



# **Review of 20 mph zones in London Boroughs**

**by D C Webster and R E Layfield**

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**REVIEW OF 20 MPH ZONES IN LONDON BOROUGHES**

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**by D C Webster and R E Layfield (TRL Limited)**

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## Executive summary

Previous research at TRL has shown that a reduction in vehicle speeds generally leads to a reduction in the number and severity of accidents. On average, each 1mph reduction in speed is expected to reduce the injury accident frequency by about 5%.

There are a number of ways in which substantial speed reductions can be achieved and one of these is the '20 mph zone' in which the 20 mph limit is indicated by boundary signing and physical traffic calming measures are used to provide a self enforcing speed reducing element. The use of 20 mph speed limit signs alone, without supporting traffic calming features is likely to lead to only small speed reductions of about 1 mph.

A national study of two hundred 20 mph zones in Great Britain was carried out by TRL in 1996 for the DfT, which showed that 20 mph zones were beneficial in reducing speeds and accidents. Speeds within the zones were reduced by 9 mph, traffic flows were reduced by 27%, injury accidents (all categories combined) were reduced by 61% and fatal and serious accidents (KSI accidents) were reduced by 70%.

In October 2002, TRL were commissioned by the London Accident Analysis Unit (LAAU) to review the performance of 20 mph zones in London. This present study applies a similar methodology used for the DfT study to the many 20mph zones in London, allowing (among other things) a comparison of the changes in accident frequency for the London schemes against 20 mph zones in other areas. Only five of the 20mph zones in London were included in the previous study as, at that time, many had not been installed long enough to obtain the required minimum of 12 months 'after' accident data.

Initial contact with the London Boroughs indicated that the number of 20 mph zones being installed in London had increased from about 5 per year (up to 1999) to over 30 per year by 2002 with a current total of about 137 installed zones. Further information was requested from the Boroughs and detailed information was received for 115 of the 137 zones. Most of the zones were in residential areas with over half containing schools or colleges. The main traffic calming measures used within the zones were road humps, raised junctions and speed cushions. On average, the measures were spaced between 50 and 95 metres apart.

Seventy eight of the 20 mph zones in London had been in long enough for at least a year of 'after' accident data to be available for analysis. 'Before' periods of 5 years were used and the average 'length' of the after periods was about 3 years. The results indicate that:

- the overall average 'after' mean traffic speed within the 20 mph zones in London was about 17 mph (22 zones).
- mean traffic speeds have reduced by an average of about 9 mph and traffic flows by an average of about 15% since the installation of the 20 mph zones (note: only a limited amount of speed (14 zones) and flow (11 zones) data was available).
- allowing for background changes in accident frequency on unclassified roads in London, the installation of 20 mph zones in London has reduced the frequency of injury accidents within the zones by about 42% and reduced the frequency of accidents involving fatal or serious injury (KSI) by about 53% (78 zones).
- the average ratios of KSI accidents to all injury accidents fell from 0.17 to 0.13 following the zone installations (78 zones).
- little, if any, accident migration has taken place from the 20 mph zones (38 zones).
- over the 'before' period, the numbers of accidents per km per year on 20mph zone roads were, on average, more than twice those on other unclassified roads in London .
- allowing for background changes in road user casualty frequency on unclassified roads in London, the installation of 20 mph zones in London has reduced the frequency of road user



casualties within the zones by about 45% and reduced the frequency of fatal or serious (KSI) casualties by about 57% (78 zones).

- The average ratios of KSI casualties to all casualties fell from 0.16 to 0.12 following the zone installations (78 zones).
- the average annual reduction in fatal and serious (KSI) casualties per 20 mph zone is 0.48. This is equivalent to an annual saving of about 66 KSI casualties across all one hundred and thirty seven 20 mph zones in London. NB Each serious casualty is currently valued at £134,000 by DfT (DfT, 2002) which is therefore equivalent to £8.84 million. This is a conservative estimate because fatal casualties are valued at £1.19 million each which would increase the overall value but predicting reductions in fatal casualties is imprecise because of the small numbers involved.
- there were statistically significant reductions in the KSI casualty frequency within the 20 mph zones for the following classes of road user: pedestrians (50%), child pedestrians (61%), pedal cyclists (50%), powered two wheelers (68%), car occupants (77%), and all child casualties (60%) [78 zones].
- allowing for background changes in KSI casualty frequency on unclassified roads in London, the installation of 20 mph zones has reduced the frequency of child KSI casualties within the zones between 45% and 60%, pedestrian KSI casualties between 39% and 50%, pedal cyclist KSI casualties between 30% and 50% and powered two wheeler casualties between 79% and 68% (78 zones).

