# Behaviour at cycle advanced stop lines

**by D Allen, S Bygrave and H Harper**

**PPR240**

**PUBLISHED PROJECT REPORT**

**TRL Limited**

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# BEHAVIOUR AT CYCLE ADVANCED STOP LINES

Version: Final Report

**by D Allen, S Bygrave and H Harper**

**Prepared for:** **Transport for London**

**Client:** **London Road Safety Unit, Street Management Division, Transport for London.**



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# Executive Summary

This research study examined the behaviour of road users at cycle Advanced Stop Lines (ASLs). ASLs are primarily a measure designed to increase cyclists' safety by allowing cycle users to move away from traffic signals slightly in advance of motorised traffic. ASL facilities provide a second stop line in advance of the regular line. Between the two lines is an area (ASL reservoir) which is reserved for cyclists. This reservoir is sometimes surfaced with a coloured material. ASLs are legally accessed by cyclists via a feeder lane, which may be located at kerbside or centrally within the carriageway.

The objective of the study was to obtain quantitative information on the behaviour of cyclists and other road users where there are Advanced Stop Lines (ASLs). At Advanced Stop Line junctions, vehicles other than cycles must stop at the first line when signalled to do so and a mandatory or advisory cycle lanes must be provided to enable cyclists to enter the reservoir lawfully, without crossing the first stop line (Rule 154 of the Highway Code, RTA 1988 Section 38 and TSRGD 2002 regulation 43).

A total of 6,041 cyclists were observed during this study. This study is to form a key part of work to evaluate the advantages and disadvantages of this type of facility. It will inform conclusions about the best and safest design and use of ASLs.

The research study employed the following methodology to meet this objective:

- The selection of twelve sites with advanced stop lines in the Greater London area, primarily based upon cyclists flows expected and the site/junction arm layout.
- The selection of two control sites without advanced stop lines as a comparator to ASL sites.
- The collection and analysis of video footage of behaviour at the selected sites. Footage was taken for two days from 07:00-18:00 per site.
- The compilation of background information regarding the site, particularly traffic flow information.
- The collection and analysis of casualty data at each of the site locations.

ASL sites with a range of layouts were sought. Sites ranged from those with two entry lanes with a combined ahead and left turn lane, one entry lane with a left, ahead and right turn out lane and those where there is a cyclists' lead-in lane between a left-turn lane and right turn/ahead lane. Some sites chosen did not have an ASL feeder cycle lane present and other sites did not have a coloured ASL reservoir or coloured feeder cycle lane.

In terms of analysing behaviour at each of the sites, the site footage was reviewed to collect the following information:

- The properties of the ASL in terms of layout and site location.
- Information about cyclists, particularly their behaviour.
- Information about other road users, particularly their behaviour.

From an analysis of the video footage, the following areas were explored further:

- The number and types of cyclist at each of the sites.
- The level of red light violation taking place by both cyclists and other road users.
- The level of conflict (both major and minor) between cyclists and other road users - defined within the glossary in Appendix A.

- Potential conflicts between cyclists and left turning vehicles using the junction.
- The amount of vehicle encroachment taking place on the ASL reservoir and on the feeder cycle lane (during a red light phase).
- The method of approach to the junction by cyclists and where they positioned themselves when waiting at the junction.
- The use of the ASL feeder cycle lane and any incidents in which the feeder was blocked.
- A review of the safety of ASLs and recommendations for their improvement.

This study, in comparatively analysing and discussing all of the data gathered for the selected sites, was able to report the following findings:

**Conflict:**

- Based on findings from the sites monitored, low levels of reported conflicts suggest that ASLs are not a safety hazard. Only 1% of cyclists monitored were involved in any form of conflict. Only 6 of the conflicts were identified to be of a ‘serious’ nature as defined within the study, which represents 0.1% of all cyclists monitored.
- The number of conflicts were too low to determine whether a relationship between the type or severity of conflict and ASL provision exists.
- Cyclists travelling straight ahead were found to be able to position themselves in front of the traffic thus reducing the risk of conflict with left turning vehicles. However, at New Cavendish Street (two entry lanes with a combined straight and left turn lane) a potential conflict was identified where cyclists were found to be crossing the path of vehicles making a left turn at the junction.
- The number of cyclists obstructed ranged from less than 1% to 10% per site across the ASL sites , indicating the potential for conflict between cyclists and other road users.

**Access/Use:**

- In all, cyclists gained access to and used Advanced Stop Lines with some success at all types of layout. Across all sites, 38% of cyclists who waited at the junction used the ASL reservoir, others waited in pedestrian crossings (this could cause conflict with pedestrians using the crossing).
- The use of colour to identify the ASL reservoir and feeder lane has not been conclusively determined to be associated with reduced encroachment by other road users in this study.
- Where a kerbside feeder lane was present, 87% of cyclists used it, compared with 77% of cyclists who used the kerbside when there was no feeder lane. This implies that where feeder lane is present, cyclists tend to be attracted to it. This is possibly because space is successfully reserved. Any variation across sites is likely to be a result of location specific characteristics.
- Where a central feeder lane was present, this is utilised by, on average, 52% of cyclists (within the traffic stream).
- 78% of cyclists at the ASL sites were able to position themselves in front of the traffic when waiting at signals. This is compared with 54% at the control sites (see Table

4.10). This indicates that there is likely to be a reduced risk from left-turning vehicles at the ASL sites as cyclists travelling straight ahead are positioned in front of the traffic when starting from stationary.

**Encroachment:**

- There is a general problem of encroachment at all layout types studied.
- All vehicles that encroached at control sites went into the pedestrian crossing, compared with 12% at ASL sites, indicating that an ASL can provide a buffer zone that discourages vehicles from blocking the pedestrian crossing.
- There was a lower proportion of cyclists waiting within the pedestrian crossing area at ASL sites (40%) compared with the control sites (54%). Therefore ASLs may aid the reduction in cyclists waiting in the pedestrian crossing area.
- 36% of all cyclists across all the ASL sites experienced some form of encroachment by vehicles onto the ASL reservoir. This suggests that ASLs are often not treated as a reserved space for pedal cyclists by all types of motorised vehicle, particularly cars and motorcycles.
- The degree of encroachment does vary across the sites, with a higher proportion of vehicles partially encroaching upon the ASL reservoir. This indicates a degree of restraint in encroaching upon the cyclist's space, as vehicles have not automatically stopped at the secondary stop line.

**Red Light Violation:**

- The proportion of cyclists found to violate a red light was 4% more at ASL sites (17%) compared with control sites (13%). This suggests a slight propensity to violate at ASL sites, but not to a large extent.
- At ASL sites an average of 17% of cyclists violated red lights, compared with 13% at control sites. This suggests that the propensity to violate red light signals may be slightly increased at ASL sites, but not to a large extent.

**Maintenance:**

- Three of the sites' ASLs were poorly marked and two of the sites' ASL feeder lanes were not clearly marked, which may reduce their effectiveness.

**Recommendations and Further Steps:**

As a result of the findings of this study it is recommended that the following should be considered when designing an Advanced Stop Line Facility:

- ASLs can be employed at virtually any type of junction layout, including those most commonly found in London: categories 2:1L/S+1 (two entry lanes with a combined straight and left turn) and 1:1L/S/R (one entry lane with a left, straight and right turn out lane).
- There may be a role for signing to warn drivers of the need to keep the reservoir clear, however the effectiveness of such a strategy would need to be researched. Additionally, more education on the importance and existence of ASLs may reduce their misuse and, if successful, increase their effectiveness for cyclists.

- The feeder lane, which should be provided at any ASL facility, should be wide enough to reduce vehicle encroachment. This could require a reconsideration of lane layouts when more than one lane is present.
- A central feeder lane, required when a separate left turn lane is present, should be of an adequate length (equivalent to peak hour queue length) and width to be available for a cyclist to use. It is possible that a narrow feeder lane might also reduce vehicle encroachment. Therefore, further research would need to be undertaken to examine the association between levels of vehicle encroachment and the width of the ASL feeder lane.
- Sites with a left only turn will always introduce a hazard for cyclists who are not turning left and should be avoided where high cycle flows are found, especially on roads with high speeds. Although ASLs may help avoid this, the hazard will remain in moving traffic.
- Full consideration of any potential obstruction to the feeder lane should be given and acted upon by the authority that is responsible for implementing the facility. For example, the feeder lane may be placed in a prime location for a van to unload goods or may be located next to a bus stop. As a result, a higher level of enforcement may be required at these locations.
- A poorly observed feeder cycle lane, which may be obstructed by parked vehicles, can endanger the cyclist when manoeuvring around the vehicle into the traffic stream. Therefore road users should be encouraged not to obstruct road areas designated for cyclists through the use of appropriate enforcement measures such as signage and road markings for example.
- It is also advised that enforcement signs should be employed (particularly for motorcyclists) to advise them not to use/encroach upon the ASL facility (reference should be made to TSRGD (Chapter 5) 2003 for guidance on the use of appropriate signage).
- Site-specific characteristics should be a key consideration in the design of an Advanced Stop Line. Each site is likely to have unique characteristics which impact upon the effectiveness of a generic Advanced Stop Line layout.

The research study highlighted a number of issues, which may demand further investigation. It identified a high level of cyclist red light violation and a number of unusual manoeuvres/behaviours by cyclists at particular sites. Therefore, it is suggested that an attitudinal study of cyclists and behaviour at junctions would reveal the motivation and attitudes behind such behaviours and identify how cycle users perceive and act at ASLs and, how it affects their chosen route. In addition, this study has shown clear evidence of vehicle encroachment into ASLs however it has not tackled the motivation of the driver of a vehicle to encroach or violate an ASL. Therefore, there is scope to further investigate the role and behaviour of drivers in relation to road layouts and cyclists.

Future work could also investigate the potential use of facilities in relation to advanced stop lines. Examples include the provision of a marked lane across the junction for cyclists or the use of an advance signal specifically for cyclists to give them a head start at the junction to avoid left turning vehicles. The examination of red light violation by motorised vehicles could also be considered. There is also an opportunity to further examine the level of feeder lane violation against the available width for cyclists and the possible use of part-width ASL reservoirs at appropriate junction layouts. Further work may be undertaken to assess whether there is a correlation between the width of the ASL reservoir and ASL feeder lane, traffic flow and the level of encroachment.

In addition, a study of the effect of the use of colour on ASLs may provide an opportunity for further research. In this study, the level of encroachment on the ASL was not conclusively proven to be associated with the use of colour. Research could investigate the potential for the use of coloured surfaces in future ASL implementation.

Further research could also provide supplementary data that used control sites where significant proportions of vehicles make left turns.

# 1 Introduction

TRL Limited was commissioned by Transport for London to study the behaviour of cyclists and other road users at cycle Advanced Stop Lines (ASLs). This report describes the use and misuse of Advanced Stop Lines based upon an analysis of selected ASL sites within Greater London.

A primary mechanism for increasing levels of cycling is the positive intervention of regional and local authorities to provide facilities making cycling safer and more convenient. Highway Authorities have been required by Government to set local targets and adopt strategies for increasing cycling. In London the Mayor's Transport Strategy includes the objective to "undertake and support measures to make the cycling environment safer and more convenient for users". Advanced Stop Lines are one measure intended to achieve this.

The combination of utility and safety within the commitment quoted from the Mayor's Transport Strategy is significant in considering the role of cycle Advanced Stop Lines. The introduction of cycle Advanced Stop Lines in the UK in the mid 1980s followed widespread experience of this facility in the Netherlands. When they were introduced in the UK, it was primarily as a measure designed to increase cycle safety by allowing cycle users to move away from signals slightly in advance of motorised traffic.

Since their introduction in the UK, cycle Advanced Stop Lines have become relatively common at urban junctions. In London, where this study took place, the provision of ASLs is encouraged by the 'London Cycling Design Standards: A guide to the design of a better cycling environment' (Transport for London, 2005), which states that "all traffic signal junctions should incorporate an advanced stop line (ASL) or similar cycle priority area". In addition to promoting safer riding behaviour, ASLs are also utilised to allow cyclists a degree of priority at junctions.

## 1.1 Key objectives

The objective of the study was to obtain quantitative information on behaviour at ASLs and conflicts between cyclists and other road users at Advanced Stop Lines. This study is to form a key part of work to evaluate the advantages and disadvantages of this type of facility. It will inform guidance on the best and safest design and use of ASLs.

This report presents the methodology used in this study to gain quantitative data on the conflicts between cyclists and other road users at ASLs. The report then goes on to compare detailed data gained from each of the sites. This is followed by a discussion of the behaviour of cyclists at Advanced Stop Lines. Finally, conclusions and recommendations are made. This report also has a number of appendices which provide supporting information. Appendix A provides a glossary of the key terms contained in this report, Appendix B provides site pictures and diagrams of the sites and Appendix C provides fold-out diagrams of each of the site layouts used in this study. Appendix D includes a summary table of the data obtained for each of the monitored sites.

# 2 Methodology

In order to meet the key objectives of the study, TRL devised the following methodology.

## 2.1 Site selection

A range of sites were selected for the monitoring of behaviour at ASLs. A total of fourteen sites were selected based upon the following criteria:

- The presence of an ASL at the junction arm;
- The expected number of cyclists passing the point of interest [the target was 100 at each site over two days], or
- The layout of the site, primarily in terms of the number and set up of the approach lanes and feeder lane.

In order to assess the use of Advanced Stop Lines in comparison with other sites without this facility, two of the sites selected were locations in which no ASL was present. ASL sites were selected from a range of locations within Greater London. Locations of the final selection are shown in Appendix B.

A key consideration when conducting the research was to ensure that a sufficiently large number of cyclists were observed at each site so that the results observed were statistically sound. Only sites with 100 cyclists expected over two days were considered.

In terms of the layout of the site, inclusion of a range of lane configurations and possible manoeuvres enabled an analysis of how cyclists act within differing scenarios and what this implies for scheme layout.

Where possible, sites with the following layouts were included/analysed [refer to Figure 3.1]:

- Two carriageway lanes with a combined ahead and left turn lane on nearside
- One carriageway lane allowing left, ahead and right turn lane movements
- Two carriageway lanes with a third separate left turn lane
- Where there is an ASL feeder lane between a left-turn lane and right turn/ahead carriageway lanes
- Sites without an ASL to act as a control, with the right hand lane for straight over and/or right turn and a left hand lane for straight over and/or left turn

The first two types of junction were considered to be most representative of a typical junction layout within London. Where possible, sites with and without feeder lanes to the ASL were sought for potential inclusion in the study sample.

Sites identified by the London Road Safety Unit (TfL) and the Cycling Centre of Excellence were considered as potential locations for study. No alterations were made to the junctions or to the ASLs themselves whilst undertaking the study. Chapter 3 details the sites selected and the rationale for doing so.

## 2.2 Data gathering

For each of the selected study sites, the following three types of data were collected:

#### 2.2.1 Background data

For each of the study sites, contact was made with the ‘host’ highway authority to gain permission for the survey work and to request background data where available. The data requested for the site area included vehicle flow data, vehicle speed data, information on the date of implementation of the advanced stop line and, if applicable, any correspondence or complaints received in relation to the facility. For a large proportion of the sites vehicle data and information regarding complaints were not available or not provided.

#### 2.2.2 Casualty Analysis

Information on the casualty record of each junction was obtained from TfL’s London Road Safety Unit for each of the monitored sites. The analysis focussed specifically upon incidents involving cyclists as required by the study brief. Where it was possible to establish the date at which the ASL was installed, a before and after comparison was made between casualty records.

#### 2.2.3 Video data

In order to allow for an in-depth analysis of the behaviour of cyclists and other road users, video footage was gathered of users at the selected sites. This enabled an accurate and reliable categorisation of behaviours and enabled specific incidents to be revisited as often as necessary during the analysis. In order to meet the requirements of a minimum of 100 cyclists per site analysed, video footage was collected for two days; from 07:00 to 18:00 for each site. This allowed a review of behaviour in peak and off-peak periods. All of the data were collected on weekdays.

Additional data were collected to focus on vehicle encroachment onto the ASL and feeder lane and red light violation by type of vehicle. These data were analysed for every $5^{th}$ traffic light phase for 1 day per site.

As an overview, the following categories of information were collected:

- Red light violation by all vehicle types
- Vehicle encroachment on to the ASL reservoir and feeder lane by all vehicle types
- Pedal cyclist details i.e. gender/type of bicycle/use of cycle equipment
- Cyclist approach method to the junction
- Position taken by cyclist at the junction
- Potential or actual conflict with other road users
- Cyclist manoeuvre leaving the junction
- Information about other road users

A definition of the terms ‘conflict’, ‘encroachment’ and ‘reservoir’ are provided in the glossary in Appendix A.

### 2.3 Data analysis

The data obtained from the videos were subject to a detailed analysis in order to explore the relationship between junction layout, user types and observed behaviour. The retrieval and analysis of these data for each site has enabled a comprehensive assessment of behaviour at each of the sites. It also enabled a comparative site review to be undertaken, particularly comparing the control sites with the ASL sites.

# 3 Site Selection

## 3.1 Selected Sites

Once an initial sample of potential monitoring sites was gathered from those provided by TfL and the Cycling Centre for Excellence, they were compiled into a site selection grid and were further reviewed in terms of their viability for video data gathering and site analysis. The subsequent reasoning for selecting the sites used for this study were primarily:

(i) knowledge of an ASL at that particular location;

(ii) feasibility of collecting video footage at the site, and

(iii) predicted number of cyclists using the arm of the junction across the day.

A key consideration during selection was the need to have a range of junction layouts in order to test different scenarios. Therefore, as discussed in the methodology, the following types of site layouts were used in the study:

**Layout types:**

- Two entry lanes with a combined straight and left turn lane: 4 sites CODE: 2:1L/S+1
- One entry lane with a left, straight and right turn out lane: 4 sites CODE: 1:1L/S/R
- One entry lane on to a signalised roundabout: 1 site CODE: 1:RNDBT
- Three entry lanes with a separate left turn lane, no central feeder lane: 1 site CODE: 3:1L1S1S
- A central feeder lane between a left turn and ahead/right turn lane(s): 2 sites CODE: 3: 1L+2
- Control site: No ASL present with the right hand lane for straight over and/or right turn and a left hand lane for straight over and/or left turn: 2 sites – Note: No left turns occurred at Control sites CODE: CNTRL

The codes listed alongside the layout types above provide a short-hand reference for use within this report. The variation in layout type has enabled the influence of layout to be tested in terms of behaviour at the ASL. The box above also indicates how many sites were studied of the various layout types. Notably, two control sites were included, where there was no ASL present, in order to judge whether particular behaviour was attributable to the ASL itself. Both of these two sites were believed to be typical types of layout for the London area.

Table 3.1 on the following page lists the sites included in the study and their characteristics. It is the first road named in the site name which denotes on which arm of the junction the ASL concerned is situated. In subsequent discussion, the site will be referred to by the first road name. Also, in some instances, the feeder lane extended a significant distance from the junction and therefore approximate length has been noted in the table. Site photographs and site diagrams are provided within Appendix B to this report.

Control sites were nominated by TfL. Site selection was partly based on prediction that ASLs may be installed at a later date, allowing 'after' monitoring to be consistent with data collected during this study.

## Table 3.1 Selected Sites: Characteristics

| Site | Location | Lights in camera view? | ASL present? | Number of Lanes | Lane Layout | Feeder Lane present? | Feeder Lane Location | Depth of ASL | Width of ASL | Colour of ASL Reservoir | ASL: Quality of Marking | Length of Feeder Lane | Width of Feeder Lane | Colour of Feeder Lane | Feeder Lane: Quality of Marking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Harleyford Street/Kennington Park Road | Lambeth | Y | Y | 2 | 2:1L/S1S/R | N | N/A | 4 metres approx. | 2 Lanes | Grey | Very Clear | N/A | N/A | N/A | N/A |
| New Cavendish Street/Portland Place | Westminster | Y | Y | 2 | 2:1L/S1S/R | Y | Kerbside | 4 metres approx. | 2 Lanes + feeder lane | Grey | Very Clear | 10+ metres | 1 metre | Grey | Very Clear |
| Gloucester Road/Coombe Road | Kingston | Y | Y | 2 | 2:1L/S1S/R | Y | Kerbside | 3 metres approx. | 2 Lanes + feeder lane | Grey | Quite Clear | 12 metres approx. | 0.25 metres | Grey | Moderately Clear |
| Queenstown Road/Battersea Park Road | Wandsworth | Y | Y | 2 | 2:1L/S1S | N | N/A | 4 metres approx. | 2 Lanes | Grey | Very Clear | N/A | N/A | N/A | N/A |
| Beaufort Street/Kings Road | Kensington and Chelsea | N | Y | 1 | 1: 1L/S/R | Y | Kerbside | 4 metres approx. | 1 Lane | Green | Very Clear | 3 metres approx. | 0.25 metres | Green | Very Clear |
| College Road/Dulwich Common | Southwark | Y | Y | 1 | 1: 1L/S/R | Y | Kerbside | 4 metres approx. | 1 1/2 Lane's width | Green | Quite Clear | 6 metres approx. | 1m | Green | Quite Clear |
| Coombe Lane West/Galsworthy Road | Kingston | Y | Y | 1 | 1: 1L/S/R | N | N/A | 4 metres approx. | 1 Lane | Grey | Not Clear | N/A | N/A | N/A | N/A |
| Pendennis Road/Streatham High Road | Lambeth | Y | Y | 1 | 1: 1L/S/R | Y | Kerbside | 4 metres approx. | 2 Lanes | Grey | Very Clear | 4 metres approx. | 1 metre | Grey | Very Clear |
| City Road/Old Street (roundabout) | Islington | Y | Y | 1 | 1: 1L/S | Y | Kerbside | 4 metres approx. | 1 Lane + feeder lane | Grey | Very Clear | 10+ metres | 1 metre | Grey | Very Clear |
| Putney High Street/Lower Richmond Road | Wandsworth | Y | Y | 3 | 3: 1L/1S/1S | Y | Kerbside | 4 metres approx. | 3 Lanes + feeder lane | Grey | Very Clear | 10+ metres | 0.25 metres | Pale Green | Very Clear |
| Battersea Park Road/Queenstown Road | Wandsworth | N | Y | 3 | 3: 1L/1S/1S | Y | Central | 4 metres approx. | 3 Lanes | Pale Green | Very Clear | 4 metres approx. | 0.75 metres | Pale Green | Very Clear |
| Upper St. Martins Lane/Long Acre & Garrick Street | Westminster | Y | Y | 3 | 3:1L/1S/1R | Y | Central | 4 metres approx. | 3 Lanes | Grey | Very Clear | 10+ metres | 1 metre | Grey | Very Clear |
| Portland Place/Weymouth Street (Control) | Westminster | Y | N | 2 | 2:1S1S/R | N | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Borough High Street/St. Thomas' Street (Control) | Southwark | Y | N | 2 | 2:1L/S1R | N | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

Please note:

The 'lights in camera view' column indicates whether or not the camera positions allowed a view of the traffic lights at each site. Where lights were not in view it was because of constraints in the location of mounting points.

Figures 3.1 and 3.2 provide a schematic representation of each of the 'typical' layouts studied and their shorthand codes. For codes 2:1L/S+1 and 3:1L+2, the last digit denotes an additional lane(s) which may be a straight ahead only or a straight ahead/right lane depending upon the site. It should be noted that one of the two control sites prohibited left turns. For ease of reference, the diagrams below are provided as a fold-out page in Appendix C.

**Figure 3.1: Layout of sites with ASLs present**

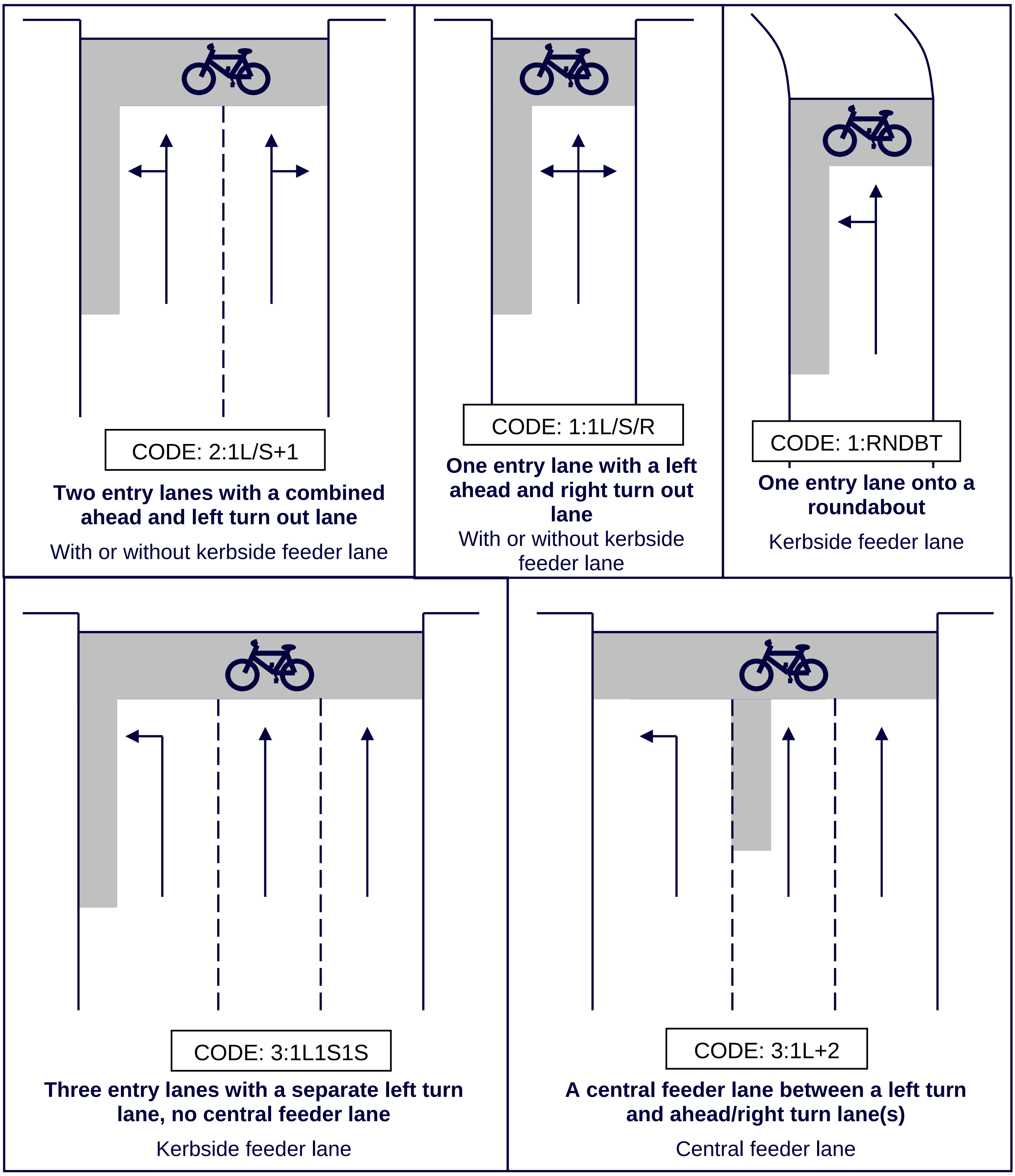
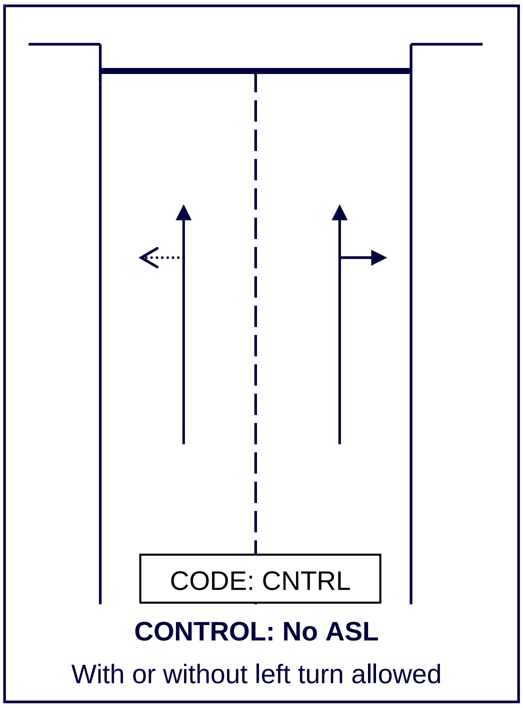


**Figure 3.2: Control site layout: no ASL present**




Once these sites had been selected, background information was gathered from the host authority where it was available. Appendix D includes a summary table of the information obtained. It should be noted at this stage that for a large proportion of the sites, traffic data were unavailable from the host highway authority, or the data were not provided. This affected the comparative analysis of traffic flow/speed data at the sites and the behaviours monitored.

The following sections examine the video, casualty and any background data for each of the sites based upon the research questions listed in the previous chapter. The analysis is framed into three interlocking aspects: behaviour at the ASL, safety at the ASL and functioning of the ASL. As requested by the Client, all percentages provided in the narrative have been rounded to the nearest whole number. More detailed percentage values can be obtained from the relevant data tables.

# 4 Comparative Site Data Analysis

This section of the research study analyses the behaviour monitored at each of the sites and compares the results across the sites with reference to the casualty and traffic flow data.

This analysis examines three key aspects:

- Behaviour at the ASL
- Safety at the ASL
- The functioning of the ASL

Firstly, the cycle flows obtained at the sites are provided. As a point of reference, the junction layout categories are classified as follows:

**Layout types:**

- Two entry lanes with a combined ahead and left turn lane: 4 sites CODE: 2:1L/S+1
- One entry lane with a left, ahead and right turn out lane: 4 sites CODE: 1:1L/S/R
- One entry lane on to a roundabout: 1 site CODE: 1:RNDBT
- Three entry lanes with a separate left turn lane, no central feeder lane: 1 site CODE: 3:1L1S1S
- A central feeder lane between a left turn and ahead/right turn lane(s): 2 sites CODE: 3: 1L+2
- Control site: No ASL present: 2 sites CODE: CNTRL

The sites are referred to by the name of the road of the specific arm of the junction being analysed.

## 4.1 Cyclist flows

Table 4.1, over the page, details the number of cyclists observed at each of the sites for each of the two days in which they were surveyed. The left column denotes the category of the site.

**Table 4.1: Cyclist flows by day for each site**

| Category | Site | Day 1 | Day 2 | Total | Within congestion zone? |
|---|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 236 | 221 | 457 | No |
| 2:1L/S+1 | New Cavendish Street | 570 | 596 | 1166 | Yes |
| 2:1L/S+1 | Gloucester Road | 99 | 101 | 200 | No |
| 2:1L/S+1 | Queenstown Road | 343 | 292 | 635 | No |
| 1:1L/S/R | Beaufort Street | 197 | 217 | 414 | No |
| 1:1L/S/R | College Road | 82 | 75 | 157 | No |
| 1:1L/S/R | Coombe Lane West | 72 | 82 | 154 | No |
| 1:1L/S/R | Pendennis Road | 41 | 46 | 87 | No |
| 1:RNDBT | City Road | 307 | 277 | 584 | No (on the boundary) |
| 3:1L1S1S | Putney High Street* | 200 | 200 | 400 | No |
| 3: 1L+2 | Battersea Park Road | 230 | 230 | 460 | No |
| 3: 1L+2 | Upper St. Martin's Lane* | 200 | 200 | 400 | Yes |
| ASL TOTAL | | 2577 | 2537 | 5114 | |
| CNTRL | Portland Place | 255 | 272 | 527 | N/A ** |
| CNTRL | Borough High Street* | 200 | 200 | 400 | Yes |
| CNTRL TOTAL | | 455 | 472 | 927 | |

* denotes three sites where, because of high numbers of cyclists, observations were capped once a sample of 400 had been obtained. 200 cyclists were analysed in the peak period (7am-10am) and 200 in the off-peak (10am-1pm). Three sites were analysed in this manner as shown.

** Portland Place is within the congestion charging zone, but one of the days of data was collected from footage before the congestion charging implementation on 17 February 2003.

The table shows that at all but one of the sites surveyed, the number of cyclists monitored exceeded the requirement of 100 per site (from 11 hours footage for each of the 2 days, 7am-6pm). Cyclist flows were particularly high at New Cavendish Street, City Road, Queenstown Road, Portland Place and the three capped sites. In total, 6,041 cyclists were observed for this study.

Interestingly, at the three sites in the congestion charging zone (implemented on 17/02/03), cyclist flows were high – two of these were capped sites. The highest cyclist flow was found at New Cavendish Street, also located within the congestion zone.

It should be noted that no left turns occurred at the two control sites.

It should also be noted that the video recording at each of these sites took place at different times of the year. Video footage for the first group of sites was recorded from January to April when the study was commissioned; further sites were filmed in August and September. The months in which the survey work was undertaken is shown in Table 4.2 below:

Table 4.2 shows that of the three sites that were ‘capped’, data were gathered in August when the weather was good for cycling. There is, therefore, a greater chance for higher cycle flows than in March or April (when the data for the other sites was collected).

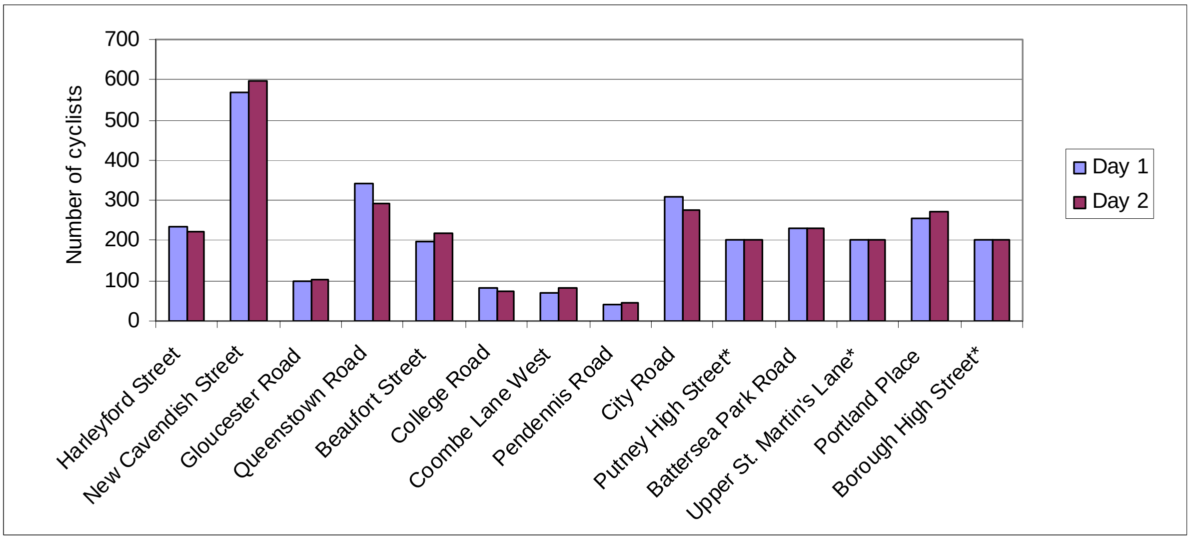
**Table 4.2 Site survey times of year with cyclist flows: 7:00 – 18:00 for two days (all surveys took place in 2003)**

| No. | Site | Time of year surveyed | Cyclist flows |
|---|---|---|---|
| 1 | Harleyford Street | March | 457 |
| 2 | New Cavendish Street | April | 1166 |
| 3 | Gloucester Road | March | 200 |
| 4 | Queenstown Road | August | 635 |
| 5 | Beaufort Street | March | 414 |
| 6 | College Road | March | 157 |
| 7 | Coombe Lane West | March | 154 |
| 8 | Pendennis Road | August | 87 |
| 9 | City Road | April | 584 |
| 10 | Putney High Street * | August | 400 |
| 11 | Battersea Park Road | March | 460 |
| 12 | Upper St. Martin's Lane* | August/September | 400 |
| 13 | Portland Place | January/March | 527 |
| 14 | Borough High Street * | August | 400 |

The yellow cells in the table above denote the summer months where data was collected, when cycling is more popular. Three of these sites were capped as explained above (see *).

