

## **Cycle Sharrow Marking Trial**

Summary of Regional Trials

June 2015



TRANSPORTATION SPECIALISTS

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## EXECUTIVE SUMMARY

This report outlines key findings of cycle sharrow marking trials undertaken by five RCAs namely:

- ◆ Auckland Transport
- ◆ Dunedin City Council
- ◆ Nelson City Council
- ◆ Palmerston North City Council; and
- ◆ Wellington City Council.

The purpose of a shared lane marking, or cycle sharrow marking (sharrow), is to indicate a shared lane environment for cyclists' and motorists'. The presence of cycle sharrow markings:

- ◆ Helps to position cyclists on the street, clear of hazards like car doors and stormwater grates
- ◆ Helps the cyclist 'occupy' the traffic lane when it is safe to do so
- ◆ Increases the visibility to motorists that the carriageway is a valid place for cyclists to travel, reinforcing to the motorist to act accordingly
- ◆ Can be used as part of a way-finding strategy to mark routes for cyclists to use.

The use of cycle sharrow markings is typical where a separated cycle facility may not be desirable or feasible.

Cycle sharrow markings are used internationally but are not currently legal for use on New Zealand roads. Therefore, a 12-month cycle sharrow road marking trial was initiated in Auckland and formally gazetted on 12th December 2013. As noted above, four other Road Controlling Authorities also undertook trials.

While some small variances are noted between the cycle sharrow marking trial findings of the five RCA's, it is broadly concluded that the implementation of cycle sharrow markings results in a shift in the lateral position of cyclists' towards the sharrow marking. This finding suggests that cyclists are 'claiming the lane' more when a cycle sharrow marking is present on the road corridor.

A reduction in vehicle speeds at many cycle sharrow marking trial sites was also reported. This is an important finding of the trials as reduced vehicle speeds are generally desirable to improve the road environment for cyclists. Some minor vehicle speed increases were noted; however, these were reported as statistically insignificant.

From the results of the regional on road trials of cycle sharrow markings outlined in the this report, it is cautiously concluded that the benefits of cycle sharrow markings include a small reduction in vehicle speed and a shift in the lateral position of cyclists' away from the kerb towards the cycle sharrow marking, thereby assisting cyclists to 'claim the lane'. While these benefits are acknowledged as slight, the low cost and ease of implementation mean the tool is excellent value for money and provide transport planners and engineers with an additional instrument in overall planning for cycling.

Furthermore, use of cycle sharrow markings on New Zealand roads would further align cycle planning in New Zealand with international best practice and current use internationally.

Perception surveys undertaken by RCA's do not appear to indicate significant negative perceptions, road user concerns and/or highlight issues with the implementation of cycle sharrow markings on the road. However, the perception surveys clearly signal that there would be the need for a campaign to inform and educate road users about the purpose of cycle sharrow markings.

Perhaps most significantly, it is concluded that of the five RCA's that trialled the use of on road cycle sharrow markings, there is no evidence of negative outcomes or potentially harmful results stated as being a consequence of the presence of cycle sharrow markings implemented on the road.

Additional post-implementation surveys conducted via the Auckland Transport Research Panel and the Automobile Association indicates that while the majority of respondents could easily tell the difference between a cycle sharrow marking and the cycle symbol used in cycle lanes, there is a relatively high level of misunderstanding as to the meaning of cycle sharrow markings. This is not unsurprising given that cycle sharrow markings have not been used on New Zealand roads prior to trials.

Furthermore, 92% of Auckland Transport Research Panel respondents (regardless of their level of understanding regarding cycle sharrow markings), indicated that they consider that there would be the need for education to inform the public of the meaning of the of cycle sharrow markings and to inform people about the difference between a cycle lane and a road implemented with cycle sharrow markings.

It is concluded that sufficient evidence exists through perception surveys to indicate that whilst many people who have not been informed about the meaning of a cycle sharrow marking are likely to be uncertain about their meaning and/or uncertain about who has priority on the road where a cycle sharrow marking is implemented, the majority of people can easily tell the difference between the cycle symbol marked as part of a cycle lane and a cycle symbol used in the context of a cycle sharrow marking.

It is further concluded that a public education and information campaign would be required to clarify the meaning of cycle sharrow markings and 'shared use' message.

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## 1 INTRODUCTION

This report outlines key findings of cycle sharrow marking trials undertaken by five Road Controlling Authorities (RCA's), namely:

- ◆ Auckland Transport
- ◆ Dunedin City Council
- ◆ Nelson City Council
- ◆ Palmerston North City Council; and
- ◆ Wellington City Council.

The purpose of a shared lane marking, also called cycle sharrow marking, is to indicate a shared lane environment for cyclists' and motorists'. The presence of cycle sharrow markings:

- ◆ Helps to position cyclists on the street, clear of hazards like car doors and stormwater grates
- ◆ Helps the cyclist 'occupy' the traffic lane when it is safe to do so
- ◆ Increases the visibility to motorists that the carriageway is a valid place for cyclists to travel, reinforcing to the motorist to act accordingly
- ◆ Can be used as part of a way-finding strategy to mark routes for cyclists to use.

The use of cycle sharrow markings is typical where a separated cycle facility may not be desirable or feasible.

This report presents the various investigations and findings of a range of trials related to the implementation of cycle sharrow markings in New Zealand.

It is noted that the information contained in this summary report has been obtained from different RCA's with information provided from diverse authors. Source material, including full reports, are provided in appendices and should be referenced for further interrogation of data. While the information gathered as part of the cycle sharrow marking trials was similar (being the lateral positioning of a cyclist and the vehicle speeds along the affected corridor), there is noted variation in the way various RCAs collected and analysed data.

On November 23 2012, the National Cycling Signs and Markings Working Group<sup>1</sup> meeting took place at the NZTA National Office in Wellington. The purpose of this meeting was to discuss issues surrounding the provision of adequate information for cyclists and other road users. As part of this working group meeting a number of issues were identified with regards to the following areas:

- ◆ Cycling is not seen as part of an integrated network solution, which affects the quality and quantity of the cycling network

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<sup>1</sup> Comprised of representatives from Auckland Transport, various local councils, Christchurch University, the Road Controlling Authorities Forum and the New Zealand Transport Agency.

- ◆ Disconnected networks geared towards motor vehicles potentially make cyclists feel they don't belong on the network
- ◆ A limited toolbox leads to a lack of understanding of cycle signs, markings and infrastructure.

Cycle sharrow markings are acknowledged as a tool used internationally but are not currently legal for use on New Zealand roads. Therefore, a 12-month cycle sharrow road marking trial was initiated in Auckland and formally gazetted on 12th December 2013.

Other RCAs were invited to take part; five RCA's councils submitted trial sites to be considered. An example of how sites were selected (in Auckland), is provided in a background report at Appendix A and examples of cycle sharrow marking trial sites are shown in Figure 1.

Figure 1: Trial on Seacliffe Ave (Auckland)



Trial on Featherstone Street (Wellington)<sup>2</sup>



A technical note on the protocols that guided the Auckland cycle sharrow marking trial is provided at Appendix B.

## 1.1 International Experience

A review of the international use of cycle sharrow markings was undertaken (referencing the United States of America (USA) and Australia given the wider availability of research and background information available for these two countries), in relation to the effectiveness of cycle sharrow marking.

Overall, the results from the research in the USA were positive. It found that applying cycle sharrow markings reduced the number of people riding on the footpath by 25 to 35% while the separation between cyclists and parked vehicles increased by 80 to 100 mm. Perhaps of most significance, the distance between cyclists and cars in the vehicle lane, while overtaking the cyclist, increased by more than 600 mm which greatly improved (perceived) safety for cyclists'.

Australian research focused on the application of cycle sharrow markings on slow-speed local roads where cyclists were encouraged to ride in the centre of the lane. Recommendations from this

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<sup>2</sup> Photo from Wellington City Council Cycle Symbol Road Marking Trial Report. Prepared for Wellington City Council by Opus International Consultants Ltd.



research include the use of cycle sharrow markings at single lane roundabouts and on streets that provide parallel parking but do not provide enough width to provide a dedicated cycle lane. Australian research also suggests that cycle sharrow markings should not be used at greenfield developments or on roads where traffic volumes or vehicle speeds are such that sharing the lane becomes unsafe and dedicated cycle infrastructure is a more appropriate treatment. Australian research also concludes that cycle sharrow markings may not be suitable for way-finding purposes due to the lack of destination information and distances.

A full report reviewing cycle sharrow markings including the use of markings, symbol type and international best practice is provided at Appendix C.

## 2 ON ROAD TRIAL FINDINGS

The following section presents key summary findings of the cycle sharrow marking trials conducted by the five RCA's.

As noted earlier, the information summarised in this section has been obtained from different councils with reports written by a range of authors. Variation in the way various RCAs collected and analysed their data is noted. Source material should be referenced for additional clarification and information.

### 2.1 Auckland Cycle Sharrow Marking On Road Trials<sup>3</sup>

Video footage was collected in December 2013 (pre markings) and in May 2014 (post markings) and studied to understand what effect the sharrow markings had on the road users. Both the position of cyclists' within the road corridor and the speed of vehicles were measured where possible.

In order to be able to compare the lateral positioning results from the three sites analysed, each site was analysed using ANOVA statistical analysis to enable different sample sizes of data to be compared and to identify if there is a significant difference in the means of the distributions pre and post the cycle sharrow marking trial. This has been used to determine if installing the cycle sharrow markings changed cyclists' behaviour (in this case as measured by the position of the mean).

Essentially this process "expands" the sample size to provide a more normalised distribution – with these then able to be compared with the results from other surveys at the same or different sites.<sup>4</sup>

#### 2.1.1 Seacliffe Avenue

Cycle sharrow markings were placed on Seacliffe Avenue, Winscombe Street and Hamana Street in Belmont, Auckland.

Video footage at this location was unsuitable with respect to assessing the lateral positioning of a cyclist pre and post installation of the cycle sharrow markings.

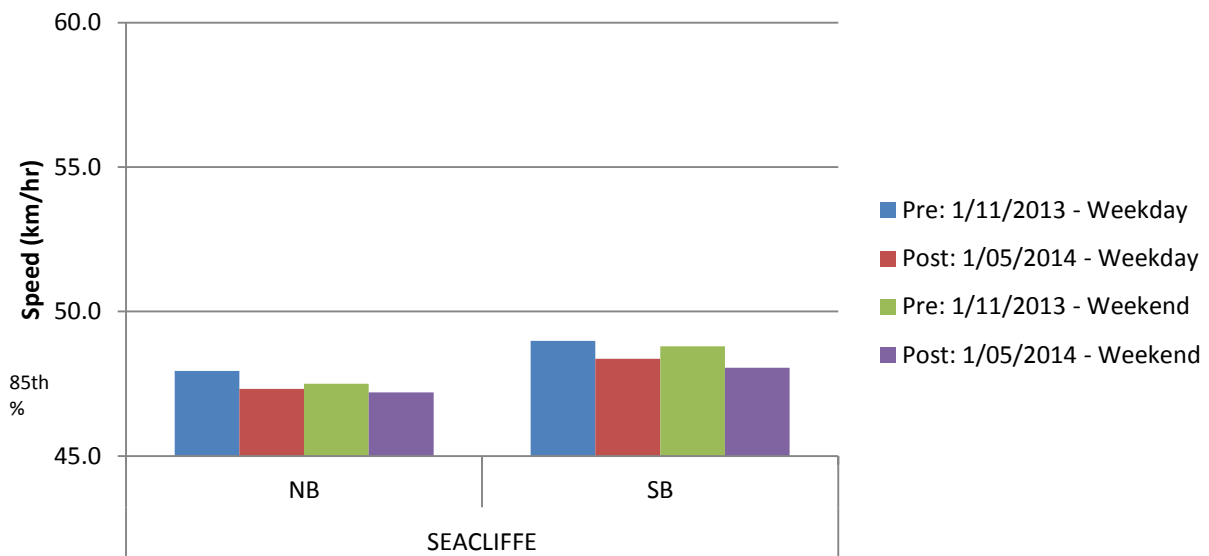
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<sup>3</sup> Information from Trial of Sharrow Markings – Trial Results Report. Prepared for Auckland Transport by Flow. February 2015.