The results of this study are very encouraging, suggesting large accident and casualty savings. However, the results also leave many questions unanswered. To answer the questions was either outside the scope of the present study or due to a lack of available data and so it is recommended that:

- further work is undertaken to assess the potential benefit of more extensive use of 20mph zones
- future schemes are more fully monitored and analysed, preferably in a comprehensive way, in order to better understand good practice
- an in depth study into the effect of 20mph zones on powered two-wheelers be undertaken.

## 1 Introduction

Research at TRL has shown that a reduction in vehicle speeds generally leads to a reduction in the number and severity of accidents, (Finch et al, 1994) and (Taylor et al, 2000). Broadly, each 1 mph reduction in speed is expected to cut injury accident frequency by 5%.

There are a number of ways in which substantial speed reductions can be achieved and one of these is the '20 mph zone' in which the 20 mph limit is indicated by boundary signing and physical traffic calming measures are used to provide a self enforcing speed reducing element (DfT, 1999).

The use of 20 mph speed limit signs alone, without supporting traffic calming features is likely to lead to only small speed reductions of about 1 mph (Mackie, 1998). The review of urban speed management methods by Mackie also indicated that there was little reduction in injury accidents in 20 mph zones and (30kph zones) which used signs alone apart from the city of Graz in Austria (13% reduction) where the signs-only installations were accompanied by a comprehensive publicity and enforcement campaign.

A national study of two hundred 20 mph zones in Great Britain was carried out by TRL for the DfT, which showed that 20 mph zones were beneficial in reducing speeds and accidents (Webster and Mackie, 1996). The main results of the report were that:

- Speeds were reduced by 9 mph
- Flows were reduced by 27%
- Injury accidents (all severities) were reduced by 61%
- Fatal and serious accidents (KSI accidents) were reduced by 70%
- Pedestrian injury accidents were reduced by 63%
- Pedal cyclist injury accidents were reduced by 29%
- Motor cyclist injury accidents were reduced by 73%
- Child (pedestrian and cyclist) injury accidents were reduced by 67%
- The ratio of fatal and serious accidents (KSI accidents) as a proportion of the total was reduced from 0.21 to 0.16.
- Injury accidents were reduced by 6.2% for each 1mph speed reduction
- There was no apparent overall accident migration on the surrounding roads

This level of reduction in accidents and casualties is supported by more recent data from the City of Hull where 26% (191 km) of the city's roads are subject to 20 mph speed restrictions. One hundred and twenty 20 mph zones have been installed since 1994 covering 500 streets. Injury accidents in the zones have decreased by 56%; KSI accidents by 90%; pedestrian casualties by 54%; child casualties by 64%; and child pedestrian casualties by 74% (Brightwell, 2003).

In October 2002, TRL were commissioned by the London Accident Analysis Unit (LAAU) to review the performance of 20 mph zones in London. Only five of the 20mph zones in London were included in the earlier DfT national study as, at that time (1996), many had not been installed long enough to obtain the required minimum of 12 months 'after' accident data. This present study applies a similar methodology used for the DfT project to the many 20mph zones in London, allowing (among other things) a comparison of the changes in accident frequency for the London schemes against 20 mph zones in other areas.

Section 2 of this report provides information about the 20 mph zones in London, Section 3 considers their impact on injury accidents, Section 4 considers their impact on casualties, Section 5 considers the changes in changes in traffic speeds and flows within the 20 mph zones and Section 6 contains the summary of results and conclusions.

## 2 20mph zones in London

### 2.1 Data collection

In November 2002, TRL contacted all London Boroughs to determine how many 20 mph zones they had installed and to obtain information concerning the location of the zones, the installation period, plans of the zones and the types of measures used in the zones. It was estimated from the initial contact that there were about 137 zones (see Figure 2.1). Further information was requested from the Boroughs and detailed information was received for 115 of the 137 zones (see Appendix A). Seventy eight of the 115 zones had been in long enough for at least a year of 'after' accident data to be available for analysis.

