

P2Ws in bus lanes study

Main Report

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1.0 Executive Summary

- I. Collisions involving Powered Two Wheeler (P2W) riders generate comparatively high numbers of casualties in London, relative to the size of this group among road users. Accordingly, P2W riders are identified as highly Vulnerable Road Users (VRUs), and share this category with cyclists and pedestrians.
- II. Whilst the Mayor's Transport Strategy recognises that P2Ws "can generate more pollution and noise" than cars it also recognises their use as a "quick, relatively low cost private transport that are more space and fuel efficient than cars" (Chapter 4G.26) and in response to the P2W lobby committed to implementing a trial of P2W usage in bus lanes (Proposal 4G.1).
- III. The primary objective for this study was to investigate and offer evidence to show whether the safety of P2W users could be enhanced by allowing them access to bus lanes (the measure), The assessment was to involve comparing the casualty history of all vulnerable road users (VRUs) to ensure the measure does not create a negative impact on themselves or other road users.
- IV. In September and October 2002, TfL introduced three pilot schemes on the Transport for London Road Network (TLRN) whereby P2Ws were permitted to use bus lanes along the three routes (A41, A13 and A10) during the hours of operation.
- V. The report has evolved since the original study was commissioned and complex arrays of factors and concerns have emerged during the course of the trial. For ease of reference the three iterations of the trial's development are:
 - Original trial – (Duration 18 months) instigated as part of the Mayor's commitment in his transport strategy to reduce P2W casualties.
 - Extended trial – (Duration 36 months) undertaken as a result of the findings of the original trial report.
 - Final trial – (Duration 36 months) Involved re-writing the extended trial to address the issues raised by the stakeholders.
- VI. This report addresses issues raised by stakeholders at a seminar held by TfL in September 2006, where preliminary findings from the extended trial were presented. These included the exclusion of one trial route as the collision history was adversely affected by roadworks during the trial, and an investigation to see whether the potential effect of migration to and away from the trial routes could be investigated.
- VII. Analysis of the casualty history on the trial routes for a 36 month period before and after implementation of the measure has been compared with two different control methods, the original control route data and a statistically more robust "Tanner control" method introduced after 18 months.

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- VIII. The casualty history on each trial route was compared to both controls using four different scenarios (two during all hours and two during bus lane operating hours). This resulted in eight comparison analyses for each VRU group.
 - IX. The assessment of **P2W collision numbers** showed six of the eight analyses as being beneficial to the safety of P2W riders and two of the eight showed a disbenefit to this group. All four assessments during operational hours showed a safety benefit.
 - X. The **pedal cycle casualty numbers** showed three of the eight analyses as being beneficial to the safety of pedal cyclists and five of the eight showed a disbenefit to this group. Two of the four assessments during operational hours showed a safety benefit.
 - XI. The **pedestrian casualty numbers** showed two of the eight analyses as being beneficial to the safety of pedestrians, five returned a disbenefit and one showed no change.
 - XII. None of the figures produced are statistically significant.
 - XIII. It was intended to undertake an assessment of casualty rates (number of collisions per P2W or cycle journey made), however the only data available for this purpose is the Department for Transport's Average Annual Daily Flow (AADF) counts which are produced at over 15,000 locations across the UK using a variety of different methods. These different methods can result in inaccuracies and variability in the data and generally proponents of the data limit its use to studies of local areas and understanding patterns.
 - XIV. The DfT is not aware of widespread use of the data for studies of trials or schemes and whilst they would not be concerned about the use of AADFs for the purposes of this study, there are some significant variations in the data that might produce spurious casualty rate results. This report, therefore, does not consider it suitable to pursue the issue of migration and casualty rates using the available data.
 - XV. Figures from the Original Trial Report demonstrate that the bus speeds on all trial routes increased.
 - XVI. Opinion surveys on behalf of TfL were made available for this study. Studies targeted motorcyclists, cyclists, bus drivers, car drivers, pedestrians and the general public.
 - XVII. The surveys revealed that only motorcyclists and car drivers (who are not bus users) were the only two user groups who approved of the measure.
 - XVIII. Amongst other VRUs the main reason for disapproval of the measure was their perception of the compromise to safety.
 - XIX. The comparisons of collisions involving VRUs using the Tanner control showed neither a benefit nor disbenefit from the introduction of the measure. None of the results from any of the user group comparisons were statistically significant.

When the VRU collisions were assessed against the original control routes (excluding the A13) during bus lane operating hours, a slight net benefit was returned. However, included in this reduction were localised increases in pedestrian casualties on the A41. None of the results were statistically significant.

2.0 Introduction

Collisions involving Powered Two Wheeler (P2W) riders generate comparatively high numbers of casualties in London, relative to the size of this group among road users. Accordingly, P2W riders are identified as highly Vulnerable Road Users (VRUs), and share this category with cyclists and pedestrians.

An extensive range of measures is being developed and deployed specifically to improve the safety of cyclists and pedestrians. In contrast, apart from the general use of safety cameras, trials of P2Ws in bus lanes and access to advanced stop lines at controlled junctions, no practical traffic management measures have been introduced in London specifically to enhance the safe use of the P2W mode.

