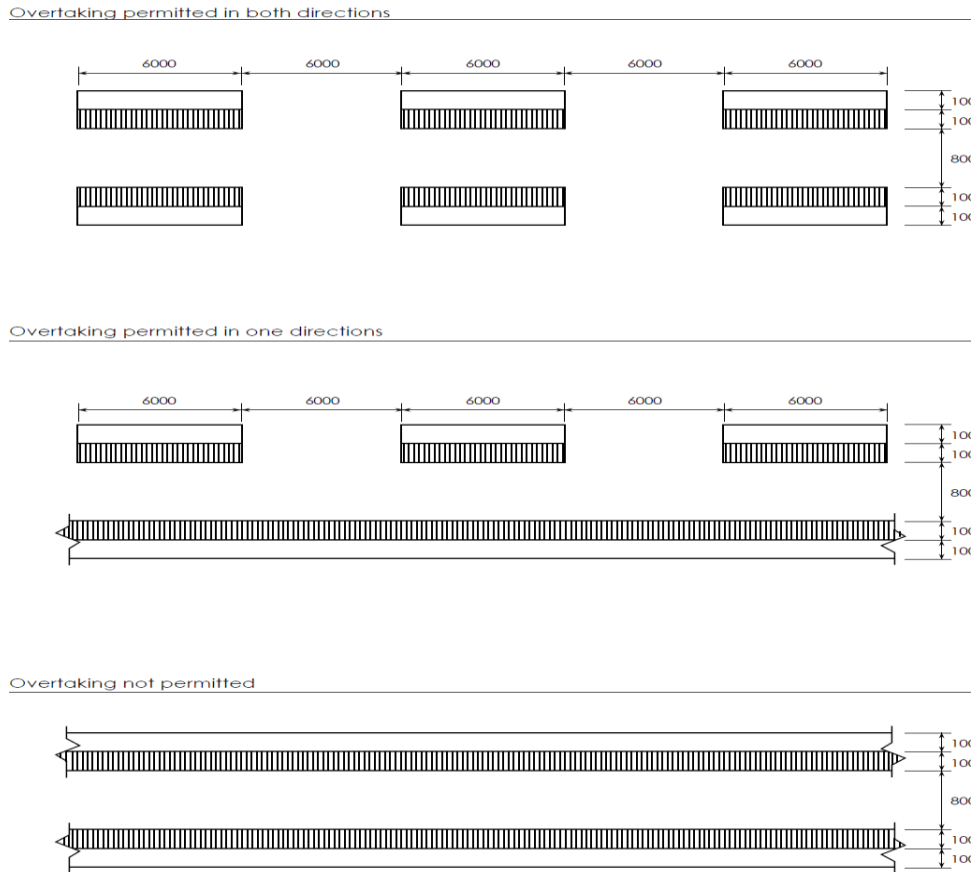


Figure 1.1 – Trial Line Marking Configurations

1.4 – Study Methodology

A ‘before and after’ crash study, based on crash data, assessing the impact of the new line marking would take a number of years, in order to provide reliable data. Consequently, this study focused on examining the change in driver behaviour following the installation of the line marking.

There were three sources of information:-

- Speed Surveys;
- Analysis of 2 weeks of 24 hour camera footage; and

Behaviour was measured both before and after implementation.

1.5 On Site Observational Surveys

Driver behaviour was analysed in terms of the position of the car in the road at a number of locations in the trial sites. The car’s position was observed in relation to the road markings (whether it was in the middle of the lane, to the shoulder side of the lane, to the centreline side of the road or whether it ran along/over the shoulder / median road marking).

Nine digital video recorders (DVR), with cameras mounted to them, were located along the trial lengths (to record digital video in order to record and analyse driver behaviour and vehicle positioning).

The recorders enabled the vehicle position to be seen quite clearly. From the video it became apparent that some cars changed their position over the extent of the video panorama. It was decided therefore to record the position of a vehicle that it held for the majority of the time whilst being observed, unless it went on or over the shoulder or centreline marking in which case it was recorded in accordance with **Figure 2** below as in cases 1, 2, 6 or 7. In such cases, the number relates to a vehicle crossing of the shoulder centreline marking.