The Boroughs were also asked for any speed or flow measurements made before or after the zones were installed. This data was added to the information that TRL had already acquired on 20 mph zones in London from previous studies.

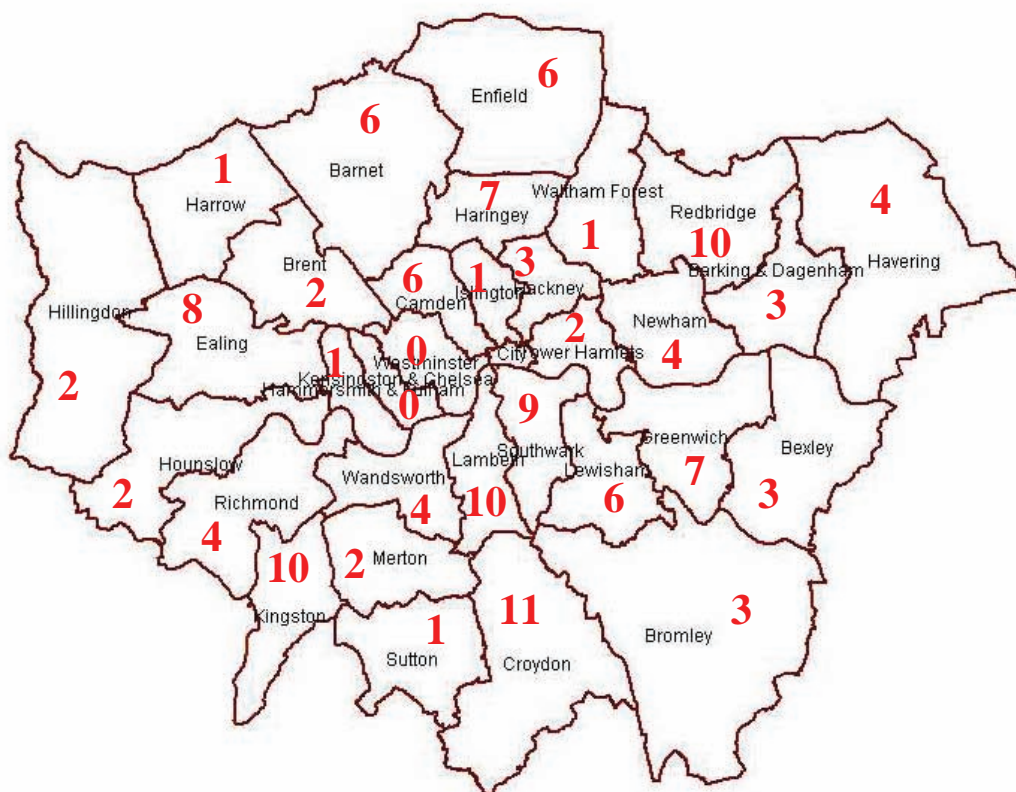
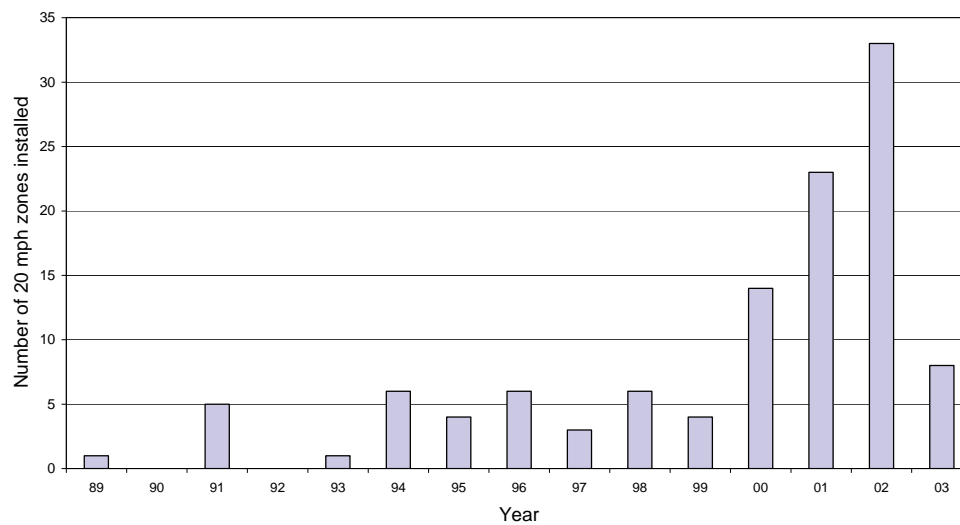


Figure 2.1 Numbers of 20 mph zones in London as at November 2002 (137 total)

### 2.2 Implementation of schemes

The implementation dates of the schemes are summarised in Figure 2.2 which shows how the number of 20 mph zones installed in London has increased from about 5 per year (up to 1999) to over 30 per year by 2002. The number for 2003 (which is a part year) is on course for a similar number to 2002.