The Mayor and TfL recognise that the P2W has a positive role to play in reducing congestion and associated pollution by offering a practical and efficient alternative to four wheeled motorised modes – especially cars and vans for courier and light freight. Other benefits to transport in London stem from low financial costs associated with the mode. Many P2Ws, including small motorcycles, mopeds and scooters, are cheap to buy and run, and are increasingly recognised by TfL and nationally by the Department for Transport (DfT) as an important component in tackling social and economic exclusion.

Currently, the extent of net benefits that the use of P2Ws offers to the population of London and its visitors is significantly limited by the high costs of relatively large numbers of collisions and casualties.

The number of trips and kilometres travelled by P2Ws have increased in London steadily from 1995 to 1999 and has remained around the 1999 level since. Correspondingly, the development of innovative traffic management measures to improve the safe use of this mode is becoming an increasingly important goal.

Proponents of P2W use consider that allowing this mode to use bus lanes would dramatically improve the safety of riders, and all other road users¹. If these expectations prove well founded, roll out of the measure has the added benefit of involving relatively simple and small changes to streets with existing bus lanes. Apart from identifying where to introduce the improvement first, the main task and cost will be to renew bus lane signage. Should it be shown that allowing motorcycles access to bus lanes would improve the safety of all road users, the costs of implementing this measure would be minimal in comparison to other major schemes.

Whilst the Mayor's Transport Strategy recognises that P2Ws "can generate more pollution and noise" than cars it also recognises their use as a "quick, relatively low cost private transport that are more space and fuel efficient than cars" (Chapter 4G.26) and in response to the P2W lobby committed to implementing a trial of P2W usage in bus lanes (Proposal 4G.1).

The outcome from such a trial was deemed to be of incalculable value to the cause of improving the safe use of P2Ws, and road safety in general throughout the capital and the UK.

3.0 Trial Objective

The primary objective for this study was to investigate and offer evidence to show whether the safety of P2W users could be enhanced by allowing them access to bus lanes (the measure). The assessment was to involve comparing the casualty history of all vulnerable road users (VRUs) to ensure the measure does not create a negative impact on other road users.

Relatively high casualty numbers associated with use of mopeds, scooters and motorcycles provide an ongoing cause for concern in London. P2W Killed or Seriously Injured casualties (KSI) for the Capital have been the road user category that has shown least progress towards the 2010 casualty reduction targets. However, it is recognised that this has been against a background of growth in ownership and usage.

The Mayor's Transport Strategy² includes a specific response to concerns about P2W casualties. Proposal 4G 1, committed TfL to consider trials allowing P2Ws into bus lanes as a means of potentially reducing the exposure of P2W riders to general traffic in order to improve safety.

TfL took these factors into account in designing a study which considered the safety of all road users. The primary objectives for the trial were to:

- Investigate whether allowing P2W use of bus lanes would be an effective way to improve the safe use of the P2W mode in London.
- Discover whether significant disbenefits would arise, with particular concern for other vulnerable road users, especially cyclists and pedestrians.
- Publish the trial data and results of comparative calculations to quantify the tangible positive and negative impacts of the measure.
- Draw conclusions from the experiment data where possible, to provide a basis for future action by TfL, and to assist other transport authorities in considering the merits of the measure on test.

4.0 Report Structure

4.1 Background

The report has evolved since the original study was commissioned and complex arrays of factors and concerns have emerged during the course of the trial. For ease of reference the three iterations of the trial's development are:

- Original trial – (Duration, 18 months) instigated as part of the Mayor's commitment in his transport strategy to reduce P2W casualties.
- Extended trial – (Duration 36 months) undertaken as a result of the findings of the original report.
- Final trial – (Duration 36 months) Involved re-writing the extended trial to address the issues raised by the stakeholders.

These are detailed in the sections below.

4.2 Original trial report

In September and October 2002, TfL introduced three pilot schemes on the Transport for London Road Network (TLRN) whereby P2Ws were permitted to use bus lanes along the three routes during the hours of operation.

The original trial was reported on after 18 months and the report published on 19th November 2004³.

The report concluded that *“further casualty data is needed in order to make a robust assessment of the trials.”*

After consultation with stakeholders, the trial was extended for a further 18 months.

4.2.1 Original trial – casualty analysis scope and plan

The original procedure for the trial required the identification of ‘trial’ sections of highway in which P2Ws were allowed in bus lanes, and ‘control’ sections of highway without P2W access to bus lanes.

Detailed records of all reported collisions and casualties were gathered from trial and control corridors throughout the eighteen month duration of the experiment. Data were also gathered to establish an accurate record of reported collisions and casualties on the corridors before the experiment began.

4.2.1.1 Methodology - Key criteria for selection of trial and control sites³

- Part of TLRN
- Known locations of motorcycle usage
- Standard with-flow bus lane
- Mix of frontage (residential, commercial)
- Mix of location, but outside congestion charge area
- High but not excessive casualty rates

4.2.1.2 Sites chosen for trial routes:

- A13 East India Dock Road, between Leamouth Road and Butcher Row East - from 9th Sept 2002;
- A23 Brixton Road, between Camberwell New Road and Streatham Common South; - from 20th Oct 2002; and
- A41 Finchley Road, between Queen’s Grove North and Platt’s Lane; - from 20th Oct 2002.