Cyclist flows across day 1 and day 2 appear to be relatively equal and comparable (as shown in Figure 4.1). There were no anomalies within the data across different days per site.

**Figure 4.1 Cyclist flows by day for each site (*capped sites)**




For the purpose of the analysis, peak hours were defined as 07:00 to 10:00 and 16:00 to 18:00 and off-peak hours as 10:00 to 16:00. As would be expected, cyclist flows at all of the sites were found to be higher during peak periods than off-peak periods as shown in Table 4.3. Of those sites for which data collection was not capped, peak flows were proportionally highest at Queenstown Road and Harleyford Street. Of the ASL sites, overall 63% of cyclists recorded were during the peak hours. Including the control sites, the number of cyclists recorded during the peak hours was 62%.

**Table 4.3 Cyclist flows by peak and off peak period for each site**

| No. | Category | Site | peak | off peak | Total |
|---|---|---|---|---|---|
| 1 | 2:1L/S+1 | Harleyford Street | (73%) 334 | (27%) 123 | 457 |
| 2 | 2:1L/S+1 | New Cavendish Street | (63%) 734 | (37%) 432 | 1166 |
| 3 | 2:1L/S+1 | Gloucester Road | (63%) 126 | (37%) 74 | 200 |
| 4 | 2:1L/S+1 | Queenstown Road | (74%) 470 | (26%) 165 | 635 |
| 5 | 1:1L/S/R | Beaufort Street | (61%) 252 | (39%) 162 | 414 |
| 6 | 1:1L/S/R | College Road | (68%) 107 | (32%) 50 | 157 |
| 7 | 1:1L/S/R | Coombe Lane West | (69%) 107 | (31%) 47 | 154 |
| 8 | 1:1L/S/R | Pendennis Road | (66%) 57 | (34%) 30 | 87 |
| 9 | 1:RNDBT | City Road | (58%) 340 | (42%) 244 | 584 |
| 10 | 3:1L1S1S | Putney High Street* | 200 | 200 | 400 |
| 11 | 3:1L+2 | Battersea Park Road | (69%) 318 | (31%) 142 | 460 |
| 12 | 3:1L+2 | Upper St. Martin's Lane* | 200 | 200 | 400 |
| | TOTAL ASL | | 3245 | 1869 | 5114 |
| 13 | CNTRL | Portland Place | (59%) 309 | (41%) 218 | 527 |
| 14 | CNTRL | Borough High Street* | 200 | 200 | 400 |
| | TOTAL CNTRL | | 509 | 418 | 927 |

Figure 4.2 below shows that flows were highest during the peak periods at virtually all of the sites. The three capped sites have not been included in Figure 4.2 because an *equal* number of cyclists were analysed from 7-10 and from 10-1 for each of the two days of footage. The graph illustrates whether the morning or evening peak contained the highest proportion of cyclists. For example, Queenstown Road had over 60% of its monitored cyclists pass in the pm peak whereas Pendennis Road had the majority of its cyclists pass the junction in the morning peak.

**Figure 4.2 Cyclist flows by time of day for each site**

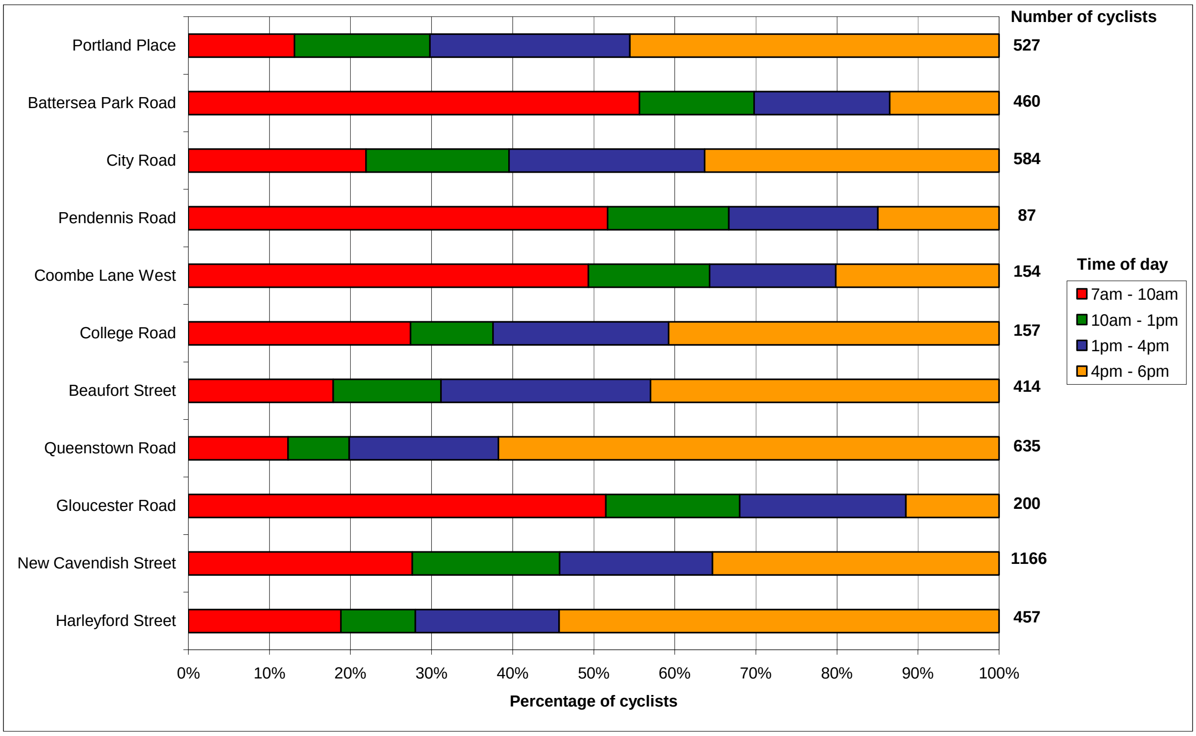
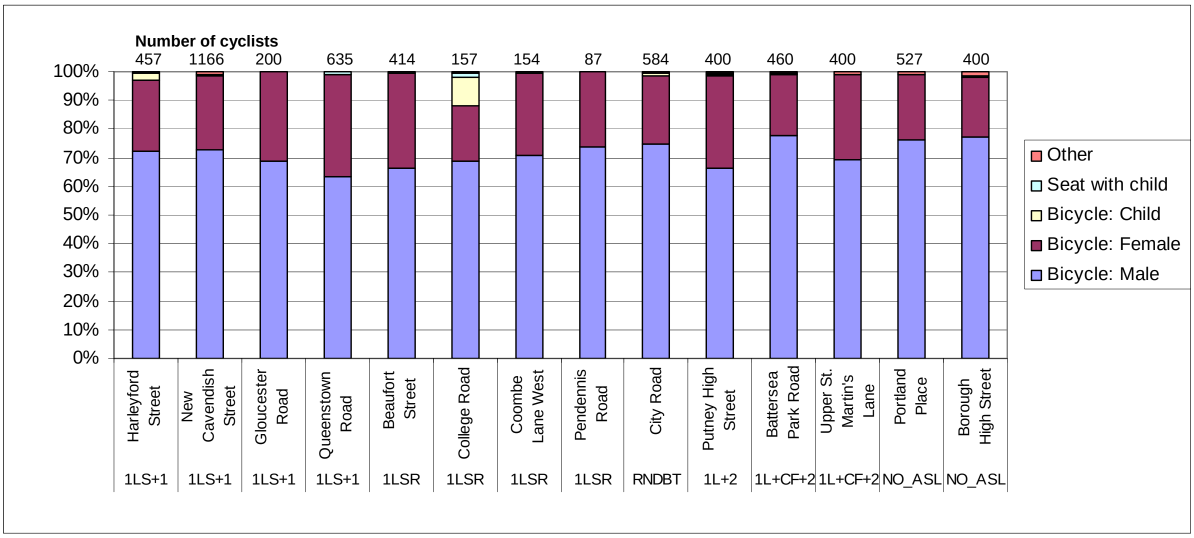



Figure 4.3 provides an analysis of cyclist flows by cyclist details (i.e. gender and estimated age). A child cyclist was a cyclist estimated by the video analyst to be 16 years old or less. Figure 4.3 indicates that the majority of cyclists at all sites were adult males (71%). In

contrast to other sites, a higher proportion of child cyclists was observed at College Road. This could be attributed to the close proximity of Dulwich College. The ‘other’ category equates to more unusual pedal cycle details, for example, a recumbent or a tandem (a recumbent cycle is a machine with two or more wheels, where the rider sits in a seat with legs in a horizontal position).

**Figure 4.3 Cyclist characteristics for each site**




**Cycle Flows Summary:**

- A high number of cyclists were counted across the majority of the sites over the two days of footage analysed.
- Overall, 62% of cyclists monitored were recorded during peak hours. Across the sites as a whole, cyclist flows were higher during peak periods (discounting the capped sites). During off peak hours just 22% of the sample was obtained between 10:00 and 13:00 and 16% between 13:00-16:00.
- The majority of cyclists observed were adult males. 71% of the sample were adult males, 27% adult females, 1% children and a few cyclists carrying a seat with a child.

The analysis will now focus upon each of the three aspects outlined above in order to provide a comprehensive review of the use of Advanced Stop Lines at the sites studied.

## 4.2 Behaviour at the ASL

To examine behaviour at and around the Advanced Stop Line the analysis focused on:

- The approach method of cyclists
- Positioning of cyclists at the junction,
- Red light violation by cyclists and other road users
- Vehicle encroachment onto the ASL reservoir and feeder lane by road users.

### *4.2.1 Cyclist approach method*

This section will examine how cyclists approached the junction to determine whether they approached using the feeder lane (if present), approached ahead of the traffic stream, or weaved amongst the traffic for example. In the graphs and text below 'ahead' means that the cyclist was travelling in front of the traffic stream with no traffic in view ahead. For the purpose of this study, nine approach methods to the junction were recorded. They included:

- **Weaving** – Cyclists weave between stationary/slow moving traffic on the approach to the junction
- **Traffic lane: outside over centre line** – Cyclists approach the junction by overtaking traffic on the right-hand side, using oncoming traffic lanes
- **Traffic lane: outside filter** – Cyclists approach on the outside of the traffic lane, to the left of the centre line
- **(Between) traffic lanes** – Cyclists approach the junction between two traffic lanes
- **No feeder: kerb** – No feeder lane was present, but cyclist approaches the junction adjacent to the kerb
- **ASL feeder: central** – Cyclists approach the junction via an ASL feeder lane in a central position (between traffic lanes of the same direction)
- **ASL feeder: kerb** – Cyclists approach the junction via an ASL feeder lane which runs adjacent to the nearside kerb
- **Footway** – Cyclists use the (pedestrian) footway adjacent to the road on the approach to the junction
- **Ahead** – Cyclists are approaching the junction whilst already being ahead of other moving traffic

### *4.2.1.1 General approach methods*

Figures 4.4, 4.5 and 4.6 indicate how cyclists approached the ASL at individual sites, by layout category and by feeder lane position. These figures are supported by Tables 4.4, 4.5 and 4.6. The method by which cyclists approached the ASL varied by site, according to the layout of the junction and the ASL facility provision.

Approaching ahead of the traffic stream was relatively common, particularly at layout 3:1L+2 sites and the control sites. At Coombe Lane West, nearly 10% of cyclists approached the junction using the footway, perhaps due to heavy traffic, fear, vehicle encroachment on the ASL/feeder lane or a narrow layout. It should be noted that Coombe Lane West was the only category 1:1L/S/R type junction that did not have an ASL feeder lane. At the Battersea Park Road and Upper St. Martin’s Lane category 3:1L+2 sites, where a feeder lane was in place, approximately 25% of cyclists used the central feeder lane to approach the junction. However, 51% of cyclists at this site type approached the junction ahead of the traffic stream and therefore did not need to contend with other traffic. Approaching between the traffic lanes occurred at all sites with more than one lane. Weaving by the cyclist was found to take place at all of the layout types, but, of the ASL sites, occurred the most at category 3:1L+2 type junction layouts. The separate left turn lane might be a factor in this increased level of weaving as cyclists manoeuvre away from the kerbside into the traffic flow.

**Figure 4.4 Approach methods of cyclists by site**

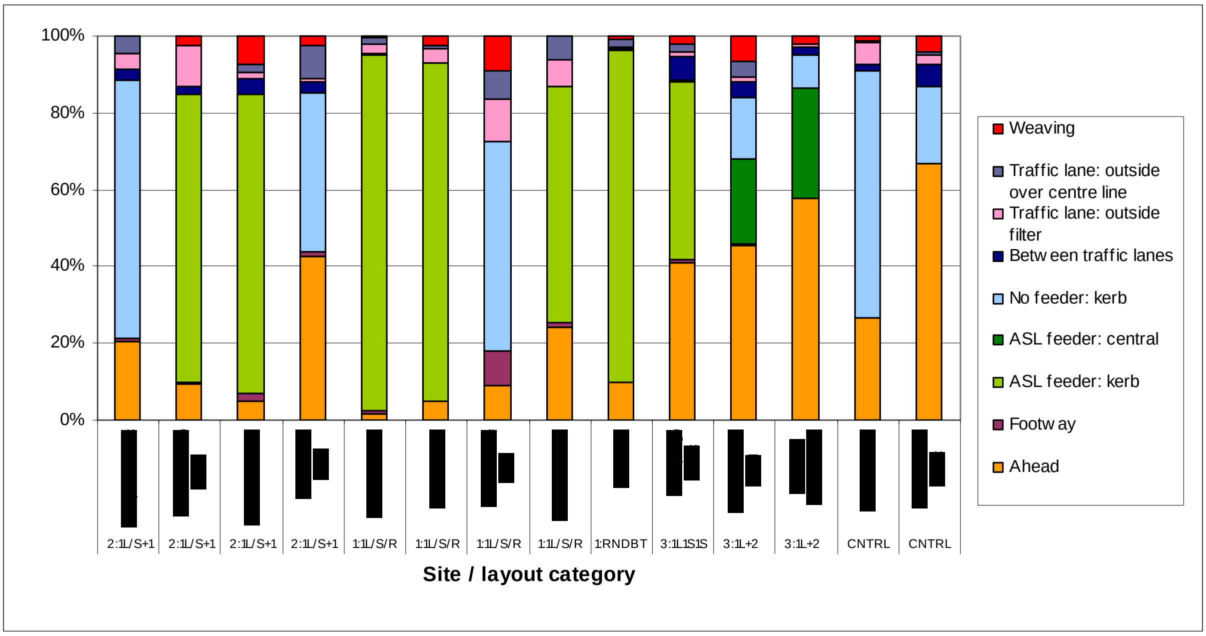



**Table 4.4 Approach methods of cyclists by site**

| Category | Site | Ahead | | Footway | | ASL feeder: kerb | | ASL feeder: central | | No feeder: kerb | | (Btw) traffic lanes | | Traffic lane: outside filter | | Traffic lane: outside over centre line | | Weaving | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. |
| 2:1L/S+1 | Harleyford Street | 93 | 20.4 | 5 | 1.1 | 0 | 0.0 | 0 | 0.0 | 307 | 67.2 | 12 | 2.6 | 19 | 4.2 | 21 | 4.6 | 0 | 0.0 | 457 |
| 2:1L/S+1 | New Cavendish Street | 112 | 9.6 | 3 | 0.3 | 876 | 75.1 | 0 | 0.0 | 0 | 0.0 | 22 | 1.9 | 125 | 10.7 | 0 | 0.0 | 28 | 2.4 | 1166 |
| 2:1L/S+1 | Gloucester Road | 10 | 5.0 | 4 | 2.0 | 156 | 78.0 | 0 | 0.0 | 0 | 0.0 | 8 | 4.0 | 3 | 1.5 | 4 | 2.0 | 15 | 7.5 | 200 |
| 2:1L/S+1 | Queenstown Road | 271 | 42.7 | 7 | 1.1 | 0 | 0.0 | 0 | 0.0 | 263 | 41.4 | 18 | 2.8 | 7 | 1.1 | 54 | 8.5 | 15 | 2.4 | 635 |
| 1:1L/S/R | Beaufort Street | 7 | 1.7 | 4 | 1.0 | 382 | 92.3 | 0 | 0.0 | 0 | 0.0 | 2 | 0.5 | 10 | 2.4 | 7 | 1.7 | 2 | 0.5 | 414 |
| 1:1L/S/R | College Road | 8 | 5.1 | 0 | 0.0 | 138 | 87.9 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 3.8 | 1 | 0.6 | 4 | 2.5 | 157 |
| 1:1L/S/R | Coombe Lane West | 14 | 9.1 | 14 | 9.1 | 0 | 0.0 | 0 | 0.0 | 84 | 54.5 | 0 | 0.0 | 17 | 11.0 | 11 | 7.1 | 14 | 9.1 | 154 |
| 1:1L/S/R | Pendennis Road | 20 | 24.1 | 1 | 1.2 | 51 | 61.4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 7.2 | 5 | 6.0 | 0 | 0.0 | 83 |
| 1:RNDBT | City Road | 57 | 9.8 | 0 | 0.0 | 506 | 86.6 | 0 | 0.0 | 0 | 0.0 | 1 | 0.2 | 4 | 0.7 | 12 | 2.1 | 4 | 0.7 | 584 |
| 3:1L1S1S | Putney High Street | 164 | 41.0 | 4 | 1.0 | 184 | 46.0 | 0 | 0.0 | 2 | 0.5 | 25 | 6.3 | 5 | 1.3 | 7 | 1.8 | 9 | 2.3 | 400 |
| 3:1L+2 | Battersea Park Road | 209 | 45.5 | 2 | 0.4 | 0 | 0.0 | 102 | 22.2 | 73 | 15.9 | 18 | 3.9 | 6 | 1.3 | 18 | 3.9 | 31 | 6.8 | 459 |
| 3:1L+2 | Upper St. Martin's Lane | 231 | 57.9 | 0 | 0.0 | 0 | 0.0 | 114 | 28.6 | 35 | 8.8 | 8 | 2.0 | 3 | 0.8 | 0 | 0.0 | 8 | 2.0 | 399 |
| CNTRL | Portland Place | 140 | 26.6 | 1 | 0.2 | 0 | 0.0 | 0 | 0.0 | 339 | 64.3 | 9 | 1.7 | 30 | 5.7 | 1 | 0.2 | 7 | 1.3 | 527 |
| CNTRL | Borough High Street | 267 | 66.8 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 80 | 20.0 | 23 | 5.8 | 10 | 2.5 | 4 | 1.0 | 16 | 4.0 | 400 |

It should be highlighted that for 'Approach methods of cyclists by site' there are some anomalies in the data (6 out of 6041 cyclists). It can be concluded that the cyclist either dismounted or made an abnormal approach to the junction and was therefore not counted. The anomalies are as follows:

- Pendennis Road – 4 cyclists
- Battersea Park Road – 1 cyclist
- Upper St. Martin's Lane – 1 cyclist

**Figure 4.5 Approach methods of cyclists by layout category**

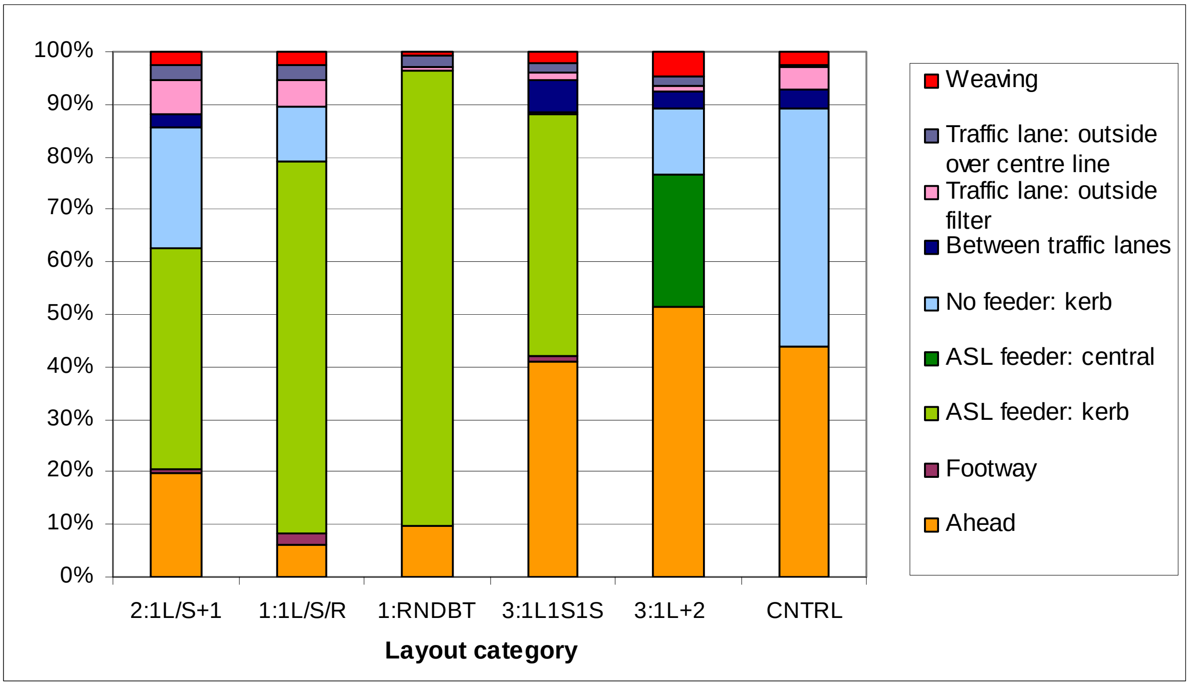



**Table 4.5 Approach methods of cyclists by layout category**

| Category | Ahead | | Footway | | ASL feeder: kerb | | ASL feeder: central | | No feeder: kerb | | (Btw) traffic lanes | | Traffic lane: outside filter | | Traffic lane: outside over centre line | | Weaving | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. |
| 2:1L/S+1 | 486 | 19.8 | 19 | 0.8 | 1032 | 42.0 | 0 | 0.0 | 570 | 23.2 | 60 | 2.4 | 154 | 6.3 | 79 | 3.2 | 58 | 2.4 | 2458 |
| 1:1L/S/R | 49 | 6.1 | 19 | 2.4 | 571 | 70.7 | 0 | 0.0 | 84 | 10.4 | 2 | 0.2 | 39 | 4.8 | 24 | 3.0 | 20 | 2.5 | 808 |
| 1:RNDBT | 57 | 9.8 | 0 | 0.0 | 506 | 86.6 | 0 | 0.0 | 0 | 0.0 | 1 | 0.2 | 4 | 0.7 | 12 | 2.1 | 4 | 0.7 | 584 |
| 3:1L1S1S | 164 | 41.0 | 4 | 1.0 | 184 | 46.0 | 0 | 0.0 | 2 | 0.5 | 25 | 6.3 | 5 | 1.3 | 7 | 1.8 | 9 | 2.3 | 400 |
| 3:1L+2 | 440 | 51.3 | 2 | 0.2 | 0 | 0.0 | 216 | 25.2 | 108 | 12.6 | 26 | 3.0 | 9 | 1.0 | 18 | 2.1 | 39 | 4.5 | 858 |
| CNTRL | 407 | 43.9 | 1 | 0.1 | 0 | 0.0 | 0 | 0.0 | 419 | 45.2 | 32 | 3.5 | 40 | 4.3 | 5 | 0.5 | 23 | 2.5 | 927 |

The cyclists that approached ahead of the traffic stream were removed from the data analysis when examining cyclist approach method against feeder lane position layout (Figure 4.6). For sites with no feeder lane, approach by cyclists along the left kerbside was a common occurrence (around 75% of cyclists). At those sites with a kerbside feeder lane, this was generally used as the main form of approach (87% of cyclists). At sites with a central feeder, this was used by just over half the cyclists and the kerbside was used by a further 26% of cyclists. At the control site 80% of cyclists use the kerbside.

It can therefore be suggested that where a central feeder lane exists, this proportionally reduces the number of cyclists approaching down the kerbside. This also demonstrates that when a central feeder lane is present, not all cyclists elect to use it. It also demonstrates that a higher proportion of cyclists use the kerbside if a feeder lane is present rather than when a feeder lane is absent. Therefore, it can be concluded that feeder lanes assist cyclists in reaching the front of the queue.

**Figure 4.6: Approach method of cyclists by ASL feeder lane layout (not ahead of traffic stream)**

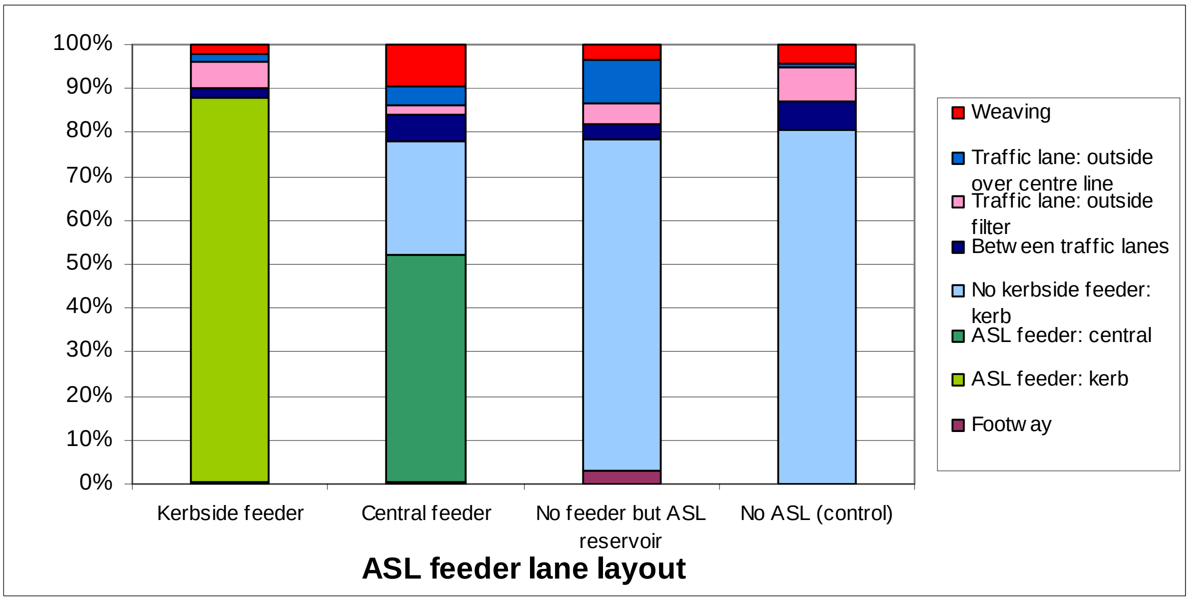



**Table 4.6: Approach method of cyclists by ASL feeder lane layout (not ahead of traffic stream)**

| Site | Footway | | ASL feeder: kerb | | ASL feeder: central | | No kerbside feeder: kerb | | Between traffic lanes | | Traffic lane: outside filter | | Traffic lane: outside over centre line | | Weaving | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| Kerbside feeder | 16 | 0.6 | 2293 | 87.3 | 0 | 0.0 | 2 | 0.1 | 58 | 2.2 | 159 | 6.1 | 36 | 1.4 | 62 | 2.4 | 2626 |
| Central feeder | 2 | 0.5 | 0 | 0.0 | 216 | 51.7 | 108 | 25.8 | 26 | 6.2 | 9 | 2.2 | 18 | 4.3 | 39 | 9.3 | 418 |
| No feeder but ASL reservoir | 26 | 3.0 | 0 | 0.0 | 0 | 0.0 | 654 | 75.3 | 30 | 3.5 | 43 | 5.0 | 86 | 9.9 | 29 | 3.3 | 868 |
| No ASL (control | 1 | 0.2 | 0 | 0.0 | 0 | 0.0 | 419 | 80.6 | 32 | 6.2 | 40 | 7.7 | 5 | 1.0 | 23 | 4.4 | 520 |

Figure 4.7 shows how cyclists approach in flowing traffic, again, those cyclists that approached ahead of the traffic stream have been removed from the data shown. Across all of the sites, over 60% of cyclists approached using either the ASL feeder lane or the kerbside of the road. At the majority of sites, (but not Queenstown Road, Coombe Lane West, Battersea Park Road or Borough High Street), 80% or more of the cyclists approached using either the ASL feeder lane or the kerbside of the road. The remaining cyclists approached either between the traffic lanes, by filtering along the outside, along the footway or by weaving between motorised vehicles. At Queenstown Road a significant proportion of cyclists approached the junction over the centre line of the road, whilst at Coombe Lane West cyclists were found to use the outside filter traffic lane and were noted as weaving on approach.

**Figure 4.7 Cyclist approach method in flowing traffic (not ahead of traffic stream)**

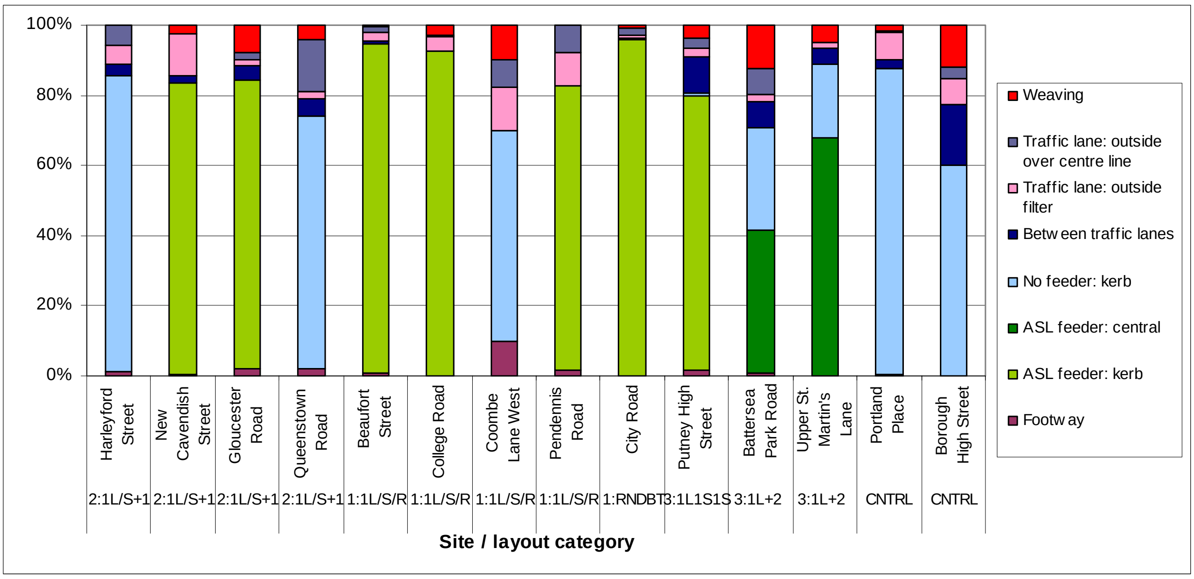



**Table 4.7: Cyclist approach method in flowing traffic (not ahead of traffic stream)**

| Category | Site | Footway | | ASL feeder: kerb | | ASL feeder: central | | No feeder: kerb | | Between traffic lanes | | Traffic lane: outside filter | | Traffic lane: outside over centre line | | Weaving | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. |
| 2:1L/S+1 | Harleyford Street | 5 | 1.4 | 0 | 0.0 | 0 | 0.0 | 307 | 84.3 | 12 | 3.3 | 19 | 5.2 | 21 | 5.8 | 0 | 0.0 | 364 |
| 2:1L/S+1 | New Cavendish Street | 3 | 0.3 | 876 | 83.1 | 0 | 0.0 | 0 | 0.0 | 22 | 2.1 | 125 | 11.9 | 0 | 0.0 | 28 | 2.7 | 1054 |
| 2:1L/S+1 | Gloucester Road | 4 | 2.1 | 156 | 82.1 | 0 | 0.0 | 0 | 0.0 | 8 | 4.2 | 3 | 1.6 | 4 | 2.1 | 15 | 7.9 | 190 |
| 2:1L/S+1 | Queenstown Road | 7 | 1.9 | 0 | 0.0 | 0 | 0.0 | 263 | 72.3 | 18 | 4.9 | 7 | 1.9 | 54 | 14.8 | 15 | 4.1 | 364 |
| 1:1L/S/R | Beaufort Street | 4 | 1.0 | 382 | 93.9 | 0 | 0.0 | 0 | 0.0 | 2 | 0.5 | 10 | 2.5 | 7 | 1.7 | 2 | 0.5 | 407 |
| 1:1L/S/R | College Road | 0 | 0.0 | 138 | 92.6 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 4.0 | 1 | 0.7 | 4 | 2.7 | 149 |
| 1:1L/S/R | Coombe Lane West | 14 | 10.0 | 0 | 0.0 | 0 | 0.0 | 84 | 60.0 | 0 | 0.0 | 17 | 12.1 | 11 | 7.9 | 14 | 10.0 | 140 |
| 1:1L/S/R | Pendennis Road | 1 | 1.6 | 51 | 81.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 9.5 | 5 | 7.9 | 0 | 0.0 | 63 |
| 1:RNDBT | City Road | 0 | 0.0 | 506 | 96.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.2 | 4 | 0.8 | 12 | 2.3 | 4 | 0.8 | 527 |
| 3:1L1S1S | Putney High Street | 4 | 1.7 | 184 | 78.0 | 0 | 0.0 | 2 | 0.8 | 25 | 10.6 | 5 | 2.1 | 7 | 3.0 | 9 | 3.8 | 236 |
| 3:1L+2 | Battersea Park Road | 2 | 0.8 | 0 | 0.0 | 102 | 40.8 | 73 | 29.2 | 18 | 7.2 | 6 | 2.4 | 18 | 7.2 | 31 | 12.4 | 250 |
| 3:1L+2 | Upper St. Martin's Lane | 0 | 0.0 | 0 | 0.0 | 114 | 67.9 | 35 | 20.8 | 8 | 4.8 | 3 | 1.8 | 0 | 0.0 | 8 | 4.8 | 168 |
| CNTRL | Portland Place | 1 | 0.3 | 0 | 0.0 | 0 | 0.0 | 339 | 87.6 | 9 | 2.3 | 30 | 7.8 | 1 | 0.3 | 7 | 1.8 | 387 |
| CNTRL | Borough High Street | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 80 | 60.2 | 23 | 17.3 | 10 | 7.5 | 4 | 3.0 | 16 | 12.0 | 133 |

### *4.2.1.2 Approach where ASL feeder lanes are present (for cyclists not ahead of the traffic stream)*

Table 4.8 shows that at sites with a kerbside feeder lane, use of this lane was generally the main form of approach. At Battersea Park Road and Upper St. Martins Road, category 3:1L+2 sites, where a central feeder lane was in place, on average 52% of the cyclists used the central ASL feeder lane while 26% travelled along the kerbside (the remainder made other approaches). The level of central feeder lane usage will depend upon the exit manoeuvres being performed at these sites which will be reviewed later in this study. In contrast, 83% of cyclists used the kerbside ASL feeder lane at category 2:1L/S+1 sites. 92% of cyclists used the kerbside ASL feeder lane at category 1:1L/S/R sites and 96% at category 1:RNDBT. The central ASL feeder lane at Battersea Park Road was blocked (a feeder lane which does not allow cyclists to flow freely due to a vehicle or other object encroaching into the space) for 31% of the cyclists which could explain the low feeder lane usage there (see also Table 4.45).