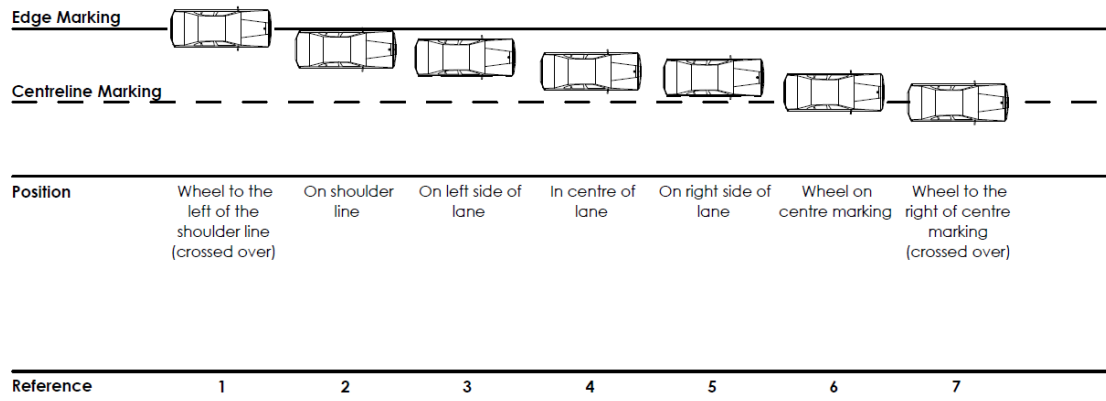


Figure 2 – Vehicle position

Over 2000 hours of data were analysed for both the before and after surveys, with over 200,000 vehicles examined across each time period.

1.6 Speed Surveys

To measure speeds, automatic traffic counters (ATCs), which can also record vehicle speeds, were placed on the approach to and on the exit from the sites. In addition, two more ATC’s were located within the study zones.

Whilst the locations of these tubes were chosen so as not to coincide with the position of the cameras, it is unlikely that this would have resulted in adverse results, as the cameras were extremely difficult for passing motorists to see.

2 Results

2.1 Vehicle Positions

There were large reductions in the proportion of vehicles crossing onto or over the edge line or the centreline, as shown in **Figures 3 to 6**.

Chi square tests were undertaken separately by site and by natural lighting (daylight or darkness): four tests in all. For each test the calculated p was zero (using PASW Statistics 18). All the effects were substantial and in the same direction. The new linemarking greatly improved lane-keeping.

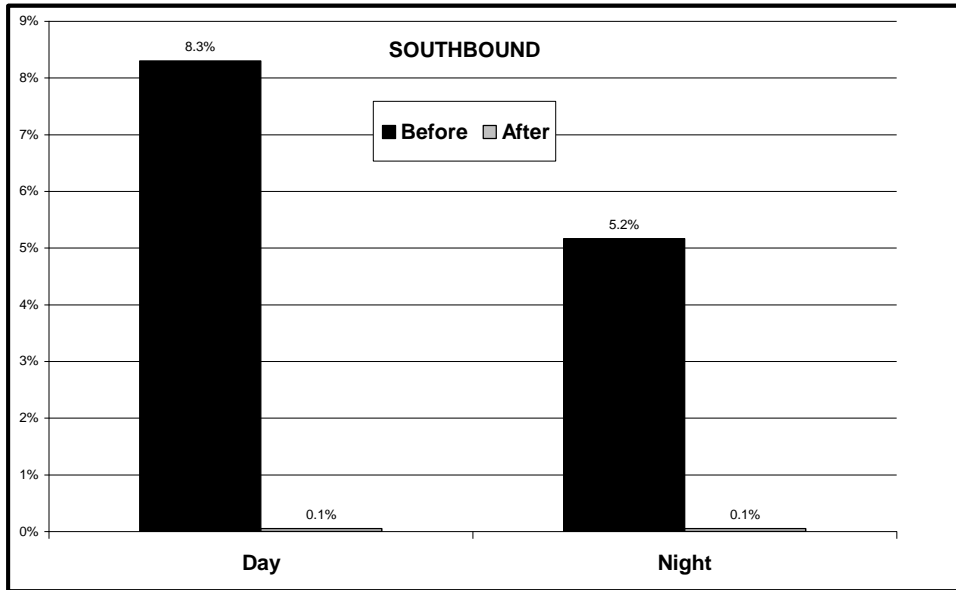


Figure 3 – Proportion of vehicles crossing onto or over the edge line at Parkes, in daylight and darkness, before and after installation