4.2.1.3 Sites chosen for control routes:

- A5 Rondou Road to Summit Close and Humber Road to Staples Corner
- A10 Pasteur Gardens to Ostcliffe Road and Wilbury Way to Laburnum Avenue

However, there were a number of concerns about this method, namely:

- The section of the carriageway of the A13 used for this trial underwent considerable roadworks during the after period of the trial. The extent of works culminated in a 22% increase in KSIs compared to a 35% fall in the KSI rate across the TLRN network. It is for this reason that the final report does not consider this data to be valid and therefore the comparisons in this final report disregard the A13 data when the assessment involves either the original control data or the Tanner Test.
- The A10 may not be a suitable control as it is in North London and generally in outer London whilst the trial sites on the A41 and A23 are generally in inner London.
- The A5 may not be a suitable control for the A41 as it was a parallel route and therefore could be directly influenced by the trial.
- The control sites were considered too small for meaningful comparison

4.3 Extended trial report

To avoid the methodological problems listed above the method of control was changed from the route based comparison, to an area based control that satisfied the requirements of the Tanner Test, a formula devised by J C Tanner in work for the Transport Research Laboratory, last published in the early 1980s.

The 'Tanner Test' formula became a new element in the method by which control data could be generated, and a detailed description of how the Tanner Test was applied can be found in Appendix II. In summary it involved collision figures from the entire TLRN divided into three sets of figures with the results for the boroughs nearest to the trial corridors being used as the control. The disadvantages of this method include the fact that it uses a control ratio rather than absolute figures,⁴ which means that collision rates are not able to be compared.

The publication of the extended report was proposed to be in the form of two types of test procedure which could be used to assess the impact of introducing the measure.

- A practical experiment – to quantify the tangible impact on collisions and casualties during a thirty-six month before and after trial period (using the Tanner Test).
- Attitudinal surveys – to gauge the opinions and feelings of road users about the measure.

4.3.1 Extended trial – Casualty analysis scope and plan

The extended trial used the same start date as the original report (October 2002).

The key criteria and the sites chosen for the trial routes remained consistent with the original scope (detailed in 4.2, above), but two changes were made to the trial structure

Firstly, the duration of the before and after casualty studies was extended from 18 months to 36 months.

The second change involved the method of assessing the trial corridors against the control data. To satisfy the Tanner Test, collision figures from the entire TLRN were divided into three sets of figures from the boroughs nearest to the trial corridors.

4.4 Final trial report

However, a number of concerns were raised by stakeholders when a verbal account of the draft report on the casualty analysis (using Tanner) and an Executive Summary of the user and attitudinal surveys were circulated at a seminar held by TfL in September 2006. It was agreed that the issues raised at the seminar would be addressed in the final report.

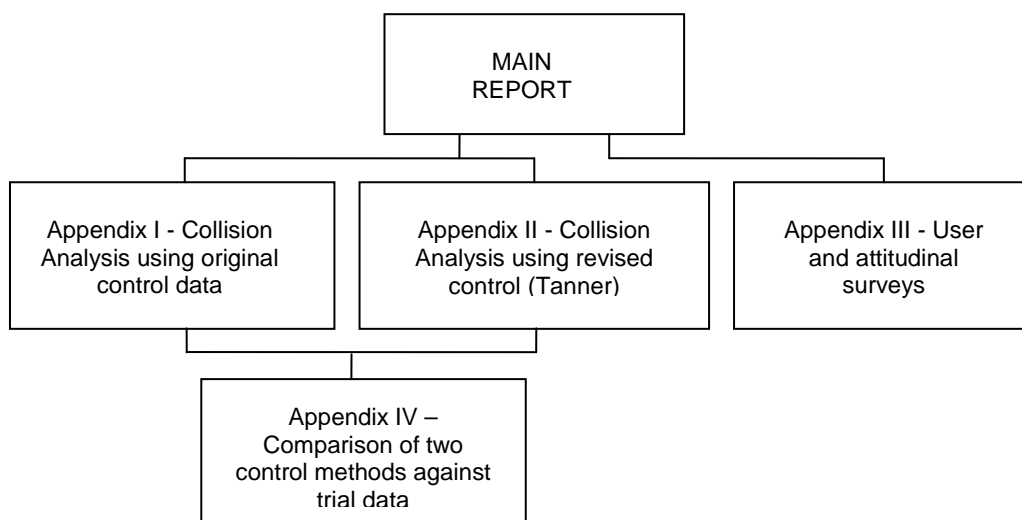
As a consequence of the issues raised by stakeholders at the seminar held in September 2006 (section 4.3), the following areas of contention were considered in the final report:

- As a result of extending the trial period to 36 months before and after analysis of the casualty data the method of control altered in mid trial from control routes to the use of the Tanner Test which allowed for a more rigorous statistical analysis. However, the stakeholders were not informed of the change.
- As a result of this change the new control method did not enable collision rate comparison (due to possible migration, which was a factor not considered during the original scoping of the trial) to be assessed.
- The Original Trial remit did not consider experiences from other authorities in the UK and abroad.
- The use of the A13 as a trial corridor was flawed due to the presence of roadworks for the duration of the after period. This skewed the collision numbers upwards.
- There was an element of subjectivity in the attitudinal and user surveys
- The impact of congestion charging (which started 4 months after this trial) was not considered.