**Table 4.8 Proportional use of feeder lane by cyclists for sites with a kerbside or central feeder lane present and where no feeder lane is present**

| Feeder location | Category | Site | Length of ASL | % use if ASL feeder | Across sites: % use (with feeder lane) | | Across sites: % use (along kerb) | |
|---|---|---|---|---|---|---|---|---|
| Kerb | 2:1L/S+1 | New Cavendish Street | Over 10 metres | 83.1% | 83.0% | 87.3% | | |
| | 2:1L/S+1 | Gloucester Road | Over 10 metres | 82.1% | | | | |
| | 1:1L/S/R | Beaufort Street | 3 metres approx. | 93.9% | 92.2% | | | |
| | 1:1L/S/R | College Road | 6 metres approx. | 92.6% | | | | |
| | 1:1L/S/R | Pendennis Road | 4 metres approx. | 81.0% | | | | |
| | 1:RNDBT | City Road | Over 10 metres | 96.0% | 96.0% | | | |
| | 3:1L1S1S | Putney High Street | Over 10 metres | 78.0% | 78.0% | | | |
| Central | 3:1L+2 | Battersea Park Road | 4 metres approx. | 40.8% | 51.7% | | 25.8% | |
| | 3:1L+2 | Upper St. Martin's Lane | Over 10 metres | 67.9% | | | | |
| No Feeder | 2:1L/S+1 | Harleyford Street | | | | | 84.3% | 77.3% |
| | 2:1L/S+1 | Queenstown Road | | | | | 72.3% | |
| | 1:1L/S/R | Coombe Lane West | | | | | 60.0% | |
| | CNTRL | Portland Place | | | | | 87.6% | |
| | CNTRL | Borough High Street | | | | | 60.2% | |

These results suggest that ASLs with kerbside feeder lanes are likely to be more successfully utilised amongst the traffic flow, than those without. At all ASL sites except those with central feeder lanes, the majority of cyclists approached along the kerbside. This implies that cyclists prefer to use the kerbside whether or not a feeder lane is present. Although a slightly higher proportion of cyclists used the kerbside where a feeder lane, was present, it cannot be concluded that feeder lanes attract cyclists to use them. However, they may help where they facilitate desired behaviour.

Where no feeder lane was present the majority of cyclists (77%) approached along the kerb. For sites where no feeder lane was present, the proportion of cyclists approaching on the outside of the traffic lane, over the centre line (between the two-way flow of traffic) was generally higher. It should be noted that this behaviour, together with the lack of feeder lane may both be the result of narrow lanes at the site. There were no other consistent differences in approach where no feeder lane is present.

**Cyclist Approach Summary:**

- Where a kerbside feeder lane was present, 87% of cyclists used it, compared with 77% of cyclists who used the kerbside when there was no feeder lane. This implies that where feeder lane is present, cyclists tend to be attracted to it. This is possibly because space is successfully reserved. Any variation across sites is likely to be reflected by location specific characteristics.

- Across all of the sites, over 60% of cyclists approached using either the ASL feeder lane or the kerbside of the road.

- Where a central feeder lane is present, this was utilised, on average, by 52% of cyclists (within the traffic stream). The need to use the central feeder lane will depend upon the exit manoeuvre performed by the cyclist (which will be reviewed later in this analysis).

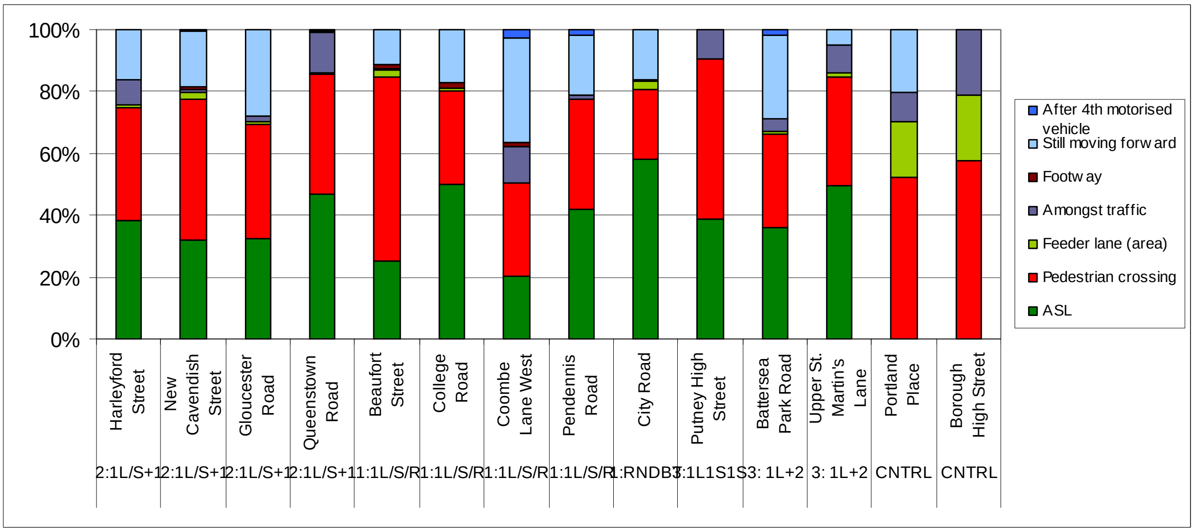
- Weaving is most prevalent at category 3:1L+2 type junction layouts. The separate left turn lane might be a factor in this increased level of weaving as cyclists manoeuvre away from the kerbside into the traffic flow.

- At the only single lane site with no feeder lane, a comparatively higher proportion of cyclists (over 10% compared with an average of 1%) approached using the footway than at all other sites.

### 4.2.2 Positioning of Cyclists

This section reports on where those cyclists who stopped at the junction (due to red traffic lights) positioned themselves. Figure 4.8 shows that the two most common positions for cyclists waiting at the junction at ASL sites were in the pedestrian crossing area (40% of cyclists) and in the ASL reservoir (38%). At Beaufort Street, the number of cyclists waiting in the pedestrian crossing area, where they are not permitted, was proportionally particularly high (59%). This might be due to site specific characteristics such as visibility splays (the views available to the cyclist whilst waiting at a junction). At Putney High Street 52% of cyclists waited in the pedestrian crossing area, which might be in order to gain a good position ahead of the traffic because the arm of the junction is on a gradient. At City Road, 58% of cyclists waited in the ASL. Highly trafficked sites, such as Borough High Street (control site), tended to have some cyclists position themselves amongst the traffic at the junction. At the control sites, 54% of cyclists positioned themselves in the pedestrian crossing. Figure 4.8 is supported by the numerical data contained in Table 4.9.

**Figure 4.8 Positioning of cyclists who waited at each site**




Note: 'After 4th motorised vehicle' refers to cyclists stopping/waiting after the 4th motorised vehicle in the traffic stream. This indicates those cyclists who have stopped further back in the traffic queue.

## Table 4.9 Positioning of cyclists who waited at each site

| Category | Site | ASL | | Pedestrian crossing | | Feeder lane (area) | | Amongst traffic | | Footway | | Still moving forward | | After 4th motorised vehicle | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. |
| 2:1L/S+1 | Harleyford Street | 80 | 38.3 | 76 | 36.4 | 2 | 1.0 | 17 | 8.1 | 0 | 0.0 | 34 | 16.3 | 0 | 0.0 | 209 |
| 2:1L/S+1 | New Cavendish Street | 160 | 31.9 | 229 | 45.7 | 10 | 2.0 | 6 | 1.2 | 4 | 0.8 | 90 | 18.0 | 2 | 0.4 | 501 |
| 2:1L/S+1 | Gloucester Road | 36 | 32.4 | 41 | 36.9 | 1 | 0.9 | 2 | 1.8 | 0 | 0.0 | 31 | 27.9 | 0 | 0.0 | 111 |
| 2:1L/S+1 | Queenstown Road | 133 | 46.8 | 110 | 38.7 | 1 | 0.4 | 37 | 13.0 | 2 | 0.7 | 0 | 0.0 | 1 | 0.4 | 284 |
| 1:1L/S/R | Beaufort Street | 76 | 25.3 | 178 | 59.3 | 7 | 2.3 | 1 | 0.3 | 4 | 1.3 | 34 | 11.3 | 0 | 0.0 | 300 |
| 1:1L/S/R | College Road | 50 | 50.0 | 30 | 30.0 | 1 | 1.0 | 0 | 0.0 | 2 | 2.0 | 17 | 17.0 | 0 | 0.0 | 100 |
| 1:1L/S/R | Coombe Lane West | 16 | 20.3 | 24 | 30.4 | 0 | 0.0 | 9 | 11.4 | 1 | 1.3 | 27 | 34.2 | 2 | 2.5 | 79 |
| 1:1L/S/R | Pendennis Road | 26 | 41.9 | 22 | 35.5 | 0 | 0.0 | 1 | 1.6 | 0 | 0.0 | 12 | 19.4 | 1 | 1.6 | 62 |
| 1:RNDBT | City Road | 91 | 58.3 | 35 | 22.4 | 4 | 2.6 | 1 | 0.6 | 0 | 0.0 | 25 | 16.0 | 0 | 0.0 | 156 |
| 3:1L1S1S | Putney High Street | 37 | 38.9 | 49 | 51.6 | 0 | 0.0 | 9 | 9.5 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 95 |
| 3: 1L+2 | Battersea Park Road | 84 | 36.2 | 70 | 30.2 | 2 | 0.9 | 9 | 3.9 | 0 | 0.0 | 63 | 27.2 | 4 | 1.7 | 232 |
| 3: 1L+2 | Upper St. Martin's Lane | 49 | 49.5 | 35 | 35.4 | 1 | 1.0 | 9 | 9.1 | 0 | 0.0 | 5 | 5.1 | 0 | 0.0 | 99 |
| ASL TOTAL | | 838 | 37.6 | 899 | 40.4 | 29 | 1.3 | 101 | 4.5 | 13 | 0.6 | 338 | 15.2 | 10 | 0.4 | 2228 |
| CNTRL | Portland Place | 0 | 0.0 | 65 | 52.4 | 22 | 17.7 | 12 | 9.7 | 0 | 0.0 | 25 | 20.2 | 0 | 0.0 | 124 |
| CNTRL | Borough High Street | 0 | 0.0 | 19 | 57.6 | 7 | 21.2 | 7 | 21.2 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 33 |
| CNTRL TOTAL | | 0 | 0.0 | 84 | 53.5 | 29 | 18.5 | 19 | 12.1 | 0 | 0.0 | 25 | 15.9 | 0 | 0.0 | 157 |

Note: See glossary in Appendix A for explanation of terms

Overall, 40% of cyclists waited in the pedestrian crossing area at ASL sites compared to 54% of cyclists who waited in the pedestrian crossing area at control sites in front of the traffic. This suggests that a benefit of ASLs may be to allow cyclists to take up a position at the front of traffic queues but less likely to obstruct pedestrians' crossing.

Table 4.10 below, shows the proportion of cyclists using the ASL reservoir or pedestrian crossing. This demonstrates the number of cyclists reaching the front of the traffic queue (including and excluding those cyclists 'still moving forward'). It can be seen that at control sites only 54% of cyclists reach the front of the traffic queue compared with 78% of cyclists at ASL sites (including those cyclists still moving forward). Excluding cyclists still moving forward, on average 92% of cyclists reached the front of the traffic queue at ASLs compared with an average of 64% at control sites. This suggests that ASLs are successful in enabling a higher proportion of cyclists to place themselves in the position considered safest.

## Table 4.10: The proportion of cyclists using the ASL or pedestrian crossing (including and excluding those cyclists 'still moving forward')

| Category | Site | No. of cyclists using ASL | No. cyclists using pedestrian crossing | Total cyclists (including cyclists still moving forward) | Proportion of cyclists using ASL and pedestrian crossing (including cyclists still moving forward | Total cyclists (excluding cyclists still moving forward) | Proportion of cyclists using ASL and pedestrian crossing (excluding cyclists still moving forward) |
|---|---|---|---|---|---|---|---|
| | | No. | No. | No. | % | No. | % |
| 2:1L/S+1 | Harleyford Street | 80 | 76 | 209 | 74.6 | 175 | 89.1 |
| 2:1L/S+1 | New Cavendish Street | 160 | 229 | 501 | 77.6 | 411 | 94.6 |
| 2:1L/S+1 | Gloucester Road | 36 | 41 | 111 | 69.4 | 80 | 96.3 |
| 2:1L/S+1 | Queenstown Road | 133 | 110 | 284 | 85.6 | 284 | 85.6 |
| 1:1L/S/R | Beaufort Street | 76 | 178 | 300 | 84.7 | 266 | 95.5 |
| 1:1L/S/R | College Road | 50 | 30 | 100 | 80.0 | 83 | 96.4 |
| 1:1L/S/R | Coombe Lane West | 16 | 24 | 79 | 50.6 | 52 | 76.9 |
| 1:1L/S/R | Pendennis Road | 26 | 22 | 62 | 77.4 | 50 | 96.0 |
| 1:RNDBT | City Road | 91 | 35 | 156 | 80.8 | 131 | 96.2 |
| 3:1L1S1S | Putney High Street | 37 | 49 | 95 | 90.5 | 95 | 90.5 |
| 3:1L+2 | Battersea Park Road | 84 | 70 | 232 | 66.4 | 169 | 91.1 |
| 3:1L+2 | Upper St. Martin's Lane | 49 | 35 | 99 | 84.8 | 94 | 89.4 |
| ASL Average | | 838 | 899 | 2228 | 78.0 | 1890 | 91.9 |
| CNTRL | Portland Place | 0 | 65 | 124 | 52.4 | 99 | 65.7 |
| CNTRL | Borough High Street | 0 | 19 | 33 | 57.6 | 33 | 57.6 |
| CNTRL Average | | 0 | 84 | 157 | 53.5 | 132 | 63.6 |

Figure 4.9 and Table 4.11 below show that a large proportion of cyclists who waited at the junction for sites 3:1L1S1S and CNTRL waited in the pedestrian crossing area beyond the

stop line. At the roundabout site (City Road) most cyclists waited in the Advanced Stop Line reservoir.

**Figure 4.9 Positioning of cyclists waiting at each layout category type**

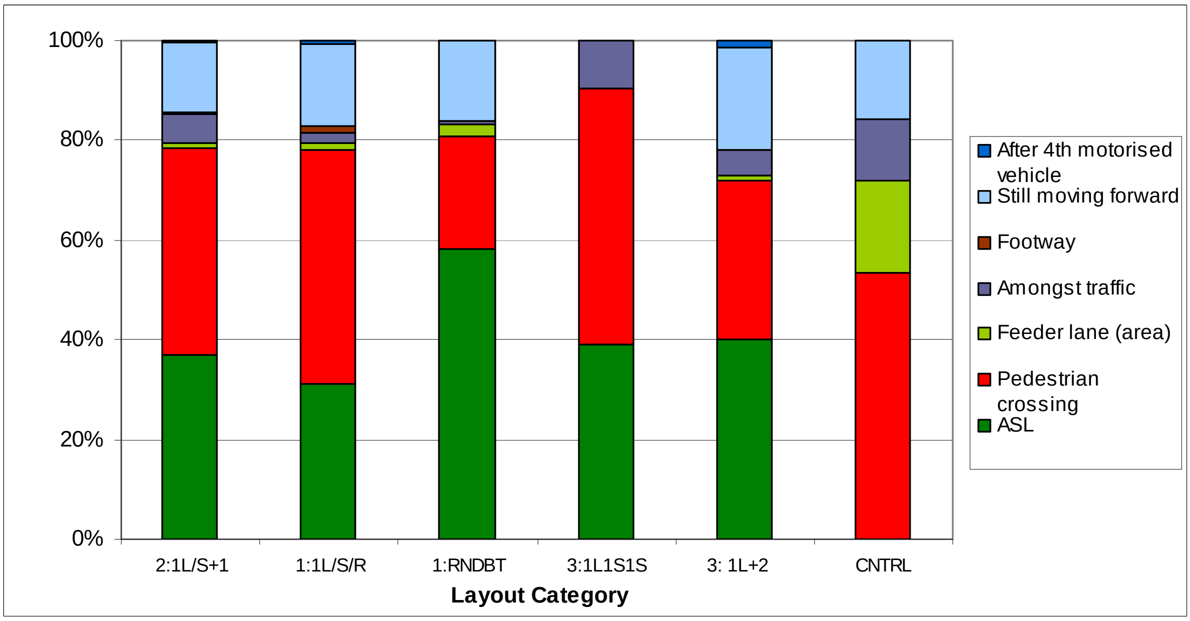



**Table 4.11 Positioning of cyclists waiting at each layout category type**

| Category | ASL | | Pedestrian crossing | | Feeder lane (area) | | Amongst traffic | | Footway | | Still moving forward | | After 4th motorised vehicle | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| 2:1L/S+1 | 409 | 37.0 | 456 | 41.3 | 14 | 1.3 | 62 | 5.6 | 6 | 0.5 | 155 | 14.0 | 3 | 0.3 | 1105 |
| 1:1L/S/R | 168 | 31.1 | 254 | 47.0 | 8 | 1.5 | 11 | 2.0 | 7 | 1.3 | 90 | 16.6 | 3 | 0.6 | 541 |
| 1:RNDBT | 91 | 58.3 | 35 | 22.4 | 4 | 2.6 | 1 | 0.6 | 0 | 0.0 | 25 | 16.0 | 0 | 0.0 | 156 |
| 3:1L1S1S | 37 | 38.9 | 49 | 51.6 | 0 | 0.0 | 9 | 9.5 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 95 |
| 3: 1L+2 | 133 | 40.2 | 105 | 31.7 | 3 | 0.9 | 18 | 5.4 | 0 | 0.0 | 68 | 20.5 | 4 | 1.2 | 331 |
| CNTRL | 0 | 0.0 | 84 | 53.5 | 29 | 18.5 | 19 | 12.1 | 0 | 0.0 | 25 | 15.9 | 0 | 0.0 | 157 |

In addition, the analysis shows that the proportion of cyclists who stop within the ASL and in front of the ASL (rather than behind the ASL or amongst the traffic) increases a great deal across almost all of the sites, during peak hours. This may suggest that it may be the desire of the cyclist to make progress, rather than the density of traffic, that determines whether s/he reaches the front of the queue.

**Cyclist Positioning Summary:**

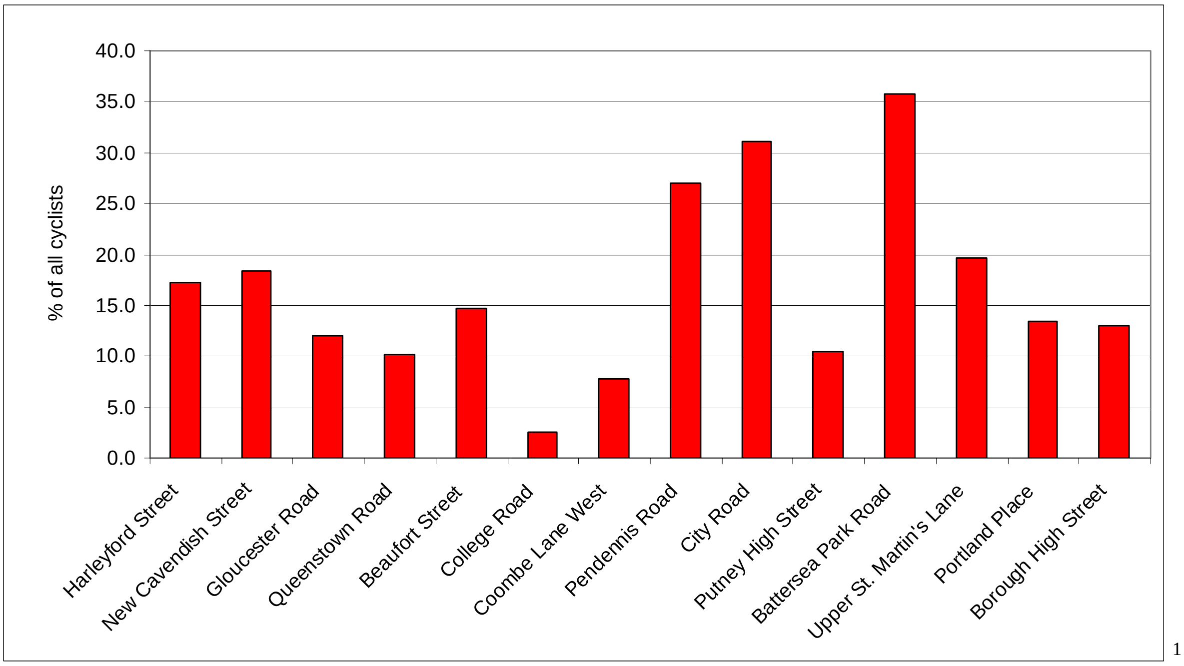
- 38% of cyclists at ASL sites positioned themselves in the ASL reservoir whilst waiting at the junction. 40% of cyclists at ASL sites positioned themselves in the pedestrian crossing area.
- At the control sites, 54% of cyclists waited in the pedestrian crossing, beyond the stop line. This suggests that, on average, ASLs may reduce cyclist encroachment into pedestrian crossings. At these sites, fewer cyclists reach the front of the traffic queue (54% compared with 78% at ASL sites (including cyclists still moving forward)). This suggests that ASLs are effective in securing a degree of priority for cyclists in front of traffic.
- The proportion of cyclists that were able to position themselves in front of the traffic varied significantly across the ASL sites. Site specific characteristics may be a factor in this variability but this would require further research.

### 4.2.3 *Red Light Violation*

Red light violation was analysed to determine whether there is a greater incidence of this type of behaviour at the ASL sites compared with the control sites. It also revealed the prevalence of violation at the sites by cyclists and other road users. Within this study, red light violation refers to a road user that passes the stop line and proceeds across the junction when the traffic signals are red. Those who cross the stop line but do not proceed across the junction are acting illegally, however, for the purposes of this study they were not included as violators. All terms used are explained in the glossary in Appendix A.

Red light violation appears to be a common occurrence across London and, at some sites, reaches high levels (see Figure 4.10). This figure shows the proportion of red light violation by cyclists of *all* cyclists observed at each site. The level of red light violation by cyclists varied a great deal across the sites. Some degree of red light violation was observed at all sites, and only one site, College Road, showed a red light violation rate of less than 5% of cyclists. Those sites showing the highest levels of violation were Pendennis Road, City Road and Battersea Park Road where the percentage of all cyclists violating reached 27%, 31% and 36% respectively. Further site specific research may determine factors which explain this higher level of violation, as would attitudinal research which may reveal underlying motives.

**Figure 4.10 Proportion of red light violation by cyclists**




Note: Traffic signals at Beaufort Street and Battersea Park Road were not in camera view, due to constraints on camera mounting points. Cycle red light violation was gauged by other vehicle movements, such as vehicles stopping and starting from stationary.

Table 4.12 below further informs the Figure 4.10 by showing the number of violations by cyclists against the number of observed cyclists per site. Across all ASL sites an average of 17% of cyclists violated red lights.

**Table 4.12 Number of red light violations by cyclists at each site**

| Category | Site | Number of cyclists violating | Total cyclists | Proportion of cyclists violating red light |
|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 79 | 457 | 17.3% |
| 2:1L/S+1 | New Cavendish Street | 209 | 1135 | 18.4% |
| 2:1L/S+1 | Gloucester Road | 24 | 199 | 12.1% |
| 2:1L/S+1 | Queenstown Road | 65 | 635 | 10.2% |
| 1:1L/SR | Beaufort Street | 59 | 403 | 14.6% |
| 1:1L/SR | College Road | 4 | 153 | 2.6% |
| 1:1L/SR | Coombe Lane West | 12 | 154 | 7.8% |
| 1:1L/SR | Pendennis Road | 23 | 85 | 27.1% |
| 1 RNDBT | City Road | 182 | 584 | 31.2% |
| 3:1L1S1S | Putney High Street | 42 | 400 | 10.5% |
| 3:1L+2 | Battersea Park Road | 154 | 430 | 35.8% |
| 3:1L+2 | Upper St. Martin's Lane | 77 | 392 | 19.6% |
| Total ASL | | 930 | 5027 | 16.5% |
| CNTRL | Portland Place | 65 | 482 | 13.5% |
| CNTRL | Borough High Street | 52 | 398 | 13.1 % |
| Total CNTRL | | 117 | 880 | 13.3 % |
| OVERALL TOTAL | | 1047 | 5907 | 17.70% |

An analysis of red light violation by cyclists for each site layout category (Figure 4.11 and Table 4.13) shows that red light violation appeared to be more prevalent at the site at a roundabout (City Road) with over 30% of cyclists passing through the junction whilst the traffic lights showed red. Whilst showing the lowest level of red light violation of all, category 1:1L/S/R sites showed the highest level of cyclists passing the junction whilst the traffic lights were on amber. All of the categories showed relatively high red light violation rates with over 10% of all cyclists passing through the junction on red (calculated from an average of each site layout category).

As shown in Table 4.13, across all the ASL sites, 19% traversed the junction on red, 25% on amber and 56% on green. Over all the sites, 18% traversed the junction on red, 24% on amber and 58% on green.

It should be noted that violation is also apparent at the control sites with 13% of cyclists crossing the junction on red. However this is lower than at ASL sites; this suggests that the propensity to violate red light signals may be slightly increased at ASL sites.

**Figure 4.11 Traffic light position of passing cyclists by layout category**

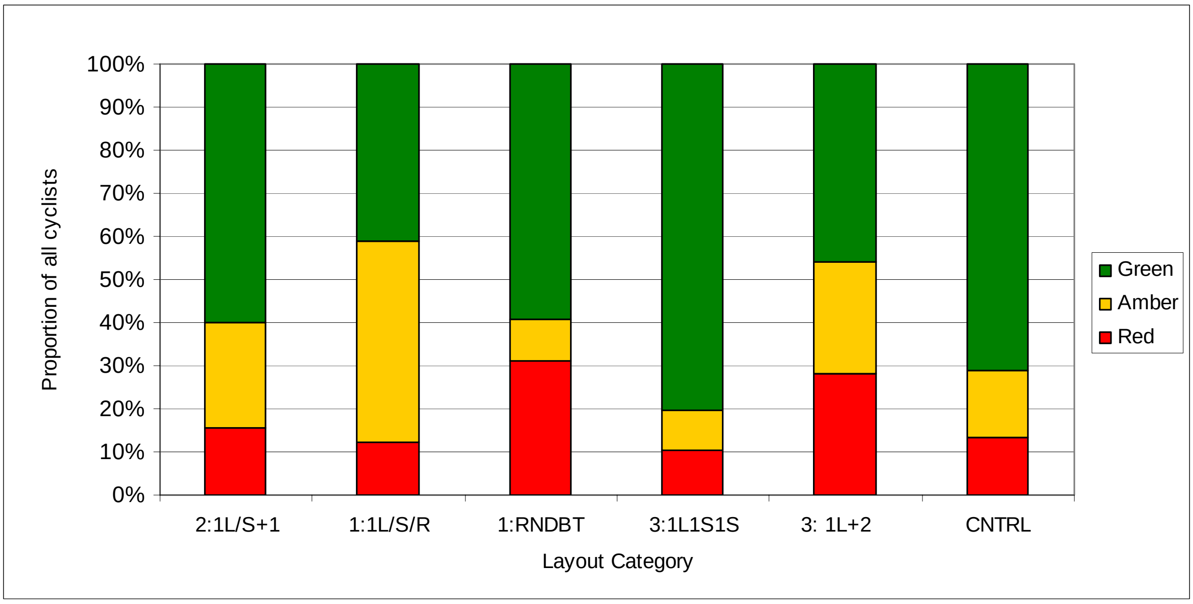
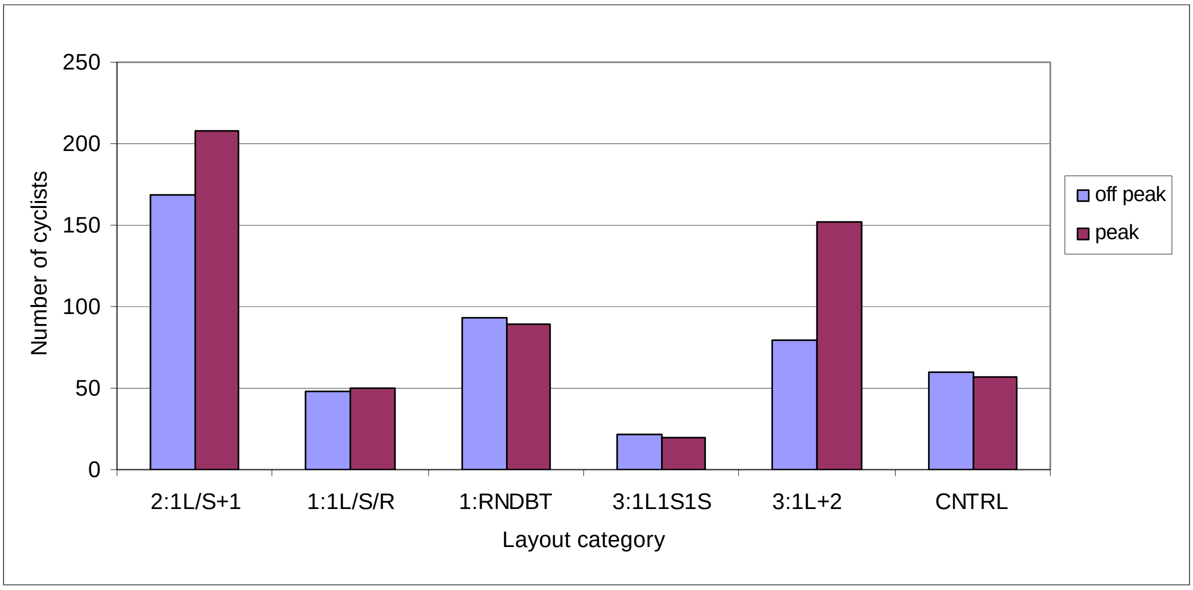



**Table 4.13: Traffic light position of passing cyclists by layout category**

| Category | Red | Amber | Green | Total |
|---|---|---|---|---|
| 2:1L/S+1 | 377 | 597 | 1452 | 2426 |
| 1:1L/S/R | 98 | 371 | 326 | 795 |
| 1:RNDBT | 182 | 57 | 345 | 584 |
| 3:1L1S1S | 42 | 36 | 322 | 400 |
| 3: 1L+2 | 231 | 213 | 378 | 822 |
| **Total ASL Sites** | **930** | **1274** | **2823** | **5027** |
| **% of cyclists crossing ASL site junctions** | **18.5** | **25.3** | **56.2** | |
| CNTRL | 117 | 138 | 625 | 880 |
| **Total All Sites** | **1047** | **1412** | **3448** | **5907** |
| **% of cyclists crossing all junctions** | **17.7** | **23.9** | **58.4** | |

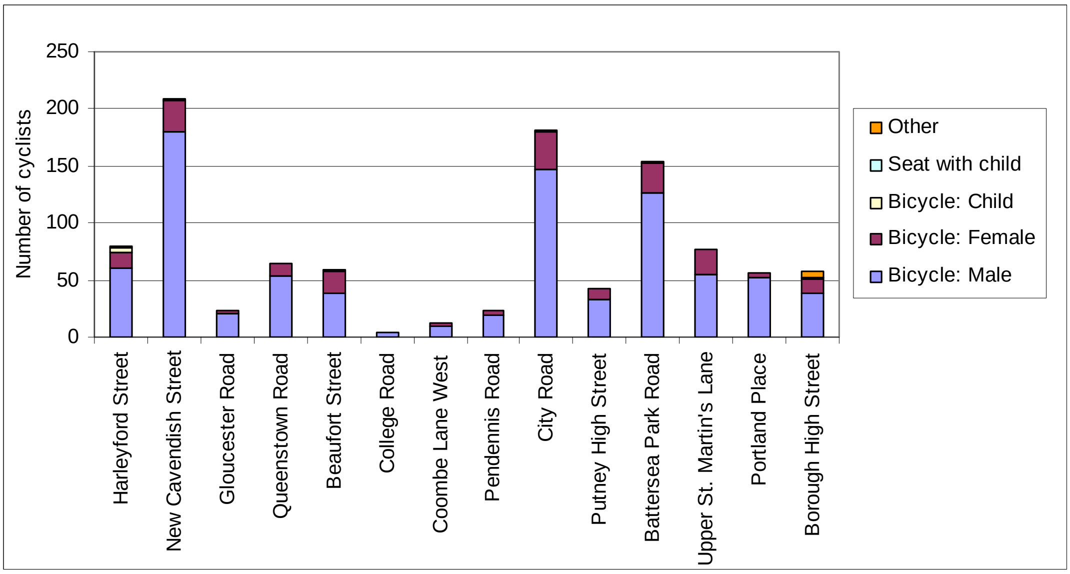
For all cyclists who violated, the proportion of red light violation appeared to be relatively equal during peak and off-peak periods. This can be seen clearly in Figure 4.12 below. Of all cyclists who violated a red light, 45% of these were during off peak hours compared to 55% during peak hours, see glossary in Appendix A for explanation of terms.

**Figure 4.12 The number of cyclists violating red lights during peak and off peak hours by layout category**




As Figure 4.13 shows, the majority of cyclists violating red lights were adult males. This was the case at every site analysed. A notable observation was the proportionally large number of under 16 cyclists violating red lights at Harleyford Street (5%) and several 'other' violating the red lights at Borough High Street. The majority of cyclists violating red lights were adult males, contributing almost 80% of violations. By considering the total numbers of cyclists surveyed, 20% of male cyclists violated the red light across all sites compared with 12% of female cyclists; this suggests that any educational approach to encourage compliance should be targeted particularly at male cyclists.

**Figure 4.13 Red light violation by cyclist details for each site**



To allow comparison between levels of red light violation by different types of vehicle (including cyclists), all violations at every fifth traffic light cycle were recorded for one survey day at each site. It should be noted that the traffic lights were not in camera view for Beaufort Street and Battersea Park Road due to the unavailability of a suitable camera mounting point and hence a review of red light violation by vehicles was not possible at these locations.

Figure 4.14 below shows the number of vehicles violating red lights at each of the sites. Borough High Street (a control site), showed a noticeably higher proportion of red light violation than any of the other sites. This could be due to site-specific factors such as:

- The junction is relatively small in size which enables vehicles to cross the junction quickly and easily (particularly bicycles).
- The heavy traffic in the area might cause vehicles to 'back-up' to the junction which may mean some vehicles creep over the line when on red as they join/proceed in the queue.