<sup>4</sup> Acknowledging data analysis by Abishek Pol, Sunil Prasad, overseen by Senior Lecturer Seosamh Costello, Auckland University as part of their Year 4 project (with respect to the lateral shift pre and post sharrow markings).

The 85<sup>th</sup> percentile vehicle speeds measured pre and post cycle sharrow marking implementation. Overall the results show a reduction in the vehicle speeds on Seacliffe Avenue after the cycle sharrow markings were implemented. This is shown in Figure 2.

**Figure 2: Seacliffe Avenue vehicle speeds**



With respect to the vehicle speeds, whilst there may be other factors as to why vehicle speeds on this corridor have changed (for example weather, side friction, construction), the sharrow markings may have played a role in reducing vehicle speeds.

Other observations and analysis of data recorded that:

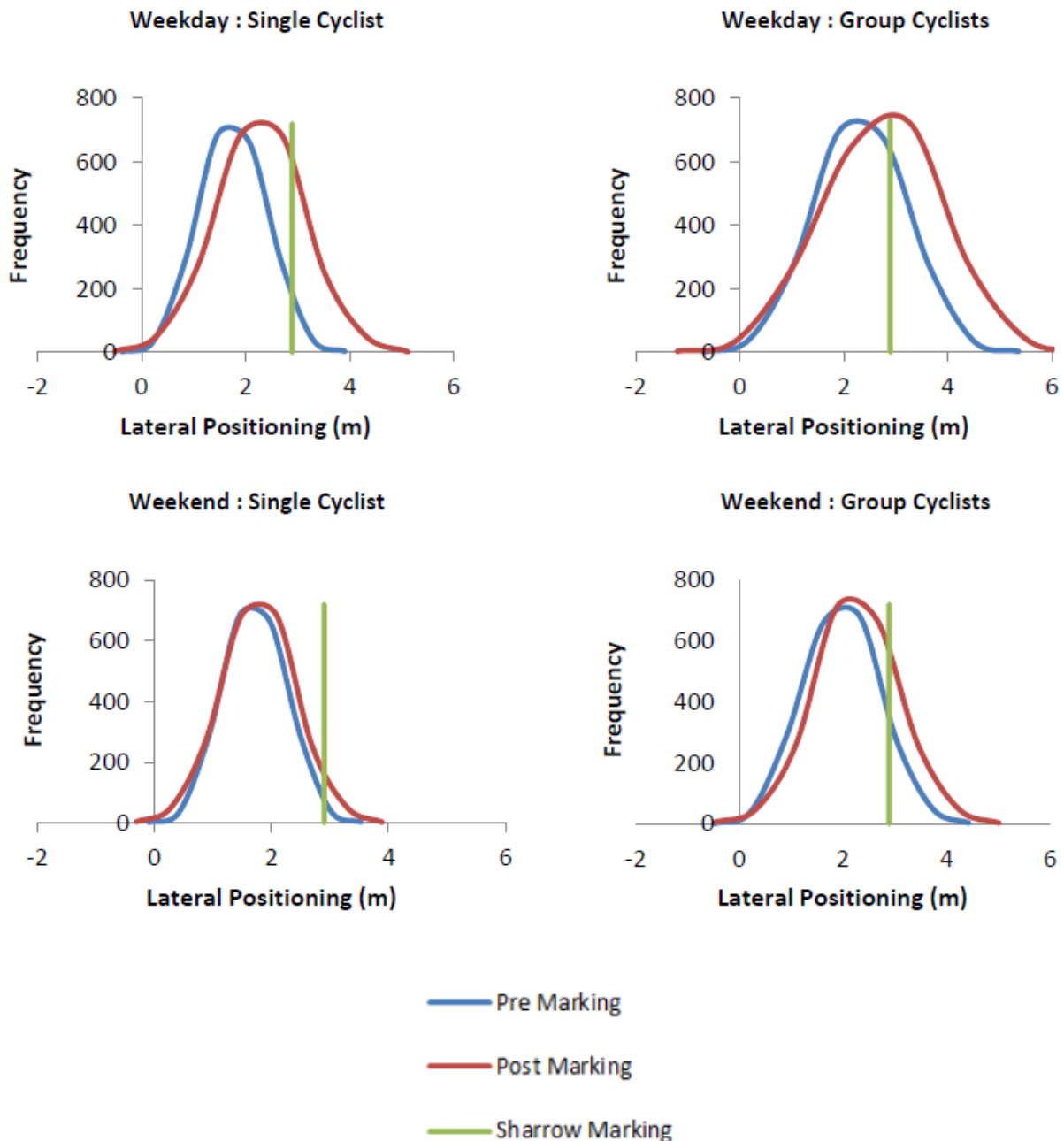
- ◆ The total percentage of cyclists' on the footpath compared to the road suggests the sharrow markings have had minimal effect in encouraging cyclists to leave the footpath and to cycle on-road

### 2.1.2 Riddell Road

Cycle sharrow markings were placed between Roberta Avenue and Glover Road on Riddell Road in Glendowie, Auckland.

The lateral positioning of cyclists' (in the carriageway when measured from the kerb face) both pre and post cycle sharrow marking implementation for Riddell Road is illustrated in Figure 3 below.

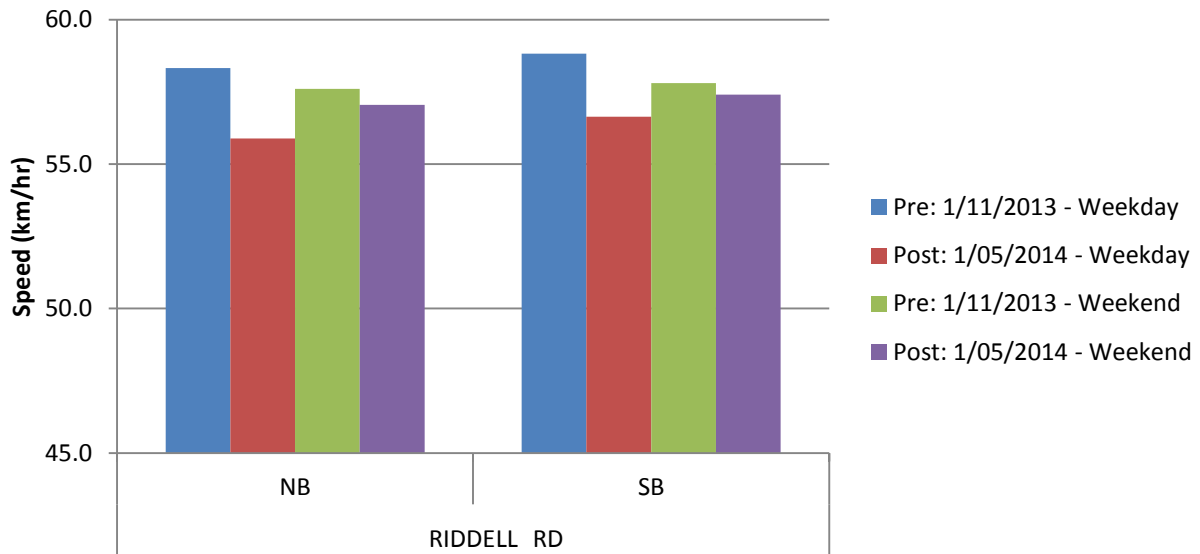
**Figure 3: Riddell Road cyclist positioning within the road carriageway: ANOVA**



With respect to cyclist positioning, all four categories show a general shift in the lateral position of cyclists' towards the cycle sharrow marking. The post results also suggest that cyclists may be slightly more dispersed across the traffic lane given the width of the red curve in the above graphs. This may suggest that a cyclist is "claiming the lane" more with the cycle sharrow marking in place.

The 85<sup>th</sup> percentile vehicle speeds measured before and implementation of the cycle sharrow markings is shown in Figure 4.

**Figure 4: Riddell Road Vehicle Speeds NB-northbound, SB-Southbound**



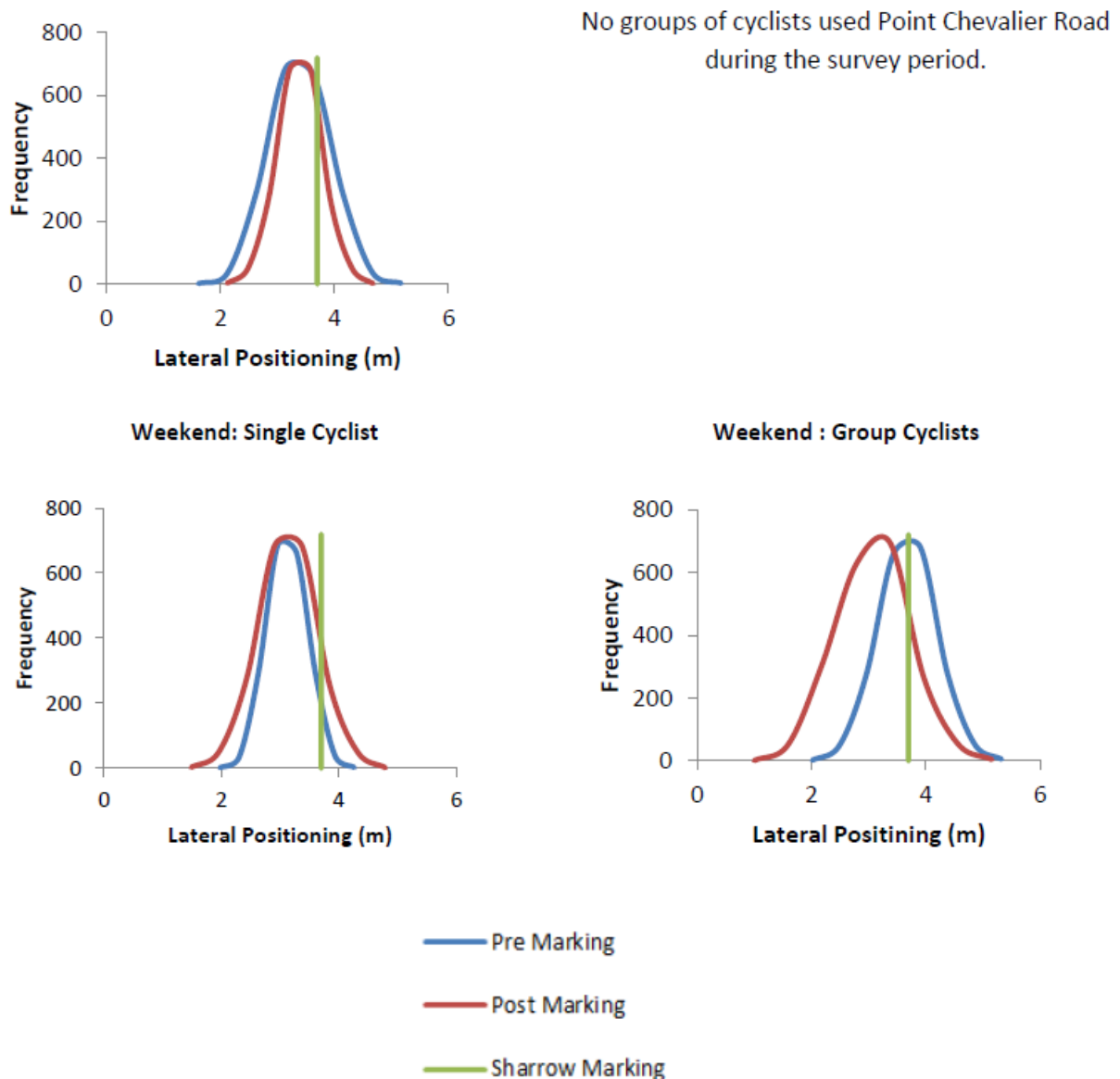
The vehicle speeds results indicate that both directions had similar decreases in vehicle speed post implementation of the cycle sharrow marking. There is a more significant reduction in vehicle speed between the weekday speeds in comparison to the weekend speeds. Whilst there may be other factors as to why vehicle speeds on this corridor have reduced (for example, weather, side friction, changes in land use, for example sports grounds in use), the cycle sharrow markings may have played a role in reducing vehicle speeds.