Obviously, the most important issue to be considered when assessing the use of bus lanes by P2Ws is the safety of all road users. The views of the stakeholders are reflected in the new suite of documents which focus on the importance of safety. All existing data has been re-assessed and the casualty history for the trial routes has been assessed against the original control routes and also the revised control method.

The data considered meaningful from the original user survey and attitudinal surveys are also re-visited and presented here.

The report structure is as follows:



This document (the main report) pulls together the evidence contained within the supporting documents (which are appended to this report) and assesses potential benefits and disbenefits of the trial. The report widens the scope of the trial to enable the concerns raised by the stakeholders to be addressed. This has enabled factors previously not considered to be considered, such as the experiences of some of the other schemes that have been introduced in the UK and overseas, with an investigation of the issue surrounding migration of P2Ws between bus lanes.

4.4.1 Final trial – casualty analysis scope and plan

All data have been re-assessed for relevance and accuracy for the purposes of assessing the viability of this measure. As requested at the stakeholders meetings, two parallel casualty reports have been produced (see Appendix I – Casualty analysis using the original control method, and Appendix II – Casualty analysis using the Tanner control method). A summary of the comparison of the two control methods against the trial data is contained within this report, with further, more detailed analyses in Appendix IV.

5.0 Collision Analysis - Before and after data comparison

The summary comparisons made in this section use the casualty data collected during the trial period and documented in Appendices I and II. These two documents share the same trial route data but differ in the way the control data are derived. Full details of the comparison analyses can be found in Appendix IV.

Appendix I derives its data from the empirical evidence gathered from the original trial control sites casualty histories. These have been produced following the most recent review commissioned after the October 2006 Stakeholder seminar.

Appendix II has been compiled from the same before data for comparison with figures resulting from extrapolations of TLRN statistics (see section 4.3), and including use of the Tanner formula. Data for the A13 is presented in this document but the assessments contained in this section only use that for the A41 and A23.

This report focuses on the impact of the measure on casualties in the VRU groups that may be affected as this is seen as essential to the overall outcome of the report. To complement this analysis and help understand general trends, all casualties are also considered.

For each VRU group assessment is carried out of the combined trial routes against the combined control routes and the Tanner control areas.

As stated in section 4.4.1, concerns have been noted that the reliability and validity of data from the A13 trial site were adversely affected by the extensive disruption caused by a major redevelopment program of works. Consequently the review using both control data concentrates on the trial as a whole but discounts the A13 route. The comparisons between sums of data from the A5 + A10 control sites, and sums of data from the A23 & A41 trial sites offer the next most useful combination of comparable data, after analysis of the A41 and A5 results.

Each VRU group is also assessed using data from the single trial route, the A41 and compared to the single control route the A5 as the A41 trial site runs parallel to the A5 control site. In many respects this makes data from these sites the most directly comparable and a potentially useful gauge of the impacts of the measure.

The VRU groups reported on are:

- P2Ws
- Pedal Cycles
- Pedestrians
- Bus occupants

5.1 Vulnerable Road Users

The assessments contained within sections 5.1.1 to 5.1.3 below consider all collision types where the casualties (of all severities) have been the respective vulnerable road user.

Each assessment investigates four scenarios

1. A41 trial route against control route (A5) and control area (using the Tanner Test control) for all times of day.
2. A41 trial route against control route (A5) and control area (using the Tanner Test control) for operating hours only.
3. A41 & A23 trial routes combined data against A5 & A10 control routes combined data and the Tanner Test for all times of day.
4. A41 & A23 trial routes combined data against A5 & A10 control routes combined data and the Tanner Test for operating hours only.

The assessments provide a very useful picture of how the measure performed in relation to VRUs and are summarised in the tables below. A full analysis of all the figures in the tables below can be found in Appendix IV.

5.1.1 Collision Analysis - Impact on Powered Two Wheeler Riders

Using the original control data, three of the four graphs (taken from graph numbers 1 to 4, Appendix IV and summarised in Table 1) show a safety benefit. Using figures from the Tanner Test calculations, the graphs also reflect a safety benefit in three cases. There is a safety benefit in all cases when bus lane operating hours are active.

P2Ws (Appendix IV Graphs 1 - 4)	%age change in collisions, trial against controls (Reduction Increase)	
	Original Control	Tanner Control
Scenario (section 4.1)		
1	1	7
2	21	1
3	8	1
4	8	3

Table 1 – Percentage change in “Before” and “After” casualty numbers from the four scenario comparisons for P2Ws

5.1.2 Collision Analysis - Impact on Pedal Cyclists

The analysis of the four scenarios (see section 5.1) showed mixed results. The original control data comparison (see Table 2) shows safety benefits in scenarios 2 and 4 (operating hours) with disbenefits in 1 and 3 (all hours). The Tanner control comparison shows a disbenefit in three of the four scenarios. The changes are not statistically significant.

Pedal cycles (Appendix IV Graphs 5 – 8)	%age change in collisions, trial against controls (Reduction Increase)	
	Original Control	Tanner Control
Scenario (section 4.1)		
1	20	19
2	19	4
3	4	11
4	13	3

Table 2 – Percentage change in “Before” and “After” casualty numbers from the four scenario comparisons for pedal cycles

5.1.3 Collision Analysis - Impact on Pedestrians

Analysis of the trial routes against the original control data showed an increase in collisions involving pedestrians in three out of four scenarios and in two out of four scenarios in the Tanner Test comparison. (See Table 3).