For all other sites monitored, the total number of vehicles violating ranges from 2 to 22 in number.

**Figure 4.14 Red light violation for each site (all vehicle types) based on 1 in 5 traffic light cycles**

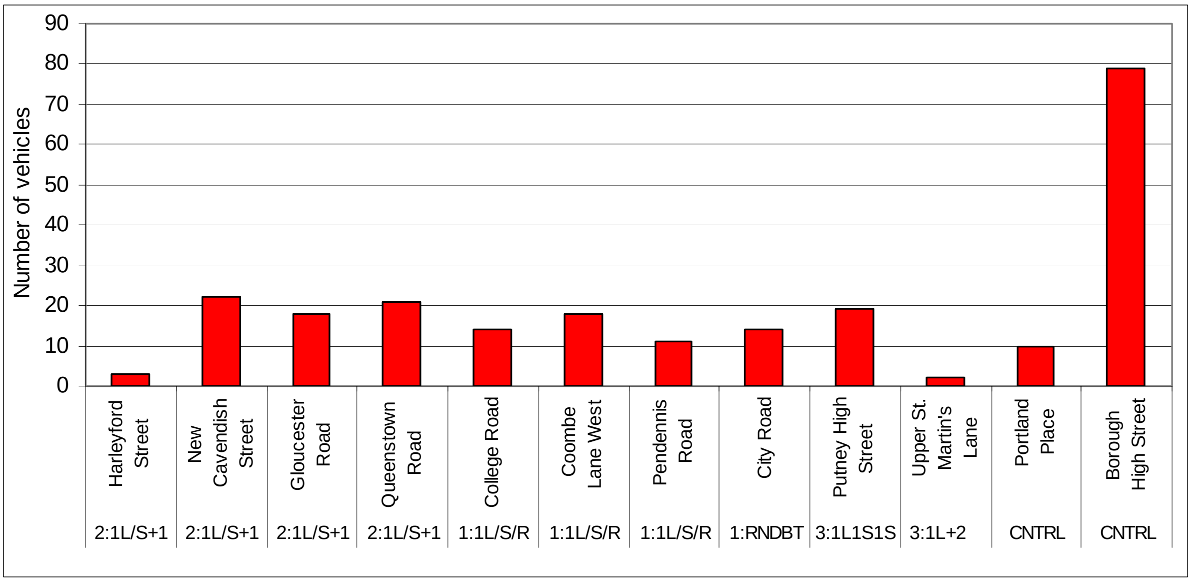



Table 4.14 supports the data shown in Figure 4.14 and illustrates the level of red light running by vehicles (for every fifth traffic light phase for one day) by the number of traffic light phases monitored. It shows the average number of red light violations per traffic light phase ranged from 0.02 to 0.65. There appears to be no correlation between the level of red light running and the lane layout.

**Table 4.14 Number of red light violations per traffic light phase**

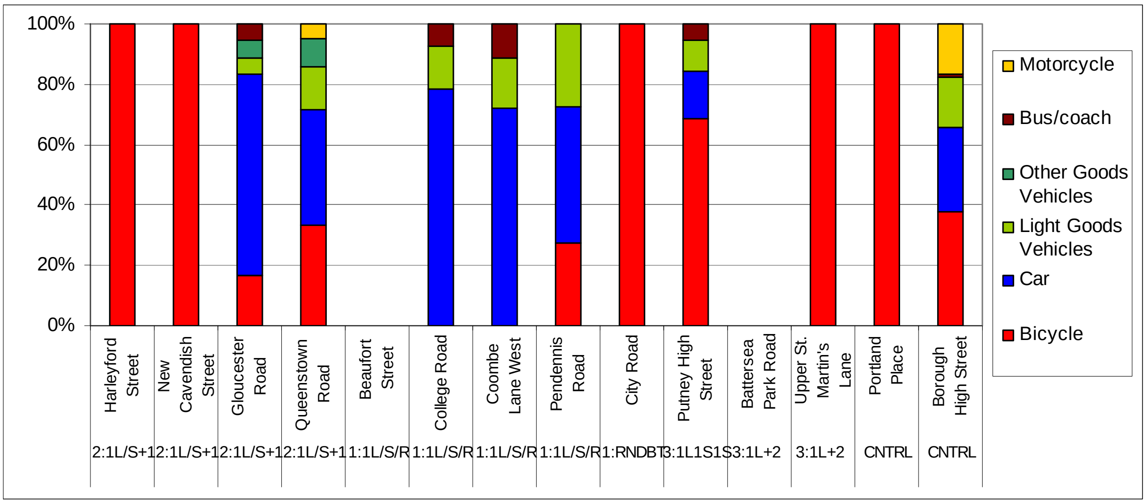
| Layout category | Site | Total number of vehicles observed violating red light | Number of traffic light phases observed | Average number of violations per phase |
|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 3 | 94 | 0.03 |
| 2:1L/S+1 | New Cavendish Street | 22 | 86 | 0.26 |
| 2:1L/S+1 | Gloucester Road | 18 | 163 | 0.11 |
| 2:1L/S+1 | Queenstown Road | 21 | 88 | 0.24 |
| 1:1L/S/R | College Road | 14 | 99 | 0.14 |
| 1:1L/S/R | Coombe Lane West | 18 | 163 | 0.11 |
| 1:1L/S/R | Pendennis Road | 11 | 88 | 0.13 |
| 1:RNDBT | City Road | 14 | 109 | 0.13 |
| 3:1L1S1S | Putney High Street | 19 | 90 | 0.21 |
| 3:1L+2 | Upper St. Martin's Lane | 2 | 108 | 0.02 |
| TOTAL ASL | | 14 | 109 | 0.14 |
| CNTRL | Portland Place | 10 | 95 | 0.11 |
| CNTRL | Borough High Street | 79 | 121 | 0.65 |
| TOTAL CNTRL | | 45 | 108 | 0.38 |

Various types of vehicle were responsible for red light violations for every fifth phase and the type of offending vehicle varied between the sites (see Figure 4.15). It should be noted that this was a monitoring of the types and numbers of vehicles that violated for every fifth phase, and therefore the numbers presented here will differ from the earlier analysis of red light violation for all cyclists and phases.

Across the ASL sites generally, the main violation offenders were cars, (including taxis) (34%) and bicycles (51%). Cyclists essentially have more opportunity to violate as more can proceed through the junction at any one time. The high percentage of red light violations by cyclists may partially be a result of the composition of traffic. At Harleyford Street, New Cavendish Street, Upper St. Martin’s Street, City Road and Portland Place, all of the red light violations recorded were committed by cyclists. In contrast, at Gloucester Road[1], College Road and Coombe Lane West, cars were responsible for the majority of red light violations. There are no clear systematic differences between these sites. At Borough High Street, motorcycles accounted for 17% of red light violations, whilst at Pendennis Road 27% of all violations were by light goods vehicles. With the exception of layout 1:1L/S/R sites, all of the site layouts showed cyclists as the main violators of red lights.

[1] Gloucester Road has a red light enforcement camera

## Figure 4.15 Percentage of red light violations by vehicle type for each site




Note: This data is taken from every one in five traffic light phases. No data was available for Beaufort Street and Battersea Park Road because the traffic light was not in the camera view

Table 4.15 below supports Figure 4.15 by showing the actual number of vehicles violating the red lights at each of the sites based on the sample of red phases.

### Table 4.15 Red light violation by vehicle type for each site (Percentages refer to each site of all violating vehicles)

| Category | Site | Bicycle | | Car | | Light Goods Vehicles | | Other Goods Vehicles | | Bus/coach | | Motorcycle | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. |
| 2:1L/S+1 | Harleyford Street | 3 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 2:1L/S+1 | New Cavendish Street | 22 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| 2:1L/S+1 | Gloucester Road | 3 | 16.7 | 12 | 66.7 | 1 | 5.6 | 1 | 5.6 | 1 | 5.6 | 0 | 0 | 18 |
| 2:1L/S+1 | Queenstown Road | 7 | 33.3 | 8 | 38.1 | 3 | 14.3 | 2 | 9.5 | 0 | 0 | 1 | 4.8 | 21 |
| 1:1L/S/R | College Road | 0 | 0 | 11 | 78.6 | 2 | 14.3 | 0 | 0 | 1 | 7.1 | 0 | 0 | 14 |
| 1:1L/S/R | Coombe Lane West | 0 | 0 | 13 | 72.2 | 3 | 16.7 | 0 | 0 | 2 | 11.1 | 0 | 0 | 18 |
| 1:1L/S/R | Pendennis Road | 3 | 27.3 | 5 | 45.5 | 3 | 27.3 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| 1:RNDBT | City Road | 14 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 3:1L1S1S | Putney High Street | 13 | 68.4 | 3 | 15.8 | 2 | 10.5 | 0 | 0 | 1 | 5.3 | 0 | 0 | 19 |
| 3:1L+2 | Upper St. Martin's Lane | 13 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| TOTAL ASL | | 78 | 51.0 | 52 | 34.0 | 14 | 9.2 | 3 | 2.0 | 5 | 3.3 | 1 | 0.7 | 153 |
| CNTRL | Portland Place | 10 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| CNTRL | Borough High Street | 30 | 38 | 22 | 27.8 | 13 | 16.5 | 0 | 0 | 1 | 1.3 | 13 | 16.5 | 79 |
| TOTAL CNTRL | | 40 | 44.9 | 22 | 24.7 | 13 | 14.6 | 0 | 0.0 | 1 | 1.1 | 13 | 14.6 | 89 |
| OVERALL TOTAL | | 118 | | 74 | | 27 | | 3 | | 6 | | 14 | | 242 |

NOTE: This data is taken from every one in five traffic light phases

**Red Light Violation Summary:**

- Red light violation by cyclists is apparent across all sites, with an average of 18% of cyclists violating overall (17% at ASL sites and 13% at Control sites).
- Red light violation by cyclists did not vary a great deal between peak and off-peak periods (45% of cyclist that violated did so at off-peak hours compared with 55% during peak hours).
- The majority of cyclists violating red lights were adult males contributing almost 80% of all cycle violations. 20% of male cyclists violated red lights, compared with 12% of female cyclists.
- 25% of cyclists across all ASL sites traversed the junction on an amber signal.
- The majority of study sites showed cyclists as the main offenders of red lights. However, at all four 1:1L/S/R sites, cars were found to be the main red light violators.
- Across all of the sites, the amount of red light running that was observed for all vehicle types varied widely. The average number of red light violations per traffic light phase ranged from 0.02 to 0.65 across the sites.
- It has not been conclusively proven that the provision of ASLs encouraged or discouraged red light violation (by all vehicles including cyclists), although 4% more cyclists were seen to violate at ASL sites compared with control sites.
- Red light violation by all vehicles is comparatively high at Borough High Street (a control site) for which there are possible site-specific explanations. Further site analysis and attitudinal survey work would need to be carried out to explain this finding.

#### *4.2.4 Level of Vehicle Encroachment [2] in relation to numbers of cyclists*

This section examines the level of vehicle encroachment on to the Advanced Stop Line reservoir in relation to *each* cyclist when the traffic lights are red. Table 4.16 shows there was a higher level of encroachment on to the ASL (by all types of vehicle ranging from buses to motorcycles) at New Cavendish Street (425 vehicles) compared to the other sites. A possible reason for this might be the fact that it is a one-way street and that the arm has a more limited visibility splay with motorised vehicles set back from the junction prompting motorists to encroach the ASL in order to secure better visibility.

City Road had a great deal of encroachment even though there was only one entry lane. This might have been caused by the fact that it is adjoining a roundabout and vehicles are seeking to join it as if it is an unsignalised roundabout. There were much lower levels of encroachment at Gloucester Road, College Road, Coombe Lane West and Pendennis Road. Generally, there was a tendency for sites with fewer entry lanes to display lower levels of encroachment, perhaps because there are fewer opportunities to encroach.

[2] See Appendix A for the definition of encroachment

The far right column in Table 4.16 indicates the ratio of encroaching vehicles (of all types) to cyclists counted. This shows that Beaufort Street, Pendennis Road and Battersea Park Road are highest with a proportion of cyclists experiencing encroachment relative to vehicle flow of over 40% (i.e. for each cyclist observed, on average 0.4 vehicles encroached). The two former sites are both one lane approaches whilst the latter has three lanes. Sites with the lowest proportions of vehicle encroachment had a range of layouts. This suggests there can be a general problem of encroachment at all layout types studied.

In total, 36% of all cyclists studied were exposed to some level of encroachment on the ASL across all ASL sites.

**Table 4.16 Level of vehicle encroachment (for all vehicle types) for each ASL site**

| Category | Site | Total number of cyclists | Total number of vehicles encroaching at least 1 cyclist | Approximate* proportion of cyclists experiencing encroachment relative to vehicle flow |
|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 457 | 178 | 39% |
| 2:1L/S+1 | New Cavendish Street | 1166 | 425 | 36% |
| 2:1L/S+1 | Gloucester Road | 200 | 47 | 24% |
| 2:1L/S+1 | Queenstown Road | 635 | 244 | 38% |
| 1:1L/S/R | Beaufort Street | 414 | 204 | 49% |
| 1:1L/S/R | College Road | 157 | 54 | 34% |
| 1:1L/S/R | Coombe Lane West | 154 | 36 | 23% |
| 1:1L/S/R | Pendennis Road | 87 | 36 | 41% |
| 1:RNDBT | City Road | 584 | 228 | 39% |
| 3:1L1S1S | Putney High Street | 400 | 101 | 25% |
| 3:1L+2 | Battersea Park Road | 460 | 196 | 43% |
| 3:1L+2 | Upper St. Martin's Lane | 400 | 87 | 22% |
| TOTAL | | 5114 | 1836 | 36% |

* This figure is approximate because some vehicles encroached more than one cyclist and some cyclists were encroached by more than on vehicle. These data includes information on all cyclists

Table 4.17 below shows the ratio of vehicle encroachment either onto the ASL reservoir, or over the second stop line at the ASL sites. This table indicates that the average number of vehicles encroaching per traffic light phase (of every fifth phase) ranged from 0.29 to 4.94. Across all the ASL sites, an average of 1.41 vehicles encroached upon the ASL reservoir per phase.

**Table 4.17 Number of vehicles encroaching when cyclists present (for all vehicle types) by number of traffic light phases**

| Category | Site | Total number of vehicles observed encroaching | Number of traffic light phases observed | Average number of encroaching vehicles per phase |
|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 178 | 94 | 1.89 |
| 2:1L/S+1 | New Cavendish Street | 425 | 86 | 4.94 |
| 2:1L/S+1 | Gloucester Road | 47 | 163 | 0.29 |
| 2:1L/S+1 | Queenstown Road | 244 | 88 | 2.77 |
| 1:1L/S/R | Beaufort Street | 204 | 99 | 2.06 |
| 1:1L/S/R | College Road | 54 | 163 | 0.33 |
| 1:1L/S/R | Coombe Lane West | 36 | 88 | 0.41 |
| 1:1L/S/R | Pendennis Road | 36 | 109 | 0.33 |
| 1:RNDBT | City Road | 228 | 90 | 2.53 |
| 3:1L1S1S | Putney High Street | 101 | 108 | 0.94 |
| 3:1L+2 | Battersea Park Road | 196 | 95 | 2.06 |
| 3:1L+2 | Upper St. Martin's Lane | 87 | 121 | 0.72 |
| TOTAL ASL | | 1836 | 1304 | 1.41 |

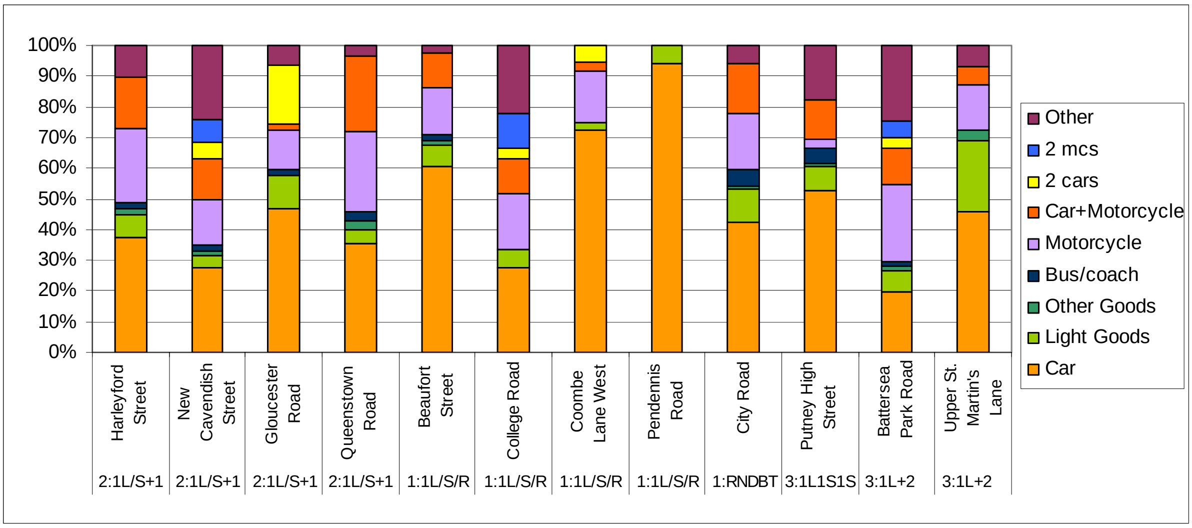
For all vehicle types, the level of vehicle encroachment was found to be higher in the peak compared with the off peak except for Upper St. Martin’s Lane, Putney High Street and City Road. The proportionally greater peak encroachment indicates that drivers might be more willing to encroach due to higher traffic flows and greater time pressure. However, this is speculative and would require further research to define the potential reasons behind the results shown.

As Figure 4.16 shows, most of the sites had a mix of vehicle types encroaching on to the ASL. The potential number of combinations of encroaching vehicles is high; therefore, in order to present this data in a graphical form, the encroachment by vehicles that occurred when a cyclist was present was collected as follows: Firstly, analysis of all vehicle types were included in the analysis, followed by any combinations of vehicle types encroaching at the same time, *which occurred on more than ten occasions* e.g. two cars. Therefore, the ‘other’ label on the graph denotes which sites tended to have combinations of vehicle types encroaching on to the ASL *which occurred ten times or less* across the day. Therefore, the ‘other’ is likely to be a higher number of different types of vehicle encroaching on the ASL when a cyclist is present.

College Road, New Cavendish Street and Battersea Park had comparatively high proportions of combinations of vehicle types encroaching on the ASL at the same time. New Cavendish Street shows the highest average number of vehicles encroaching due to the presence of a high number of powered-two wheelers. These three sites also display the most varied range of vehicle type encroachment. Two of the category 1:1L/S/R layouts – Pendennis Road and Coombe Lane West – had a higher level of encroachment by cars. Harleyford Street, Queenstown Road and Battersea Park Road tended to have more motorcycles encroaching and Upper St. Martin’s Lane shows a higher proportion of Light Goods Vehicles. It should be noted that a two-wheeled vehicle will take up less of the ASL than a four-wheeled vehicle but may still discourage a cyclist from using it.

The low level of traffic information received for each of the sites means that the level of vehicle encroachment cannot be compared with the traffic flows for each type of vehicle.

**Figure 4.16 Level of vehicle encroachment by vehicle type for each site**




The level of vehicle encroachment was generally greater during peak hours (but not exclusively at all sites) as described by Table 4.18 below:

**Table 4.18 Level of vehicle encroachment per cyclist by peak and off peak hours**

| Category | Site | Off peak | Peak | Total |
|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 41 (23%) | 137 (77%) | 178 |
| 2:1L/S+1 | New Cavendish Street | 152 (36%) | 273 (64%) | 425 |
| 2:1L/S+1 | Gloucester Road | 13 (28%) | 34 (72%) | 47 |
| 2:1L/S+1 | Queenstown Road | 67 (27%) | 177 (73%) | 244 |
| 1:1L/S/R | Beaufort Street | 71 (35%) | 133 (65%) | 204 |
| 1:1L/S/R | College Road | 14 (26%) | 40 (74%) | 54 |
| 1:1L/S/R | Coombe Lane West | 13 (36%) | 23 (64%) | 36 |
| 1:1L/S/R | Pendennis Road | 6 (17%) | 30 (83%) | 36 |
| 1:RNDBT | City Road | 118 (52%) | 110 (48%) | 228 |
| 3:1L1S1S | Putney High Street | 67 (66%) | 34 (34%) | 101 |
| 3:1L+2 | Battersea Park Road | 54 (28%) | 142 (72%) | 196 |
| 3:1L+2 | Upper St. Martin's Lane | 60 (69%) | 27 (31%) | 87 |

### *4.2.5 Vehicle Encroachment on the ASL reservoir*

This section examines the level of vehicle encroachment, monitored as a separate exercise, for one of the two days of footage for each site at every fifth phase of the traffic light sequence. The purpose of this additional approach was to examine the severity and amount of encroachment for a sample of traffic light phases without considering the potential impact caused from the presence of cyclists. The level of encroachment was recorded as being:

- vehicle encroached a half or less into the ASL reservoir;
- vehicle encroached more than half into the reservoir; and

- vehicle over the second stop line after the ASL reservoir (but not committing a red light violation by crossing the junction, as defined in this study).

Table 4.19 provides an overview of the results for ASL and control sites by vehicle type. The column which details the 'site average stopping over the stop line' shows the average number (for all of the sites) of each type of vehicle to stop over the second stop line of both ASL and control sites. On average, less vehicles stopped beyond the final stop line at the ASL sites compared with the control sites. 13% of vehicles crossed final stop lines at the ASL sites compared with 26% at the control sites.

**Table 4.19 Level of vehicle encroachment by vehicle type for ASL and control sites**

| Type of site | Vehicle Type | 1/2 or less | | More than 1/2 | | Over stop line * | | Site average over stop line | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | No. | % of total | No. | % of total | No. | % of total | | |
| ASL sites | Car | 497 | 68.2 | 175 | 24.0 | 57 | 7.8 | 4.8 | 729 |
| | Light Goods Vehicle | 88 | 69.8 | 32 | 25.4 | 6 | 4.8 | 0.5 | 126 |
| | Other Goods Vehicle | 30 | 62.5 | 12 | 25.0 | 6 | 12.5 | 0.5 | 48 |
| | Bus/Coach | 9 | 34.6 | 17 | 65.4 | 0 | 0.0 | 0.0 | 26 |
| | Motorcycle | 49 | 12.5 | 251 | 64.0 | 92 | 23.5 | 7.7 | 392 |
| | TOTAL | 673 | 50.9 | 487 | 36.9 | 161 | 12.2 | 13.4 | 1321 |
| Control sites | Car | | | | | 9 | 100.0 | 4.5 | 9 |
| | Light Goods Vehicle | | | | | 1 | 100.0 | 0.5 | 1 |
| | Other Goods Vehicle | | | | | 4 | 100.0 | 2.0 | 4 |
| | Bus/Coach | | | | | 37 | 100.0 | 18.5 | 37 |
| | Motorcycle | | | | | 0 | 100.0 | 0.0 | 0 |
| | TOTAL | | | | | 51 | 100.0 | 25.5 | 51 |

* At ASL sites, this refers to the second stop line at the front of the ASL reservoir

Note: These data are taken from every one in five traffic light phases

Table 4.19 shows that irrespective of the overall level of encroachment, cars (including taxis) and motorcycles were found to encroach the most at ASL sites. At two of the sites, more motorcycles than cars were found to encroach on the ASL, which could be explained by a higher proportion of motorcycles within the traffic flow. Few buses and coaches were found to encroach on to the ASL reservoir but this may reflect the low flows of these types of vehicle using the junction. The table shows that at the ASL sites the frequency of encroachment generally decreases as the degree of encroachment on to the reservoir increases. Encroachment by cars (including taxis) was high compared to other vehicle types (55% of all vehicle types for all levels of encroachment).

Of particular significance, more vehicles were found to stop in the pedestrian crossing (i.e. over the stop line) on average at the control sites compared with sites with an ASL. Therefore, it seems that an ASL can provide a buffer zone that discourages vehicles from blocking the pedestrian crossing.

The analysis also considered the level of encroachment by each vehicle type. Table 4.20 shows the level of encroachment upon the ASL reservoir at each site, from a sample of each fifth traffic light phase observed. The table includes the total number of traffic light phases.

Car encroachment on the ASL reservoir was found to be comparatively high at Pendennis Road, Coombe Lane West and Gloucester Road. The level of encroachment by cars does not appear to be related to the number of vehicle lanes present at a given site.

The two sites with a distinctly coloured ASL reservoir (Beaufort Street and College Road) did have a lower level of encroachment by cars than sites without colour differentiation but it was not of a high order. In the absence of total vehicle flow data, no conclusive comparative figures have been produced. Therefore, it cannot be determined whether the use of colour in the ASL reservoir has an effect on the level of encroachment.

A separate study of driver attitudes would be necessary to determine whether driver encroachment is a matter of not noticing the ASL, not understanding the ASL, or choosing to violate it, and therefore whether coloured surfacing may increase compliance.

Encroachment of the ASL by light goods vehicles was particularly noticeable at Upper St. Martin's Lane, Queenstown Road and Harleyford Street although the highest value of the three sites was only 23 vehicles in total from every fifth traffic light phase (which was 16% of all vehicles found to encroach at that site). Interestingly, apart from Upper St. Martin's Lane, these are not the sites at which car encroachment was highest. There were 7 light goods vehicles found to fully encroach onto the ASL at the City Road site (10% of all vehicles which fully encroached at this site). Only three ASL sites had a small number of encroachments over the second stop line.

Levels of encroachment by other goods vehicles were low with only one site recording more than 10% of vehicles encroaching at a site. Levels of ASL encroachment by other goods vehicles were highest at Battersea Park Road compared with other ASL sites. This could be explained by the importance/use of the road (A3205) for these types of vehicles and the high number of lanes with possibly higher traffic flows. The lack of traffic flow data prevents further examination of this.

In contrast to the encroachment by other vehicles, the majority of buses/coaches that did encroach tended to fully encroach upon the ASL. However, figures are low with a maximum of five vehicles encroaching at one of the sites from the phases sampled (City Road). Overall, few buses/coaches were found to encroach on the reservoir (2% of all vehicle types).

The majority of motorcycles that did encroach onto the ASL reservoir were found to encroach fully – this was the scenario at all of the ASL sites. 88% were found to encroach more than half or position themselves over the stop line.

In general (and in relation to vehicle flow numbers), encroachment by motorcycles was prevalent, and at two sites (College Road and Battersea Park Road) motorcycle encroachment was greater than encroachment by cars. Encroachment was a particular issue at New Cavendish Street and City Road. Overall, of all vehicle encroachment across the ASL sites, motorcycles were responsible for 30% of encroachment. By virtue of their size, more motorcycles than cars are able to encroach in any given signal cycle.

## Table 4.20 Level of ASL reservoir vehicle encroachment by vehicle type for each site (for one day)

| Category | Site | Vehicle Type | 1/2 or less | More than 1/2 | Over stop line | Total vehicles encroaching | % of total for each site | Number of Traffic Light Phases |
|---|---|---|---|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | Car | 52 | 14 | 1 | 67 | 59.8 | 94 |
| | | Light Goods Vehicle | 10 | 4 | 0 | 14 | 12.5 | |
| | | Other Goods Vehicle | 3 | 3 | 0 | 6 | 5.4 | |
| | | Bus/Coach | 1 | 2 | 0 | 3 | 2.7 | |
| | | Motorcycle | 0 | 19 | 3 | 22 | 19.6 | |
| | TOTAL | | 66 | 42 | 4 | 112 | | |
| 2:1L/S+1 | New Cavendish Street | Car | 27 | 18 | 2 | 47 | 37.6 | 86 |
| | | Light Goods Vehicle | 5 | 1 | 0 | 6 | 4.8 | |
| | | Other Goods Vehicle | 2 | 0 | 0 | 2 | 1.6 | |
| | | Bus/coach | 0 | 2 | 0 | 2 | 1.6 | |
| | | Motorcycle | 11 | 47 | 10 | 68 | 54.4 | |
| | TOTAL | | 45 | 68 | 12 | 125 | | |
| 2:1L/S+1 | Gloucester Road | Car | 48 | 8 | 10 | 66 | 79.5 | 163 |
| | | Light Goods Vehicle | 8 | 0 | 0 | 8 | 9.6 | |
| | | Other Goods Vehicle | 2 | 0 | 0 | 2 | 2.4 | |
| | | Bus/coach | 1 | 3 | 0 | 4 | 4.8 | |
| | | Motorcycle | 0 | 2 | 1 | 3 | 3.6 | |
| | TOTAL | | 59 | 13 | 11 | 83 | | |
| 2:1L/S+1 | Queenstown Road | Car | 37 | 16 | 3 | 56 | 47.9 | 88 |
| | | Light Goods Vehicle | 13 | 2 | 0 | 15 | 12.8 | |
| | | Other Goods Vehicle | 1 | 0 | 0 | 1 | 0.9 | |
| | | Bus/coach | 1 | 2 | 0 | 3 | 2.6 | |
| | | Motorcycle | 5 | 24 | 13 | 42 | 35.9 | |
| | TOTAL | | 57 | 44 | 16 | 117 | | |
| 1:1L/S/R | Beaufort Street | Car | 24 | 11 | 8 | 43 | 49.4 | 99 |
| | | Light Goods Vehicle | 4 | 5 | 1 | 10 | 11.5 | |
| | | Other Goods Vehicle | 2 | 2 | 2 | 6 | 6.9 | |
| | | Bus/coach | 0 | 2 | 0 | 2 | 2.3 | |
| | | Motorcycle | 1 | 9 | 16 | 26 | 29.9 | |
| | TOTAL | | 31 | 29 | 27 | 87 | | |
| 1:1L/S/R | College Road | Car | 27 | 17 | 6 | 50 | 55.6 | 163 |
| | | Light Goods Vehicle | 3 | 4 | 0 | 7 | 7.8 | |
| | | Other Goods Vehicle | 0 | 1 | 0 | 1 | 1.1 | |
| | | Bus/coach | 1 | 0 | 0 | 1 | 1.1 | |
| | | Motorcycle | 3 | 26 | 2 | 31 | 34.4 | |
| | TOTAL | | 34 | 48 | 8 | 90 | | |
| 1:1L/S/R | Coombe Lane West | Car | 38 | 24 | 14 | 76 | 80.0 | 88 |
| | | Light Goods Vehicle | 3 | 2 | 3 | 8 | 8.4 | |
| | | Other Goods Vehicle | 1 | 2 | 2 | 5 | 5.3 | |
| | | Bus/coach | 0 | 0 | 0 | 0 | 0.0 | |
| | | Motorcycle | 0 | 4 | 2 | 6 | 6.3 | |
| | TOTAL | | 42 | 32 | 21 | 95 | | |
| 1:1L/S/R | Pendennis Road | Car | 31 | 19 | 6 | 56 | 91.8 | 109 |
| | | Light Goods Vehicle | 2 | 1 | 0 | 3 | 4.9 | |
| | | Other Goods Vehicle | 0 | 0 | 0 | 0 | 0.0 | |
| | | Bus/coach | 0 | 0 | 0 | 0 | 0.0 | |
| | | Motorcycle | 1 | 1 | 0 | 2 | 3.3 | |
| | TOTAL | | 34 | 21 | 6 | 61 | | |
| 1:RNDBT | City Road | Car | 32 | 20 | 2 | 54 | 40.3 | 90 |
| | | Light Goods Vehicle | 4 | 7 | 0 | 11 | 8.2 | |
| | | Other Goods Vehicle | 3 | 0 | 0 | 3 | 2.2 | |
| | | Bus/coach | 2 | 3 | 0 | 5 | 3.7 | |
| | | Motorcycle | 3 | 42 | 16 | 61 | 45.5 | |
| | TOTAL | | 44 | 72 | 18 | 134 | | |
| 3:1L1S1S | Putney High Street | Car | 52 | 5 | 3 | 60 | 47.2 | 108 |
| | | Light Goods Vehicle | 7 | 3 | 0 | 10 | 7.9 | |
| | | Other Goods Vehicle | 2 | 1 | 0 | 3 | 2.4 | |
| | | Bus/coach | 1 | 1 | 0 | 2 | 1.6 | |
| | | Motorcycle | 1 | 41 | 10 | 52 | 40.9 | |
| | TOTAL | | 63 | 51 | 13 | 127 | | |
| 3:1L+2 | Battersea Park Road | Car | 67 | 5 | 1 | 73 | 51.4 | 95 |
| | | Light Goods Vehicle | 9 | 0 | 2 | 11 | 7.7 | |
| | | Other Goods Vehicle | 10 | 3 | 2 | 15 | 10.6 | |
| | | Bus/coach | 1 | 2 | 0 | 3 | 2.1 | |
| | | Motorcycle | 14 | 15 | 11 | 40 | 28.2 | |
| | TOTAL | | 101 | 25 | 16 | 142 | | |
| 3:1L+2 | Upper St. Martin's Lane | Car | 62 | 18 | 1 | 81 | 54.7 | 121 |
| | | Light Goods Vehicle | 20 | 3 | 0 | 23 | 15.5 | |
| | | Other Goods Vehicle | 4 | 0 | 0 | 4 | 2.7 | |
| | | Bus/coach | 1 | 0 | 0 | 1 | 0.7 | |
| | | Motorcycle | 10 | 21 | 8 | 39 | 26.4 | |
| | TOTAL | | 97 | 42 | 9 | 148 | | |
| | TOTAL ALL SITES | | 673 | 487 | 161 | 1321 | | |

Note: These data are taken from every one in five traffic light phases

#### 4.2.6 Vehicle Encroachment [3] on the ASL Feeder Lane

Encroachment upon the feeder lane was analysed in the same way as encroachment upon the ASL reservoir with a sample of every fifth traffic light phase observed for one day at each site. Feeder lane encroachment varied widely from site to site as Table 4.21 shows. Three of the sites with Advanced Stop Lines did not have feeder lanes, these are; Harleyford Street, Queenstown Road and Coombe Lane West. Most encroachment onto the feeder lane was partial although some full encroachment was observed. Table 4.21 includes the total number of traffic light phases.

The table shows that feeder lane encroachment by cars was relatively low across the sites. In contrast, Gloucester Road showed a high level of feeder lane encroachment compared with other sites. This could be explained by the fact that the arm of the junction has two lanes and therefore motorised vehicles on the inside lane may move into the feeder lane to provide room for motorised vehicles in the other lane. Another reason could be that on approach to the junction there is a slight bend in the road which may cause drivers to cut into the feeder lane and block it. A third explanation might be that there is no advisory cycle route on Gloucester Road. This may mean that drivers are less aware of cycling facilities generally and less likely to adopt the right behaviour at junctions with ASLs. In addition, the feeder lane is not distinguished by colour. Two of the sites with distinctly coloured feeder lanes, Beaufort Street and College Road, showed the two lowest levels of encroachment which indicates that identifying the feeder in this way may lessen encroachment.

In addition, research found that generally, there was more encroachment during peak hours than during the off-peak.

Overall, there are fewer vehicles of all types encroaching upon the feeder lane compared with encroachment on the Advanced Stop Line reservoir. A review of the estimated feeder lane widths and the level of encroachment on to the feeder lane found no relationship between the two factors.