### 2.1.3 Point Chevalier Road

Cycle sharrow markings were placed on Point Chevalier Road between Meola Road and Coyle Park in Point Chevalier, Auckland.

The lateral positioning of cyclists' pre and post cycle sharrow marking implementation for Point Chevalier Road is shown in Figure 5.

Figure 5: Point Chevalier Road cyclist positioning within the road corridor

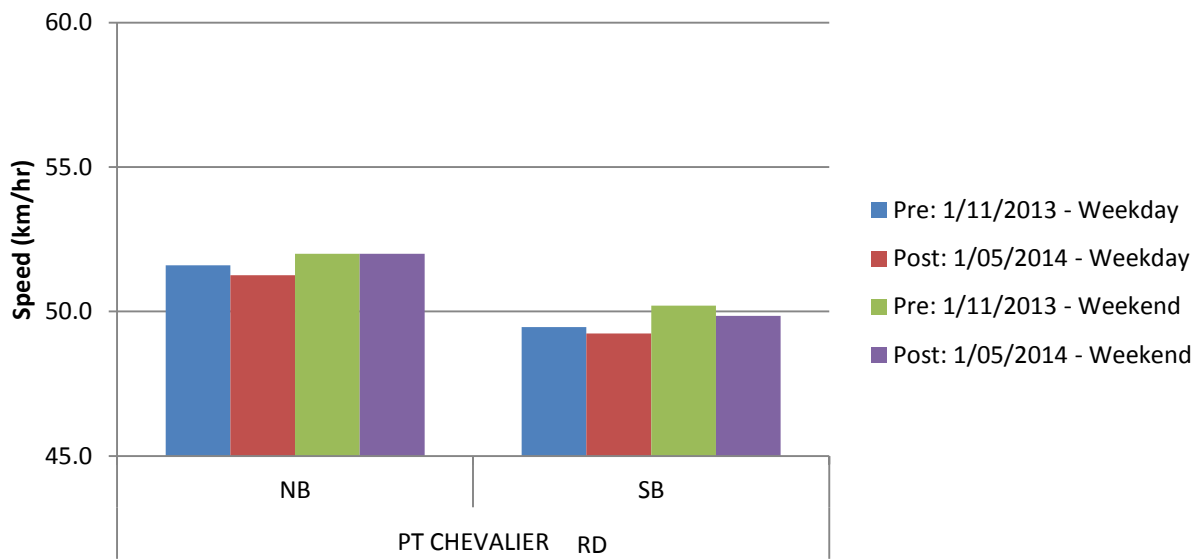


With respect to the cyclists' positioning, the weekday single cyclists have remained in a similar position on the road, with a narrower dispersion of cyclists across the traffic lane post cycle sharrow markings. Weekend single cyclists have also remained in a similar position; however, their utilisation of the corridor widened post cycle sharrow markings, suggesting they have "claimed the lane" more post sharrow marking.

Furthermore, the weekend group cyclists showed a shift away from the cycle sharrow marking during the weekend, closer to the left hand side of the road. These cyclists have also used more of the traffic lane in comparison to before the cycle sharrow markings were implemented (which may have been influenced by the presence of on-street parking) If, during the post marking surveys the parking space alongside the cycle sharrow marking was vacant, cyclists were more likely to position themselves closer to the kerb.

The 85<sup>th</sup> percentile vehicle speeds measured before and after the cycle sharrow markings being implemented are shown in Figure 6, illustrating both the weekday and weekend vehicle speed results.

**Figure 6: Point Chevalier Road vehicle speeds (NB-northbound, SB-Southbound)**



In general the vehicle speeds on this section of Point Chevalier Road decreased when the sharrow markings were implemented albeit that the vehicle speeds remained the same pre and post sharrow marking for northbound traffic on a weekend.

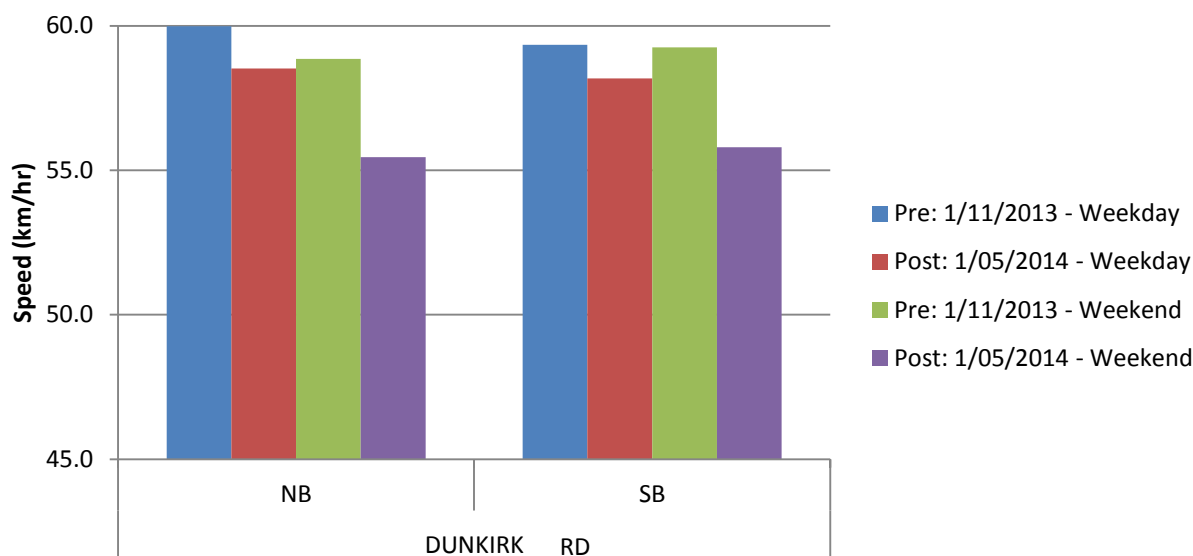
### 2.1.4 Riverside Avenue and Dunkirk Road

Cycle sharrow markings were placed on Riverside Avenue and Dunkirk Road between Kings Road and Pt England Road in Point England.

Due to the presence of overhead power lines along this corridor it was not possible to mount a camera high enough to enable the lateral positioning of cyclists' to be observed.

The 85<sup>th</sup> percentile vehicle speeds measured on Dunkirk Road before and after the cycle sharrow markings being implemented are illustrated in Figure 7.

**Figure 7: Dunkirk Road vehicle speeds (NB-northbound, SB-Southbound)**



The Dunkirk Road vehicle speeds were among the highest recorded as part of this assessment, with the 85<sup>th</sup> percentile vehicle speeds all over 55 km/h and most of the results being closer to 60 km/h.

The vehicle speeds are indicated to have reduced after the cycle sharrow markings were implemented. A significant reduction in the speed on the “post marking” weekend survey days can be seen. However, this may be due to the presence of on-street parking, with considerable on-street parking evident, likely linked to local sporting activities during the May post surveys.

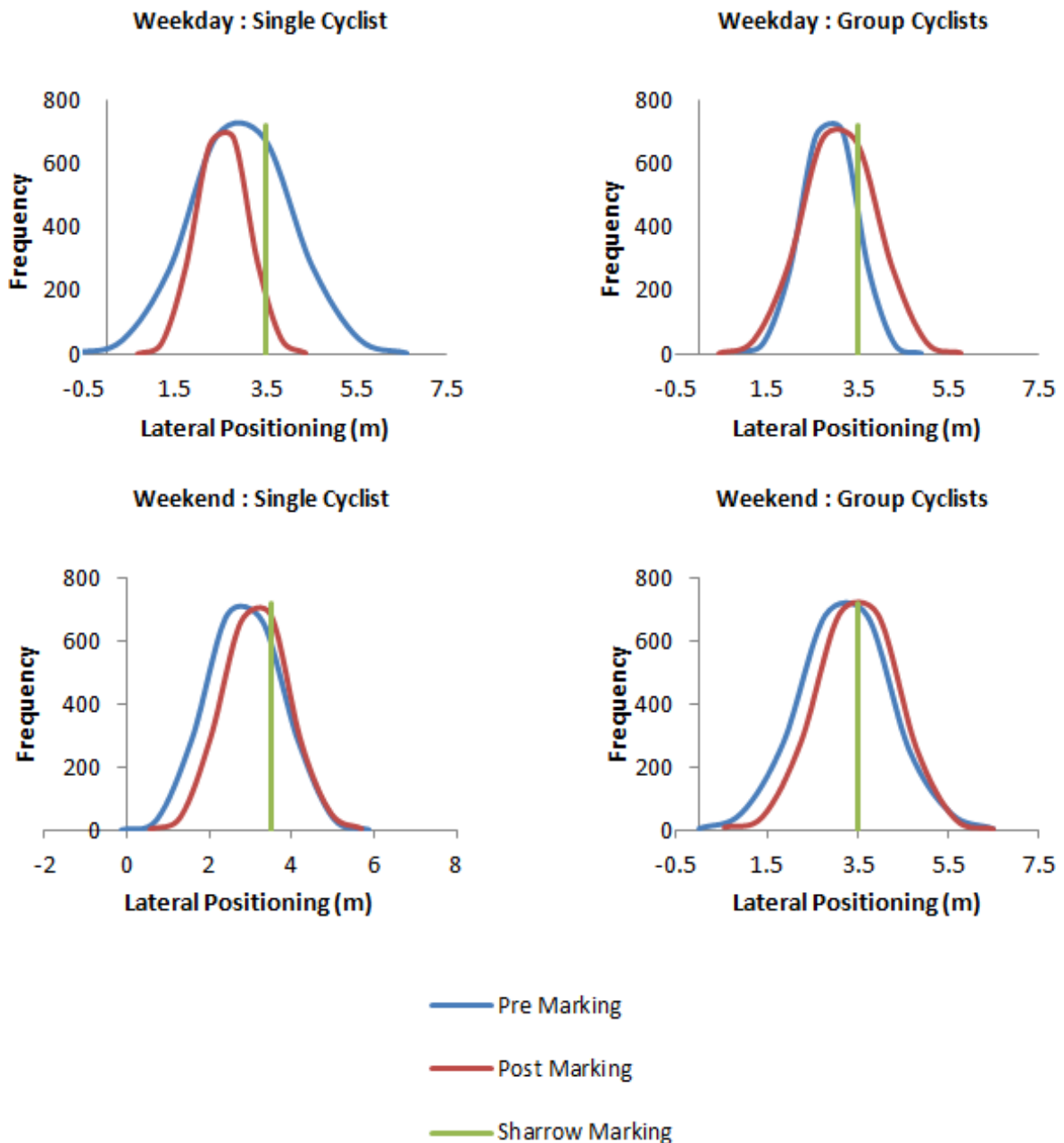
A reduction in vehicle speeds post marking is also noted with the weekday traffic.

### 2.1.5 Elstree Avenue and Taniwha Street Roundabout

Cycle sharrow markings were placed on all four approaches to the Elstree Avenue/Taniwha Street roundabout in Tamaki, Auckland.