Of the two that showed a benefit, both were during operating hours.

These results are not statistically significant.

Pedestrians (Appendix IV Graphs 5 – 8)	%age change in collisions, trial against controls (Reduction Increase)	
	Original Control	Tanner Control
Scenario (section 4.1)		
1	27	32
2	40	66
3	3	0
4	15	5

Table 3 – Percentage change in “Before” and “After” casualty numbers from the four scenario comparisons for pedestrians

5.2 Conclusions - Impact on Vulnerable Road Users

The **VRU casualty number** assessments were carried out using four scenarios. Each scenario compared the trial against both types of control, resulting in eight analyses for each VRU group.

The assessment of **P2W collision numbers** showed six of the eight analyses as being beneficial to the safety of P2W riders and two out of eight showed a dis-benefit. All four assessments during operational hours showed a safety benefit.

The **pedal cycle casualty numbers** showed three of the eight analyses as being beneficial to the safety of pedal cyclists and five out of eight showed a disbenefit. Two of the four assessments during operational hours showed a safety benefit.

The **pedestrian casualty numbers** showed two of the eight analyses as being beneficial to the safety of pedestrians, five returned a disbenefit and one showed no change.

None of the figures produced are statistically significant.

6.0 User and Attitudinal surveys

To understand fully how riders of P2Ws and pedal cycles would adjust to the measure, vehicle counts before and after the implementation of the measure were assessed. The attitude of all road users towards the measure was also investigated using opinion poll surveys

The full report and data sets used can be found in Appendix III, and this section summarises the results. In order to address the concern raised by stakeholders about the casualty rates on the trial and control routes, it is necessary to explore whether any robust vehicle usage data is available. Any such data would allow a casualty rate to be derived by simply dividing the casualty numbers by the usage to produce a casualty rate. However, the only available data that could potentially be used retrospectively for this exercise is the estimated Annual Average Daily Traffic (AADT) flows from DfT counters which exist extensively across the TLRN network. The validity of these counts is explored in this section.

6.1 Opinion surveys

Opinion surveys on behalf of TfL were made available for this study. Studies targeted motorcyclists, cyclists, bus drivers, car drivers, pedestrians and the general public and details of all surveys can be found in Appendix III.

The surveys did not reveal many surprises in their findings with only motorcyclists and car drivers (who are not bus users) being the two user groups who approved of the measure.

Amongst the VRU groups, the main reason for disapproval of the measure was their perception of the compromise to safety.

The findings also showed that pedal cyclists are viewed by bus drivers as being the most problematic of all road users.

It must be noted that the small size of the response groups to some of the surveys might not be representative of that groups' opinion.

6.2 Speeds and bus journey times

One concern for the introduction of the measure relates to the potential for the delay to buses, which obviously contradicts the commitment in the Mayor’s Transport Strategy for the expeditious movement of public transport.

The assessment of the impact of the measure on the speed of buses has to rely on the only “before and after” comparisons that were available. These were presented in the Original trial report ³ and are detailed below.

These “before” and “after” data (Table 5 - shown below) only provides 18 months figures but is sufficient enough to make a valid comparison.

Table 5 – Before and After speed data from Original Trial report

	Bus lanes						Other traffic lanes					
	Buses (mph)			PTWs (mph)			PTWs (mph)			General traffic (mph)		
	Before	After	Change	before*	after	change	before	After	Change	before	after	change
A13	21	26	+20%	34	31	-9%	31	33	+7%	30	29	-3%
A23	20	24	+17%	25	30	+17%	25	23	-8%	23	26	+12%
A41	23	27	+15%	28	31	+9%	28	27	-3%	25	29	+14%
A5	22 mph average			31 mph average*			32 mph average			31 mph average		
A10	27 mph average			32 mph average*			29 mph average			30 mph average		

Spot survey average speeds (in free-flowing traffic)

* = illegal

The table demonstrates that the bus speeds increased in all cases but when assessing this data the following must be considered,

- The “before” P2W speeds in the trial bus lanes and the “before” and “after” speeds from the control routes are based on illegal usage of the lanes by P2Ws and cannot be considered representative.

The Original Trial Report also reported that bus journey times fell by 1 to 2 minutes on the A13 and A41, but increased by 1 minute on the A23. The document states that the following must be considered,

- The A13 bus routes were affected by roadworks
- The A23 journey times were affected by changes to the bus route.

The Extended Trial Report carried out a more detailed assessment of the bus journey times on the three trial and two control routes and is included in Appendix III.

The data sets were collected using the “Marquis” roadside beacon infrastructure that records the time of each bus that passes.

The report states that there was

- “remarkable consistency in average speed provided by bus lanes”
- “Most routes have seen an improvement in reliability” culminating in a “range in journey time of just two minutes on a 30 minute journey”,

though it wasn’t stated that this was as a result of the trial.

However the reliability of this data is subject to the following:

- The start date for the collection of the data is April 2004, 18 months after the implementation of the trial routes.
- There is no before and after comparison of journey times from these data sets.
- The journey times recorded do not consider the effect of the length of time spent at each stop due to the number of passengers alighting or disembarking.

6.3 Vehicle Usage and Migration

The potential for migration of P2Ws and indeed cyclists to or away from the trial routes must be understood in order to gauge the impact this might have when comparing casualty statistics.