Focussing specifically upon feeder lane encroachment by cars, encroachment was highest at the layout types 3:1L1S1S, 2:1L/S+1 and 3:1L+2. In the case of layouts 1:1L/S/R and 1:RNDBT, both only have one lane which may provide more road space for the motorised vehicle and mean they are less likely to encroach. It is possible that the presence of two or more lanes caused the kerbside lane of traffic to move further towards the kerb so as to distance themselves from the other traffic lane, yet at the same time blocking the feeder lane. It could also be the case that the feeder lane and traffic lanes are more likely to be of a reduced or narrower width when more lanes are present. Further work would need to be conducted in order to fully evaluate any relationship between encroachment upon the ASL reservoir and feeder lane and the width of the traffic lanes and feeder lane.

[3] See Appendix A for the definition of encroachment

## Table 4.21 Level of feeder lane vehicle encroachment by vehicle type for each site (for one day)

| Category | Site | Vehicle Type | 1/2 or less | More than 1/2 | Total vehicles encroaching | % of total for each site | Number of Traffic Light Phases |
|---|---|---|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | Car | | | | | 94 |
| | | Light Goods Vehicle | | | | | |
| | | Other Goods Vehicle | | | | | |
| | | Bus/Coach | | | | | |
| | | Motorcycle | | | | | |
| 2:1L/S+1 | New Cavendish Street | Car | 1 | 1 | 2 | 9.1 | 86 |
| | | Light Goods Vehicle | 5 | 7 | 12 | 54.5 | |
| | | Other Goods Vehicle | 0 | 0 | 0 | 0.0 | |
| | | Bus/Coach | 5 | 0 | 5 | 22.7 | |
| | | Motorcycle | 0 | 3 | 3 | 13.6 | |
| | | TOTAL | | | 22 | | |
| 2:1L/S+1 | Gloucester Road | Car | 54 | 12 | 66 | 66.0 | 163 |
| | | Light Goods Vehicle | 19 | 1 | 20 | 20.0 | |
| | | Other Goods Vehicle | 0 | 2 | 2 | 2.0 | |
| | | Bus/Coach | 10 | 2 | 12 | 12.0 | |
| | | Motorcycle | 0 | 0 | 0 | 0.0 | |
| | | TOTAL | | | 100 | | |
| 2:1L/S+1 | Queenstown Road | Car | | | | | 88 |
| | | Light Goods Vehicle | | | | | |
| | | Other Goods Vehicle | | | | | |
| | | Bus/Coach | | | | | |
| | | Motorcycle | | | | | |
| 1:1L/S/R | Beaufort Street | Car | 0 | 0 | 0 | 0.0 | 99 |
| | | Light Goods Vehicle | 0 | 10 | 10 | 100.0 | |
| | | Other Goods Vehicle | 0 | 0 | 0 | 0.0 | |
| | | Bus/Coach | 0 | 0 | 0 | 0.0 | |
| | | Motorcycle | 0 | 0 | 0 | 0.0 | |
| | | TOTAL | | | 10 | | |
| 1:1L/S/R | College Road | Car | 8 | 1 | 9 | 69.2 | 163 |
| | | Light Goods Vehicle | 2 | 0 | 2 | 15.4 | |
| | | Other Goods Vehicle | 0 | 1 | 1 | 7.7 | |
| | | Bus/Coach | 1 | 0 | 1 | 7.7 | |
| | | Motorcycle | 0 | 0 | 0 | 0.0 | |
| | | TOTAL | | | 13 | | |
| 1:1L/S/R | Coombe Lane West | Car | | | | | 88 |
| | | Light Goods Vehicle | | | | | |
| | | Other Goods Vehicle | | | | | |
| | | Bus/Coach | | | | | |
| | | Motorcycle | | | | | |
| 1:1L/S/R | Pendennis Road | Car | 10 | 3 | 13 | 100.0 | 109 |
| | | Light Goods Vehicle | 0 | 0 | 0 | 0.0 | |
| | | Other Goods Vehicle | 0 | 0 | 0 | 0.0 | |
| | | Bus/Coach | 0 | 0 | 0 | 0.0 | |
| | | Motorcycle | 0 | 0 | 0 | 0.0 | |
| | | TOTAL | | | 13 | | |
| 1:RNDBT | City Road | Car | 10 | 7 | 17 | 68.0 | 90 |
| | | Light Goods Vehicle | 1 | 2 | 3 | 12.0 | |
| | | Other Goods Vehicle | 0 | 0 | 0 | 0.0 | |
| | | Bus/Coach | 1 | 0 | 1 | 4.0 | |
| | | Motorcycle | 0 | 4 | 4 | 16.0 | |
| | | TOTAL | | | 25 | | |
| 3:1L1S1S | Putney High Street | Car | 29 | 5 | 34 | 65.4 | 108 |
| | | Light Goods Vehicle | 11 | 2 | 13 | 25.0 | |
| | | Other Goods Vehicle | 2 | 2 | 4 | 7.7 | |
| | | Bus/Coach | 0 | 0 | 0 | 0.0 | |
| | | Motorcycle | 0 | 1 | 1 | 1.9 | |
| | | TOTAL | | | 52 | | |
| 3:1L+2 | Battersea Park Road | Car | 7 | 6 | 13 | 37.1 | 95 |
| | | Light Goods Vehicle | 5 | 1 | 6 | 17.1 | |
| | | Other Goods Vehicle | 6 | 2 | 8 | 22.9 | |
| | | Bus/Coach | 1 | 2 | 3 | 8.6 | |
| | | Motorcycle | 2 | 3 | 5 | 14.3 | |
| | | TOTAL | | | 35 | | |
| 3:1L+2 | Upper St. Martin's Lane | Car | 24 | 11 | 35 | 64.8 | 121 |
| | | Light Goods Vehicle | 9 | 2 | 11 | 20.4 | |
| | | Other Goods Vehicle | 4 | 2 | 6 | 11.1 | |
| | | Bus/Coach | 0 | 0 | 0 | 0.0 | |
| | | Motorcycle | 2 | 0 | 2 | 3.7 | |
| | | TOTAL | | | 54 | | |
| | | **TOTAL ALL SITES** | **229** | **95** | **324** | | |

Note: These data are taken from every one in five traffic light phases

**Vehicle Encroachment Summary:**

**General findings:**

- There is encroachment independent of the layout type, although site specific factors may have affected the amount of encroachment.
- Fewer vehicles generally encroached upon the feeder lane compared with the Advanced Stop Line reservoir.

**Traffic components:**

- Encroachment by cars (including taxis) was high compared to other vehicle type (55% of all vehicle types for all levels of encroachment).
- Few buses/coaches were found to encroach on the reservoir (2% of all vehicle types).
- Motorcycle encroachment was prevalent across the sites as a whole (30% of all vehicle types).

**ASL Reservoir:**

- The level of vehicle encroachment on to the ASL reservoir by all vehicle types varied a great deal across the different ASL sites.
- More vehicles partly encroached than fully encroached the ASL reservoir and feeder lane.
- Overall, 36% of cyclists across the ASL sites experienced some level of encroachment on to the ASL.
- Across all the ASL sites, an average of 1.4 vehicles encroached upon the ASL reservoir per traffic light phase. This equates to 14 encroachments in every 10 phases (analysis was taken from every fifth traffic light phase for one day).
- On average, less vehicles stopped beyond the final stop line at the ASL sites compared with the control sites. 13% of vehicles crossed final stop lines at the ASL sites compared with 26% at the control sites.
- The majority of those motorcycles that did encroach on the ASL, were found to encroach more than half or position themselves over the stop line (88%).
- It cannot be conclusively proven whether the use of colour in an ASL reservoir reduces encroachment.

**Feeder lane:**

- Most feeder lane encroachment was partial, rather than fully encroaching.
- Generally, there was more encroachment during peak hours than during the off-peak.
- Feeder lane encroachment was lowest at sites with only one entry lane.
- Two of the sites with distinctly coloured feeder lanes had lower levels of encroachment suggesting that colour differentiation may reduce levels of encroachment. The use of colour in ASLs and feeder lanes may require further research.

### 4.2.7 *Vehicle Obstruction of the ASL feeder lane/reservoir*

This section presents data on obstruction of the ASL feeder lane or reservoir in which a cyclist was prevented from using the ASL at each of the sites. An obstruction is defined as an occurrence in which a cyclist is prevented from using the ASL facility due to blocking (feeder lane or ASL reservoir) by other vehicles (for further examination of the functioning of the ASL feeder lane in relation to blockages refer to Section 4.4.3). Obstruction differs from encroachment. Encroachment refers to a vehicle that has been placed/driven into the road area marked for cyclists; this may or may not cause obstruction to a cyclist. In comparison, obstruction is where a vehicle is in an area marked for cyclists and that vehicle is stopping the cyclist from moving freely. A vehicle does not have to be stopped to be classified as causing an obstruction. See Appendix A for a definition of obstruction and encroachment.

Table 4.22 below, shows vehicle obstruction was a particular issue at New Cavendish Street with a total of 98 vehicles causing an obstruction to cyclists (8% of all cyclists monitored at that site). The majority of these were motorcycles and it should be noted that this site also had the highest level of vehicle encroachment by motorcycles. Beaufort Street also had a notable level of obstruction by cars although encroachment here was comparably lower. Battersea Park Road and City Road also had some cases in which motorcycles obstructed bicycles at the junction. At Putney High Street, where there are three lanes and some colour differentiation in the ASL and feeder lane, only one obstruction was reported. There appeared to be no relationship between layout type and the amount of obstruction taking place.

The table also provides an indication of the level of obstruction caused to cyclists against the total cycle flow for each site. As shown, the proportion varies from less than one percent to 10%.

**Table 4.22 Number of cyclists obstructed by various types of vehicle at each site (over two days)**

| Category | Site | Car | Light Goods | Other Goods | Bus/coach | Motorcycle | Car+Motorbike | Other | Total | Total cycle flow (and proportion of cyclists obstructed) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 6 | 4 | 0 | 4 | 12 | 1 | 0 | 27 | (5.9%) 457 |
| 2:1L/S+1 | New Cavendish Street | 25 | 3 | 1 | 6 | 57 | 4 | 2 | 98 | (8.4%) 1166 |
| 2:1L/S+1 | Gloucester Road | 7 | 2 | 0 | 1 | 0 | 0 | 4 | 14 | (7.0%) 200 |
| 2:1L/S+1 | Queenstown Road | 5 | 3 | 1 | 0 | 0 | 0 | 3 | 12 | (1.9%) 635 |
| 1:1L/S/R | Beaufort Street | 23 | 3 | 1 | 3 | 1 | 3 | 0 | 34 | (8.2%) 414 |
| 1:1L/S/R | College Road | 4 | 1 | 0 | 0 | 4 | 0 | 0 | 9 | (5.7%) 157 |
| 1:1L/S/R | Coombe Lane West | 13 | 1 | 0 | 0 | 2 | 0 | 0 | 16 | (10.4%) 154 |
| 1:1L/S/R | Pendennis Road | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 7 | (8.0%) 87 |
| 1:RNDBT | City Road | 8 | 0 | 0 | 0 | 15 | 0 | 0 | 23 | (3.9%) 584 |
| 3:1L1S1S | Putney High Street | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | (0.25%) 400 |
| 3:1L+2 | Battersea Park Road | 11 | 0 | 1 | 3 | 21 | 0 | 2 | 38 | (8.3%) 460 |
| 3:1L+2 | Upper St. Martin's Lane | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | (0.5%) 400 |
| CNTRL | Portland Place* | | | | | | | | | |
| CNTRL | Borough High Street * | | | | | | | | | |

* Data was not collected at these sites as there was no ASL or feeder lane present

**Vehicle Obstruction Summary**

- The level of obstruction of cyclists varied considerably from site to site.
- The number of cyclists obstructed ranged from less than one percent to 10% per site.
- There appeared to be no relationship between the level of obstruction and site layout.

## 4.3 Safety at the ASL

This section examines the ASL sites in regard to safety, primarily analysing the conflicts observed at the ASL and control sites and the casualty record obtained for each of the sites monitored.

### *4.3.1 Conflicts involving cyclists*

Each of the sites were analysed for potential conflict situations over a period of two days[4]. The total number of conflicts and their degree of severity were measured in relation to each cyclist studied across the 14 sites. The aim was to find out whether there was an increased level of conflict involving cyclists at sites with an ASL, compared with those sites without an ASL. The research focussed on the safety of cyclists with regard to ASLs and therefore the analysis was limited to capturing conflict involving cyclists only. Potential conflicts were captured and categorised into five types:

**Potential conflict categories in relation to cyclists:**

| | |
|---|---|
| **1** | Precautionary or anticipatory braking or lane change when risk of collision is minimal. |
| **2** | Controlled braking or lane change to avoid collision (but with ample time for manoeuvre). |
| **3** | Rapid deceleration, lane change or stopping to avoid collision, resulting in a near miss situation. |
| **4** | Emergency braking or violent swerve to avoid collision resulting in a near miss situation. |
| **5** | Emergency action followed by collision. |

Types 1 and 2 were considered to be minor conflicts whereas types 3, 4 and 5 were defined to be serious conflicts. Table 4.23 below indicates the number of conflicts by severity for each of the sites analysed. It can be seen that conflict types vary across all ASL and control sites and there appears to be no pattern/trend for this variation across different site layouts.

[4] Except for three sites (Putney High Street, Upper St. Martin's Lane and Borough High Street) where, because of high numbers of cyclists, observations were capped once a sample of 400 had been obtained. 200 cyclists were analysed in the peak period (7am-10am) and 200 in the off-peak (10am-1pm).

**Table 4.23 Level of conflict by site (proportion involved in conflicts relates to all cyclists monitored)**

| Category | Site | Level of Conflict | Number of Conflicts | Total | Proportion of cyclists involved in conflicts (%) |
|---|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 1 | 1 | 1 | 0.2 |
| 2:1L/S+1 | New Cavendish Street | 1 | 3 | | |
| | | 2 | 4 | | |
| | | 3 | 2 | 9 | 0.8 |
| 2:1L/S+1 | Gloucester Road | 1 | 7 | | |
| | | 5 | 1 | 8 | 4 |
| 2:1L/S+1 | Queenstown Road | 1 | 12 | | |
| | | 2 | 2 | 14 | 2.2 |
| 1:1L/S/R | Beaufort Street | 1 | 7 | | |
| | | 2 | 3 | | |
| | | 3 | 2 | 12 | 2.9 |
| 1:1L/S/R | College Road | 1 | 1 | | |
| | | 2 | 1 | 2 | 1.3 |
| 1:1L/S/R | Coombe Lane West | 2 | 2 | 2 | 1.3 |
| 1:1L/S/R | Pendennis Road | 1 | 4 | | |
| | | 2 | 4 | 8 | 9.2 |
| 1:RNDBT | City Road | | 0 | 0 | 0 |
| 3:1L1S1S | Putney High Street | | 0 | 0 | 0 |
| 3:1L+2 | Battersea Park Road | 1 | 6 | | |
| | | 2 | 2 | 8 | 1.7 |
| 3:1L+2 | Upper St. Martin's Lane | 1 | 2 | 2 | 0.5 |
| CNTRL | Portland Place | | 0 | 0 | 0 |
| CNTRL | Borough High Street | 1 | 4 | | |
| | | 2 | 1 | | |
| | | 5 | 1 | 6 | 1.5 |
| **TOTAL** | | | | **72** | **1.2** |

In all, there were 72 conflicts of all types of severity involving cyclists which is 1.2% of all cyclists observed across the sites. The number of observed conflicts that occurred varied from 0 to 14 per site, with the highest number of conflicts at Queenstown Road. It should be noted that the number of cyclists monitored varied at each site. The following observations can be made:

- Only two of the sites, Gloucester Road and Borough High Street (a control site) had a *level 5* conflict (emergency action followed by collision).
- City Road, Putney High Street and Portland Place had no recognised potential conflicts of any form.
- Neither the 1:RNDBT category (City Road) or 3:1L1S1S category (Putney High Street) had any observed conflicts.
- 10 conflicts occurred at category 3:1L+2 sites (two sites) and 6 at the two sites with no ASL (CNTRL).
- 92% of the conflicts across all sites were of minor severity.

Table 4.24 shows the number of conflicts (of all severities) for all cyclists monitored, with the cyclist flows recorded for each of the sites. These show that there appears to be no direct correlation between the numbers of cyclists passing the junction and the number of conflicts witnessed during the two days of observation. On average, for all of the ASL sites, 1.3% of cyclists were involved in a conflict. This contrasts with 0.6% of cyclists at the control sites.

**Table 4.24 Cyclist flows compared with conflicts witnessed**

| ASL Site | Total number of cyclists | Number of Conflicts | % of cyclists involved in a conflict |
|---|---|---|---|
| Harleyford Street | 457 | 1 | 0.2 |
| New Cavendish Street | 1166 | 9 | 0.8 |
| Gloucester Road | 200 | 8 | 4.0 |
| Queenstown Road | 635 | 14 | 2.2 |
| Beaufort Street | 414 | 12 | 2.9 |
| College Road | 157 | 2 | 1.3 |
| Coombe Lane West | 154 | 2 | 1.3 |
| Pendennis Road | 87 | 8 | 9.2 |
| City Road | 584 | 0 | 0.0 |
| Putney High Street* | 400 | 0 | 0.0 |
| Battersea Park Road | 460 | 8 | 1.7 |
| Upper St. Martin's Lane* | 400 | 2 | 0.5 |
| **Total for ASL sites** | **5114** | **66** | **1.3** |
| Portland Place | 527 | 0 | 0.0 |
| Borough High Street* | 400 | 6 | 1.5 |
| **Total for Control sites** | **927** | **6** | **0.6** |

*Cyclists monitored capped at 400.

Overall, the number of conflicts witnessed equates to 1.2% of all cyclists monitored. In terms of the severity of the conflict, 1.1% of all cyclists were involved in a minor conflict and 0.1% of cyclists were involved in a serious conflict. 8% of all conflicts observed were identified to be of a ‘serious’ nature. The ‘serious’ conflicts are described below. No clear reason was identified as to why Pendennis Road had a greater number of potential conflicts compared with all other sites.

#### 4.3.1.1 Serious Conflicts

Of all the conflicts reported, the more serious incidents (levels 3, 4 and 5) were further analysed to provide a brief description of what took place.

**Gloucester Road [2:1L/S+1] (Plate 4.1)**

| **Conflict level 5** | **Time - 08:05** |
|---|---|
| ***Incident Description*****:** The cyclist moved towards the rear of the traffic and manoeuvred to outside the lane near the centre line. A car started to turn right into the outside lane, and whilst doing so hit the cyclist who wobbles but does not fall off. The cyclist stops to check the bicycle, signals to the driver and then carries on with the journey. | |

**Plate 4.1: Gloucester Road conflict level 5**

**Borough High Street [CNTRL] (Plate 4.2)**

| **Conflict level 5** | **Time - 11:17** |
|---|---|
| ***Incident Description*****:** The cyclist approached the ASL behind a car which braked suddenly. The cyclist, travelling at speed, cycled into the back of the car and fell off the bike. | |

**Plate 4.2: Borough High Street conflict level 5**

**Beaufort Street [1:1L/S/R]**

**Conflict level 3 Time - 12:07**

***Incident Description*:** The cyclist approached the junction travelling straight on. A car turning left at the junction stopped quickly upon leaving the junction and was protruding out into the junction. The cyclist had to immediately go around the car and in the course of doing so wobbled.

**Beaufort Street [1:1L/S/R]**

**Conflict level 3 Time - 17:55**

***Incident Description*:** The cyclist approached the ASL travelling at high speed and turned left. This caused a car turning into the same exit from the opposite arm to brake whilst manoeuvring.

**New Cavendish Street [2:1L/S+1]**

**Conflict level 3 Time - 15:04**

***Incident Description*:** The cyclist travelled along the feeder lane towards the junction with a bus alongside which encroached on to the feeder lane. The cyclist had to continually brake.

**New Cavendish Street [2:1L/S+1]**

**Conflict level 3 Time - 16:43**

***Incident Description*:** The cyclist travelling straight ahead in the feeder lane reached the ASL and whilst moving forward had to brake to let a taxi turn left at the junction in front of him.

The two *level 5* conflicts both occurred on the cyclist's approach to the junction. The Borough High Street incident (a control site) is notable in that the cyclist was behind the car at a site where no ASL or feeder lane was present. The two more serious incidents at Beaufort Street took place actually on the junction, whilst the two at New Cavendish Street occurred with cyclists on the nearside approach to the junction with a poor awareness of cyclists on the part of the driver.

None of the serious conflicts witnessed would appear to be directly attributable to the ASL or the lack of an ASL. In addition to the above analysis of conflict, a review of conflict data as a result of red light violation produced no significant results.

**Conflicts Summary:**

- The number of conflicts witnessed involving cyclists across all sites (ASL and control) was low, at around 1% of all cyclists monitored.
- Only two of the sites had a level 5 conflict (emergency action followed by collision) which is 2.8% of all conflicts observed, one an ASL site and one a control site.
- 92% of the conflicts witnessed were of minor severity.
- There appears to be no correlation between the numbers of cyclists passing the junction with the number of conflicts witnessed.
- Over all of the ASL sites, 1.3% of cyclists were involved in a conflict. This contrasts with 0.6% of cyclists at the control sites.
- The ASLs do not appear to have directly contributed to the conflicts witnessed at the ASL sites. It is not possible to speculate on the cause of these conflicts, however factors such as junction layout, speed and volume of traffic/traffic flows may be contributory.
- There appears to be no relationship between the layout of the junction and the number and/or severity of conflicts witnessed.

### 4.3.2 Casualty Statistics

Table 4.25 below provides an overview of the casualty statistics gathered for each of the sites under examination in this study. The data were provided by TfL (Stats 19). The casualty numbers were low across the sites and ASL installation dates were not available for all sites preventing examinations of casualties 'before' and 'after' installation. The highest casualty rate per year is for Harleyford Street with 12.8 casualties per year. Generally, the rate of casualties per year would appear very low for the majority of sites, however this information cannot account for unreported incidents. There is no historic cycle flow information available for this study and therefore it is not possible to assess the level of risk at these sites.

- For the following sites, one set of casualty data only was needed as the sites form part of the same junction:
  - Gloucester Road (Junction with Coombe Road) and Coombe Lane West (Junction with Galsworthy Road)
  - Battersea Park Road (towards station) and Queenstown Road (Junction with Battersea Park Road – southbound)
- The 'Data Used in Analysis' column refers to the number of whole years (i.e. 2003 is not included);
- A casualty rate per year has been calculated for all casualties and for cyclist casualties only. This figure gives a generalised indication of the occurrence of casualties at a given site and provides no insight into other factors involved, for example, severe weather conditions may have caused a high number of casualties during two months of a ten year period and therefore may distort the results. The table also includes, where possible, the rate of cycle casualties per year before and after the date of ASL installation. This should be treated with caution due to the sheer variation in 'years of data' applied before and after. Further work being conducted by TfL will inform this element of the study.
- It is noted that at two of the sites (Gloucester Road/Coombe Lane West and Battersea Park Road/Queenstown Road) there is an increased total cycle casualty rate subsequent to the installation of the ASL. However, it is not possible to draw any firm relationships due to the variation in 'years of data' applied before and after. As is noted above, larger collision analysis is being carried out by the London Road Safety Unit at Transport for London which will provide further data to inform these findings.

It should be noted that in relation to this casualty data, specific information is not available for casualty rate before and after installation of ASLs and therefore it cannot be accurately determined whether there is a relationship between casualty rates and ASL provision.

**Table 4.25 Overview of Casualty Information for each site**

| Site | Data Used in Analysis (Number of years data available for) | ASL Installed Date | No. & % of Cyclist Casualties | Casualty Rate Per Year (of data available) | Cycle Casualty Rate Per Year before ASL | Cycle Casualty Rate Per Year after ASL |
|---|---|---|---|---|---|---|
| Gloucester Road<br>Coombe Lane West | 1992 to 2002 (11 years) | Jan-97 | 5 (12%) | 3.9 | 1.7 | 3 |
| College Road | 1993 to 2002 (10 years) | Apr-98 | 3 (7%) | 4.1 | 2.5 | 2 |
| Beaufort Street | 1996-2002 (June) (6 years) | Sep-99 | 13 (30%) | 7.3 | 1.1 | 0.5 |
| Putney High Street | 1996 to 2003 (April) (7 years) | Mar-00 | 9 (31%) | 4.1 | 0.8 | 0.8 |
| New Cavendish Street | 1996 to 2001 (6 years) | Oct-01 | 6 (38%) | 2.6 | 1.3 | Date of installation at end of period |
| Battersea Park Road | 1996 to 2003 (April) (7 years) | Apr-01 | 6 (11%) | 7.5 | 1 | 2 |
| Queenstown Road | | Unknown | | | (for Battersea Park Road only) | |
| Harleyford Street | 1998 to 2002 (5 years) | Unknown | 7 (11%) | 12.8 | *1.4 | Installation date unknown |
| Pendennis Road | 2002 to 2003 (January) (1 year) | Unknown | 0 (0%) | 4 | *0 | Date of installation at end of period |
| City Road | 1990 to 2002 (13 years) | Unknown | 64 (39%) | 12.7 | *1.6 | Installation date unknown |
| Upper St. Martins Lane | 1996 to 2002 (7 years) | Unknown | 1 (6%) | 2.4 | 0.1 | N/A |
| Portland Place | 1998 to 2003 (January) (5 years) | No ASL | 2 (15%) | 2.6 | 0.4 | N/A |
| Borough High Street | 1996 to 2003 (March) (7 years)<br>(7 years) | No ASL | 6 (19%) | 4.5 | 0.8 | N/A |

* An asterix denotes that the casualty rate per year before the casualty could not be calculated because the ASL installation date is not known. Therefore the average casualty rate per year was calculated using all the data available for that particular site for the complete period of data available.

### 4.3.3 Casualties by Site

This section will detail the casualties reported for each of the sites studied. The following set of tables below show the casualties recorded at each study site when selecting 'Vehicle Type' = 'Pedal Cycle' (in the Stats 19 data). In these tables:

- the red dashed line indicates when the ASL was installed in order to show the casualties occurring before and after this date;
- the tables also show the type and location of the other vehicles involved in the casualty. These have been labelled as 'Vehicle Type 2'.
- a dash (-) in the age column indicates that the age of the casualty was unknown.

The data do not clearly indicate whether the provision of an ASL facility has a bearing on the number of casualties. Where the ASL installation date is known, few of the sites have the range (or detail) of casualty data to indicate the effect of the ASL on casualties. However, Putney High Street is recorded to have had five casualties since the ASL installation and they are all on the main road. No cyclist related casualties were recorded during 2002 and 2003 at Pendennis Road.

**Table 4.26 Harleyford Street (junction with Kennington Park Road) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2001 | 21 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | Entering Main Rd |
| 2001 | 30 | Female | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 2001 | 34 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | On Minor Rd |
| 2001 | 24 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Bus or Coach | On Main Rd |
| 2000 | 29 | Male | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2000 | - | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1999 | 23 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Entering Main Rd |

*Date of ASL installation at Harleyford Street unknown*

**Table 4.27 New Cavendish Street (junction with Portland Place) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2001 | 41 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2001 | 34 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Goods | On Main Rd |
| 1998 | 29 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Goods | Leaving Main Rd |
| 1997 | 53 | Male | Slight | Driver/Rider | Pedal Cycle | Entering Main Rd | Car | On Main Rd |
| 1996 | 34 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1996 | 32 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | M/C >125cc | On Main Rd |

*Dashed line denotes ASL installation date for New Cavendish Street in October 2001.*

**Table 4.28 Gloucester Road (junction with Coombe Road) and Coombe Lane West (junction with Galsworthy Road) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2002 | 34 | Male | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1997 | 28 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Bus or Coach | On Main Rd |
| 1996 | 55 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 1994 | 28 | Female | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | Entering Main Rd |
| 1994 | 18 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |

*Dashed line denotes ASL installation date for Gloucester Road in January 1997.*

The two sites above form part of the same junction, therefore only one set of casualty data is required.

**Table 4.29 Queenstown Road (junction with Battersea Park Road – southbound) and Battersea Park Road (towards station) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2002 | 42 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Bus or Coach | On Main Rd |
| 2000 | 23 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 1999 | 33 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | On Minor Rd |
| 1998 | 25 | Female | Slight | Driver/Rider | Pedal Cycle | Leaving Main Rd | Goods | Leaving Main Rd |
| 1998 | 22 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Goods | On Main Rd |
| 1997 | 28 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |

*Dashed line denotes ASL installation date for Battersea Park Road in April 2001.*

The two sites above form part of the same junction, therefore only one set of casualty data is required.

**Table 4.30 Beaufort Street (junction with Kings Road) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2002 | 26 | Female | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2002 | 35 | Male | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2000 | 32 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2000 | 34 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 2000 | 19 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Goods | Leaving Main Rd |
| 1999 | 38 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1999 | 49 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Goods 3.5 to 7.5T MGW | On Main Rd |
| 1999 | 28 | Female | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Taxi | On Main Rd |
| 1997 | - | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 1997 | 22 | Female | Slight | Driver/Rider | Pedal Cycle | Leaving Main Rd | Car | On Main Rd |
| 1996 | 22 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1996 | 32 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | On Minor Rd |
| 1996 | 42 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | Entering Main Rd |

*Dashed line denotes ASL installation date for Beaufort Street in September 1999.*

**Table 4.31 College Road (junction with Dulwich Common) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 1999 | 33 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 1996 | 28 | Female | Slight | Driver/Rider | Pedal Cycle | Entering Main Rd | Car | Entering Main Rd |
| 1994 | 23 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |

*Dashed line denotes ASL installation date for College Road in April 1998.*

**Table 4.32 City Road (junction with Old Street Roundabout) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2002 | 33 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Entering Main Rd |
| 2002 | 41 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | M/C >125cc | Entering Main Rd |
| 2002 | 26 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2001 | - | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Taxi | On Main Rd |
| 2001 | 42 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Goods | On Main Rd |
| 2001 | - | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Entering Main Rd |
| 2001 | 33 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2001 | 30 | Male | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Goods | On Main Rd |

*ASL Installation date for City Road unknown*

**Table 4.33 Putney High Street (junction with Lower Richmond Road) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2003 | 23 | Female | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Goods | On Main Rd |
| 2002 | 35 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Bus or Coach | On Main Rd |
| 2000 | 23 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Bus or Coach | On Main Rd |
| 2000 | 28 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Bus or Coach | On Main Rd |
| 2000 | 43 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 1998 | 56 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | On Minor Rd |
| 1998 | 15 | Male | Slight | Driver/Rider | Pedal Cycle | On Minor Rd | Car | Leaving Main Rd |
| 1998 | 37 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1996 | 20 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |

*Dashed line denotes ASL installation date for Putney High Street in March 2000.*

**Table 4.34 Upper St. Martin's Lane (junction with Long Acre and Garrick Street) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 1996 | 50 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Taxi | On Main Rd |

*ASL Installation Date for Upper St. Martin's Lane unknown*

**Table 4.35 Portland Place (junction with Weymouth Street) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2002 | 28 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1998 | 56 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |

*Control site = no ASL*

**Table 4.36 Borough High Street (junction with St Thomas's Road) casualty data**

| Year | Age | Sex | Severity | Class | User | Location of User | Vehicle Type 2 | Location of Vehicle 2 |
|---|---|---|---|---|---|---|---|---|
| 2001 | 24 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Bus or Coach | On Main Rd |
| 2001 | 32 | Male | Serious | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 2001 | 25 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | Leaving Main Rd |
| 1999 | 45 | Female | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1998 | - | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |
| 1996 | 19 | Male | Slight | Driver/Rider | Pedal Cycle | On Main Rd | Car | On Main Rd |

*Control site = no ASL*

**Casualty Statistics Summary:**

- The data does not clearly indicate whether the provision of an ASL facility has a bearing on the number of casualties.
- It was proven difficult to assess the change in the casualty rate before and after ASL implementation due to the lack of an implementation date for some sites.
- As the data tables above show, the range of casualty data available before and after ASL implementation varies significantly from site to site.

## 4.4 The functioning of the ASL

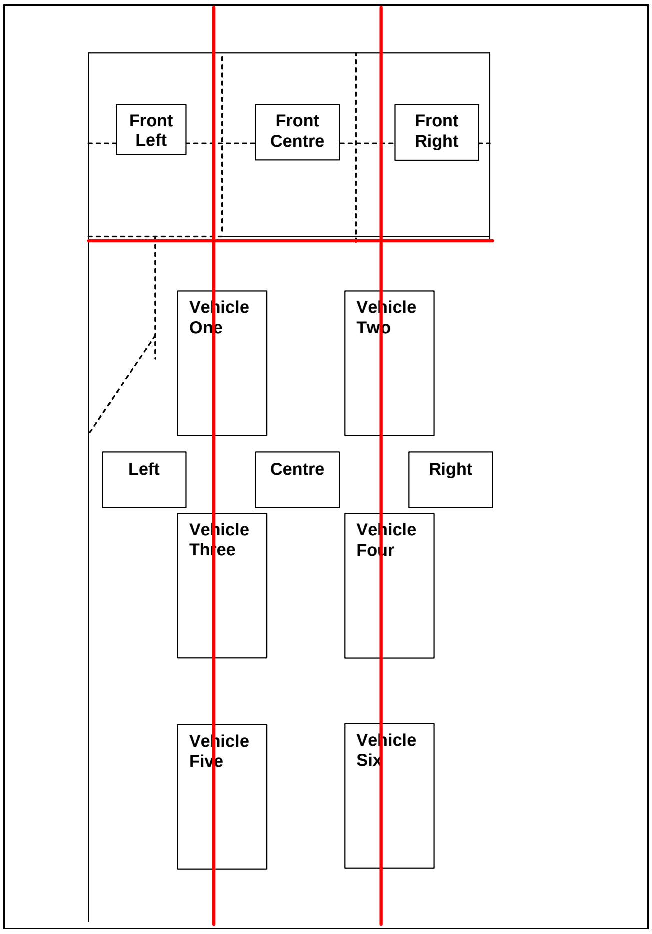
This section intends to determine how well the ASL functions based upon examination of the manoeuvres performed by cyclists at the junction. It will draw upon a combination of factors to provide an understanding of how cyclists use the ASL and any potential problems associated with it. In the absence of more robust casualty data, this section will focus upon any higher risk behaviour performed by cyclists, particularly conflicts with left-turning vehicles.

### *4.4.1 Cyclists' movements*

To examine how cyclists leave the junction and their interaction with vehicle movements, particularly left turning vehicles, it was determined that the most appropriate technique would be to look at the position at which they waited, the layout type and the manoeuvre made on exit.

The diagram in Figure 4.17 illustrates the area referred to in the tables and figures that follow. For each of the layout categories, a table presents the actual numbers of cyclists performing each type of manoeuvre monitored. A graph shows the relative proportion of cyclists at each layout category who performed each manoeuvre. Cyclists that were still moving forward or were behind the first six vehicles (as shown in the diagram) have been excluded from this analysis.

**Figure 4.17 Diagram of an ASL site illustrating the terms used to describe the positioning of cyclists at the junction**




Before detailing the results for each of the site layouts, it should be identified that the total number of cyclists listed per site in each of the data tables below does not directly match the totals in Section 4.2.2. This is because some cyclists at each of the sites approached the junction, usually waited, but did not necessarily continue left, straight on or right. Instead, cyclists were found to mount the footway or dismounted and pushed their bicycles. For some cyclists it was not possible to identify their exiting manoeuvre due to another vehicle blocking the view.  It should also be noted that no 'left turns' occurred at the two control sites.