The lateral positioning of cyclists' pre and post cycle sharrow marking implementation for Elstree Avenue/Taniwha Street is shown in Figure 8.

Figure 8: Elstree Avenue/Taniwha Street roundabout cyclist positioning



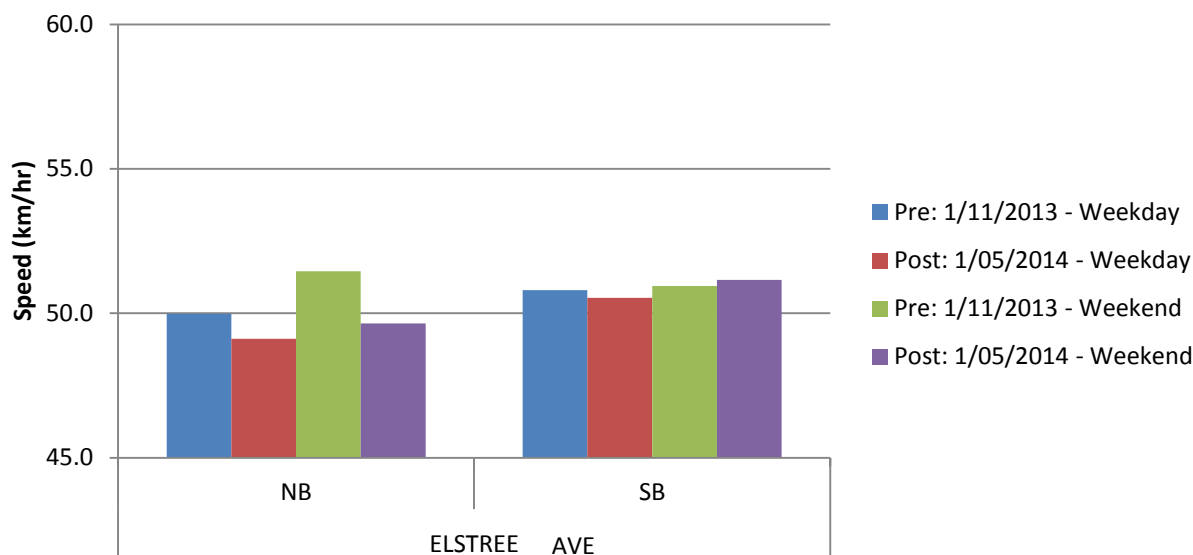
In general, the cycle sharrow markings changed cyclists' lateral position with shifting shift towards the centre of the cycle sharrow marking. The one exception to this is single cyclist on a weekday. Single



weekday cyclists did change their positioning within the traffic lane. Post implementation of the cycle sharrow marking, weekday single cyclists utilised a narrower band of the road corridor.

The 85<sup>th</sup> percentile vehicle speeds measured on Elstree Street pre and post cycle sharrow markings being implemented are shown in Figure 9.

**Figure 9: Elstree Avenue vehicle speeds (NB-northbound, SB-Southbound)**



With respect to the vehicle speeds on Elstree Avenue the results indicate vehicle speeds decreased when the cycle sharrow markings were implemented. The one exception to this is the southbound movements on the weekend, where there is a very slight increase in speed. These results are somewhat expected given that the cycle sharrow marking is on the approach to the roundabout, being the northbound movements, whereas there is no cycle sharrow marking on the southbound exit from the roundabout.

### 2.1.6 Summary of Auckland On Road Cycle Sharrow Marking Trial Results

The lateral positioning results across the three sites surveyed are mixed. In some situations the results suggest cyclists are travelling closer to the cycle sharrow marking; whilst in others this is not the case. In some situations the cyclists seem to be cycling within a more defined road space, whilst in other situations the cyclists are more spread out following the cycle sharrow marking being installed.

Vehicle speeds at each of the survey sites are generally shown to decrease post cycle sharrow markings. Whilst there are a number of factors (for example, weather, changes in parking behaviour, construction), that may have influenced the vehicle speeds along each of the corridors, the general trend of reduced speeds post cycle sharrow markings suggest that the markings have influenced drivers' behaviour.

A full report on the Auckland cycle sharrow marking on road trial is provided at Appendix D.

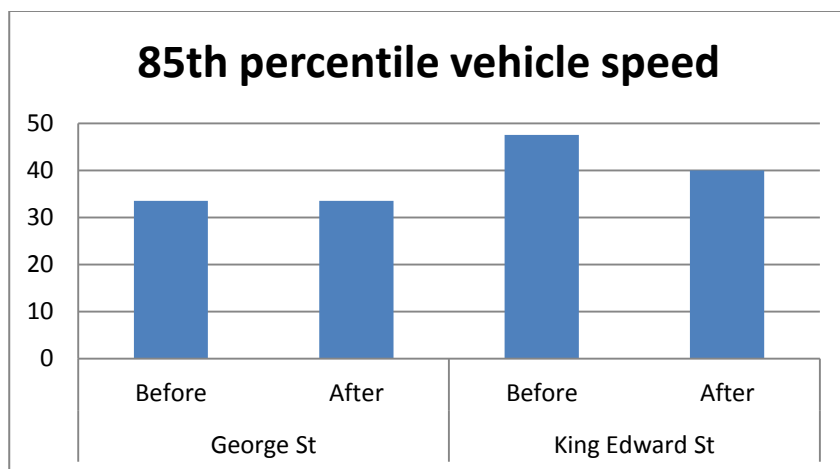
## 2.2 Dunedin Cycle Sharrow Marking On Road Trial<sup>5</sup>

Two sites, George Street and King Edward Street were approved for a cycle sharrow marking trial in Dunedin between June and November 2014. Both sites are low speed environments, have no existing dedicated cycle facilities and are located in busy activity centres.

The evaluation of the Dunedin sharrow marking trial used a methodology similar to the Auckland trial (ANOVA analysis) to ensure final results were consistent and compatible.

The 85<sup>th</sup> percentile vehicle speed data before and after the implementation of the cycle sharrow marking trial is provided in Figure 10.

Figure 10: George Street and King Edward Street 85<sup>th</sup> Percentile Vehicle Speeds

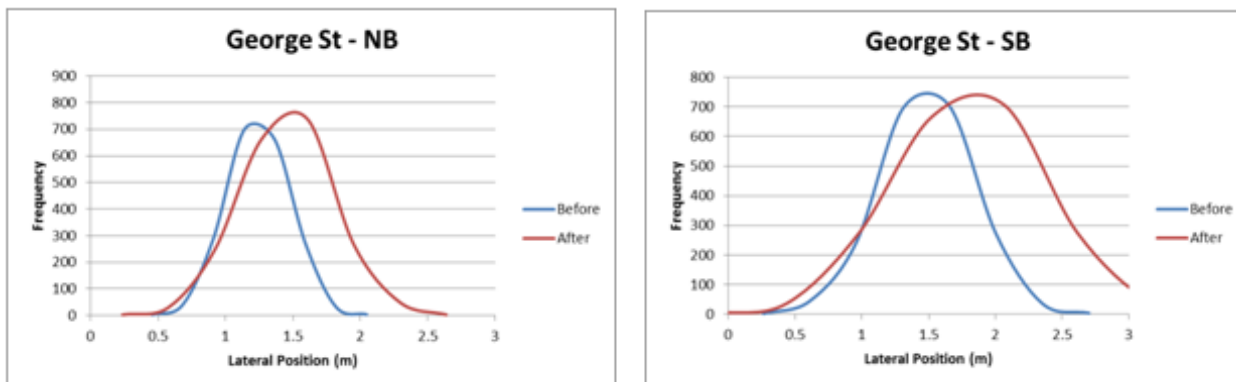


An analysis of the 85<sup>th</sup> percentile vehicle speed data saw no changes in speed on George Street as a result of the cycle sharrow marking trial; however, there was a 7.5 km/h reduction in the 85<sup>th</sup> percentile vehicle speed on King Edward Street. The variation between the two sites is likely to be related to the fact that the posted speed limit on George Street is 30 km/h, hence there is not likely to be a significant speed reduction here compared with King Edward Street, where the posted speed limit is 50 km/h.

<sup>5</sup> Information from a report titled Dunedin Sharrow Trial – June to November 2014 (Date and author unknown).

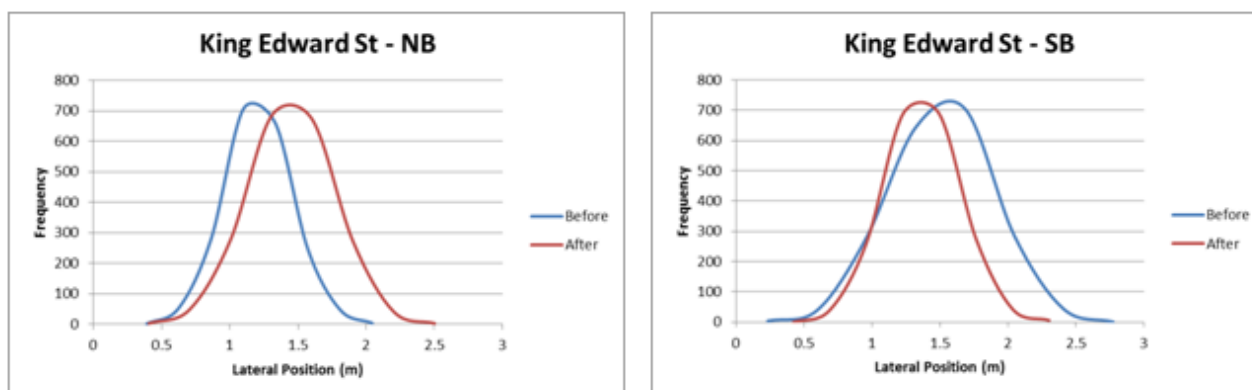
Miovision video footage was analysed to record changes in cyclist lateral positioning before and after the cycle sharrow marking trial. Figure 11 and Figure 12 show the differences in lateral offsets recorded on George Street and King Edward Street when a parked vehicle was located at the recording site (distance given is that between a parked vehicle and cyclist).

**Figure 11: Lateral positioning of cyclists' adjacent to a parked car before and after trial – George Street NB-northbound, SB-Southbound**



On George Street, cyclists were recorded moving 0.4 – 0.5 m further away from the kerb following the implementation of the cycle sharrow marking.

**Figure 12: Lateral positioning of cyclists' adjacent to a parked car before and after trial –King Edward Street NB-northbound, SB-Southbound**

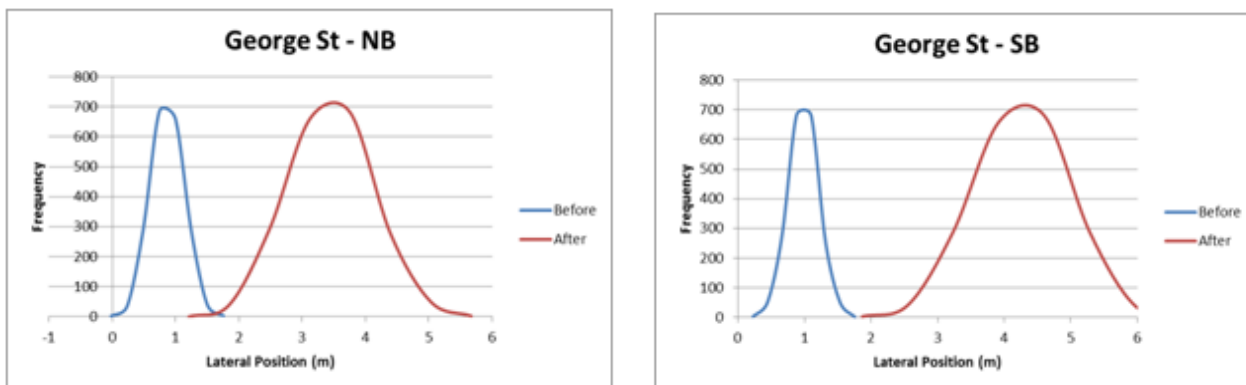


On King Edward Street, there was a 0.2-0.3 m shift away from the kerb.<sup>6</sup>

<sup>6</sup> A reason for the larger lateral shift on George Street is likely to be attributed to the lower speed limit; cyclists are more likely to take the lane in a 30 km/h speed environment, where they can keep pace with the traffic flow compared to a 50 km/h zone.