The scope of the original trial did not account for the collection of meaningful vehicle usage data and so alternative data sets were sought.

The only available data available retrospectively for the six year period of the trial is the Department for Transport's (DfT) Average Annual Daily Flow (AADF) data. Consequently, investigation of the DfT AADF data was undertaken for both trial routes and comparison AADFs from a similar route that follows each trial route in relatively close proximity. The data of the A41 were compared to the control route A5 corridor. However, the path of the A23 in south west London bears no similarities to that of the other control route, the A10 which is in north London. Therefore, for this exercise only, a new data set was introduced to enable a more accurate comparison and that was collected from AADF flows on the A24 in south west London.

Tables 6 and 7 show the figures obtained from the three DfT AADF counter positions on each of the trial and control routes.

Table 6 Estimated AADT flows of P2Ws and cyclists for A41 trial route and A5 control route

P2W	2000		2001		2002		2003		2004		2005	
	A41	A5	A41	A5	A41	A5	A41	A5	A41	A5	A41	A5
Outer	712	533	770	577	737	695	762	719	728	367	668	338
Central	1370	658	896	732	1548	685	2440	667	1190	700	2004	698
Inner	768	658	866	732	1121	685	1540	667	1999	700	1894	698
Average	950	616	844	680	1135	688	1581	684	1306	589	1522	578
CYCLISTS												
Outer	50	256	55	281	57	253	83	367	72	152	73	155
Central	300	304	218	346	717	352	488	417	252	441	419	569
Inner	191	304	198	346	477	352	350	417	500	441	564	569
Average	180	288	157	324	417	319	307	400	275	345	352	431

Table 7 Estimated AADT flows of P2Ws and cyclists for A23 trial route and A24 control route

P2W	2000		2001		2002		2003		2004		2005	
	A23	A24	A23	A24	A23	A24	A23	A24	A23	A24	A23	A24
Outer	624	1000	685	1081	773	659	799	681	632	651	1173	598
Central	1503	1544	1673	2119	1895	1985	1974	2457	2049	2582	2043	1629
Inner	509	1294	567	2281	531	2138	553	1772	582	2923	580	2241
Average	879	1279	975	1827	1066	1594	1109	1637	1088	2052	1265	1489
CYCLISTS												
Outer	130	388	315	426	136	205	197	298	332	256	450	262
Central	1152	1455	1312	1193	927	1214	1082	1214	797	1286	1030	1454
Inner	441	732	502	3309	511	3368	596	2088	632	2747	615	2582
Average	574	858	710	1643	525	1596	625	1200	587	1430	698	1433

However, before any meaningful assessment using the data was carried out, the quality and accuracy of the data had to be established as the data in table 6 the annual production of the data uses a variety of different methods. These different methods can result in inaccuracies and variability in the data and generally proponents of the data limit its use to studies of local areas and understanding patterns.

The DfT is not aware of widespread use of the data for studies of trials or schemes and whilst they would not be concerned about the use of AADFs for the purposes of this study, there are some significant variations in the data that might produce spurious casualty rate results. This report, therefore, does not consider it suitable to pursue the issue of migration and casualty rates using the available data.

A full explanation of the process for the production of the AADF data can be found in Appendix III.

7.0 Experiences from other schemes

During the last eleven years, P2W access to bus lanes has been trialled or introduced as a permanent measure in a number of locations throughout the UK.

The first Local Authority to implement this measure was Bristol, following a trial scheme. Deployment of this measure in the City of Bristol has continued since 1996.

By the end of 2006, seventeen UK local authorities⁶ had introduced this measure in varying forms, and it is also deployed as a permanent measure throughout Northern Ireland. The primary reason of all schemes is to improve road safety. Indeed, there are also a number of schemes that have been implemented in London by some London boroughs.

A growing number of European towns and cities deploy this measure for road safety purposes. Motorcycles have been allowed in the bus lanes of Sweden's capital, Stockholm,

since 1986, and the same approach has been successfully adopted in Barcelona in Spain and some Italian cities.

As far as could be established by the authors, no trial of P2W in bus lanes anywhere in the UK – or anywhere else in the world – has ever resulted in a rejection of the measure for safety reasons. Similarly, in all known trials to date, once P2W access to bus lanes has been granted, such access has never been subsequently rescinded.

Since the TfL trial started, the DfT published 'The Government's Motorcycling Strategy'⁷ which followed a five year study by the Government Advisory Group for Motorcycling (GAGM). In essence, government and the DfT now formally acknowledge that the P2W mode has vital contributions to make in developing sustainable transport throughout Britain. The P2W offers an extremely efficient and low financial cost alternative to four wheeler modes in many situations where walking, cycling or public transport cannot meet demand for transporting people and goods.

The national strategy document makes it clear that more can and should be done by Local Transport Planning authorities to improve the safe use of P2Ws throughout the UK.

The principle aim of this major nationwide policy initiative is to 'mainstream' motorcycling. In particular it says that taking account of motorcycling is to play a greater part in plans for road design and traffic management.

7.1 Bus Lane trials in London – M4 motorway

Aside from the trials that are the subject of this report, a number of trial and permanent schemes have been implemented in London.

Perhaps the most high profile of these is the offside bus lane implemented on the eastbound carriageway of the M4 motorway from Junction 3 to the elevated section.