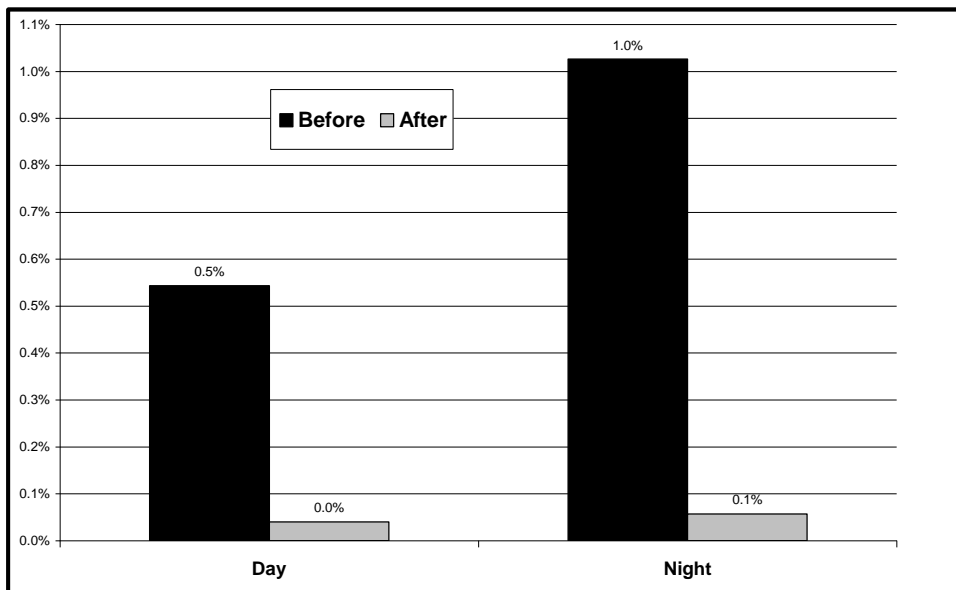


Figure 4 – Proportion of vehicles crossing onto or over the centreline at Parkes, in daylight and darkness, before and after installation

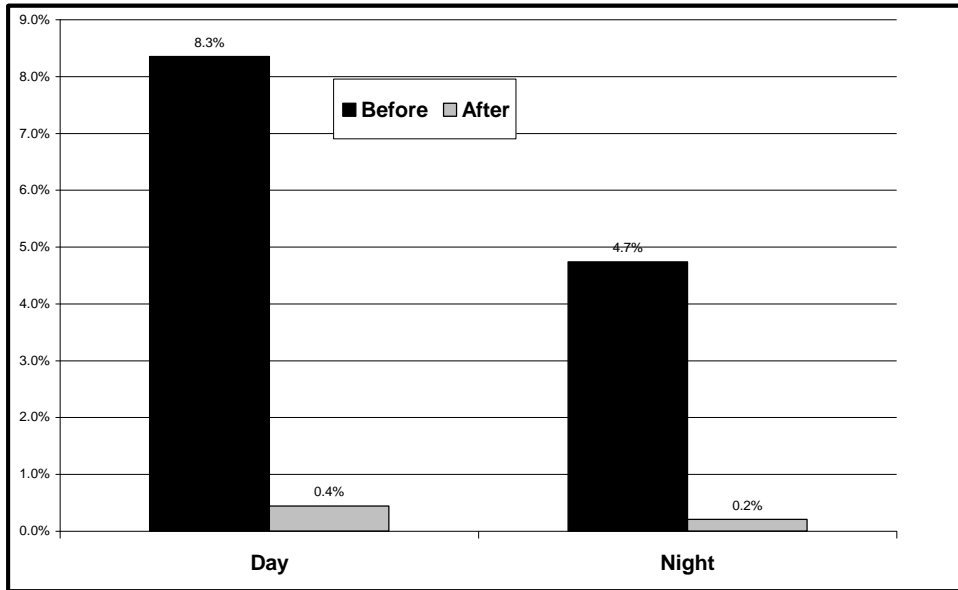


Figure 5 – Proportion of vehicles crossing onto or over the edge line at West Wyalong, in daylight and darkness, before and after installation