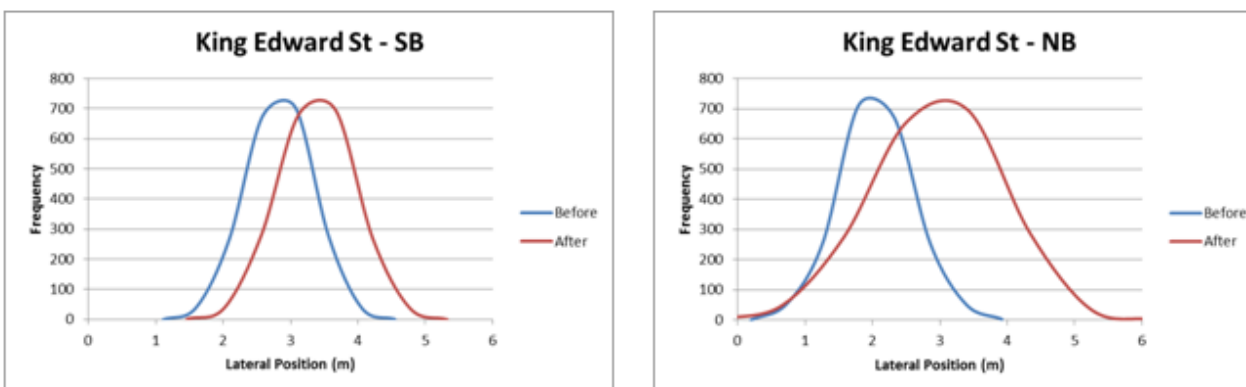
Data was also separately recorded when the adjacent parking space to the recording site was not occupied by a vehicle. Figure 13 and Figure 14 show the differences in lateral movement away from the kerb where there was no parked car before and after implementation of the cycle sharrow marking installation.

**Figure 13: Lateral positioning of cyclists' (no parked car present) before and after trial –George Street NB-northbound, SB-Southbound**



Following installation of the cycle sharrow marking, cyclists were recorded as 'taking the lane', shifting a further 2.5 – 3.2 m from the kerb.

**Figure 14: Lateral positioning of cyclists' (no parked car present) before and after trial –King Edward Street NB-northbound, SB-Southbound**



On King Edward Street, a lateral shift of 0.5 – 1.0 m away from the kerb was recorded.<sup>7</sup>

<sup>7</sup> Higher lateral shifts were evidenced in the 30 km/h speed zone trial site, as cyclists maintain their position within the traffic flow.

### 2.2.1 Summary of Dunedin On Road Cycle Sharrow Marking Trial Results

The Dunedin cycle sharrow marking trial concludes that cycle sharrow markings have provided cyclists with the confidence and legitimacy of riding in the carriageway and 'taking the lane'. This has significant safety benefits for cyclists, through improved visibility, and more predictable and consistent travel as cyclists are not swerving between parked cars. The data also suggests the cycle sharrow markings encourage drivers to slow down.

The Dunedin cycle sharrow marking also concludes that cycle sharrow markings are especially beneficial when there is no parked car present and that cycle sharrow markings encourage cyclists to ride in the carriageway rather than weaving between parked vehicles.

An analysis of the 85<sup>th</sup> percentile vehicle speed data noted a significant speed reduction of 7.5 km/h reduction on King Edward Street although no reduction on George Street. The variation between the two sites is attributed, in part, to the lower speed limit on George Street.

A full report on the Dunedin cycle sharrow marking on road trial is provided at Appendix E.

## 2.3 Nelson Cycle Sharrow Marking On Road Trial<sup>8</sup>

Cyclist and motorist lateral positioning was recorded pre and post implementation of the Nelson cycle sharrow marking trial to determine if the cycle sharrow marking had any effect on these parameters. Vehicle speeds were also measured pre and post implementation.

The trial sites within Nelson were chosen to determine how the cycle sharrow marking performed in different road environments. The trial locations were:

- ◆ Tasman Street
- ◆ Hardy Street
- ◆ Brook Street.

### 2.3.1 Tasman Street

After the introduction of cycle sharrow markings:

- ◆ Toward the Hills right - Cyclist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.1 m
- ◆ Toward the Hills - Motorist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.2 m
- ◆ Away from Hills - Cyclist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.2 m
- ◆ Away from Hills - Motorist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.1 m.

It is noted that the increases noted above are statistically insignificant.

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<sup>8</sup> Data collection and analysis was undertaken by Ben Wong a Masters student from the University of Canterbury.

There was an increase in the mean vehicle speeds on Tasman Street of approximately 0.1 km/h (from 38.8 km/hr to 38.9 km/hr). The increase in speed is also noted as statistically insignificant.

### 2.3.2 Hardy Street

After the introduction of cycle sharrow markings:

- ◆ Polytech Side - Cyclist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.1 m
- ◆ Polytech Side - Motorist lateral positioning shifted left away from the cycle sharrow marking by approximately 0.07 m

It is noted that the increases noted above are statistically insignificant.

- ◆ Opposite Polytech - Cyclist lateral positioning stayed constant
- ◆ Opposite Polytech - Motorist lateral positioning shifted left away from the cycle sharrow marking by approximately 0.3 m.

The decrease in motorist lateral positioning is noted as statistically significant; however, lateral positioning results for Hardy Street are considered to be skewed because during the pre-trial, the parking spaces were occupied but in the post-trial the parking spaces were vacant. This is a likely contributing explanation as to why the motorist lateral positioning shifted left.

There was a decrease in the mean vehicle speeds on Hardy Street of approximately of 3.7 km/hr (from 22.5 km/hr to 18.8 km/hr). The decrease in speed is noted as statistically significant.

### 2.3.3 Brook Street (Site 1)

After the introduction of the sharrow:

- ◆ Cyclist lateral positioning shifted right towards the cycle sharrow marking by approximately by approximately 0.2 m
- ◆ Motorist lateral positioning shifted left away from the cycle sharrow marking by approximately 0.3 m.

It is noted that the cyclist lateral positioning increase is statistically insignificant and the decrease in motorist lateral positioning is statistically significant.

### 2.3.4 Brook Street (Site 2)

After the introduction of the sharrow:

- ◆ Cyclist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.2 m
- ◆ Motorist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.1 m.

It is noted that the increases noted above are statistically insignificant.

There was an increase in the mean vehicle speeds on Brook Street of approximately of 1.3 km/hr (from 38.6 km/hr to 39.9 km/hr). This result is statistically insignificant.

### 2.3.5 Summary of Nelson On Road Cycle Sharrow Marking Trial

Overall, the Nelson on road cycle sharrow markings trials suggest that the cycle sharrow marking has generally resulted in the lateral positioning of cyclists' and motorists' shifting right towards the cycle sharrow marking.

The decrease in vehicle speeds noted on Hardy Street (3.7 km/hr) is noted as statistically significant; this is in contrast to minor speed increases noted on Tasman Street and Brook Street. These speed increases are reported as statistically insignificant.

Further information from the Nelson on road trials is provided in Appendix F.

## 2.4 Palmerston North Cycle Sharrow Marking On Road Trial<sup>9</sup>

Cyclist and motorist lateral positioning were recorded pre and post implementation the Palmerston North cycle sharrow marking trial to determine if the cycle sharrow marking has had any effect on these parameters. Vehicle speed was also measured pre and post sharrow to see if the cycle sharrow markings had an effect on vehicle speed.

The trial locations were:

- ◆ Broadway Street
- ◆ College Street (Site 1)
- ◆ College Street (Site 2).

### 2.4.1 Broadway Street

After the introduction of the cycle sharrow marking:

- ◆ Cyclist lateral positioning shifted right towards the cycle sharrow marking by approximately 1.2 m
- ◆ Motorist lateral positioning shifted right towards the cycle sharrow marking approximately 0.5 m.

There was a reduction in mean vehicle speeds on Broadway Street of approximately of 5.2 km/hr (from 27.2 km/hr to 22.0 km/hr).

The results noted above are statistically significant.

### 2.4.2 College Street (Site 1)

After the introduction of the cycle sharrow marking:

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<sup>9</sup> Data collection and analysis was undertaken by Ben Wong - Master student from the University of Canterbury and by Regan Hunt - Palmerston North City Council engineering cadet.

- ◆ Cyclist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.8 m
- ◆ Motorist lateral positioning shifted left away from the cycle sharrow by approximately 0.5 m.

The cyclist and motorist lateral position results College Street (Site 1) are noted as statistically significant.

### 2.4.3 College Street (Site 2)

After the introduction of the cycle sharrow marking

- ◆ Cyclist lateral positioning shifted right towards the cycle sharrow marking approximately 0.2 m
- ◆ Motorist lateral positioning shifted right towards the cycle sharrow marking by approximately 0.6 m.

The cyclist lateral positioning for College Street (Site 2) is noted as being statistically insignificant while the motorist lateral positioning is noted as being statistically significant.

There was a reduction in the mean vehicle speeds on College Street of approximately 3.4 km/hr (from 31.9 km/hr to 28.5 km/hr). This is statistically significant.

### 2.4.4 Summary of Palmerston North On Road Cycle Sharrow Marking Trial

In general, the results of the Palmerston North cycle sharrow marking trial show that the cycle sharrow marking has increased vehicle and cyclist lateral positioning.

It is highlighted that both trial sites reported a statistically significant decrease in mean vehicle speeds.

Further information from the Palmerston North on road trials is provided in Appendix F.

## 2.5 Wellington Cycle Sharrow Marking On Road Trial<sup>10</sup>

The Wellington cycle sharrow marking trial observed pre and post trial road user behaviour at a 50 kph speed zone site at approximately the corner of Featherston and Gray Street in the Wellington central business district. Video observations of 268 cyclists were made, including key measures like cyclist lane position, numbers travelling within car door zones and overtaking distance between cyclists and vehicles.

### 2.5.1 Summary of Wellington On Road Cycle Sharrow Marking Trial

The results of the observational cycle sharrow marking trial indicated that there was no significant effect on cyclist behaviour. There is the possibility that environmental factors could have affected behaviour, including the 50 km/h speed limit on the section of road where road user behaviour was being monitored. Anecdotal survey participant comments suggested that the substantial difference between the speed of vehicles' and the speed of cyclists' made the cyclists less likely to move into the

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<sup>10</sup> Information from Wellington City Council Cycle Symbol Road Marking Trial. Prepared for Wellington City Council by Opus International Consultants Ltd.



middle of a lane where they could be perceived as slowing down other traffic. Similarly, results from cycle sharrow marking trials in 30 kph speed zones (such as those outlined in the findings of the Dunedin trial); do suggest a significant shift in cyclist lane position behaviour.

An independent sample t-test between the pre and post implementation cycle sharrow marking periods indicated there were no significant changes in cyclist position for those travelling within the door zone or those travelling outside the door zone; this held true irrespective of which lane the cyclist was in<sup>11</sup>.

While the number of vehicles observed over-taking a cyclist was minimal, five in the pre and ten in the post-cycle sharrow marking trial period, there did appear to be an increase in distance between the cyclists and vehicles from 1.6 m to 1.9 m.