In July 2002 the eastbound carriageway speed limit was increased to 60mph from 50mph and motorcycles were allowed to use the offside bus lane. The site was monitored by TfL's London Road Safety Unit who undertook a 36 month before and after study.

The study showed that the number of collisions involving injury decreased from 44 in the 36 months to July 2002 to 28 in the 36 months after. This decrease of 36% was found to be statistically significant at the 10% level using the K test⁸.

Collisions involving P2Ws reduced by nearly twice as much – from 12 to 4 which equates to 67%.

7.2 Other London borough schemes

There have been other trials in three London boroughs, Westminster, Kingston and Richmond. Table 8 gives a summary of the performance of each scheme.

In September 2005 the City of Westminster introduced the measure in the form of a trial on a total of ten lengths of bus lane. The overall impact suggests that there are safety benefits for all vulnerable road users. In the 14 months of the measure, the figures have returned a 24% reduction in pedestrian casualties, and 17% reduction for both pedal cycles and P2Ws.

There are four schemes introduced in the Royal Borough of Kingston, with two having collected 36 months after data sets and two with 31 months data sets. The collective casualty figures have shown reductions for all vulnerable road users with pedestrian casualties down by 17%, P2Ws down by 29% and pedal cycle casualties down by 50%.

Two schemes have been introduced in one of Kingston's neighbours, Richmond. These schemes have been operating for 31 months and have seen a 33% reduction in pedestrian casualties, and 67% reduction in P2W casualties. There has, however, been an increase from 0 to 3 in pedal cycle injuries.

None of these schemes has been implemented against a control area so no comparison can be made with the general trends. However, it does give an indication that the measure in differing scenarios can provide safety benefits to vulnerable road users in the vast majority of cases.

7.3 UK schemes outside London

There has not been a trial of the measure in the UK that has undertaken a comprehensive "before and after" casualty analysis using control sites. The majority of studies failed to introduce trial routes and supplement the data with vehicle usage surveys and journey times. However, some useful studies have been undertaken which have been assessed using differing methodologies over the last decade.

Avon County Council first resolved to introduce motorcycles to bus lanes in Bristol using an Experimental Order on 14th February 1995. The experimental order came into effect in June of that year and was confirmed as a Permanent Order on 12th March 1996 when the Committee, anticipating the imminent Local Government Reorganisation, strongly recommended that its four successor Unitary Authorities should extend the scheme to their areas (which each has subsequently done).

There has been much written on the Bristol scheme but the evidence recently given to the aforementioned Transport Select Committee by the Motorcycle Industry Association (MCIA) probably sums the results most succinctly.

"During the 36 months prior to the implementation, accidents involving motorcyclists averaged 1.1 per month, compared to 0.8 during the six-months of the experiment, suggesting a 25% decrease, and that no motorcycle accidents were recorded in the bus lanes and no collisions with pedestrians or cyclists were recorded".

The same evidence also stated that *"an 18-month experiment by Sheffield City Council during 2003/04 which also reported a 25% decrease in monthly average motorcycle accidents."*

7.4 Conclusions – experiences from other schemes

No trials in the UK have been removed for safety reasons, though there has not been any comprehensive casualty analysis trials undertaken.

The trials that have occurred have shown a reduction in casualties by up to 25% though none of the trials has used a control for objective comparison with collisions after its introduction

Table 8 Before and after collisions for borough P2W in bus lane schemes at all times (by November 2006 data provisional)

N.B. This is for all hours/days and not just the bus lane hours of operation.

Borough	Scheme name	Months	Collisions Before							Collisions After							Change in collisions (Numeric)						
			Fat	Ser	Sli	Pedn	P2W	PC	Tot	Fat	Ser	Sli	Pedn	P2W	PC	Tot	Fat	Ser	Sli	Pedn	P2W	PC	Tot
Westminster	Cockspur Street	14	0	1	12	6	0	3	13	1	0	7	5	1	0	8	1	-1	-5	-1	1	-3	-5
Westminster	Kensington Gore	14	0	0	3	0	0	0	3	0	1	0	0	1	0	1	0	1	-3	0	1	0	-2
Westminster	Kensington Road	14	0	2	8	2	6	1	10	0	3	3	1	1	2	6	0	1	-5	-1	-5	1	-4
Westminster	Knightsbridge	14	0	0	4	2	3	0	4	0	0	1	0	0	0	1	0	0	-3	-2	-3	0	-3
Westminster	Baker Street	14	0	1	14	6	3	1	15	0	0	10	3	3	1	10	0	-1	-4	-3	0	0	-5
Westminster	Haymarket	14	0	2	10	5	2	2	12	1	1	8	3	1	3	10	1	-1	-2	-2	-1	1	-2
Westminster	Bayswater Road	14	0	2	1	3	0	0	3	0	1	4	0	2	1	5	0	-1	3	-3	2	1	2
Westminster	Piccadilly (SW end)	14	1	0	6	1	2	1	7	0	2	5	3	3	1	7	-1	2	-1	2	1	0	0
Westminster	Piccadilly (NE end)	14	0	5	30	14	7	3	35	0	4	23	13	6	2	27	0	-1	-7	-1	-1	-1	-8
Westminster	Gloucester Place	14	0	1	6	2	1	1	7	0	1	9	3	2	0	10	0	0	3	1	1	-1	3
Kingston	Cambridge Road	36	0	0	8	2	1	2	8	0	0	6	2	2	0	6	0	0	-2	0	1	-2	-2
Kingston	Cambridge Road	36	1	6	25	7	8	2	32	0	8	22	7	9	3	30	-1	2	-3	0	1	1	-2
Kingston	London Road (SB)	31	0	0	6	2	3	0	6	0	0	1	0	0	0	1	0	0	-5	-2	-3	0	-5
Kingston	London Road (NB)	31	0	0	11	1	5	2	11	0	2	4	1	1	0	6	0	2	-7	0	-4	-2	-5
Richmond	London Road, TW10	31	0	1	7	3	1	0	8	0	1	5	2	2	2	6	0	0	-2	-1	1	2	-2
Richmond	Eton Street	31	0	0	10	3	5	0	10	0	0	5	2	0	1	5	0	0	-5	-1	-5	1	-5
Total			2	21	161	59	47	18	184	2	24	113	45	34	16	139	0	3	-48	-14	-13	-2	-45
																% change	0%	14%	-30%	-24%	-28%	-11%	-24%
Total for schemes in Westminster			1	14	94	41	24	12	109	2	13	70	31	20	10	85	1	-1	-24	-10	-4	-2	-24
																% change	100%	-7%	-26%	-24%	-17%	-17%	-22%
Total for schemes in Kingston			1	6	50	12	17	6	57	0	10	33	10	12	3	43	-1	4	-17	-2	-5	-3	-14
																% change	-100%	67%	-34%	-17%	-29%	-50%	-25%
Total schemes in Richmond			0	1	17	6	6	0	18	0	1	10	4	2	3	11	0	0	-7	-2	-4	3	-7
																% change	0%	0%	-41%	-33%	-66%	300%	-39%