No Boroughs reported that any 20 mph zones had been removed after installation and it was believed that the roads within the zone were originally subject to a 30 mph speed limit.



**Figure 2.2 20 mph zones in London – number installed in each year (03 part year)**

### 2.3 Types of schemes

It was found that 102 (89%) of the hundred and fifteen 20 mph zones were ‘area’ zones and 13 (11%) were ‘linear’ zones. The ‘linear’ zones were those that consisted of only one road.

There were 40 (35%) purely residential zones, 70 zones (61%) containing schools and 5 zones (4%) which were town /city centres or mainly commercial zones.

### 2.4 Types of traffic calming measures used

Information on the types of traffic calming measures used within the 20 mph zones was provided by the London Boroughs for 95 of the zones (see Appendix B). Examples of the measures used in Ealing (zone 29), Kingston (zone 55) and Sutton (zone 101) are given in Figures 2.3, 2.4 and 2.5.

**Road humps (flat-top and round-top)** Roads humps are an effective and versatile traffic calming measure. Round-top humps were used in 49 zones (52%) and flat-top humps in 70 zones (74%). The most common height for the humps was 75 mm (see DfT, 1999). This height was used in about 80% of the zones with road humps; the remainder used humps in the range 75 to 100 mm high.

**Raised junctions** Raised junctions are a form of flat-top road hump covering the whole junction. The extent to which a raised junction extends into the side road depends on the local factors at the site. They were used in 26 zones (27%) mainly combined with road humps.

**Speed cushions** Speed cushions were developed to reduce the discomfort / delay to large vehicles such as buses and fire appliances. For cars, the speed reduction achieved is mainly determined by cushion width with narrower cushions allowing higher speeds. Speed cushions were used in 42 zones (44%), mainly combined with road humps and raised junctions. Four zones in LB Southwark used only speed cushions (Zones 96, 97, 98 and 100).

The most common height of the cushions used in the 20 mph zones was 75 mm (94%); the others were 80 mm high (6%). The most common width of the cushions was 1.6 m (64%). Other widths of cushion used were 1.7 m (17%), 1.8 m (11%) and 1.9 m (8%).

Chicanes Chicanes generally cause less discomfort than road humps but they are more expensive and not so effective at reducing speeds. They can be unpopular with residents for a number of reasons: little speed reduction for powered two wheelers, fear of collisions with opposing traffic, loss of parking space and difficulty in using accesses. Chicanes were not very common and were used at only 2 (2%) of the 20 mph zones in London.

Raised footway Raised footways are a form of flat-top hump which is used to raise the footway at the entrance to a zone.



a

Figs 2.3a and 2.3b

Signing and raised footway across entrance to 20 mph zone



b



Fig 2.3c Raised junction



Fig 2.3d Flat-top hump and controlled parking bays

**Figure 2.3 Five Roads 20 mph Zone, LB Ealing (zone 29 - first part of phased installation of Five Roads Home Zone)**



Figs 2.4a, 2.4b and 2.4c showing 20 mph zone signing and road narrowing at entrance gateway



Fig 2.4d Round-top hump

**Figure 2.4 The Groves 20 mph Zone, LB Kingston (zone 55)**



Fig 2.5a Road narrowing and signing at entry to 20 mph zone



Fig 2.5b Signing on exit from the 20 mph zone



Fig 2.5c Parking along road with round-top humps

Figure 2.5 Worcester Park 20 mph zone, LB Sutton (zone 101)



## 2.5 Spacing of measures

Ideally the physical traffic calming measures used in the 20 mph zones should not only keep speeds low but also encourage a smooth driving style through the zone. In order to achieve this, the measures should be spaced about 60m to 70m apart (DfT, 1999).