No cyclist-driver conflict, collisions, or 'near misses', for example, the need to take evasive braking or swerving manoeuvres, were observed in any of the 268 cyclist observations.

### 2.5.2 Recommendations From Wellington Trial

In light of the results of the observational study, the following recommendations are made in the Wellington Trial Report<sup>12</sup>.

- ◆ Cycle sharrow markings should be positioned in the centre of the lane to encourage cyclists to "take the lane"
- ◆ Cycle sharrow markings should only be used where there is a low speed differential between all road users, i.e. where the speed limit is 30 km/h or lower.

A full report on the Wellington cycle sharrow marking on road trial is provided at Appendix G.

## 2.6 Summary and Comparisons of Regional On Road Regional Trials

While variances are noted between trial findings, it is broadly concluded that the implementation of cycle sharrow markings results in a shift in the lateral position of cyclists' towards the cycle sharrow marking. This finding suggests that cyclists are 'claiming the lane' more when a cycle sharrow marking is present on the road corridor.

A reduction in vehicle speeds at many cycle sharrow marking trial sites was recorded. This is an important finding of the trials as reduced vehicle speeds are desirable to improve safety for cyclists. Some minor vehicle speed increases were noted; however, these increases are noted as statistically insignificant.

From the results of the regional on road trials of cycle sharrow markings outlined in the this report, it is cautiously concluded that the benefits of cycle sharrow markings include a small reduction in vehicle speed and a shift in the lateral position of cyclists' away from the kerb towards the cycle sharrow marking, thereby assisting cyclists to 'claim the lane'. While these benefits are acknowledged as slight,

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<sup>11</sup> Left lane within door zone,  $t(138.31) = 1.53$ ,  $p = 0.13$ ; Right lane within door zone,  $t(28.58) = -0.12$ ,  $p = 0.91$ ; Left lane outside door zone,  $t(36.54) = 0.20$ ,  $p = 0.84$ ; Right lane outside door zone,  $t(18.42) = -0.81$ ,  $p = 0.43$

<sup>12</sup> It is noted that other trial reports did not necessarily state recommendations.

the low cost and ease of implementation mean the tool is excellent value for money and provide transport planners and engineers with an additional instrument in overall planning for cycling. Furthermore, appropriate use of cycle sharrow markings on New Zealand roads would further align cycle planning in New Zealand with international best practice and current use internationally.

### 3 PERCEPTION SURVEY FINDINGS

Perception surveys were undertaken by Auckland Transport, Dunedin City Council, Nelson City Council, Palmerston North City Council and Wellington City Council

#### 3.1 Auckland Cycle Sharrow Marking Perception Survey<sup>13</sup>

A survey was undertaken by Auckland Transport to understand the public's perception of cycle sharrow markings. This was undertaken using the Auckland Transport Research Panel, a database of Auckland residents who have volunteered to receive information from Auckland Transport. In December 2013 Auckland Transport surveyed a panel of 715 voluntary respondents to ascertain their understanding of the cycle sharrow marking. The participants were shown photographs of the trial cycle sharrow markings in-situ, but were not told the meaning of the cycle sharrow marking and thus respondents' "uneducated" understanding of the symbol was able to be gauged.

Queries regarding the proposed cycle sharrow markings were put to the survey respondents. This questioned the respondents understanding of a proposed cycle sharrow marking as illustrated in Figure 15.

**Figure 15: Survey figure of sharrow markings**



The majority of people surveyed thought the cycle sharrow markings meant that bikes and cars should share the road. A significant portion of those surveyed were unsure whether cycle sharrow markings imply a right of way.

Respondents were also asked to rate whether a cycle sharrow marking is a clear and easily understood way to intersections. The results show one in four consider sharrows to be a good way to mark intersections, or that they would improve safety.

A full report on the Auckland cycle sharrow marking trial is provided at Appendix D.

<sup>13</sup> Information from Trial of Sharrow Markings – Trial Results Report. Prepared for Auckland Transport by Flow. February 2015.

### 3.2 Dunedin Cycle Sharrow Marking Perception Survey<sup>14</sup>

Dunedin City Council undertook a 'People's Panel' survey to measure and further understand the community's reaction and understanding of the cycle sharrow marking. The People's Panel is an email-based panel that gives people in Dunedin the opportunity to provide online feedback on a range of Council issues, as well as contribute to shaping policy and decision making. The survey was completed by 347 panel members.

Key findings of the survey included:

- ◆ 64% of the respondents who had used the cycle sharrow marking trial sites (George Street or King Edward Street) in the previous two months had seen the sharrow marking
- ◆ 57% of cyclists felt like more legitimate road users after seeing the sharrow marking
- ◆ 54% of motorists looked for cyclists after seeing the sharrow marking
- ◆ 66% of the respondents thought the cycle sharrow marking meant that cars and bikes should share the road
- ◆ 76% of the respondents thought motorists should share the road with cyclists and pass when safe to do so when sharrows are marked on the road
- ◆ 72% of the respondents thought that cyclists should position themselves in the left half of the lane when sharrows are marked on the road.

Cyclists responded that the cycle sharrow marking made them feel:

- ◆ Like a more legitimate road user (57%),
- ◆ More visible (23%)
- ◆ Safer (20%).

However, one third of cyclists stated that they felt no different following the installation of the sharrow symbol.

In reference to Figure 16, most cyclists (68%) stated that they rode in position B.

**Figure 16: Where should a Cyclist Be Riding?**



<sup>14</sup> Information from a report titled Dunedin Sharrow Trial – June to November 2014 (Date and author unknown).

Of the motorists that had encountered the cycle sharrow marking at either location:

- ◆ Many stated that they drove no differently to normal (45%)
- ◆ Others stated that they had looked for cyclists but not slowed down (28%)
- ◆ Some slowed down and checked for cyclists (26%).

Motorists were also asked where cyclists should be positioned on the road (refer to Figure 16) where there is a cycle sharrow marking; 40% stated position A and 32% stated position B.

Despite many of the reported positive road safety responses, nearly 20% of survey participants indicated they were confused about the meaning of the symbols, and/or that more education and information was needed. Extensive communication on the cycle sharrow marking trial was undertaken by Dunedin City Council; however, there is clearly a need for wider education and information dissemination. Should the sharrow be formally adopted as a Traffic Control Device, it will be necessary to educate all road users about their purpose.

A full report on the Dunedin cycle sharrow marking trial survey is provided at Appendix E.

### 3.3 Nelson Cycle Sharrow Marking Perception Survey<sup>15</sup>

Nelson City Council conducted a perception survey between October and November 2014. The survey received 79 responses. A summary of findings is provided below.

#### **Cycle sharrow markings - Midblock**

- ◆ 92% of respondents think that the cycle sharrow markings meant that bikes and cars should share the road
- ◆ 57% of respondents consider cycle sharrow markings to be a good treatment where road width is not wide enough for a cycle lane.
- ◆ 41% respondents consider cycle sharrow markings improve safety for cyclists
- ◆ 51% of respondents consider that motorists will look for cyclists when they see this marking

#### **Cycle sharrow markings - at the approach to a roundabout (intersection)**

- ◆ 94% of respondents think that the cycle sharrow markings meant that bikes and cars should share the road
- ◆ 48% of respondents consider cycle sharrow markings to be a good way to mark intersections, or that they would improve safety
- ◆ 42% of respondents consider cycle sharrow markings to improve safety of cyclists
- ◆ 49% of respondents consider that motorists will look for cyclists when they see this marking.

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<sup>15</sup> Information from Nelson Sharrow and Cycle Lane Marking Trial – Perception Survey Results. December 2014 Author unknown

### **Positioning of Cyclist**

- ◆ 75% of respondents consider that the location of cycle sharrow markings does not indicate where cyclists should ride on the road.

A full report on the Nelson sharrow and cycle lane trial (perception survey results) is provided at Appendix H.

### **3.4 Palmerston North Cycle Sharrow Marking Perception Survey<sup>16</sup>**

Palmerston North City Council conducted a perception survey between 21 August and 24 September, 2014. The survey received 121 respondents.

- ◆ Letter drop to businesses and residents within the vicinity of survey area;
- ◆ Invitation to stakeholders
- ◆ Survey/ Interviews on Broadway Ave and the Plaza Shopping Mall.

A summary of findings is provided below.

#### **Cycle sharrow markings -midblock**

- ◆ 78% of respondents think that the cycle sharrow markings meant that bikes and cars should share the road
- ◆ 49% of respondents consider cycle sharrow markings to be a good treatment where road width is not wide enough for a cycle lane
- ◆ 33% of respondents consider cycle sharrow markings improve safety of cyclists
- ◆ 42% of respondents consider that motorists will look for cyclists when they see this marking

#### **Cycle sharrow markings - at the approach to a roundabout (intersection)**

- ◆ 80% of respondents think that the cycle sharrow meant that bikes and cars should share the road.
- ◆ 51% of respondents consider cycle sharrow markings to be a good way to mark intersections, or that they would improve safety
- ◆ 37% of respondents consider cycle sharrow markings improve safety of cyclists.
- ◆ 47% of respondents consider that motorists will look for cyclists when they see this marking.

### **Positioning of Cyclist**

76% of respondents consider that the location of cycle sharrow markings does not indicate where cyclists should ride on the road.

A full report on the Palmerston North sharrow and cycle lane marking trial (perception survey results) is provided at Appendix I.

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<sup>16</sup> Information from Sharrow and Cycle Lane Marking Trial. Perception Survey Results. Palmerston North City Council. December 2014 (Revision 1)

### 3.5 Wellington Cycle Sharrow Marking Perception Survey<sup>17</sup>

Wellington City Council conducted an online survey to evaluate user perceptions and any shifts to the desired, safer behaviour under the different cycle symbol interventions (‘cycle sharrow markings and cycle lane markings’). The survey link was sent to members of the Wellington City Council panel. The survey received 479 responses.

The results of the online survey indicated that some participants felt that the cycle sharrow markings would be difficult to see, particularly for drivers, and about two in three road users reported finding it difficult to understand the meaning of the cycle sharrow marking without explanation.

Participants did not believe that, in general, the cycle sharrow markings would have any impact on cyclist safety and that there was no difference in the actions participants felt they would take when following a cyclist between a cycle sharrow marking and no cycle sharrow marking condition. The majority of both cyclists and drivers also felt that the cycle sharrow markings did not affect their own cycling or driving behaviour or the cycling or driving behaviour of others.

Around 40% of cyclists also felt that the cycle sharrow markings did not impact on their sense of safety or confidence.

The positioning of the cycle sharrow marking on the road did have an impact of where participants thought cyclists should ride. When there was no cycle sharrow marking or the cycle sharrow marking was positioned in the left of the lane, participants were more likely to think cyclists should be cycling on the left side of the lane, whereas, when the cycle sharrow marking was positioned in the centre of the lane participants were more likely to think cyclist should be cycling in the middle. Therefore, in order to encourage cyclists to “own the road” and cycle in the middle of the lane, further from parked cars, the cycle sharrow marking should be positioned in the centre of the road. This is supported by the finding that the majority of participants selected the ‘centre of the lane’ as the preferred location for the cycle sharrow marking.

The results of the Wellington perception survey resulted in the following recommendations:

- ◆ A significant education and public marketing campaign around cycle sharrow markings should be conducted in order to enhance driver and cyclist awareness of the markings and understanding of their meaning and the behaviours they are intended to elicit.
- ◆ Cycle sharrow markings should have complementary information, for example, signage at the side of the road, to indicate that the road is a shared space and that cyclists should move into the centre of the lane.

A full report on the Wellington cycle sharrow marking trial is provided at Appendix G.

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<sup>17</sup> Information from Wellington City Council Cycle Symbol Road Marking Trial. Prepared for Wellington City Council by Opus International Consultants Ltd.