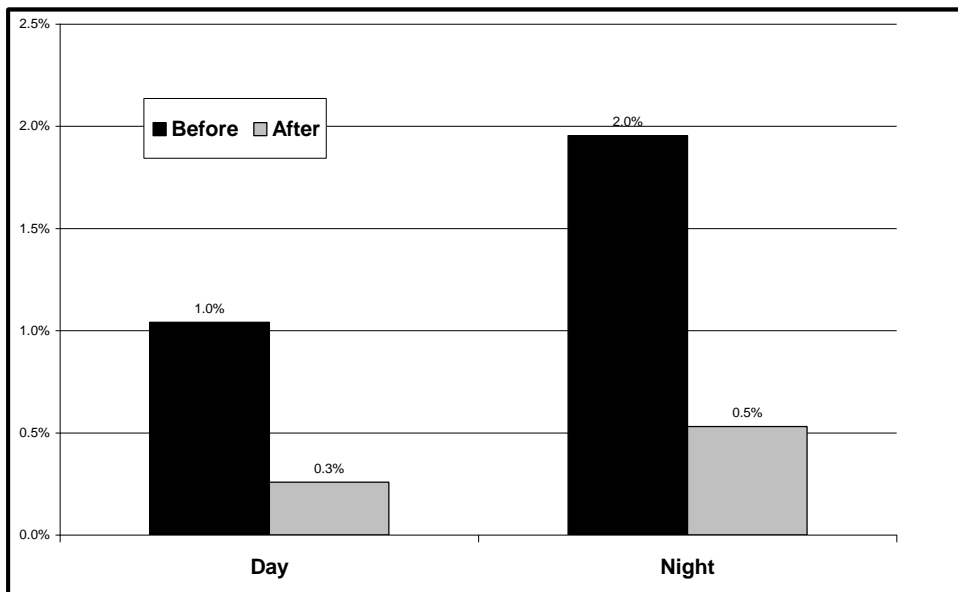


Figure 6 – Proportion of vehicles crossing onto or over the centreline at West Wyalong, in daylight and darkness, before and after installation

2.2 Speed

The speed surveys before installation were conducted in February 2010. The speed surveys after installation were conducted in June 2010.

The average speeds decreased, except for heavy vehicles at Parkes, as shown in **Table 1** below. The mean speeds were compared using analysis of variance, and all were statistically significant (p was equal to zero again).

Table 1 - Average Speeds

<i>Location</i>	<i>Vehicle Type</i>	<i>Data for the whole data set</i>	
		<i>Before</i>	<i>After</i>
<i>West Wyalong</i>	<i>Lights</i>	102.8	99.7
	<i>Heavies</i>	101.0	99.1
<i>Parkes</i>	<i>Lights</i>	100.5	99.8
	<i>Heavies</i>	101.0	102.7

3 Conclusion

New widely spaced audio-tactile centrelines were evaluated. The new line markings were installed at two sites on the Newell Highway, at West Wyalong and Parkes. The evaluation was based on site observations, speed data, discussion with local road users and camera footage.

Drivers were much more likely to keep wholly within their lane.

Mean speeds decreased, except for heavy vehicles at the Parkes trial site.

One issue that arose during the trial was the gap-length between lines for a broken line (allowing overtaking). Although a 6-metre line with a 6-metre gap was used in this trial, the usual practice for centrelines was a 3-metre line with a 9-metre gap. RTA regional officers pointed out that the 6-metre line and 6-metre gap, from a distance, looked like an unbroken line. In future use of wide centrelines, line length and spacing will require further consideration.

Overall, the new line markings have been successful, resulting in reduced speeds and greatly improved lane discipline.

References

- Hatfield J, Murphy S, Job RFS and Du W (2009) The effectiveness of audio-tactile lane-marking in reducing various types of crash: A review of evidence, template for evaluation, and preliminary findings from Australia *Accident Analysis and Prevention* 41 pp 365–379
- Levett SP, Job RFS and Tang J (2009) Centreline treatment countermeasures to address crossover crashes In Australasian Road Safety Research, Policing and Education Conference proceedings, Sydney
- Roads and Traffic Authority (2009) Newell Highway Safety Review RTA, Sydney