8.0 Conclusions

8.1 Context

The evidence from this experiment offers more information about the impact of allowing P2W access to bus lanes than any study to date. Nevertheless, it is vital to recognise the scope and limitations of this test of a potential enhancement to road safety in a live experiment with several significant other variables; one of the most important being changes in highway usage by different modes during the investigation.

Changing the methodology for generating control data for the experiment during the second 18 month phase of the trial gave rise to problems. It rekindled initial questions about the experiment design, and generated new concerns among some stakeholders that the clarity, reliability and validity of results and conclusions might be reduced from optimum levels.

In addition to concerns about changes in control method, questions focused on the scientific value of data collected from attitudinal surveys. Queries also arose regarding the collection of speed and journey time data and vehicle usage of the actual bus lanes themselves. The largest gap in the data sets concerned the vehicle usage data. The lack of these data resulted in the inability to produce any modal migration assessment and consequently any casualty rate analysis.

TfL has, where possible, addressed such questions and concerns with freshly focused action and this final report results from that action. The suite of reports and these conclusions are made in response to input from all concerned with the experiment, inside and outside TfL, and to optimise the value of the study to all parties interested in improving road safety for all road users.

8.2 Control method changes

It can be argued that the Tanner Test calculations, to extrapolate figures for control data on casualties, offer a more statistically robust outcome than use of figures from control sites that are of correspondingly small size to trial sites.

However, what the Tanner method cannot do is allow for any fluctuations in vehicle usage, and therefore cannot account for the impact of migration on the results to be used in assessing the impacts of the measure under test.

The original control data method does allow direct comparisons between adjacent routes for trial and control, and it allows the influence of migration to be taken into account when analysing the impact of the measure on casualty numbers and rates. However, the lack of any vehicle usage data meant that this assessment could not be carried out.

It must be stated that because of the small size of all the data sets (even when the Tanner control was applied), none of the results returned were statistically significant.

8.3 Findings

8.3.1 Opinion surveys

The views collected from the opinion surveys were as expected.

Powered two wheeler riders responding to the survey favoured the measure as they felt it made the network safer for them.

Pedestrian and cyclist respondents expressed more negative views, formed by expectations that they would be less safe. There were indications that some cyclists did not like the idea of sharing use of bus lanes with P2W riders regardless of any safety factors.

Bus driver respondents indicated a preference for sharing bus lane road space with P2Ws rather than pedal cycles.

8.3.2 Cyclists

The evidence from casualty and collision data shows that cyclists' concerns that their casualty rates would significantly rise, were generally unfounded in practice.

Against the original control data, the pedal cycle casualties reduced during bus lane operating hours, but increased marginally under the Tanner test assessment, providing a largely neutral picture overall.

8.3.3 Pedestrians

The sum of casualty evidence shows that two of the four scenarios assessed returned a safety benefit during operating hours, whilst in all other situations casualties increased.

When looking at the actual casualty numbers from the individual trial routes without considering the migration issue, the experiences have been conflicting. In one trial site, pedestrian casualties from P2W collisions halved (A23), and in the other they doubled (A41).

8.3.5 Powered Two Wheelers

Although there has been a reduction in collisions for P2W riders on the trial routes, it has not been statistically significant.

8.5 Summary

The evidence shows increased collisions for pedestrians and pedal cyclists and a reduction for powered two wheelers, however none of these results are statistically significant.

Cyclists and pedestrians had concerns about motorcyclists in bus lanes. Car drivers, who were not bus passengers and motorcyclists did not share the same concerns.