Information on the spacing of the traffic calming measures was available for 74 of the 20 mph zones from the plans supplied by the Boroughs. The maximum and minimum spacings of the measures were recorded for each of the zones and overall averages obtained. The average 'minimum' spacing was about 49m and the average 'maximum' spacing was about 94m.

## 2.6 Length of roads

The maximum length of road comprising one zone was 14.5 km in Plashet Residential Haven, LB Newham (zone 76) and the minimum was 0.15 km in Watling Street, City of London (zone 26). The average length of road in each zone was 3.4 km. The total length of all roads in the zones was 391 km including short lengths that did not have speed-reducing measures. The total length of the roads in the 20 mph zones used for the accident analysis was 253.4km (see Section 3.2).

## 2.7 Size of schemes

The largest 20 mph zone was in Waverley, LB Southwark (zone 97) which has an area of 2.08 km<sup>2</sup>. The smallest (excluding the linear zones) was Cabul Road, LB Wandsworth (zone 114) with an area of 0.02 km<sup>2</sup>. The average size of all of the zones was 0.35 km<sup>2</sup>.

# 3 Impact on injury accidents

## 3.1 Data collection

As was mentioned in Section 2.1, detailed information was received from the London Boroughs for 115 of the 137 zones. Seventy eight of these 115 zones had been in long enough for at least a year of 'after' accident data to be available for analysis.

The following information was determined for each of the 78 zones:

- The date that construction started
- The date that the 20 mph zone was finished
- The roads (wholly or partly) contained within the 20 mph zone.
- Whether there were well defined boundary roads onto which any displaced traffic might have transferred.

This information enabled a 'before' injury accident period of 5 years to be specified for each zone. This was generally taken as 5 calendar years. Calendar years were used because some Boroughs could not be precise as to when the scheme started e.g. 'in the summer of 1998'.

Schemes which had traffic calming measures installed before the introduction of the 20 mph zone and schemes which were installed in phases, had their 5 year 'before' period finishing before the traffic calming or first phases were installed. The 3 phases in North Tottenham (zones 43, 44 and 45) were self contained and separated by main roads that were not part of the 20 mph zones and hence they were all treated individually.

The dates when the 20 mph zones were completed were generally known so there was less of a problem with the specification of the ‘after’ periods. The start of each ‘after’ injury accident period was taken as the first complete month after the 20 mph zone was completed. The lengths of the ‘after’ injury accident periods were constrained by the data available. The maximum length was five years and the minimum was one year.

The information for each zone specifying the ‘before’ and ‘after’ injury accident periods and the roads contained within the zone was sent to the London Accident Analysis Unit (LAAU) who extracted the relevant accident and casualty data. LAAU also supplied accident data for the boundary roads around some thirty eight 20 mph zones (see Section 3.4), and ‘control data’ for unclassified roads and other ‘A’ and ‘B’ class roads in London (see Section 3.6).

Most zones were on minor roads and most boundary roads were main roads. Therefore, it was decided to use all unclassified roads in London as ‘control’ data for zone roads and all ‘A’ and ‘B’ roads in London as ‘control’ data for boundary roads. This data was supplied by LAAU.

### 3.2 Changes in annual accident frequency

The numbers of ‘before’ and ‘after’ reported injury accidents (slight, serious and fatal) in each of the seventy eight 20mph zones are given in Appendix C. In the ‘before’ period, the annual frequency of injury accidents ranged from 0 accidents per year (six schemes) to about 20 accidents per year (St Peter’s Street, LB Islington). Four schemes had no accidents in the ‘before’ or ‘after’ periods.

Details of the changes in the annual frequency of injury accidents are given in Table 3.1. During the ‘before’ period there were 1660 reported injury accidents in 4680 site months giving an overall ‘before’ accident frequency of about 4.3 accidents per year per site. During the ‘after’ period there were 590 reported injury accidents in 2930 site months giving an overall ‘after’ accident frequency of about 2.4 accidents per year per site.

**Table 3.1 Accidents in 20 mph zones in London (78 zones)**

	No of accidents		No of months		Accs/year/site		% diff.	Stat.
	Before	After	Before	After	Before	After	Before to after	Signif.
All injury accidents	1660	590	4680	2930	4.256	2.416	-43.2	Yes
KSI accidents	282	77	4680	2930	0.723	0.315	-56.4	Yes

The overall annual accident frequency has reduced by 43% (1.84 accidents per year per 20 mph zone) between the ‘before’ and ‘after’ periods. This reduction in accidents is highly statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance. (See Appendix D for details of the significance test.)