Table 4.37 below shows the number of cyclists making each type of exit manoeuvre by the position waited at the junction for all category 2:1L/S+1 sites. The table shows that at all of these sites, the majority of cyclists exited straight on from a ‘front left’ position. Supporting this, Figure 4.18 shows that around 90% of cyclists who turn left at category 2:1L/S+1 sites position themselves at the front left of the junction (i.e. to the left of the junction arm in the pedestrian crossing or in the ASL). Of the cyclists travelling straight ahead, 76% positioned themselves front left. Those cyclists turning right managed to site themselves front right at New Cavendish Street, Gloucester Road and Queenstown Road but at Harleyford Street the position is more mixed with some cyclists waiting in the right hand side somewhere behind the ASL. In general, the incidence of right turning cyclists waiting at left and front left positions is very low.

### Table 4.37 Number of cyclists waiting in each position by manoeuvre made on exit Category 2:1L/S+1

| Category | Site | Leaving the ASL | Position waiting | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | front left | | left | | front centre | | centre | | front right | | right | | |
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| 2:1L/S+1 | Harleyford Street | left turn | 26 | 86.7 | 3 | 10.0 | 1 | 3.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 30 |
| | | straight ahead | 100 | 72.5 | 6 | 4.3 | 4 | 2.9 | 3 | 2.2 | 23 | 16.7 | 2 | 1.4 | 138 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 1 | 14.3 | 2 | 28.6 | 1 | 14.3 | 3 | 42.9 | 7 |
| 2:1L/S+1 | New Cavendish Street | left turn | 20 | 90.9 | 2 | 9.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 22 |
| | | straight ahead | 273 | 80.3 | 10 | 2.9 | 21 | 6.2 | 3 | 0.9 | 33 | 9.7 | 0 | 0.0 | 340 |
| | | right turn | 1 | 3.3 | 0 | 0.0 | 2 | 6.7 | 0 | 0.0 | 26 | 86.7 | 1 | 3.3 | 30 |
| 2:1L/S+1 | Gloucester Road | left turn | 23 | 92.0 | 2 | 8.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 25 |
| | | straight ahead | 46 | 86.8 | 1 | 1.9 | 6 | 11.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 53 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 1 |
| 2:1L/S+1 | Queenstown Road | left turn | 3 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 3 |
| | | straight ahead | 196 | 70.8 | 7 | 2.5 | 40 | 14.4 | 31 | 11.2 | 3 | 1.1 | 0 | 0.0 | 277 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 1 |

### Figure 4.18 Position cyclists wait at junction by manoeuvre made on exit Category 2:1L/S+1

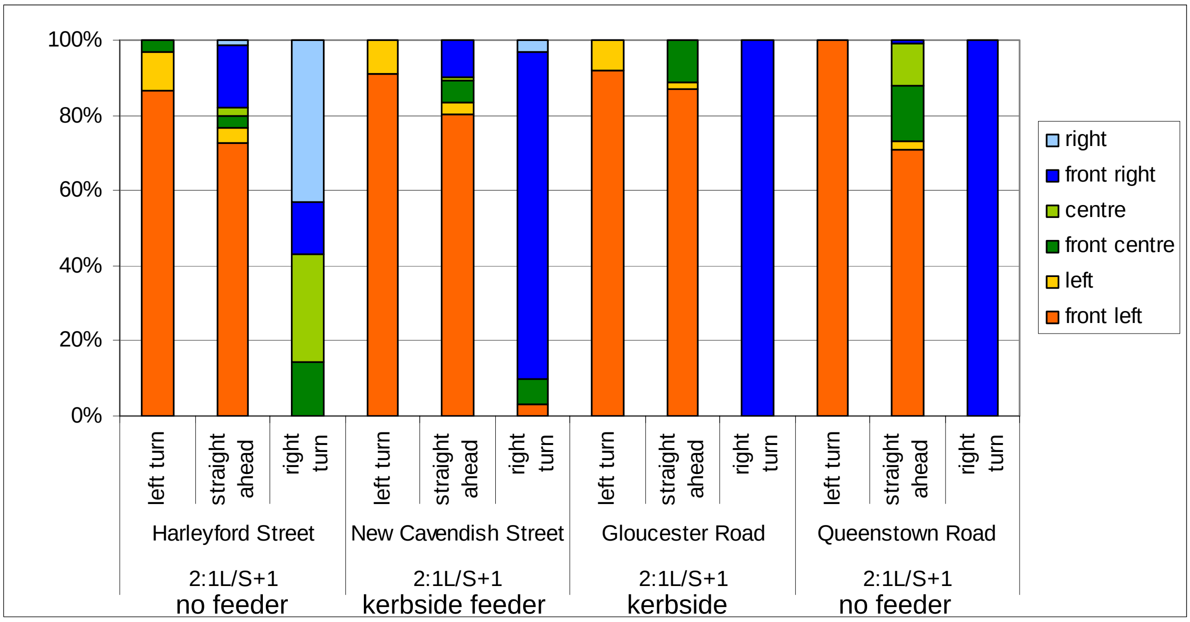


Table 4.38 and Figure 4.19 show that for all single lane (1:1L/S/R) layouts, the majority of cyclists were travelling straight on. It can be determined that 85% of cyclists across all the sites continued straight ahead from a front left position, whilst 92% of the left-turners located themselves at the front left. It should be noted however the overall number of cyclists making a left turn was relatively small (38 cyclists). Of the cyclists turning right, there was more variation. At Coombe Lane West there was a mixture between front right, centre and front centre whereas at Pendennis Road 44% (4 cyclists) were able to locate to the front right. Although trends can be identified within the data it should be highlighted that in some cases sample sizes are small.

### Table 4.38 Number of cyclists for position waited by manoeuvre made on exit Category 1:1L/S/R

| Category | Site | Leaving the ASL | Position waiting | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | front left | | left | | front centre | | centre | | front right | | right | | |
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| 1:1L/S/R | Beaufort Street | left turn | 32 | 94.1 | 2 | 5.9 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 34 |
| | | straight ahead | 194 | 87.8 | 6 | 2.7 | 19 | 8.6 | 0 | 0.0 | 2 | 0.9 | 0 | 0.0 | 221 |
| | | right turn | 2 | 66.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 33.3 | 0 | 0.0 | 3 |
| 1:1L/S/R | College Road | left turn | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 |
| | | straight ahead | 66 | 84.6 | 1 | 1.3 | 9 | 11.5 | 0 | 0.0 | 2 | 2.6 | 0 | 0.0 | 78 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 |
| 1:1L/S/R | Coombe Lane West | left turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| | | straight ahead | 28 | 73.7 | 4 | 10.5 | 1 | 2.6 | 4 | 10.5 | 1 | 2.6 | 0 | 0.0 | 38 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 4 | 36.4 | 1 | 9.1 | 6 | 54.5 | 0 | 0.0 | 11 |
| 1:1L/S/R | Pendennis Road | left turn | 2 | 66.7 | 0 | 0.0 | 1 | 33.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 3 |
| | | straight ahead | 28 | 75.7 | 0 | 0.0 | 8 | 21.6 | 0 | 0.0 | 1 | 2.7 | 0 | 0.0 | 37 |
| | | right turn | 3 | 33.3 | 0 | 0.0 | 1 | 11.1 | 1 | 11.1 | 4 | 44.4 | 0 | 0.0 | 9 |

### Figure 4.19 Position cyclists wait at junction by manoeuvre made on exit – Category 1:1L/S/R

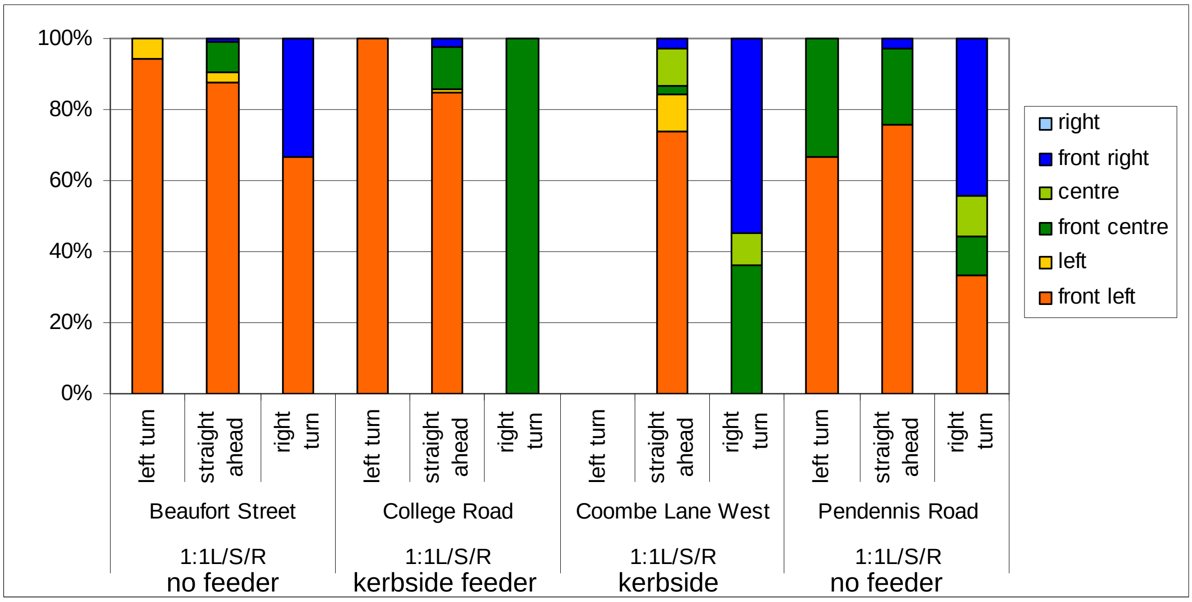
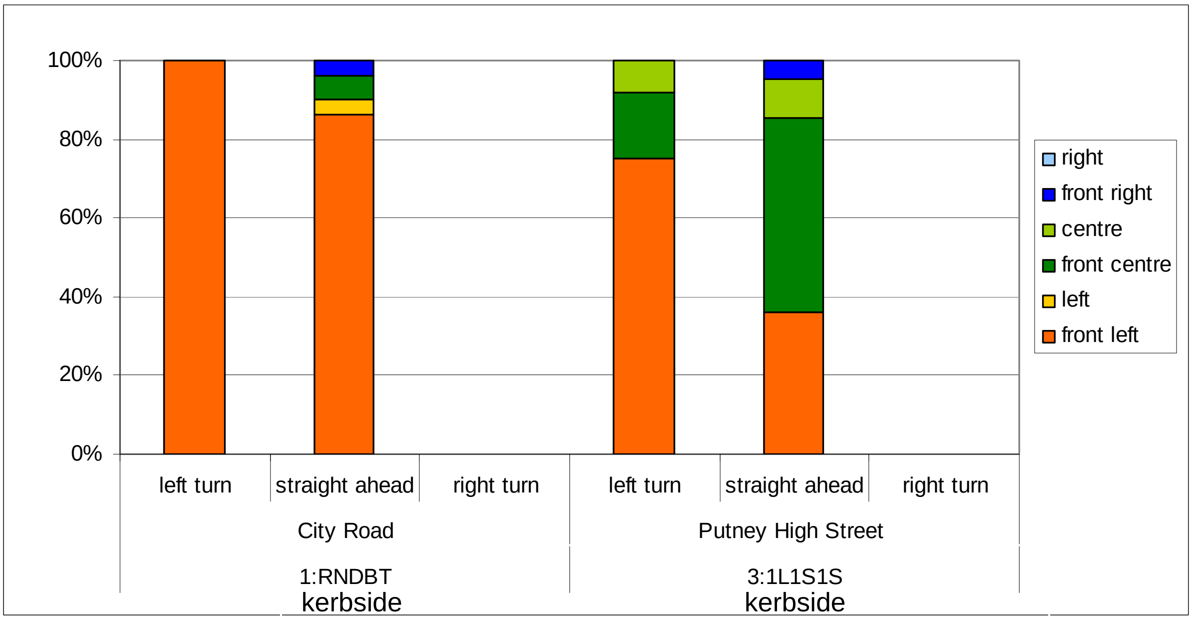


Table 4.39 and Figure 4.20 below show the layout categories 1:RNDBT and 3:1L1S1S. The large majority of cyclists were travelling straight ahead. At City Road, for both travelling straight on and left, it can be determined that 86% of cyclists positioned themselves front left. At Putney High Street, for turning left 9 out of 12 cyclists (75%) were situated front left whereas for travelling straight on, the positions varied, mainly between front left (36%) and front centre (49%) which indicates they managed to reach the front of the traffic (it should be noted that in this instance the number of cyclists travelling straight on from front left and front centre is relatively small at 30 and 41 cyclists respectively). It also shows that cyclists travelling straight on were able to manoeuvre away from the separate left turn lane.

**Table 4.39 Number of cyclists for position waited by manoeuvre made on exit Categories 1:RNDBT and 3:1L1S1S**

| Category | Site | Leaving the ASL | Position waiting | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | front left | | left | | front centre | | centre | | front right | | right | | |
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| 1:RNDBT | City Road | left turn | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 |
| | | straight ahead | 112 | 86.2 | 5 | 3.8 | 8 | 6.2 | 0 | 0.0 | 5 | 3.8 | 0 | 0.0 | 130 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| 3:1L1S1S | Putney High Street | left turn | 9 | 75.0 | 0 | 0.0 | 2 | 16.7 | 1 | 8.3 | 0 | 0.0 | 0 | 0.0 | 12 |
| | | straight ahead | 30 | 36.1 | 0 | 0.0 | 41 | 49.4 | 8 | 9.6 | 4 | 4.8 | 0 | 0.0 | 83 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |

**Figure 4.20 Position cyclists wait at junction by manoeuvre made on exit Categories 1:RNDBT and 3:1L1S1S**



For layout category 3:1L+2 sites with a central feeder lane as shown below (Table 4.40 and Figure 4.21), exiting straight on was the most common manoeuvre (81% of all manoeuvres). At Upper St Martins lane the ASL reservoir was split in two: there was an ASL reservoir in front of the left hand lane, for all cyclists turning left. There was another ASL reservoir which was separated by a traffic island for the remaining two lanes for cyclists going straight on or right. Of the cyclists turning left at layout category 3:1L+2 sites, it can be determined that 87% of cyclists positioned themselves front left (also shown in Table 4.42). However, for travelling straight on, at Upper St. Martin's Lane, 95% (53 out of 56 cyclists) of cyclists positioned themselves front centre (which is the left position of the second ASL in this case), whilst at Battersea Park Road they either predominantly located front left (43%) or front centre (49%) (which indicates that they were able to manoeuvre out of the left turn lane). At Upper St Martins Lane, those cyclists that went straight on approached via the central feeder or ahead of the traffic stream. For turning right (only relevant to Upper St. Martin's Lane), 60% (15 out of 25 cyclists) of cyclists managed to position themselves front right, ahead of the traffic.

**Table 4.40 Number of cyclists for position waited by manoeuvre made on exit Category 3:1L+2**

| Category | Site | Leaving the ASL | Position waiting | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | front left | | left | | front centre | | centre | | front right | | right | | Total |
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| 3: 1L+2 | Battersea Park Road | left turn | 10 | 90.9 | 0 | 0.0 | 1 | 9.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 11 |
| | | straight ahead | 64 | 42.7 | 2 | 1.3 | 74 | 49.3 | 8 | 5.3 | 1 | 0.7 | 1 | 0.7 | 150 |
| | | right turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| 3: 1L+2 | Upper St. Martin's Lane | left turn | 10 | 83.3 | 1 | 8.3 | 0 | 0.0 | 0 | 0.0 | 1 | 8.3 | 0 | 0.0 | 12 |
| | | straight ahead | 0 | 0.0 | 0 | 0.0 | 53 | 94.6 | 1 | 1.8 | 2 | 3.6 | 0 | 0.0 | 56 |
| | | right turn | 0 | 0.0 | 1 | 4.0 | 2 | 8.0 | 6 | 24.0 | 15 | 60.0 | 1 | 4.0 | 25 |

**Figure 4.21 Position cyclists wait at junction by manoeuvre made on exit Category 3:1L+2**

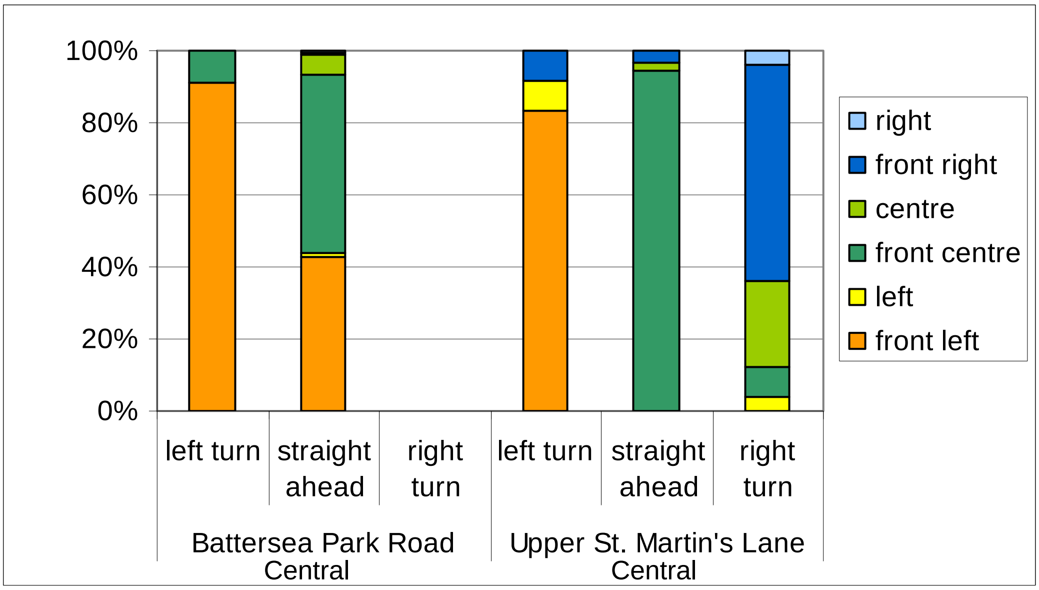


Table 4.41 and Figure 4.22 show the position waited by manoeuvre made of cyclists at the two control sites. At Portland Place there was no left turn allowed. At Borough High Street a left turn was allowed, but no cyclists made this manoeuvre. The data shows a strong variability in the positing of cyclists at control sites.

**Table 4.41 Number of cyclists for position waited by manoeuvre made on exit Control sites**

| Category | Site | Leaving the Junction | Position waiting | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | front left | | left | | front centre | | centre | | front right | | right | | |
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| CNTRL | Portland Place | left turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| | | straight ahead | 54 | 59.3 | 21 | 23.1 | 3 | 3.3 | 2 | 2.2 | 9 | 9.9 | 2 | 2.2 | 91 |
| | | right turn | 0 | 0.0 | 1 | 25.0 | 0 | 0.0 | 0 | 0.0 | 1 | 25.0 | 2 | 50.0 | 4 |
| CNTRL | Borough High Street | left turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| | | straight ahead | 6 | 37.5 | 5 | 31.3 | 2 | 12.5 | 3 | 18.8 | 0 | 0.0 | 0 | 0.0 | 16 |
| | | right turn | 0 | 0.0 | 2 | 12.5 | 2 | 12.5 | 2 | 12.5 | 9 | 56.3 | 1 | 6.3 | 16 |

**Figure 4.22 Position cyclists wait at junction by manoeuvre made on exit Control sites**

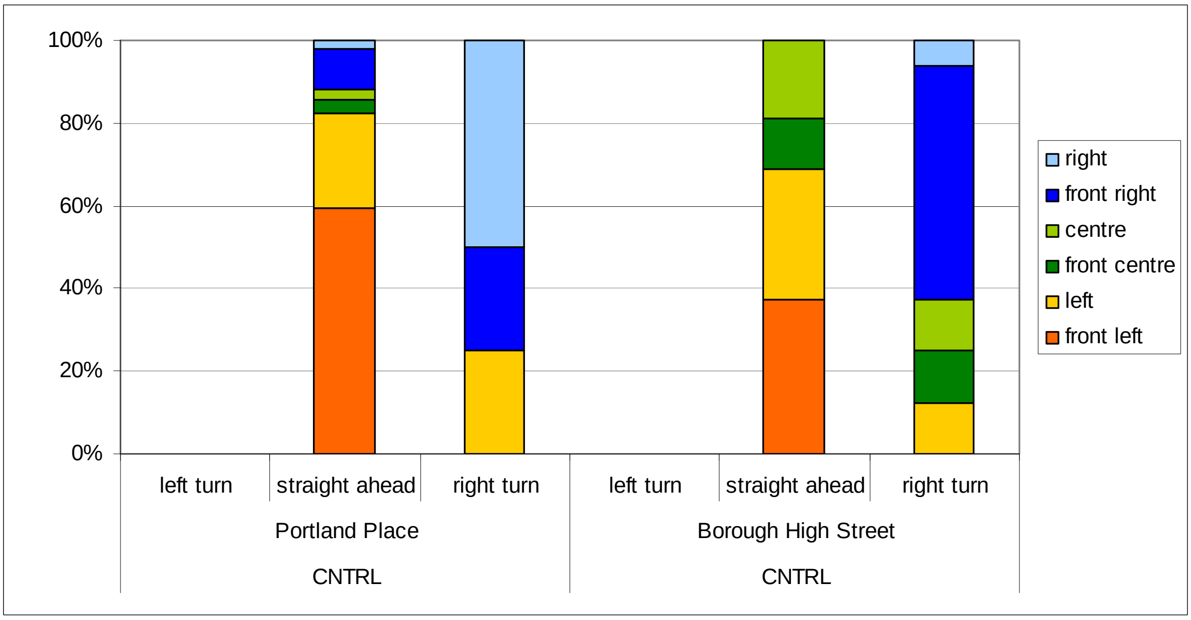


Figure 4.23 and Table 4.42 provide an overview displaying all of the layout categories.

**Figure 4.23 Position cyclists wait at junction by manoeuvre made on exit All category layouts**

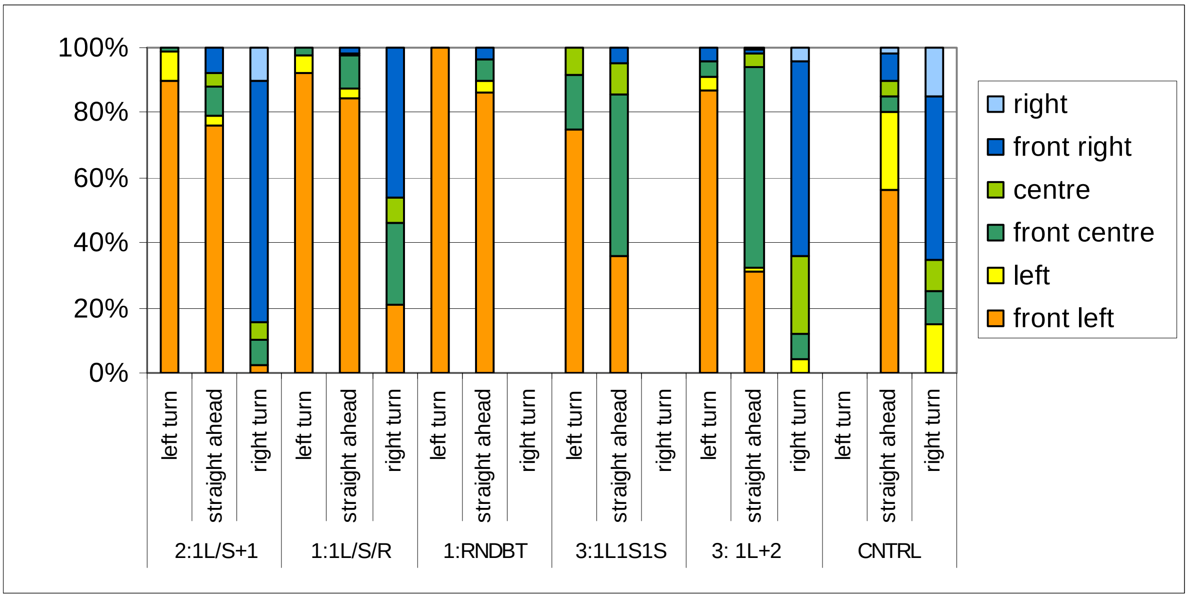



**Table 4.42 Position cyclists wait at junction by manoeuvre made on exit All category layouts**

| Category | Leaving the ASL | Position waiting | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | front left | | left | | front centre | | centre | | front right | | right | | Total | |
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % for category |
| 2:1L/S+1 | left turn | 72 | 90.0 | 7 | 8.8 | 1 | 1.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 80 | 8.6 |
| | straight ahead | 615 | 76.1 | 24 | 3.0 | 71 | 8.8 | 37 | 4.6 | 59 | 7.3 | 2 | 0.2 | 808 | 87.2 |
| | right turn | 1 | 2.6 | 0 | 0.0 | 3 | 7.7 | 2 | 5.1 | 29 | 74.4 | 4 | 10.3 | 39 | 4.2 |
| 1:1L/S/R | left turn | 35 | 92.1 | 2 | 5.3 | 1 | 2.6 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 38 | 8.7 |
| | straight ahead | 316 | 84.5 | 11 | 2.9 | 37 | 9.9 | 4 | 1.1 | 6 | 1.6 | 0 | 0.0 | 374 | 85.8 |
| | right turn | 5 | 20.8 | 0 | 0.0 | 6 | 25.0 | 2 | 8.3 | 11 | 45.8 | 0 | 0.0 | 24 | 5.5 |
| 1:RNDBT | left turn | 1 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 |
| | straight ahead | 112 | 86.2 | 5 | 3.8 | 8 | 6.2 | 0 | 0.0 | 5 | 3.8 | 0 | 0.0 | 130 | 99.2 |
| | right turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 3:1L1S1S | left turn | 9 | 75.0 | 0 | 0.0 | 2 | 16.7 | 1 | 8.3 | 0 | 0.0 | 0 | 0.0 | 12 | 12.6 |
| | straight ahead | 30 | 36.1 | 0 | 0.0 | 41 | 49.4 | 8 | 9.6 | 4 | 4.8 | 0 | 0.0 | 83 | 87.4 |
| | right turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 3: 1L+2 | left turn | 20 | 87.0 | 1 | 4.3 | 1 | 4.3 | 0 | 0.0 | 1 | 4.3 | 0 | 0.0 | 23 | 9.1 |
| | straight ahead | 64 | 31.1 | 3 | 1.5 | 127 | 61.7 | 8 | 3.9 | 3 | 1.5 | 1 | 0.5 | 206 | 81.1 |
| | right turn | 0 | 0.0 | 1 | 4.0 | 2 | 8.0 | 6 | 24.0 | 15 | 60.0 | 1 | 4.0 | 25 | 9.8 |
| TOTAL ASL | | 1280 | 69.5 | 54 | 2.9 | 300 | 16.3 | 68 | 3.7 | 133 | 7.2 | 8 | 0.4 | 1843 | |
| CNTRL | left turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| | straight ahead | 60 | 56.1 | 26 | 24.3 | 5 | 4.7 | 5 | 4.7 | 9 | 8.4 | 2 | 1.9 | 107 | 84.3 |
| | right turn | 0 | 0.0 | 3 | 15.0 | 2 | 10.0 | 2 | 10.0 | 10 | 50.0 | 3 | 15.0 | 20 | 15.7 |
| TOTAL CNTRL | | 60 | 47.2 | 29 | 22.8 | 7 | 5.5 | 7 | 5.5 | 19 | 15.0 | 5 | 3.9 | 127 | |

It is of interest to examine the proportions of cyclists travelling straight ahead compared with the position waited, particularly in comparing those cyclists who waited front left to those that waited in a left position next to the kerbside. At ASL sites, 71% of cyclists travelling straight on were able to position themselves front left, compared with 56% at the control sites (see Table 4.43 below). Comparatively, at ASL sites, just 3% of cyclists travelling straight on stopped in a left position, compared with 24% at control sites. In addition, 18% of cyclists travelling straight on at ASL sites were positioned front centre, compared with 5% of cyclists travelling straight on at the control sites. Overall, these results indicate that the majority of cyclists at ASL sites were able to wait in front of the traffic, thus reducing the risk of conflict with left turning vehicles.

**Table 4.43 Position cyclists wait at junction by manoeuvre made on exit for ASL and control sites**

| Type of site | Leaving the ASL | front left | | left | | front centre | | centre | | front right | | right | | TOTAL No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| ASL sites | left turn | 137 | 89.0 | 10 | 6.5 | 5 | 3.2 | 1 | 0.6 | 1 | 0.6 | 0 | 0.0 | 154 |
| | straight ahead | 1137 | 71.0 | 43 | 2.7 | 284 | 17.7 | 57 | 3.6 | 77 | 4.8 | 3 | 0.2 | 1601 |
| | right turn | 6 | 6.8 | 1 | 1.1 | 11 | 12.5 | 10 | 11.4 | 55 | 62.5 | 5 | 5.7 | 88 |
| Control sites | left turn | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 |
| | straight ahead | 60 | 56.1 | 26 | 24.3 | 5 | 4.7 | 5 | 4.7 | 9 | 8.4 | 2 | 1.9 | 107 |
| | right turn | 0 | 0.0 | 3 | 15.0 | 2 | 10.0 | 2 | 10.0 | 10 | 50.0 | 3 | 15.0 | 20 |

At ASL layouts which allowed right-turning, on average 68% of cyclists were able to position themselves at the right or front right compared with 65% at control sites (calculated by adding all right turn movements and all front right and right positioning). Of these right turning cyclists, at ASL sites 63% were positioned front right compared with 50% at the control sites. It also can be identified that 75% of right turning cyclists managed to position themselves front centre or front right (in front of the traffic) at the junction for the ASL sites, compared with 60% at the control sites, but this latter figure is based upon 20 cyclists only. This indicates that a significant proportion of cyclists who wished to turn right at the junction were able to position themselves right or front right, reducing potential conflict with motorised vehicles; a safer position in principle. However it should be noted that the control site percentages should be treated with caution due to the low number of cyclists found to make right turning manoeuvres.

Table 4.44 summarises the total number of cyclists who positioned themselves in front of the traffic (front left, front centre and front right) and amongst the traffic (left, centre, right).

**Table 4.44: Percentage of cyclists waiting in front of traffic and behind traffic by manoeuvre made on exit - All categories of layout**

| Category | Leaving the ASL | Front of traffic | | Amongst traffic | | Total |
|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. |
| 2:1L/S+1 | left turn | 73 | 91.3 | 7 | 8.8 | 80 |
| | straight ahead | 745 | 92.2 | 63 | 7.8 | 808 |
| | right turn | 33 | 84.6 | 6 | 15.4 | 39 |
| TOTAL | | 851 | 91.8 | 76 | 8.2 | 927 |
| 1:1L/S/R | left turn | 36 | 94.7 | 2 | 5.3 | 38 |
| | straight ahead | 359 | 96.0 | 15 | 4.0 | 374 |
| | right turn | 22 | 91.7 | 2 | 8.3 | 24 |
| TOTAL | | 417 | 95.6 | 19 | 4.4 | 436 |
| 1:RNDBT | left turn | 1 | 100.0 | 0 | 0.0 | 1 |
| | straight ahead | 125 | 96.2 | 5 | 3.8 | 130 |
| | right turn | 0 | 0.0 | 0 | 0.0 | 0 |
| TOTAL | | 126 | 98.1 | 5 | 1.9 | 131 |
| 3:1L1S1S | left turn | 11 | 91.7 | 1 | 8.3 | 12 |
| | straight ahead | 75 | 90.4 | 8 | 9.6 | 83 |
| | right turn | 0 | 0.0 | 0 | 0.0 | 0 |
| TOTAL | | 86 | 91.0 | 9 | 9.0 | 95 |
| 3: 1L+2 | left turn | 22 | 95.7 | 1 | 4.3 | 23 |
| | straight ahead | 194 | 94.2 | 12 | 5.8 | 206 |
| | right turn | 17 | 68.0 | 8 | 32.0 | 25 |
| TOTAL | | 233 | 91.7 | 21 | 8.3 | 254 |
| TOTAL ASL | | 1713 | 92.9 | 130 | 7.1 | 1843 |
| CNTRL | left turn | 0 | 0.0 | 0 | 0.0 | 0 |
| | straight ahead | 74 | 69.2 | 33 | 30.8 | 107 |
| | right turn | 12 | 60.0 | 8 | 40.0 | 20 |
| TOTAL CNTRL | | 86 | 67.7 | 41 | 32.3 | 127 |

**Cyclists' Movements Summary:**

- At ASL sites, 71% of cyclists travelling straight on were able to position themselves front left, compared with 56% at the control sites.
- At ASL layouts which allowed right-turning, on average 68% of cyclists were able to position themselves at the right or front right compared with 65% at control sites. Of these right turning cyclists, at ASL sites 63% were positioned front right compared with 50% at the control sites.
- Both of these results above indicate that ASLs do provide cyclists with some degree of priority compared with control sites and therefore a safer position (however there were a low number of right turning cyclists at control and therefore this data should be treated with caution).
- At category 2:1L/S+1 sites, 76% of cyclists who travelled straight on positioned themselves at the front left of the junction.
- At category 1:1L/S/R sites, 85% of cyclists who travelled straight on positioned themselves at the front left of the junction.

### 4.4.2 Relationship between use of the ASL feeder lane and use of the ASL reservoir

The proportion of cyclists who waited in the ASL reservoir varied from around 25% to 50% (of all cyclists monitored including those not waiting at the traffic lights). Of the 2:1L/S+1 sites, Queenstown Road had the greatest proportion of cyclists who waited in the ASL reservoir despite having no ASL feeder lane. Similarly Harleyford Street had the next greatest proportion of cyclists who waited in the ASL reservoir (for the 2:1L/S+1 layout) and also had no ASL feeder lane. Amongst 1:1L/S/R sites, Coombe Lane West (no feeder lane) showed the reverse trend and had the smallest proportion of cyclists who waited in the ASL. Coombe Lane West also had the largest proportion of cyclists approaching on the footway, of any site.

As described in Section 4.2.1.2, 52% of cyclists (not ahead of the traffic stream) in category 3:1L+2 sites used the central ASL feeder lane compared to 87% of cyclists using the kerbside feeder lane where present at all other category types. In addition, 3:1L+2 sites also had the second greatest proportion of cyclists waiting in the ASL reservoir. The effectiveness of an ASL feeder lane for the site with the roundabout and site 3:1L1S1S cannot be commented on because they both had feeder lanes and there is a lack of comparison sites. At category 1:1L/S/R sites ASL feeder lanes may increase the number of cyclists waiting in the ASL and reduce the number of cyclists approaching on the footway.

Overall, the analysis shows that a much lower proportion of cyclists reached the front of the traffic at the control sites compared with the ASL sites. This might be due to the lack of feeder lane. However, at sites with central feeder lanes it was found that the lower usage of the feeder lane did not prevent use of the ASL reservoir. To summarise, feeder lanes help by reserving space for cyclists but are not strictly necessary as it has been shown that cyclists will get to the front of the traffic anyway. It should be noted that feeder lanes are required by the Traffic Signs Regulations and General Directions (TSRGD) 2003.