### 3.6 Summary of Regional Perception Surveys

The results of the various perception surveys indicate that cycle sharrow markings are generally understood to mean that motorists and cyclists should/can share the road. (It is noted that some perception surveys gave background information about cycle sharrow markings and/or the on road trials, while others did not).

Cyclists were reported acknowledging that the cycle sharrow marking made them feel like more legitimate road users; with some cyclists indicating that cycle sharrow markings made them feel safer.

Wellington surveys indicated that respondents did not generally believe the cycle sharrow markings would have any impact (positive or negative) on safety; nor did those findings suggest that there would be any change in the behaviour of road users as a result of cycle sharrow markings.

Overall, perception surveys do not appear to indicate significant negative perceptions with respect to road user concerns or highlight issues with the implementation of cycle sharrow markings on the road. However, the perception surveys clearly signal that there would be the need for a campaign to inform and educate road users about the purpose of cycle sharrow markings.

## 4 ADDITIONAL PERCEPTION SURVEYS – POST-IMPLEMENTATION

An additional perception survey was conducted post-implementation via the Auckland Transport Research Panel. The Automobile Association also conducted a post-implementation perception survey amongst its members.

### 4.1 Auckland Transport Research Panel: Post-Implementation Perception Survey

An additional perception survey was conducted in Auckland via the Auckland Transport Research Panel in April 2015. A total of 695 panel members took part in the survey. This survey was formulated with the aim of better understanding the likelihood, or otherwise, of road users being confused by the application of a cycle symbol in a cycle lane and as part of the cycle sharrow marking.

A copy of the post-implementation perception survey questionnaire conducted via the Auckland Transport Research Panel is provided in Appendix J.

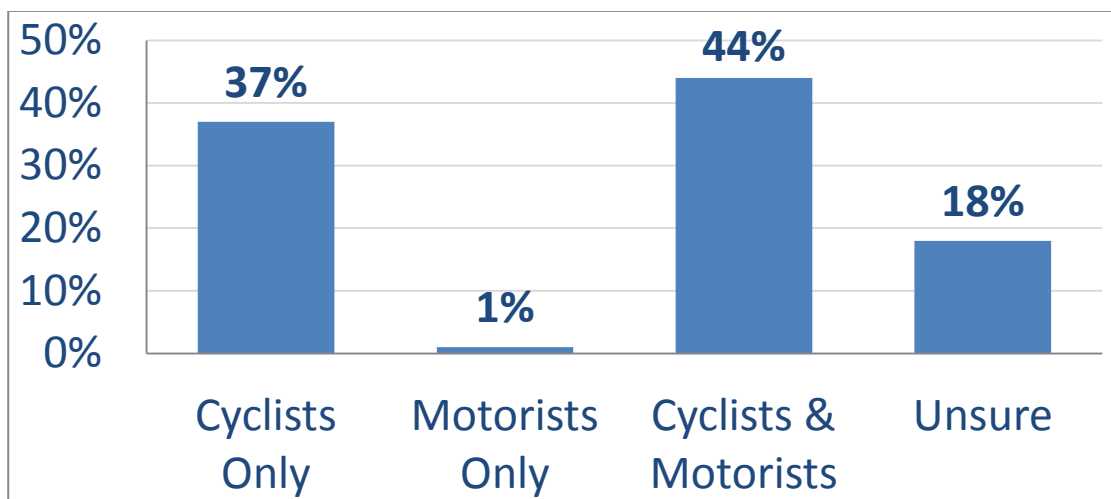
The following information summarises key findings from the Auckland Transport Research Panel post-implementation survey.



#### 4.1.1 Who can use the part of the road marked with the symbol? (Understanding of the cycle sharrow marking)

As can be seen in Figure 17 below, 37% of respondents incorrectly stated that only cyclists are able to use the road indicated by the presence of a sharrow marking; combined with the 18% of respondents that were unsure of which road users could use that part of the road, it is noted that more than half of respondents did not understand the meaning of a cycle sharrow marking.

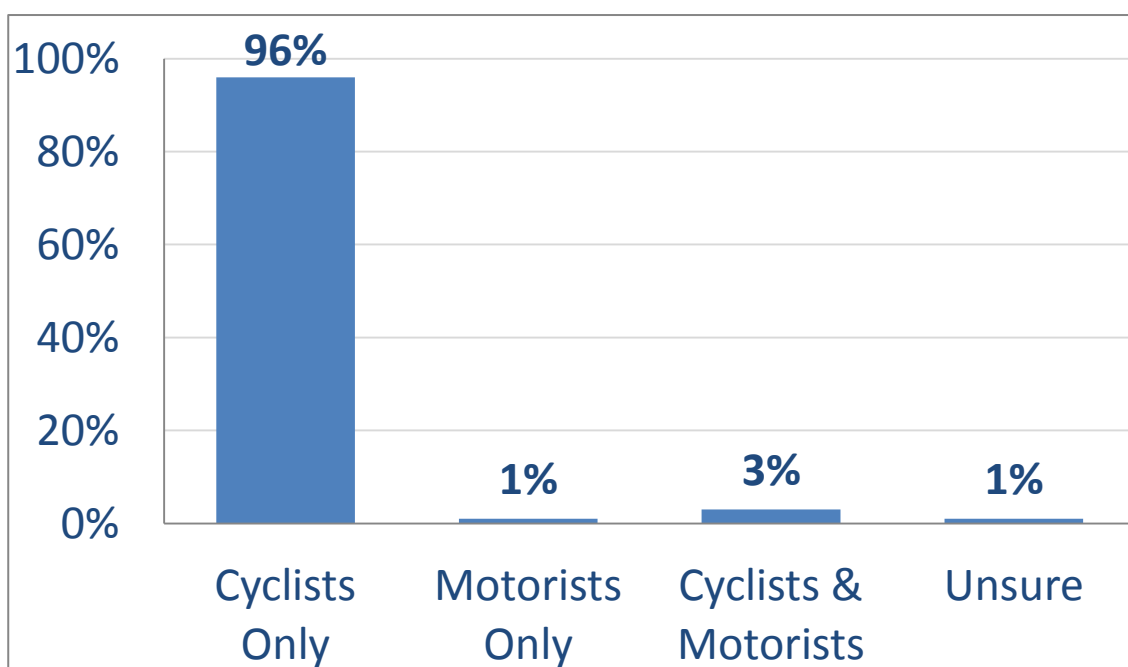
Figure 17: Who can use the part of the road marked with a cycle sharrow marking?



#### 4.1.2 Who can use the part of the road marked with the symbol? (Understanding of the cycle lane marking)

An overwhelming majority of people (96% of respondents), correctly interpreted the meaning of the cycle lane symbol used in on road cycle lanes.

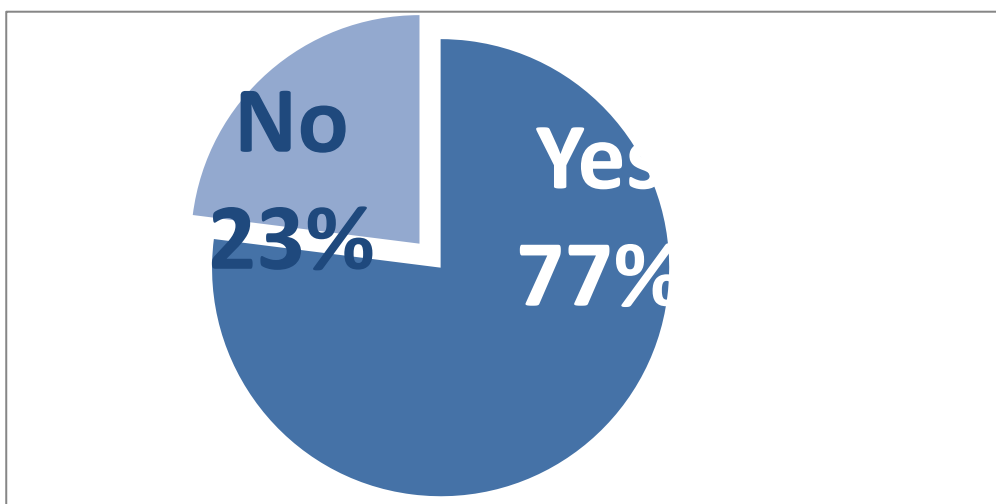
Figure 18: Where should a Cyclist Be Riding?



#### 4.1.3 Can you easily tell the two symbols apart?

The majority of respondents (77% as illustrated in Figure 19), indicated that they could easily distinguish the two symbols (being the cycle sharrow marking and cycle lane marking) apart. Of the respondents who incorrectly identified the cycle sharrow marking as being a part of the road for use by cyclists only, 72% still indicated that they could easily tell the two markings apart.

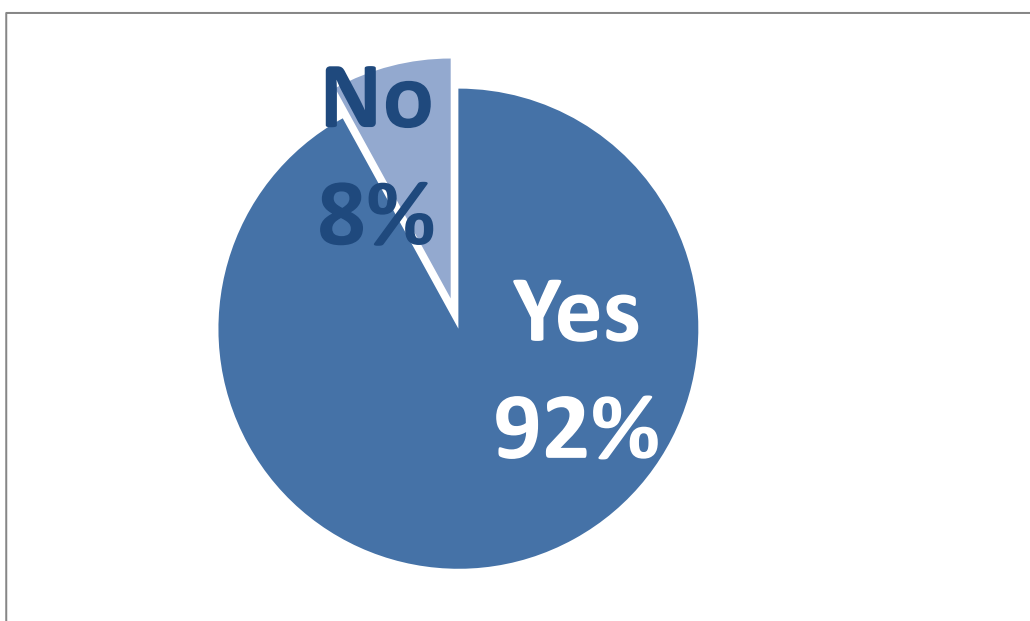
Figure 19: Can you easily tell the two symbols apart?



#### 4.1.4 Will the public need to be educated about what the different symbols mean?

Regardless of earlier answers and/or respondent demographic, 92% of respondents (illustrated in Figure 20 ) indicated that they considered that there would be the need for some form of education for the public to understand the meaning of, and difference between, the two symbols. Of those who said that it was 'easy to tell the markings apart' (see Section 4.1.3 above), 90% of respondents still indicated that education (of some form) would be required.

Figure 20: Will the public need to be educated about what the different symbols mean?



This significant response rate indicates that an education campaign will be required should cycle sharrow markings become legal for use on New Zealand roads.

Further analysis of the Auckland Transport Research Panel post-implementation survey is provided at Appendix K.

## 4.2 Automobile Association: Post-Implementation Perception Survey

A similar perception survey was offered by the Automobile Association (AA) to members throughout New Zealand in April 2015. A total of 2,664 AA members responded. Flow undertook analysis of the AA survey (noting that not all survey questions presented by the AA were analysed or summarised due to several additional 'open ended' questions included by the AA in their survey<sup>18</sup>).