### 4.4.3 Blocking of the Feeder Lane

A blocked feeder lane is defined for the purpose of this study as a feeder lane which does not allow cyclists to flow freely due to a vehicle or other object encroaching into the space (see Appendix A). Table 4.45 and Figure 4.24 present information on all sites with reference to whether the feeder lane was blocked for each cyclist that approached the junction. Only those sites with a feeder lane (either kerbside or central) are included. Pendennis Road had no incidences when the feeder lane was blocked. The data shows that the feeder lane was most frequently blocked at Battersea Park Road (31% of cyclists) which has a short central feeder lane. Feeder lanes at Beaufort Street and Upper St. Martin's Lane were blocked less often, both for 4% of cyclists. Overall category 1:1L/S/R tended to have a lower level of feeder lane blockage (4% - 6%).

**Table 4.45: Proportion of cyclists for whom the ASL feeder lane is blocked**

| | | Feeder Lane Blocked? | | %cyclists feeder |
|---|---|---|---|---|
| **Category** | **Site** | **Yes** | **No** | **lane blocked** |
| 2:1L/S+1 | New Cavendish Street | 172 | 994 | 15% |
| 2:1L/S+1 | Gloucester Road | 21 | 178 | 11% |
| 1:1L/S/R | Beaufort Street | 15 | 399 | 4% |
| 1:1L/S/R | College Road | 10 | 147 | 6% |
| 1:RNDBT | City Road | 56 | 387 | 10% |
| 3:1L1S1S | Putney High Street | 38 | 361 | 10% |
| 3: 1L+2 | Battersea Park Road | 141 | 318 | 31% |
| 3: 1L+2 | Upper St. Martin's Lane | 15 | 384 | 4% |

**Figure 4.24: Proportion of cyclists at each site for whom feeder lane was blocked**

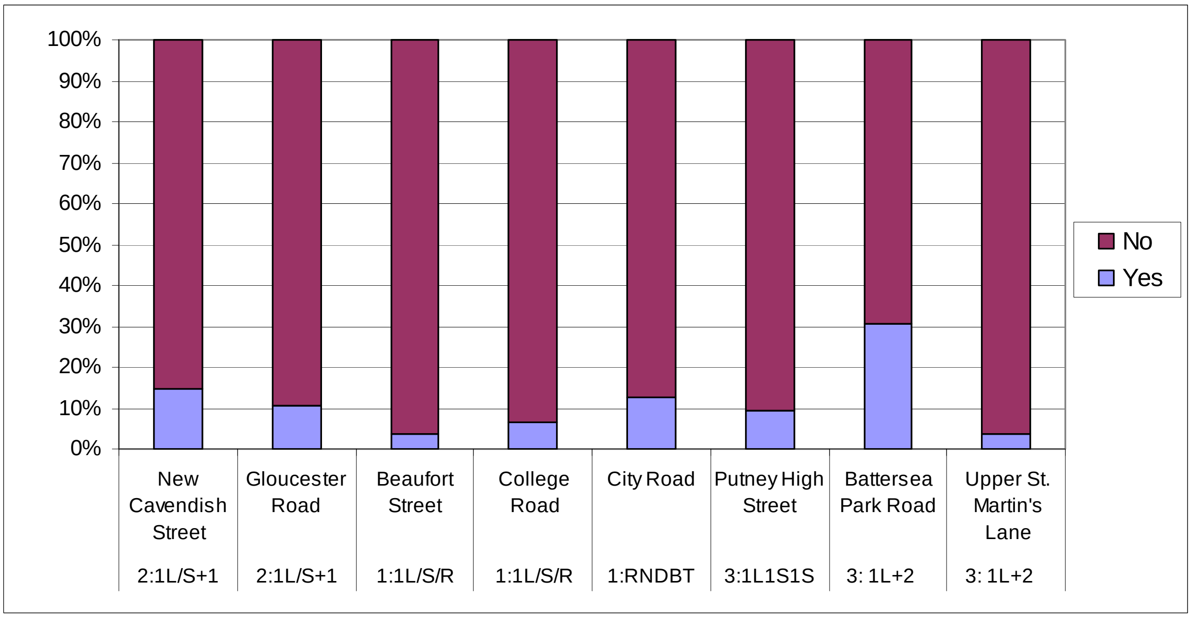



Table 4.46, summarised in Table 4.47, and illustrated in Figure 4.25, shows the method of approach by cyclists who experienced a blocked feeder lane. It indicates that across all sites, when the feeder lane is partially or fully blocked, the proportion of cyclists weaving increases from 1% of cyclists to 13% of cyclists. There is also a higher level of footway cycling when the feeder lane is blocked. The ASL kerbside feeder lane is used by 62% of cyclists when it is free compared to 35% when it is blocked. Likewise the central feeder lane is used by 7% of cyclists when it is free compared to 1% when it is blocked. This represents a 33% decrease of feeder lane use (kerbside or central) when the feeder lane is blocked.

**Table 4.46: The approach method by cyclists based upon whether the feeder lane was blocked**

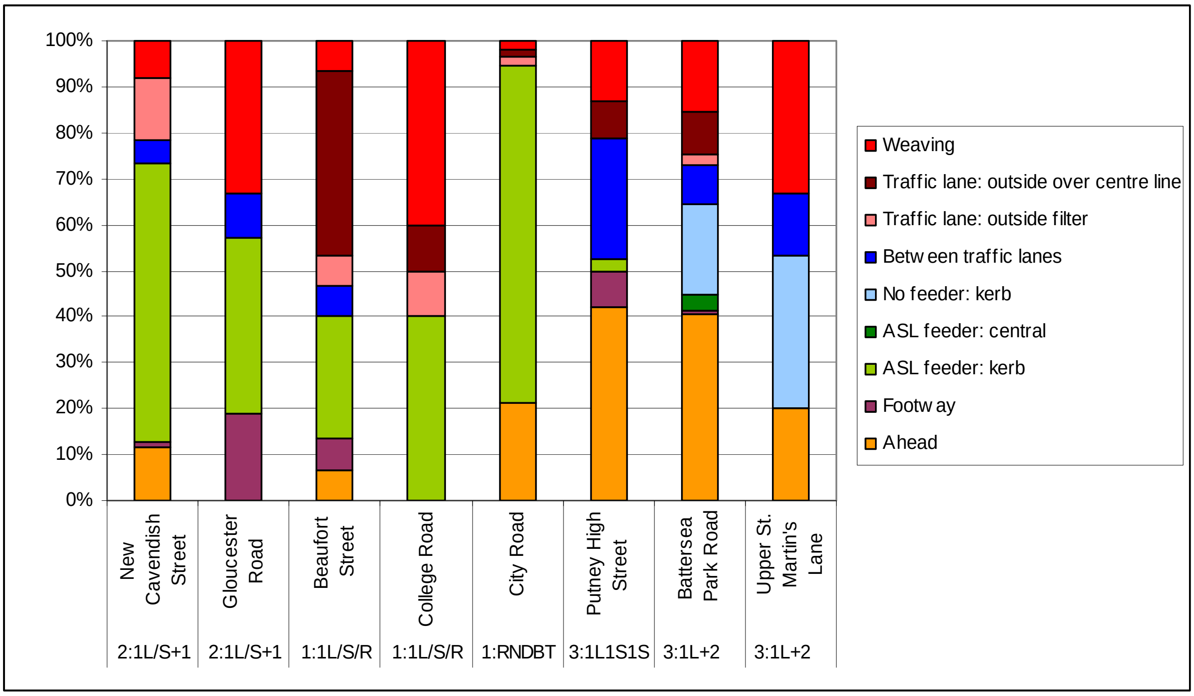
| Site | Feeder Lane Blocked? | Ahead | Footway | ASL feeder: kerb | ASL feeder: central | No feeder: kerb | Between traffic lanes | Traffic lane: outside filter | Traffic lane: outside over centre line | Weaving | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| New Cavendish Street | Yes | 20 | 2 | 104 | 0 | 0 | 9 | 23 | 0 | 14 | 172 |
| | No | 92 | 1 | 772 | 0 | 0 | 13 | 102 | 0 | 14 | 994 |
| Gloucester Road | Yes | 0 | 4 | 8 | 0 | 0 | 2 | 0 | 0 | 7 | 21 |
| | No | 9 | 0 | 148 | 0 | 0 | 6 | 3 | 4 | 8 | 178 |
| Beaufort Street | Yes | 1 | 1 | 4 | 0 | 0 | 1 | 1 | 6 | 1 | 15 |
| | No | 6 | 3 | 378 | 0 | 0 | 1 | 9 | 1 | 1 | 399 |
| College Road | Yes | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 1 | 4 | 10 |
| | No | 8 | 0 | 134 | 0 | 0 | 0 | 5 | 0 | 0 | 147 |
| City Road | Yes | 12 | 0 | 41 | 0 | 0 | 0 | 1 | 1 | 1 | 56 |
| | No | 38 | 0 | 336 | 0 | 0 | 1 | 2 | 7 | 3 | 387 |
| Putney High Street | Yes | 16 | 3 | 1 | 0 | 0 | 10 | 0 | 3 | 5 | 38 |
| | No | 147 | 1 | 183 | 0 | 2 | 15 | 5 | 4 | 4 | 361 |
| Battersea Park Road | Yes | 57 | 1 | 0 | 5 | 28 | 12 | 3 | 13 | 22 | 141 |
| | No | 152 | 1 | 0 | 97 | 45 | 6 | 3 | 5 | 9 | 318 |
| Upper St. Martin's Lane | Yes | 3 | 0 | 0 | 0 | 5 | 2 | 0 | 0 | 5 | 15 |
| | No | 228 | 0 | 0 | 114 | 30 | 6 | 3 | 0 | 3 | 384 |

**Table 4.47: The approach method by cyclists based upon whether the feeder lane was blocked for all sites**

| Feeder Lane Blocked? | Ahead | | Footway | | ASL feeder: kerb | | ASL feeder: central | | No feeder: kerb | | Between traffic lanes | | Traffic lane: outside filter | | Traffic lane: outside over centre line | | Weaving | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. |
| Yes | 109 | 23.3 | 11 | 2.4 | 162 | 34.6 | 5 | 1.1 | 33 | 7.1 | 36 | 7.7 | 29 | 6.2 | 24 | 5.1 | 59 | 12.6 | 468 |
| No | 680 | 21.5 | 6 | 0.2 | 1951 | 61.6 | 211 | 6.7 | 77 | 2.4 | 48 | 1.5 | 132 | 4.2 | 21 | 0.7 | 42 | 1.3 | 3168 |

Figure 4.25 below supports the information contained in Table 4.46 showing the approach method by cyclists when the feeder lane was blocked. It illustrates the proportion of cyclists weaving at some sites and the use of the footway or cycle manoeuvres between traffic lanes. This indicates that where feeder lanes are blocked cyclists seem most likely to continue to make progress engaging in potentially more risky behaviour, rather than wait at the blockage. A blockage of the feeder lane is therefore likely to increase the risk to cycle users.

**Figure 4.25 Approach method when the feeder lane was blocked**




### *4.4.4 Use of the central feeder lane*

The ability to use the central feeder lane was examined specifically. Figures in Table 4.45 show that the central feeder lane at Battersea Park Road was blocked for 31% of cyclists which was the largest figure across all the sites. However, Upper St Martins Lane was blocked for only 4 % of cyclists which was one of the lowest figures. The central ASL feeder lane at Battersea Park Road is only approximately 4 metres long whereas the feeder lane at Upper St Martins Lane is much longer. In addition, the width of the road and the feeder lane itself may affect the degree to which the feeder lane is blocked. Although the Battersea Park Road site had some colouration in the feeder lane, there was a higher level of obstruction at this site compared with Upper St. Martin's Lane. This may be due to the lanes being narrower at the Battersea Park Road site, therefore future research should look into the relationship between lane width and vehicle encroachment.

#### 4.4.5 Feeder Lane Blocked – noted discrepancies

It is recognised that at some of the sites there were cases where, even when the feeder lane was blocked, cyclists were still recorded as using it. These cases were investigated and are described below.

**New Cavendish Street**

At New Cavendish Street, buses frequently turn left and this can conflict with cyclists approaching from the ASL feeder lane wishing to go straight ahead. There was a case where a bus did not block the ASL feeder lane, but because the bus was indicating left the cyclist waited for the bus to turn before proceeding to go straight ahead across the junction.

104 cyclists tried to use the kerbside ASL feeder despite it being blocked. There were several cases where vehicles waiting at the traffic lights encroached on the ASL feeder lane. In these cases the feeder lane was only blocked for one traffic light cycle. However, there were also some cases where a vehicle parked across the footway and ASL feeder lane. This was invariably due to a delivery at a shop/business near the junction. None of the 104 cyclists waited behind the blockage: the majority of cyclists manoeuvred around the blocked feeder lane, and re-entered the feeder as soon as they were able to. However some chose to weave through the traffic or move to the other side of the traffic lane to continue proceeding to the front of the traffic.

**Gloucester Road**

Eight cyclists were found to use the ASL feeder lane at Gloucester Road even when it required an extra manoeuvre or waiting for a blockage/encroachment to clear. The eight cases where the ASL feeder lane was blocked were due to vehicle encroachments which lasted one traffic light cycle.

**Beaufort Street**

Four cyclists at Beaufort Street were found to manoeuvre around a blockage in the ASL feeder lane and re-entered the feeder lane on approaching the junction. The four cases where the ASL feeder lane was blocked were due to a car that parked across the footway and ASL (and double yellow lines) to load building materials. Pedestrians were also forced to walk into the road to pass the stationary vehicle.

**College Road**

All of the cases where cyclists were found to use the ASL feeder lane at College Road despite it being blocked, were due to vehicles waiting at the junction and encroaching on the ASL feeder lane, so that the blockage only lasted one traffic light cycle. In all these cases the cyclists waited in the ASL feeder lane until the vehicle moved and then they continued to approach the junction using the feeder lane.

**City Road**

Forty one cyclists at City Road were found to approach the junction using the ASL feeder lane despite it being blocked. The video data showed that a van was parked across the ASL feeder lane and kerb for over 15 minutes and then returned on another occasion. There were also cases of vehicle encroachment into the feeder lane. The cyclists were again willing to either manoeuvre around the blocked feeder lane returning to it having passed the obstruction, or wait for the blockage to clear when the traffic lights changed, and to continue approaching the junction using the ASL feeder lane.

**Feeder Lane Usage and Blockage Summary:**

- The lack of a feeder lane was not found to considerably affect the ease with which cyclists could access the ASL.
- The availability of the feeder lane reduced the incidence of illegal behaviour such as cycling on the footway.
- The proportion of cyclists for whom the feeder lane was blocked ranged from 0% to 31% per site.
- The proportion of cyclists weaving increased from 1% to 13% when the feeder lane was blocked. This suggests an increase in risky behaviour when the feeder lane is blocked.
- Longer feeder lanes appear to be easier to access than shorter lanes. This may be because the longer the feeder lane, the less likely it is to be blocked by other road users.
- The review of feeder lane blockage at particular sites indicated that cyclists tend to want to use it even when it is illegally blocked by other road users.
- When the feeder lane is blocked, it receives 33% less use compared to when it is not blocked (at ASL sites where a feeder lane is present).
- A lower proportion of cyclists were able to position themselves in front of the traffic at the control sites compared with the ASL sites which may be attributable to the availability of a feeder lane or of the space to wait.

### 4.5 Summary

The analysis of the results above has provided a comprehensive assessment of the behaviour of road users at Advanced Stop Line facilities at a range of sites. It has provided an indication of the numbers of cyclists using the junctions monitored, the degree to which red light violation is taking place and the amount of encroachment that takes place on the ASL reservoir. The analysis has shown that a comparatively low number of conflicts took place at each of the sites and has, by an examination of the approach and positioning of cyclists, indicated the level of use of the ASL facility.

Table 4.48 on the following page provides an overview of the key results for each of the sites monitored in this research study. The last column provides an estimate of traffic flows on a low, medium and high scale based upon a judgement from visiting the site and from a comparative estimate across all sites.

From an examination of these data, there appears to be little evident relationship between the factors analysed across the sites. It could be argued that there is a slight relationship between traffic flow and the level of encroachment, with three sites with an estimated low traffic flow displaying comparatively lower levels of encroachment. Neither does the level of encroachment relate to any of the other factors measured, including the number of lanes indicated by the category layout.

**Table 4.48 Overview of the data compiled for each of the studied sites**

| Category | Site | Total number of cyclists over two days | % of cyclists performing red light violation | Total number of conflicts (of any level) | Total No. of vehicles encroaching on ASL | % cyclists positioned within ASL when waiting | Comparative traffic flow (estimated) |
|---|---|---|---|---|---|---|---|
| 2:1L/S+1 | Harleyford Street | 457 | 17.3 | 1 | 178 | 38.3 | Med/High |
| 2:1L/S+1 | New Cavendish Street | 1166 | 18.4 | 9 | 425 | 31.9 | Low/Med |
| 2:1L/S+1 | Gloucester Road | 200 | 12.1 | 8 | 47 | 32.4 | Low/Med |
| 2:1L/S+1 | Queenstown Road | 635 | 10.2 | 14 | 244 | 46.8 | High |
| 1:1L/S/R | Beaufort Street | 414 | 14.6 | 12 | 204 | 25.3 | Low/Med |
| 1:1L/S/R | College Road | 157 | 2.6 | 2 | 54 | 50.0 | Med/High |
| 1:1L/S/R | Coombe Lane West | 154 | 7.8 | 2 | 36 | 20.3 | Low |
| 1:1L/S/R | Pendennis Road | 87 | 27.1 | 8 | 36 | 41.9 | Low |
| 1:RNDBT | City Road | 584 | 31.2 | 0 | 228 | 58.3 | High |
| 3:1L1S1S | Putney High Street* | 400 | 10.5 | 0 | 101 | 38.9 | High |
| 3: 1L+2 | Battersea Park Road | 460 | 35.8 | 8 | 196 | 36.2 | High |
| 3: 1L+2 | Upper St. Martin's Lane* | 400 | 19.6 | 2 | 87 | 49.5 | High |
| CNTRL | Portland Place | 527 | 13.5 | 0 | | | Med |
| CNTRL | Borough High Street* | 400 | 13.1 | 6 | | | High |

*denotes three sites where, because of high numbers of cyclists, observations were capped once a sample of 400 had been obtained. 200 cyclists were analysed in the peak period (7am-10am) and 200 in the off-peak (10am-1pm).

# 5 Behaviour at Cycle Advanced Stop Lines: Discussion

This chapter reviews the results detailed in the previous section and discusses the findings in relation to the research questions posed. It will seek to provide an evaluation of the advantages and disadvantages of ASLs and, where possible, indicate their best and safest design and use.

## 5.1 Cyclist Flows and Types

Cyclist flows are the total number of cyclists observed at each of the sites for each of the two days. Cyclist types are the cyclist flows by cyclist detail (i.e. gender and age).

In addition to a specific review of behaviour at the Advanced Stop Lines, the research has revealed some interesting statistics regarding cycle flows in the London area. Many of the central London sites had over 200 cyclists per day travelling through the arm of the junction concerned. New Cavendish Street and Portland Place are two examples of such high flows with 1,166 cyclists in total surveyed at the former site from 7am to 6pm for two days. For three of the sites; Putney High Street, Borough High Street and Upper St. Martins Lane, it was necessary to restrict the number of cyclists analysed by random sampling due to the resource constraints (as agreed with the Client); therefore 100 cyclists per day for peak hours and 100 cyclists per day for off-peak hours were sampled. This provided 400 cyclists to review for each of these sites.

There was a tendency for sites with one entry lane to have comparatively lower cycle flows with one of these sites, Pendennis Road, achieving slightly under the required number of cyclists (87). This may reflect the tendency of cyclists to follow strategic desire lines in the carriageway common to general traffic. However, in all, the cyclist numbers achieved through the selection of the sites provides a firm basis from which to draw conclusions regarding behaviour at ASLs. In terms of cyclist types, 72% of all the cyclists were adult males and, notably, 51% of cyclists wore no safety equipment. This provides an indication of the characteristics of the cyclist population that an ASL facility in London is generally catering for at present.

## 5.2 Method of approach and positioning at the junction

For the purpose of this study, nine approach methods to the junction were recorded:

- **Weaving** – Cyclists weave between stationary/slow moving traffic on the approach to the junction
- **Traffic lane: outside over centre line** – Cyclists approach the junction by overtaking traffic on the right-hand side, using oncoming traffic lanes
- **(Between) traffic lanes** – Cyclists approach the junction between two traffic lanes
- **No feeder: kerb** – No feeder lane was present, but cyclist approaches the junction adjacent to the kerb
- **ASL feeder: central** – Cyclists approach the junction via an ASL feeder lane in a central position (between traffic lanes of the same direction)
- **ASL feeder: kerb** – Cyclists approach the junction via an ASL feeder lane which runs adjacent to the nearside kerb
- **Footway** – Cyclists use the (pedestrian) footway adjacent to the road on the approach to the junction
- **Ahead** – Cyclists are approaching the junction whilst already being ahead of other moving traffic

The study sought to explore how cyclists approach a junction, particularly when an advanced stop line and a feeder lane are present. Overall, it was found that cyclists tend to approach by the kerb side whether there is a feeder lane present or not. Central feeder lanes are sometimes used but it is suggested that a short lead-in is unlikely to be effectively used or unobstructed (e.g. Battersea Park Road). This suggests that feeder lanes will be used when they are present and (particularly in relation to central feeder lanes) are of significant length and width. The length required is likely to be relative to the peak hour traffic queue. This will enable cyclists to access the feeder lane when traffic congestion may otherwise inhibit their progress to the ASL.

At many of the ASL sites monitored, a similar proportion of cyclists waited in the advanced stop line reservoir (38%), to those waiting in the pedestrian crossing area (40%). This could be due to visibility splays, other locational factors or the types of cyclist. However, a comparison of control sites (with 54% of cyclists waiting in the pedestrian crossing area) with ASL sites suggests that ASLs provide an opportunity for cyclists to get ahead of traffic without obstructing the pedestrian crossing. Although ASL reservoirs are associated with a smaller proportion of cyclists who wait in the pedestrian crossing, further efforts should be made to eliminate this behaviour.

This highlights the fact that cyclists are generally able to reach the front of the traffic at the junction and can therefore move in advance of it. However, it also draws attention to potential conflicts between pedestrians and cyclists who wait in the pedestrian crossing at all types of junction layout. It should be noted that more cyclists reached the front of the traffic queue when an ASL was present compared to control sites; therefore it seems ASLs are effective priority measures.

### 5.3 Red Light Violation

For the purpose of this study, motorised vehicles and cyclists crossing stop lines whilst traffic lights are displaying red and then proceeding across the junction are classified as being in violation of a red light. Those vehicles that cross the stop line, but do not proceed across the junction are not classified as violating a red light, although they are committing an offence. Red light violation was recorded for each cyclist studied over two days. In addition, red light violation by all vehicles was measured for one in five traffic light phases over one day.

The analysis revealed that there was a significant amount of red light violation by cyclists across all the sites. On average, 17% of cyclists violated across all the ASL sites. The extent of red light violation may depend on the ease/relative safety with which the cyclist felt they could undertake a violating manoeuvre.

Red light violation was not associated with direction of travel or the manoeuvre made. The site which led on to a roundabout also had a large level of violation with over 30% of all cyclists violating. The majority of cyclists displaying this behaviour were adult males, with 20% of male cyclists violating red lights compared with 12% of female cyclists. Red light violation was also witnessed at the control sites by cyclists. However, there were 4% less cyclists violating a red light at control sites compared with ASL sites. This may suggest that the propensity to violate red light signals by cyclists may be slightly increased at ASL sites.

From a review of red light violation for all traffic, approximately half of the violations that were recorded were carried out by cyclists and with the exception of layout 1:1L/S/R sites, all of the site layouts showed cyclists as the main offenders of red light violation. Of the red light violations that occurred at the monitored sites, various types of vehicle were responsible and the type of offending vehicle varied between the sites. Aside from the 51% of cyclist violations across the ASL sites generally, the main other violation offenders were cars (including taxis) at 34% and light good vehicles at 9%. The remaining 6% of violations were carried out by bus/coaches, motorcycles and ‘other’ vehicles.

Such behaviour raises the question of how this might be resolved. It is suggested that attitudinal research should be conducted to examine why cyclists violate red lights at junctions. It might be that the decision to violate is primarily based upon the type of cyclist and unreported site specific conditions. Site specific conditions may include sight lines at the junction or the ease/safety with which a cyclist can proceed across the junction at a red light. In addition, one possible explanation for violating could be that for turning left there is highly unlikely to be conflict with motor vehicles, as the cyclist does not need to cross the junction, whereas for carrying straight on they can avoid any possible left-turning vehicles. In both situations, momentum for the cyclist is maintained. This, however, remains to be established.

### 5.4 Vehicle Encroachment on the ASL reservoir

Encroachment refers to any vehicle other than a bicycle situated within the ASL reservoir whilst traffic is stationary. The data for encroachment was collected for every fifth traffic light phase and, in addition, for instances when a cyclist was present. The data collected for every fifth phased was only for one of the two days of footage with the level of encroachment being recorded.

Vehicle encroachment onto the ASL reservoir is a problem, to a greater or lesser extent, across all sites. Overall, 36% of cyclists across the ASL sites experienced some level of encroachment on to the ASL. In addition, an average of 1.4 vehicles encroached upon the ASL reservoir per traffic light phase. The level of encroachment is, as might be expected, related to the depth of the Advanced Stop Line reservoir. The opportunity to encroach is greater where there are more entry lanes present. However, in relation to each cyclist, the sites with one entry lane were noted as having the highest rate of encroachment (to each cyclist passing). At the site approaching a roundabout, vehicle encroachment was also significant.

Vehicle encroachment affects all types of site and is a problem that needs to be overcome by enforcement of the use of the space. This is particularly the case at peak hours, when traffic flows are higher. Certain sites were found to have a range of vehicle types encroaching on the ASL when a cyclist was using the junction, although a slight majority of the encroachment observed was undertaken by cars (and taxis). This level of encroachment may have severely inhibited cyclists from using the ASL effectively or prompted more risky behaviour such as weaving.

Motorcycles were found to encroach on the ASL a great deal at certain sites, particularly centrally located ones. In total, around 30% of all vehicles that encroached upon the ASL (partially or fully) were motorcyclists.

The degree of encroachment does vary across the sites, with a higher proportion of vehicles partially encroaching upon the ASL reservoir. This indicates a degree of restraint in encroaching upon the cyclist’s space, as vehicles have not automatically stopped at the secondary stop line.

### 5.5 Vehicle Encroachment on and obstruction of the ASL feeder lane

The majority of the sites studied had an Advanced Stop Line feeder lane for cyclists either at the near side of the road or centrally placed (to the right of a separate left turn lane). Encroachment on to the feeder lane by vehicles was evident at the majority of sites. There are a few possible explanations for this behaviour. The number of lanes (and related width of the approach lanes) is one possible factor, with vehicles ensuring that they are providing adequate space for motorised vehicles in the offside lane rather than for cyclists in their lane. An examination of the geometry of the lanes would reveal more information on this. In addition, the visual distinction/clarity of the feeder lane (in terms of the use of colour) might be another factor. This research has been able to suggest that colour differentiation on the

ASL feeder lane may reduce levels of encroachment. Finally, where only one lane was present, motorised vehicles were less likely to encroach which is possibly a result of the greater width available to vehicles or the lack of parallel vehicles to influence positioning.

This raises the question of the best approach where there is insufficient road space to insert a cycle feeder lane at an Advanced Stop Line. A previous TRL Report (Wall et al, 2003) suggests that reducing vehicle lane width is a better option than reducing the number of lanes in terms of vehicle flow and capacity. Where a central feeder lane is required, the same consideration applies with the potential for obstruction from both sides. Generally though, since there was less encroachment into feeder lanes than into ASL reservoirs, it is encroachment into the ASL reservoir which demands greater attention.

Only one of the sites displayed a noticeable problem with obstruction for cyclists. Motorcycles were largely seen to be the cause for this particular case.

## 5.6 Conflict

The total number of conflicts and their degree of severity were measured in relation to each cyclist studied across the 14 sites.

Conflicts were observed across all of the fourteen sites over the two days. Of the 6,041 cyclists monitored for this study, only 72 (1%) were involved in any form of conflict and 92% of the conflicts were of minor severity. None of the serious conflicts took place in the ASL reservoir. The two most serious conflicts involved a cyclist approaching the junction and highlight that, when cyclists manoeuvre amongst traffic, conflict can potentially occur. The other major incidents call into question how well cyclists are provided for on the kerbside with conflict reported due to encroachment on the feeder lane, a left turn ‘cut-up’ and obstruction across the junction. This questions the adequacy of the width provided for cyclists at the kerbside (where a feeder is present), the compliance by drivers and the value and potential effectiveness of a marked lane leading the cyclist across the junction and making other road users aware of their potential presence. This does not necessarily indicate a problem with the safety of ASLs specifically but draws attention to the apparent general dangers for cyclists in negotiating a junction.

Comparison of the conflicts witnessed and available casualty statistics does not suggest any correlation. Few of the conflicts involved motorcycles, even though, motorcycles were found to use cycle Advanced Stop Line reservoirs frequently at some sites. There is scope for further data analysis to examine the signal sequence when conflicts occurred and where in the junction they took place.

## 5.7 Cyclists and vehicle movements

Cyclists and vehicle movements examines how cyclists approach and leave the junction and their interaction with vehicle movements, particularly left turning vehicles. This was analysed by looking at the position they waited in, the layout type and the manoeuvre made on exit.

The data has shown that cyclists travelling straight on tend to locate front left at most layout categories. This suggests that cyclists generally travel to the left side of the junction, even if intending to cross the junction, which could potentially place them in conflict with left turning vehicles. However, by locating in front of the stopped traffic, cyclists are visible to potential left-turners. On the whole, due to relatively low conflict levels, this was not seen as a distinct problem; only one of the major conflicts was attributable to this. However, there was a noted problem at one of the sites (New Cavendish Street) in which buses were turning left which affected cyclists travelling straight on. It is believed that this issue is a site-specific problem dependent upon the types of vehicles which regularly use the junction and turn left.

With a high proportion of cyclists noted to travel straight on from a front left/left position, it is possible that the use of a marked lane across the junction (as if a continuation of a cycle lane) could raise awareness of cyclists travelling straight on from a left-hand position; the position where a lane is most required. A brief review was performed to identify any existing research on the use of marked cycle lanes across the junction. No conclusive information was found on the effectiveness and safety of such a measure.

It should also be noted that, at the control sites, there was a lower proportion of cyclists positioning themselves in front of the traffic compared with the ASL sites (78% at ASL sites compared with 54% at control sites). In addition, at the control sites, cyclists were more often found to locate themselves in the pedestrian crossing area when able to reach the front. This suggests that ASLs and feeder lanes assist cyclists in reserving some space for them. The study has not demonstrated any capacity implications for the ASL reservoir. Further reference should be made to TRL Report 585 (Wall *et al,* 2003) which found that an ASL has no negative junction capacity implication provided a traffic lane is not removed. The report made the following recommendations:

- The checking and possible extension of the intergreen times and minimum green times, particularly at large signal-controlled junctions and where cyclists are observed to cross the stop line near the end of green, to ensure that cyclists are given adequate clearance time.
- Consideration given to the positioning of, and extension times for, vehicle detectors used in the control of traffic signals.
- Use of signal controlled junction modelling computer programs such as OSCADY to assess the impact of changes, especially where a traffic lane is to be removed.
- Further encourage the compliance of motorised vehicle drivers with ASLs by the use of, for example, signs, education and/or enforcement, and maintaining the visibility of road markings. Appropriate signs would need to be designed and trialled before use.
- Further research to be carried out to establish the safety record of ASLs and establish more precisely the safety and capacity relationships.

### 5.8 ASL Feeder Lane use

The lack of a feeder lane did not generally prevent cyclists' use of the ASL reservoir at different types of site layout or their ability to reach the front of the traffic. However, in some respects, feeder lanes provide a relatively safe access point for cyclists to get to the front of traffic. Although, if a feeder lane is not present, this does not necessarily prevent cyclists from reaching the front, it does slightly increase the likelihood that cyclists will weave between the traffic, potentially causing a greater level of risk.

All but one of the sites with a feeder lane experienced occasions in which it was blocked. Up to 31% of cyclists at a site encountered a blocked feeder. Feeder lane blockage was particularly common at Battersea Park Road which had a very short central feeder lane and suggests that central feeder lanes need to be of sufficient size and prominence to prevent encroachment. The research shows that the level of weaving and cycling amongst traffic increases when the feeder lane is blocked, suggesting a need to ensure that the feeder lane is kept clear to provide a clear passage for the cyclist and to minimise conflict. Cyclists tended to want to use the feeder lane where possible but a blockage inhibited their direct passage to the front of the queue. Often they would manoeuvre around the obstacle and rejoin the feeder lane where possible. Overall, the analysis showed that a lower proportion of cyclists reached the front of the traffic whilst waiting at the control sites compared with the ASL sites.

To summarise, feeder lanes help by reserving space for cyclists but are not strictly necessary as many cyclists will get to the front of the traffic anyway. It should be noted that feeder lanes are required by the Traffic Signs Regulations and General Directions (TSRGD) 2003(Schedule 6, diagram 1001.2).

### 5.9 Are Advanced Stop Lines safe?

Given the low frequencies of conflicts and casualties at these sites, and the limited traffic flow data, a definite conclusion on whether cycle ASLs are safe cannot be drawn (although there did not appear to be any obvious safety problems associated directly with the ASL). In this study, ASLs did not generally exhibit a greater number of casualties per annum or potential conflicts. A greater level of enforcement to prevent encroachment and obstruction of feeder lanes and the ASL reservoir may increase their perceived safety to cyclists, reduce more unusual behaviour and improve an ASL's effectiveness. ASLs do not, to a large extent, further encourage red light violation (although higher than control sites by 4% of cyclists) and appear to reduce the frequency of waiting within the pedestrian crossing area where potential conflict could occur. A study focussed upon examining the change in behaviour before and after the installation of the ASL would provide more rigorous results to answer this.

### 5.10 Higher Risk Behaviour

This study provided the opportunity to examine whether ASLs promote risky behaviour by cyclists. Risky behaviour denotes behaviour by cyclists which may put them at risk with other road users based upon the potential for conflict and the manoeuvres they make in negotiating the junction. Risky behaviour can become particularly apparent when cyclists wish to exit right from the junction and are positioned to the left or at the centre of the approach arm.

The data shows that 31% of cyclists travelling straight on at sites at which there is a separate left turn lane (3:1L+2) were found to position themselves front left, which may lead to potential conflict with left-turning vehicles. However, of the conflicts observed, no major conflicts were found to be directly as a result of this.

Alongside this, additional analysis shows that 8% of cyclists at ASL sites and 15% of cyclists at control sites turning right at the junction were positioned left or front left whilst waiting. 24% of right turning cyclists position themselves centre or front centre at the ASL sites whilst 20% of cyclists waited centre or front centre at the control sites. This indicates that there are a small proportion of cyclists at both control and ASL sites undertaking potentially risky behaviour in order to turn right. However, ASLs help proportionally more cyclists to position themselves for right hand turns.

In addition, a review of incidents in which the feeder lane was blocked and therefore not accessible to cyclists showed that it can increase the proportion of cyclists weaving and travelling amongst the traffic.

The level of red light running by cyclists can also denote risky behaviour. The study found that there was no direct correlation between the level of red light violation and the availability of an ASL facility, although, overall, there was a 4% increase compared with the control sites. All of the categories showed relatively high red light violation rates with 17% of all cyclists at ASL sites passing the junction on red.

To summarise this section, the results have demonstrated that risky behaviour by cyclists is evident at both ASL sites and at the control sites. It may be concluded that ASLs can support less risky behaviour but do not conclusively prevent (or inspire) risk taking by cyclists.

# 6 Conclusions

The discussion in Chapter 5 has summarised and taken forward the analysis performed in Chapter 4. The following findings provide an overall evaluation of Advanced Stop Lines based upon the research performed in this study.

**Conflict:**

- Based on findings from the sites monitored, low levels of reported conflicts suggest that ASLs are not a safety hazard. Only 1% of cyclists monitored were involved in any form of conflict. Only 6 of the conflicts were identified to be of a 'serious' nature as defined within the study, which represents 0.1% of all cyclists monitored.
- The number of conflicts were too low to determine whether a relationship between the type or severity of conflict and ASL provision exists.
- Cyclists travelling straight ahead were found to be able to position themselves in front of the traffic thus reducing the risk of conflict with left turning vehicles. Furthermore 40% of cyclists waited in the pedestrian crossing at ASL sites. However, at New Cavendish Street (two entry lanes with a combined straight and left turn lane) a potential conflict was identified where cyclists were found to be crossing the path of vehicles making a left turn at the junction.
- The number of cyclists obstructed ranged from less than 1% to 10% per site across the ASL sites , indicating the potential for conflict between cyclists and other road users.
- The research has identified that ASLs can support less risky behaviour but do not conclusively prevent (or inspire) risk taking by cyclists.

**Access/Use:**

- In all, cyclists gained access to and used Advanced Stop Lines with some success at all types of layout. Across all sites, 38% of cyclists who waited at the junction used the ASL reservoir, others waited in pedestrian crossings (this could cause conflict with pedestrians using the crossing).
- At ASL sites an average of 17% of cyclists violated red lights, compared with 13% at control sites. This suggests that the propensity to violate red light signals may be slightly increased at ASL sites, but not to a large extent.
- The use of colour to identify the ASL reservoir and feeder lane has not been conclusively determined to be associated with reduced encroachment by other road users in this study.
- Where a kerbside feeder lane was present, 87% of cyclists used it, compared with 77% of cyclists who used the kerbside when there was no feeder lane. This implies that where feeder lane is present, cyclists tend to be attracted to it. This is possibly because space is successfully reserved. Any variation across sites is likely to be a result of location specific characteristics.
- Where a central feeder lane was present, this is utilised by, on average, 52% of cyclists (within the traffic stream).
- 78% of cyclists at the ASL sites were able to position themselves in front of the traffic when waiting at signals. This is compared with 54% at the control sites (see Table 4.10). This indicates that there is likely to be a reduced risk from left-turning vehicles

at the ASL sites as cyclists travelling straight ahead are positioned in front of the traffic when starting from stationary.

**Encroachment:**

- There is a general problem of encroachment at all layout types studied.
- All vehicles that encroached at control sites went into the pedestrian crossing, compared with 12% at ASL sites, indicating that an ASL can provide a buffer zone that discourages vehicles from blocking the pedestrian crossing.
- There was a lower proportion of cyclists waiting within the pedestrian crossing area at ASL sites (40%) compared with the control sites (54%). Therefore ASLs may aid the reduction in cyclists waiting in the pedestrian crossing area.
- 36% of all cyclists across all the ASL sites experienced some form of encroachment by vehicles onto the ASL reservoir. This suggests that ASLs are often not treated as a reserved space for pedal cyclists by all types of motorised vehicle, particularly cars and motorcycles.
- The degree of encroachment does vary across the sites, with a higher proportion of vehicles partially encroaching upon the ASL reservoir. This indicates a degree of restraint in encroaching upon the cyclist's space, as vehicles have not automatically stopped at the secondary stop line.

**Red Light Violation:**

- The proportion of cyclists found to violate a red light was 4% at ASL sites compared with control sites. This suggests a slight propensity to violate at ASL sites, but not to a large extent.
- There was found to be no correlation between red light running by cyclists and lane layout.

**Maintenance:**

- Three of the sites' ASLs were poorly marked and two of the sites' ASL feeder lanes were not clearly marked, which may reduce their effectiveness.

# 7 Recommendations

As a result of the findings of this study it is recommended that the following should be considered when designing an Advanced Stop Line Facility:

- ASLs can be employed at virtually any type of junction layout, including those most commonly found in London: categories 2:1L/S+1 (two entry lanes with a combined straight and left turn) and 1:1L/S/R (one entry lane with a left, straight and right turn out lane).
- There may be a role for signing to warn drivers of the need to keep the reservoir clear, however the effectiveness of such a strategy would need to be researched. Additionally, more education on the importance and existence of ASLs may reduce their misuse and, if successful, increase their effectiveness for cyclists.
- The feeder lane, which should be provided at any ASL facility, should be wide enough to reduce vehicle encroachment. This could require a reconsideration of lane layouts when more than one lane is present.
- A central feeder lane, required when a separate left turn lane is present, should be of an adequate length (equivalent to peak hour queue length) and width to be available for a cyclist to use. It is possible that a narrow feeder lane might also reduce vehicle encroachment. Therefore, further research would need to be undertaken to examine the association between levels of vehicle encroachment and the width of the ASL feeder lane.
- Sites with a left only turn will always introduce a hazard for cyclists who are not turning left and should be avoided where high cycle flows are found, especially on roads with high speeds. Although ASLs may help avoid this, the hazard will remain in moving traffic.
- Full consideration of any potential obstruction to the feeder lane should be given and acted upon by the authority that is responsible for implementing the facility. For example, the feeder lane may be placed in a prime location for a van to unload goods or may be located next to a bus stop. As a result, a higher level of enforcement may be required at these locations.
- A poorly observed feeder cycle lane, which may be obstructed by parked vehicles, can endanger the cyclist when manoeuvring around the vehicle into the traffic stream. Therefore road users should be encouraged not to obstruct road areas designated for cyclists through the use of appropriate enforcement measures such as signage and road markings for example.
- It is also advised that enforcement signs should be employed (particularly for motorcyclists) to advise them not to use/encroach upon the ASL facility (reference should be made to TSRGD (Chapter 5) 2003 for guidance on the use of appropriate signage).

Site-specific characteristics should be a key consideration in the design of an Advanced Stop Line. Each site is likely to have unique characteristics which impact upon the effectiveness of a generic Advanced Stop Line layout. For example, in Gloucester Road, the bend on approach to the ASL increased the likelihood of vehicles encroaching on the kerbside feeder lane. Other factors to consider include:

- Lane layout – the number of general traffic lanes present and the designation of lanes for particular manoeuvres. The overall width of the traffic lane might inhibit the ability to provide an adequate feeder lane width for cyclists. The length of feeder lane relative to the traffic queue should also be considered

- Visibility splays – the level of visibility available to view other road users at the junction based upon the position at the stop line. Visibility can be affected by the placement of street furniture, the location of buildings or the layout of the junction.
- Topography – particular site specific factors such as gradients across the junction (e.g. is it on an incline as with Putney High Street?) or the degree to which the junction arm has a level gradient. The topography may affect the way in which cyclists will position themselves at the junction in order to ensure a view of it.
- The size/importance of the junction – whether the road is of a local or strategic nature. This may affect the perception of safety felt by the cyclist and their ability to carry out particular manoeuvres at the junction.
- Traffic flows and vehicle types (e.g. is the site on a bus route?) – the type and flow of traffic using the junction might inhibit a cyclist's ability to use the ASL and may cause additional obstructions to the reservoir.
- Level of cycle usage/cycle flows – a higher flow of cyclists at a particular junction may increase the awareness of cyclists by other road users and therefore reduce the potential for conflict.

In addition, it is considered important, as identified in this research, to ensure the date of implementation of ASLs and other cycle facilities is recorded, to enable subsequent assessment of their safety and effectiveness.

Alongside the recommendations above, reference is made to the guidance set out by the DfT in the Traffic Signs Manual (TSGRD, 2003) and the Cycling Design Standards (Transport for London, 2005, Chapter 5). The key points of the current guidance are:

- Feeder cycle lanes should be present at all ASL facilities for safety and regulatory reasons (Rule 154 of the Highway Code, RTA 1988 Section 38 and TSRGD 2003 regulation 43).
- The width of the feeder lane should be of a minimum 1.5 metres in order to prevent potential vehicle encroachment and obstruction as advised within the regulations, but would ideally be a width of 2 metres.
- The two stop lines must be between 4 and 5m apart; the area between them across the full width of the approach is available for cyclists to wait at the red light. This area and the approach lane may be highlighted using coloured surfacing. The stop lines should be 200mm or 300mm wide and the boundary line should be the same width as the centre line of the road.
- Where there is a considerable left turn flow of motor vehicles, but cyclists travel straight ahead, the approach cycle lane may be positioned centrally. The lane will be advisory, as it can then be indicated using markings to diagram 1057 and 1004 or 1004.1 without the need for an upright sign.
- Colour surfacing should be used in ASL reservoirs to increase awareness of the facility by motorists.

### 7.1 Further considerations

The research study highlighted a number of issues, which may demand further investigation. It identified a high level of cyclist red light violation and a number of unusual manoeuvres/behaviours by cyclists at particular sites. Therefore, it is suggested that an attitudinal study of cyclists and behaviour at junctions would reveal the motivation and attitudes behind such behaviours and identify how cycle users perceive and act at ASLs and, how it affects their chosen route. In addition, this study has shown clear evidence of vehicle encroachment into ASLs however it has not tackled the motivation of the driver of a vehicle to encroach or violate an ASL. Therefore, there is scope to further investigate the role and behaviour of drivers in relation to road layouts and cyclists.

Future work could also investigate the potential use of facilities in relation to advanced stop lines. Examples include the provision of a marked lane across the junction for cyclists or the use of an advance signal specifically for cyclists to give them a head start at the junction to avoid left turning vehicles. The examination of red light violation by motorised vehicles could also be considered. There is also an opportunity to further examine the level of feeder lane violation against the available width for cyclists and the possible use of part-width ASL reservoirs at appropriate junction layouts. Further work may be undertaken to assess whether there is a correlation between the width of the ASL reservoir and ASL feeder lane, traffic flow and the level of encroachment.

In addition, a study of the effect of the use of colour on ASLs may provide an opportunity for further research. In this study, the level of encroachment on the ASL was not conclusively proven to be associated with the use of colour. However, observations suggested that coloured facilities may be better observed by other road users, and therefore may increase the effectiveness of ASLs. Research could investigate the potential for the use of coloured surfaces in future ASL implementation.

Further research could also provide supplementary data that used control sites where significant proportions of vehicles make left turns.

# References

Department for Transport (2003) *The Traffic Signs Regulations and General Directions*. London: The Stationary Office.

Greater London Authority (2001) *The Mayor's Transport Strategy*. London.

Transport for London (2005) *London Cycling Design Standards: A guide to the design of a better cycling environment*. London: Cycling Centre of Excellence.

Wall, G.T., Davies, D.G. and Crabtree, M (2003) *Capacity Implications of Advanced Stop Lines for cyclists*. Crowthorne: TRL Report 585.

# Appendix A. Glossary of Terms

## Appendix A

**Advanced Stop Line (ASL) -** Advanced stop lines are a measure designed to increase cycle safety by allowing cycle users to move away from signals slightly in advance of motorised traffic. ASLs are usually positioned at a junction, consisting of a reservoir section usually stretching the width of the traffic lanes, large enough to contain waiting cycles.

**Approach method at junction – various locations –** The method of approach was recorded for all cyclists over two days. Nine approach methods were recorded for the purposes of this study:

- **Weaving** – Cyclists weave between stationary/slow moving traffic on the approach to the junction
- **Traffic lane: outside over centre line** – Cyclists approach the junction by overtaking traffic on the right-hand side, using oncoming traffic lanes
- **Traffic lane: outside filter** – Cyclists approach on the outside of the traffic lane, to the left of the centre line
- **(BTW) traffic lanes** – Cyclists approach the junction between two traffic lanes
- **No feeder: kerb** – No feeder lane was present, but cyclist approaches the junction adjacent to the kerb
- **ASL feeder: central** – Cyclists approach the junction via an ASL feeder lane in a central position (between traffic lanes of the same direction)
- **ASL feeder: kerb** – Cyclists approach the junction via an ASL feeder lane which runs adjacent to the nearside kerb
- **Footway** – Cyclists use the (pedestrian) footway adjacent to the road on the approach to the junction
- **Ahead** – Cyclists are approaching the junction whilst already being ahead of other moving traffic

**Blocked feeder lane** – For the purpose of this study, a blocked feeder lane is defined as a feeder lane which does not allow cyclists to flow freely due to a vehicle or other object encroaching into the space

**Conflict** – The total number of conflicts and their degree of severity were measured in relation to each cyclist studied across the 14 sites. For the purpose of this study, conflict was assessed between cyclists and other road users at five different levels:

1. Precautionary or anticipatory braking or lane change when risk of collision is minimal
2. Controlled braking or lane change to avoid collision (but with ample time for manoeuvre)
3. Rapid deceleration, lane change or stopping to avoid collision, resulting in a near miss situation
4. Emergency braking or violent swerve to avoid collision resulting in a near miss situation
5. Emergency action followed by collision

**Encroachment** – Encroachment refers to any vehicle other than a bicycle in the ASL reservoir or feeder lane whilst traffic is stationary. The data for encroachment was collected for every 5$^{th}$ traffic light phase and only for instances when a cyclist was present.

**Levels of encroachment** – Levels of encroachment included vehicles encroached a half or less on the ASL, fully encroached in to the ASL reservoir, and over the second stop line after the ASL reservoir

**Feeder Lane/Feeder Cycle Lane** – A feeder cycle lane is a lane denoted on the road surface, adjacent to or between other traffic lanes, for use by cycles which feeds into the ASL reservoir.

**Manoeuvre at Exit** – refers to the manoeuvre made by cyclists when exiting the junction in terms of a left turn, right turn or continuing straight ahead

**Obstruction** – obstruction refers to anything that prevents cyclists from reaching the ASL reservoir at a junction. Where analysis indicates that the lane/reservoir is obstructed, but still used, cyclists were required to manoeuvre around the obstruction in order to proceed.

**Peak/off peak** – Peak refers to periods between 7am and 10am, and 4pm to 6pm. Off peak is between 10am and 4pm

**Position at junction – various locations** – Positioning at the junction was recorded for all cyclists studied over two days. This refers to the position on the approach to a junction where cyclists waited before traffic began to move. Positions included:

- In the ASL reservoir – Cyclist positioned in the space reserved for cyclists at the front of the traffic
- On the pedestrian crossing – Cyclists positioned in the space reserved for pedestrians to cross the road in front of the stop line. At ASL sites this is in front of the ASL reservoir (in front of the second stop line).
- In the ASL feeder lane area – Cyclist positioned within the feeder lane area (either kerbside or in a central feeder lane where available).
- Amongst traffic – Cyclist positioned amongst the motorised traffic at the junction
- On the footway – Cyclist positioned on the footway alongside the arm of the junction
- Still moving forward - Cyclist moving forward through traffic whilst approaching red light
- After the 4th motorised vehicle – Cyclist waiting after the fourth motorised vehicle in the traffic queue

**Red Light Violation** – For the purpose of this study, vehicles crossing stop lines whilst traffic lights are displaying red and then proceeding across the junction can be classed as being in violation of a red light. Those vehicles that cross the stop line, but do not proceed across the junction are not classified as violating a red light in this study. Red light violation was recorded for all cyclists studied over two days. In addition, red light violation by all vehicles was measured for one in five traffic light phases over one day.

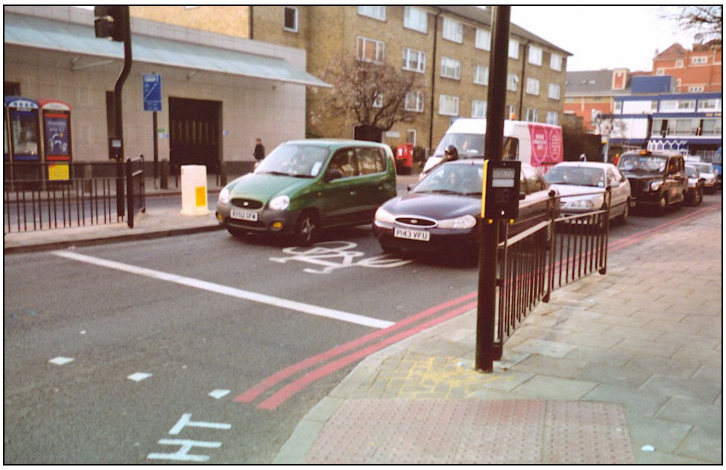
**Reservoir** – The space provided for cyclists in front of queuing traffic as part of the advanced stop line.

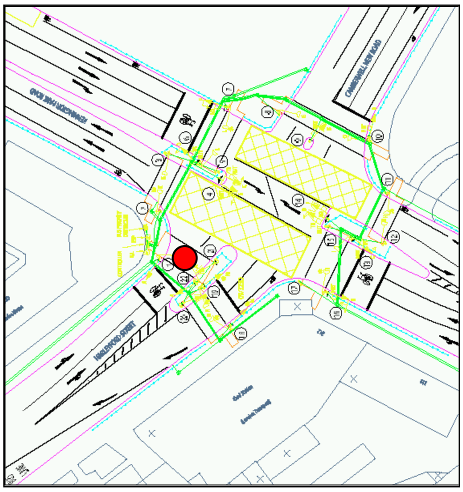
**Visibility Splay** – The view available to the driver, in this instance, whilst waiting at the junction

# Appendix B. Site Photographs and Sketches

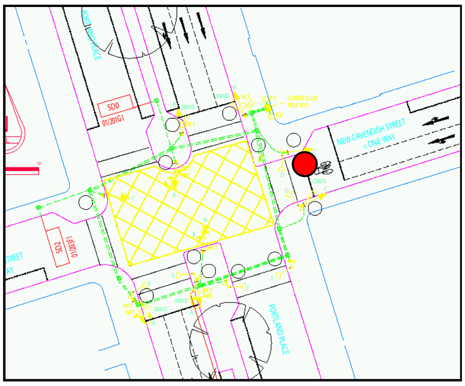
The photographs and sketches below illustrate each of the sites monitored within the research study. The red circle on each of the sketches denotes the arm of the junction surveyed.

### **Harleyford Street CODE: 2:1L/S+1** (no feeder)

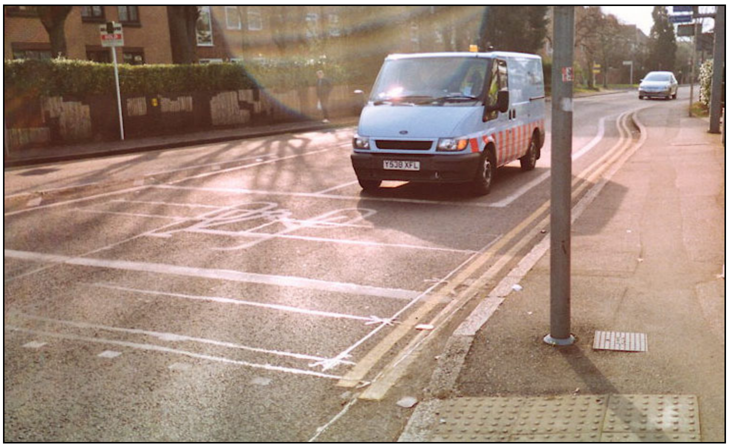


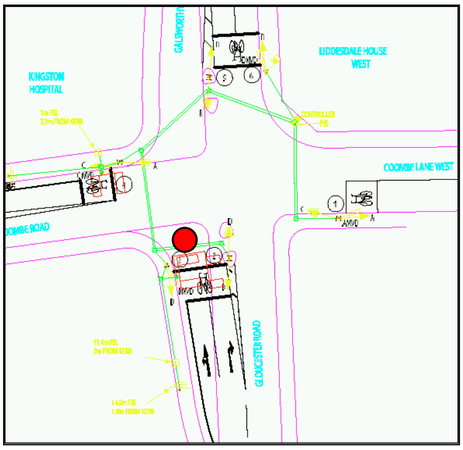


### **New Cavendish Street CODE: 2:1L/S+1**

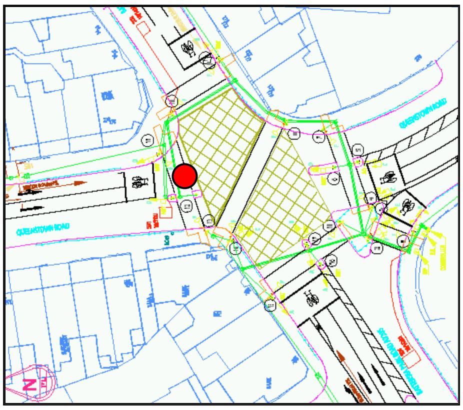


**Gloucester Road CODE: 2:1L/S+1**

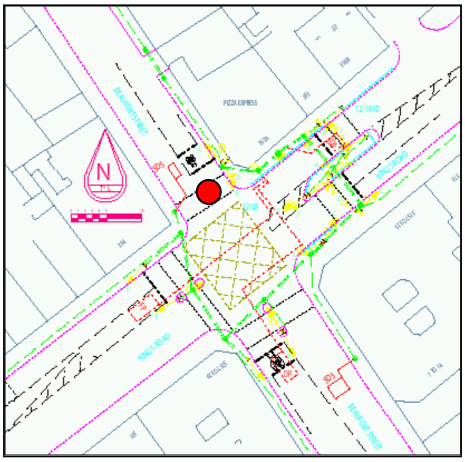




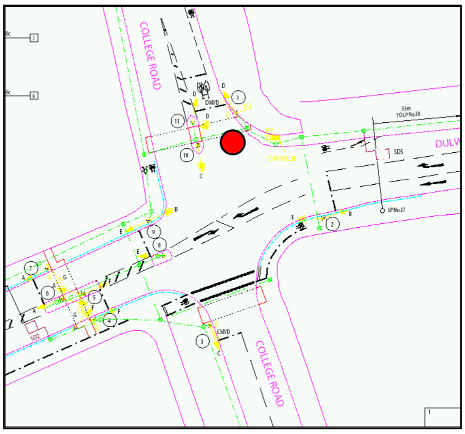

**Queenstown Road CODE: 2:1L/S+1** (no feeder)



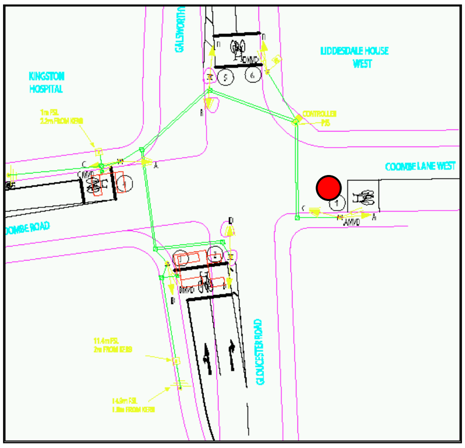
**Beaufort Street CODE: 1:1L/S/R**



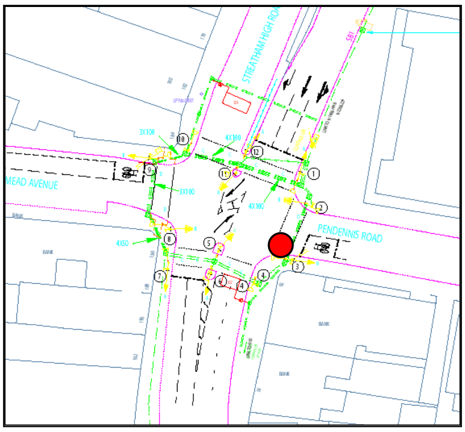
**College Road CODE: 1:1L/S/R**



**Coombe Lane West CODE: 1:1L/S/R** (no feeder)



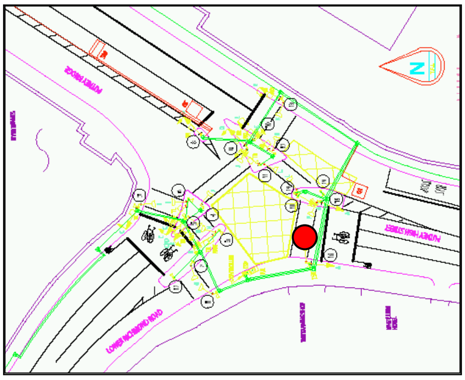

**Pendennis Road CODE: 1:1L/S/R**



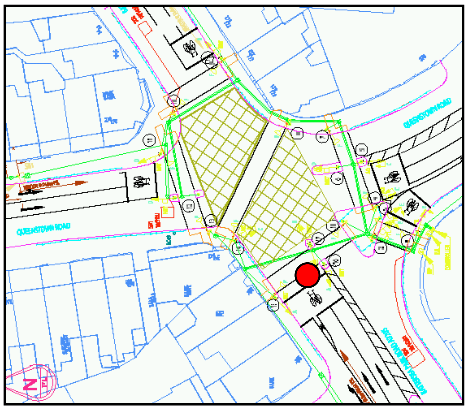
**City Road CODE: 1:RNDBT**


Sketch not available

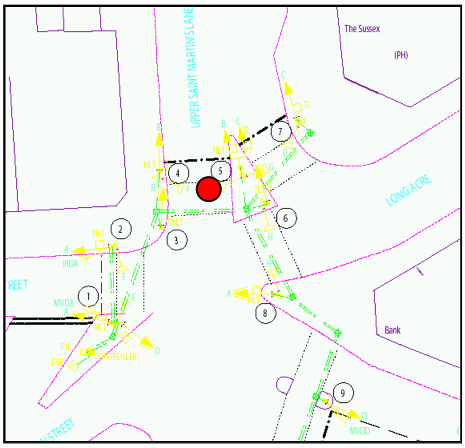
**Putney High Street CODE: 3:1L1S1S**

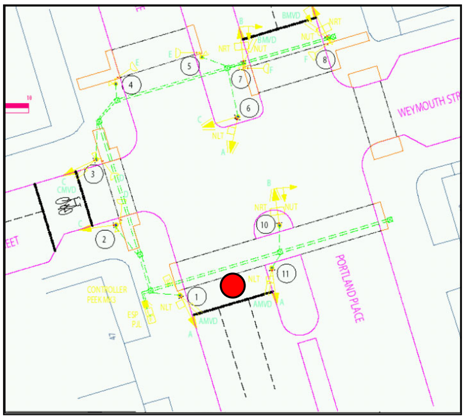
**Battersea Park Road CODE: 3:1L+2**

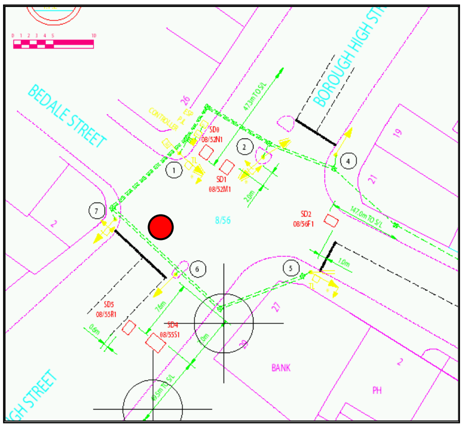
**Upper St. Martin's Lane CODE: 3:1L+2**


**Portland Place CODE: CNTRL** (no ASL reservoir or feeder)

**Borough High Street CODE: CNTRL** (no ASL reservoir or feeder)




Note: Left turns are allowed at this site, but no vehicles turned left over the 2 days analysed.

The following map identifies the location of the sites within London. Please note that for a few of the sites the same junction was selected.

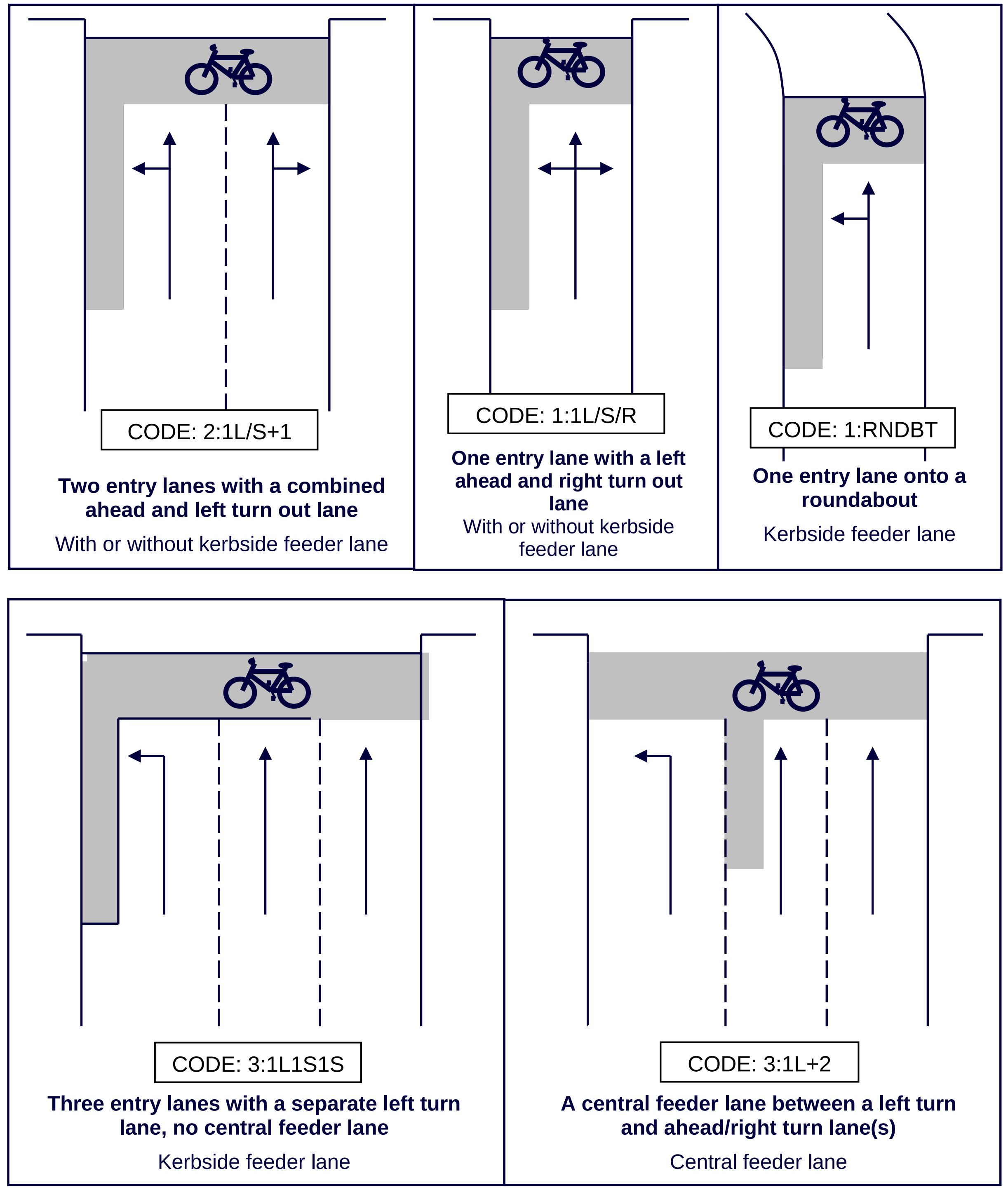
## Map indicating the location of selected sites

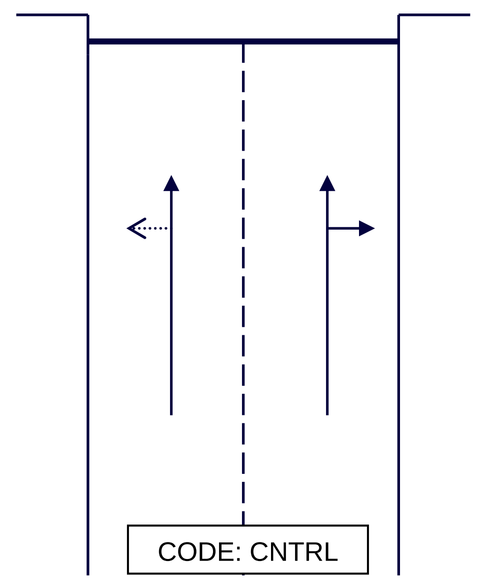

**ASL sites:**

1. Harleyford Street
2. New Cavendish Street
3. Gloucester Road
4. Queenstown Road
5. Beaufort Street
6. College Road
7. Coombe Lane West
8. Pendennis Road
9. City Road
10. Putney High Street
11. Battersea Park Road
12. Upper St. Martin's Lane
13. Portland Place
14. Borough High Street

# Appendix C. Fold out diagrams

## Appendix C






**CONTROL: No ASL**
With or without left turn allowed

# Appendix D. Site Data Table

## Summary Site Data Table

| No. | Site | Location | Category | Traffic Flow Data | Accident Data | ASL installed |
|---|---|---|---|---|---|---|
| 1 | Harleyford Street (junction with Kennington Park Road) | Lambeth | 2:1L/S+1 | Data not received | Yes | Not known |
| 2 | New Cavendish Street (junction with Portland Place) | Westminster | 2:1L/S+1 | Data not received | Yes | Oct-01 |
| 3 | Gloucester Road (junction with Coombe Road) | Kingston | 2:1L/S+1 | Data provided | Yes | Jan-97 |
| 4 | Queenstown Road (junction with Battersea Park Road) | Wandsworth | 2:1L/S+1 | No data available | Yes | 1999 |
| 5 | Beaufort Street (junction with Kings Road) | Kensington and Chelsea | 1:1L/S/R | Data provided | Yes | Jun-99/Sep-99 |
| 6 | College Road (junction with Dulwich Common) | Southwark | 1:1L/S/R | No data available | Yes | Apr-98 |
| 7 | Coombe Lane West (junction with Galsworthy Road) | Kingston | 1:1L/S/R | Data provided | Yes | Jan-97 |
| 8 | Pendennis Road (at the junction with Streatham High Road) | Lambeth | 1:1L/S/R | Data not received | Yes | Not known |
| 9 | City Road (at the junction with Old Street roundabout) | Islington | 1:RNDBT | Data provided | Yes | Not known |
| 10 | Putney High Street (at the junction with Lower Richmond Road) | Wandsworth | 3:1L1S1S | No data available | Yes | 2000 |
| 11 | Battersea Park Road (at the junction with Queenstown Road) | Wandsworth | 3: 1L+2 | No data available | Yes | Apr-01 |
| 12 | Upper St. Martin's Lane (at the junction with Long Acre and Garrick Street) | Westminster | 3: 1L+2 | No data received | Yes | Not known |
| 13 | Portland Place (at the junction with Weymouth Street) | Westminster | CNTRL | Data not received | Yes | No ASL |
| 14 | Borough High Street (at the junction with St. Thomas's Street) | Southwark | CNTRL | Data not received | Yes | No ASL |