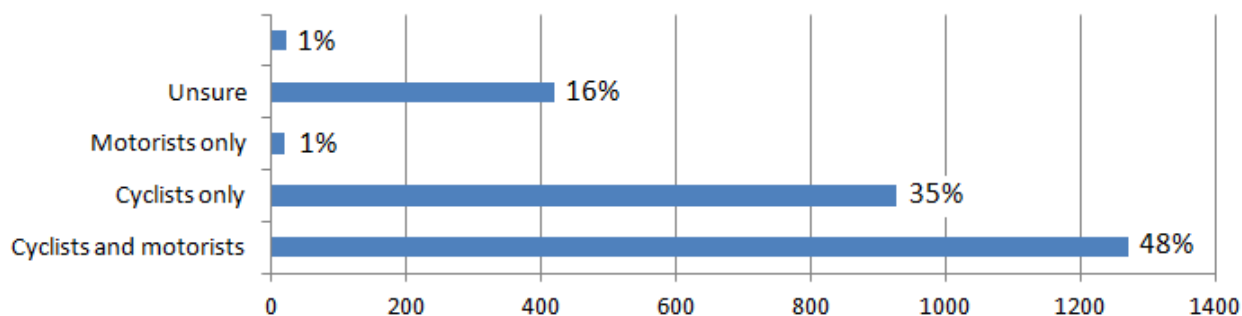
A copy of the post-implementation perception survey questionnaire conducted via the Automobile Association is provided in Appendix L.

The following information summarises key findings from the AA post-implementation survey.

### 4.2.1 Who can use the part of the road marked with the symbol? (Understanding of the cycle sharrow marking)

As can be seen in Figure 21 below, almost half of the respondents (48%) correctly identified the meaning of the cycle sharrow marking; however, more than half were either unsure what the marking meant (17%), or incorrectly identified the meaning of the marking (36%).

**Figure 21: Understanding of the cycle sharrow marking**

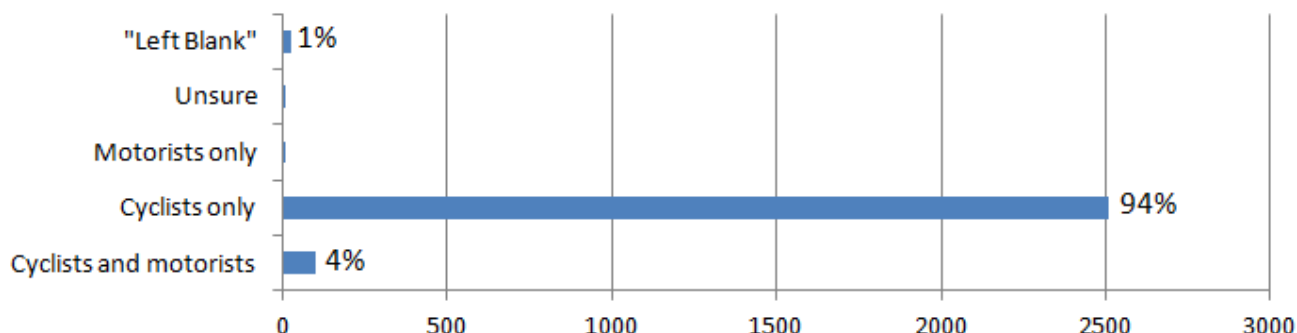


<sup>18</sup> Open ended questions were not summarised for the purposes of this report; however, it is understood that the AA intends to analyse all survey questions at a later date.

#### 4.2.2 Who can use the part of the road marked with the symbol? (Understanding of the cycle lane marking)

The survey results suggest that, when used in the context of a cycle lane, the cycle symbol is well understood with a significant portion of respondents stating the lane is for cyclists' only. As can be seen in Figure 22 below, 94% of respondents correctly identified that a cycle lane is for use by cyclists only.

Figure 22: Understanding of the cycle lane marking

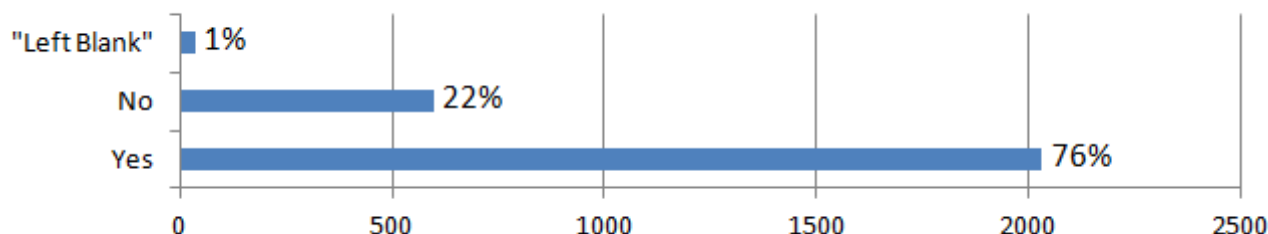


#### 4.2.3 Can you easily tell the two symbols apart?

As can be seen in Figure 23 below, the majority of respondents (76%) stated that they could 'easily tell the two cycle symbols apart'.

Of the respondents that had earlier stated the cycle sharrow marking illustrated in question one was for 'cyclists only', 69% of these respondents still stated that they could easily tell the symbols apart. This indicates that the majority of the population can see a difference between the two cycle symbols and suggests that, with education, the meaning of cycle sharrow markings could be understood by most people

Figure 23: Ability to easily tell the two cycle symbols apart

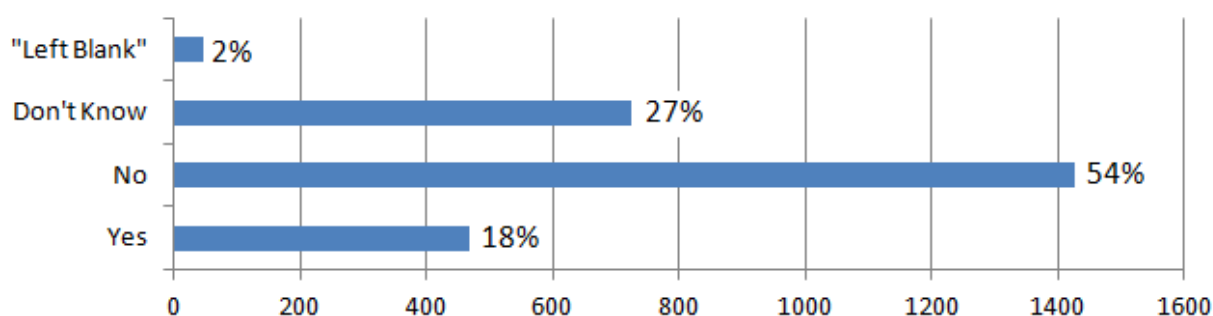


#### 4.2.4 Do you think this marking changes any rights or obligations of any road users under the road code?

In addition to the questions outlined above, the AA presented an additional question relating to respondents' understanding of whether or not the presence of a cycle sharrow marking would change their rights or obligations

Around half of respondents stated that the presence of a cycle sharrow marking would not change their rights or obligations under the road code. As shown in Figure 24 below, just under half of respondents thought that the presence of cycle sharrow marking would change their rights or obligations or were unsure.

Figure 24: Rights or Obligations of any road users under the road code



Additional post-implementation surveys conducted via the Auckland Transport Research Panel and the Automobile Association indicates that while the majority of respondents could 'easily tell the two symbols apart' there is a relatively high level of misunderstanding as to the meaning of cycle sharrow markings. This could be expected given that cycle sharrow markings have not been used on New Zealand roads prior to trials.

Furthermore, 92% of Auckland Transport Research Panel respondents (regardless of their level of understanding regarding cycle sharrow markings), indicated that they consider that there would be the need for education to inform the public of the meaning of the of cycle sharrow markings and to inform people about the difference between a cycle lane and a road implemented with cycle sharrow markings.

Further analysis of the AA post-implementation survey is provided at Appendix M.

## 5 CONCLUSION

While small variances are noted between the on road cycle sharrow marking trials, it is broadly concluded that the implementation of cycle sharrow markings results in a shift in the lateral position of cyclists' towards the cycle sharrow marking. This finding suggests that people on bikes are 'claiming the lane' more when a cycle sharrow marking is present on the road corridor.

A reduction in vehicle speeds at many cycle sharrow marking trial sites was recorded. This is an important finding of the trials as reduced vehicle speeds are desirable to improve the safety of the road environment for cyclists. Some minor vehicle speed increases were noted; however, these were minor and reported as statistically insignificant increases.

From the results of the regional on road trials of cycle sharrow markings outlined in this report, it is cautiously concluded that the benefits of cycle sharrow markings include a small reduction in vehicle speed and a shift in the lateral position of cyclists' away from the kerb towards the cycle sharrow marking, thereby assisting cyclists to 'claim the lane'. While these benefits are acknowledged as slight, the low cost and ease of implementation mean the tool is excellent value for money and provide transport planners and engineers with an additional instrument in overall planning for cycling. Furthermore, appropriate use of cycle sharrow markings on New Zealand roads would further align cycle planning in New Zealand with international best practice and current use internationally.

Overall, the perception surveys have not accentuated significant negative perceptions, road user concerns or highlighted any issues with the implementation of cycle sharrow markings on the road. However, the perception surveys clearly signal that there would be the need for a campaign to inform and educate road users about the purpose of cycle sharrow markings.

Perhaps most significantly, it is concluded that of the five cities that trialled the use of on road cycle sharrow markings, there is no evidence of negative outcomes or potentially harmful results stated as being a consequence of the presence of cycle sharrow markings implemented on the road.

Additional post-implementation surveys conducted via the Auckland Transport Research Panel and the Automobile Association indicates that while the majority of respondents could 'easily tell the two symbols apart' there is a relatively high level of misunderstanding as to the meaning of cycle sharrow markings. This could be expected given that cycle sharrow markings have not been used on New Zealand roads prior to trials.

Furthermore, 92% of Auckland Transport Research Panel respondents (regardless of their level of understanding regarding cycle sharrow markings), indicated that they consider that there would be the need for education to inform the public of the meaning of the of cycle sharrow markings and to inform people about the difference between a cycle lane and a road implemented with cycle sharrow markings.

It is concluded that sufficient evidence exists through perception surveys to indicate that whilst many people who have not been informed about the meaning of a cycle sharrow marking are likely to be uncertain about their meaning and/or uncertain about who has priority on the road where a cycle sharrow marking is implemented, the majority of people can easily tell the difference between the

cycle symbol marked as part of a cycle lane and a cycle symbol used in the context of a cycle sharrow marking.

It is further concluded that an education and information campaign would be required to clarify the meaning of cycle sharrow markings and 'shared use' message.

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## **APPENDIX A**

## **Sharrow site selection report (Auckland)**

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## **APPENDIX B**

## **Cycle sharrow marking trial protocols (Auckland)**

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## **APPENDIX C                      International best practice and review of cycle sharrow markings**

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## **APPENDIX D                      Trial of cycle sharrow markings (Auckland)**

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## **APPENDIX E                      Trial of cycle sharrow markings (Dunedin)**

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## **APPENDIX F          Nelson and Palmerston North on road trial summary report**

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## **APPENDIX G**

# **Trial of cycle sharrow markings (Wellington)**



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## **APPENDIX H                      Nelson sharrow and cycle lane marking trial – perception report**

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## **APPENDIX I**

## **Palmerston North trial – perception survey report**

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## **APPENDIX J**

## **AT research panel - perception survey questions**

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# **APPENDIX K** **AT research panel –post- implementation perception survey**

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## APPENDIX L      AA post-implementation survey questions

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## **APPENDIX M**

## **AA – summary of post- implementation perception survey**

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