The total length of roads in the seventy eight 20 mph zones used for the accident analysis was 253.4 km. Giving a ‘before’ overall accident frequency of 1.31 accidents per year per km and an ‘after’ accident frequency of 0.74 accidents per year per km.

### 3.3 Accident severity

Accidents in which there are fatalities or serious injuries are grouped together as killed and seriously injured (KSI) accidents. Details of the changes in the annual frequency of KSI accidents are also given in Table 3.1.

During the 'before' period there were 282 KSI accidents (7 fatal and 275 serious) in 4680 site months giving an overall 'before' KSI accident frequency of about 0.7 accidents per year per zone.

During the 'after' period there were 77 KSI accidents (4 fatal and 73 serious) in 2930 site months giving an overall 'after' KSI accident frequency of about 0.3 accidents per year per zone.

The annual frequency of KSI accidents has reduced by 56% (0.41 accidents per year per 20 mph zone) between the 'before' and after periods. This reduction in accidents is statistically significant at the 95% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The average 'before' severity ratio (proportion of total injury accidents that are fatal and serious) was 0.170. The 'after' severity ratio (KSI accidents/all reported accidents) reduced to 0.13. This change in the proportion is also statistically significant at above the 95% level according to the Z test statistic.

### 3.4 Accident migration

A possible concern of traffic calming schemes is that traffic and accidents may be redistributed to the neighbouring surrounding area, as drivers choose different routes, so as to avoid the speed reducing measures. This possibility was investigated for 38 of the 20 mph zones where there were clear boundary roads onto which driver route changes may have occurred and increased the potential for transfer of accidents.

Details of the changes in the annual frequency of injury accidents on the boundary roads are given in Table 3.2. On the boundary roads, there were 4605 reported injury accidents in 2280 'before' site months and 3066 reported accidents in 1554 'after' site months. The overall annual accident frequency reduced by 2% (0.56 accidents per year per site) between the 'before' and 'after' periods. This reduction in accidents is small and not statistically significant. The annual KSI accident frequency also reduced by 2% (0.07 accidents per year per site) between the 'before' and 'after' periods. This reduction in accidents is also small and not statistically significant.

These results suggest that little, if any, accident migration is taking place onto the boundary roads but see also Section 3.6.

**Table 3.2 Accidents in 20 mph zone boundary roads in London (38 zones)**

	No of accidents		No of months		Accs/year/site		% diff.	Stat.
	Before	After	Before	After	Before	After	Before to after	Signif.
All injury accidents	4605	3066	2280	1554	24.24	23.68	-2.3	No
KSI accidents	715	478	2280	1554	3.76	3.69	-1.9	No

### 3.5 Accidents at/near junctions

A high proportion of accidents take place at or near junctions because of the inevitable conflicts with other road users when vehicles turn into or out of a junction. The proportions of all accidents that occurred at junctions were 70% 'before' the implementation of the 20 mph zones and 68% 'after'. This 'before' to 'after' change was small and not statistically significant.

An analysis of the following accident types were carried out:-

Car/Car (Accidents involving only cars)

Car/Pedestrian (Accidents involving a car and a pedestrian)

Car/Pedal cyclist	(Accidents involving a car and a pedal cyclist)
Car/Powered 2 wheeler	(Accidents involving a car and a powered 2 wheeler)
Goods and buses/Pedestrian	(Accidents involving a goods vehicle or bus and a pedestrian)

The proportion of Car/Car accidents that occurred at junctions was 81% in the ‘before’ period and 79% in the ‘after’ period. The corresponding proportions for Car/Pedestrian accidents were 54% ‘before’ and 57% ‘after’. These were the largest two categories of accidents, and both the changes were small and not statistically significant. There was no evidence that the proportions of the other accident types given above, that took place at a junction, were affected by the installation of the 20 mph zone.

### 3.6 Comparison with trends for accidents on roads in London

#### 3.6.1 20 mph zones

The results in Sections 3.2 and 3.3 indicate that the 20mph zones in London have had a large impact on accidents within their boundaries. However some adjustments to the magnitude of the changes are required to allow for general underlying changes in accident frequency on roads within London during the time covered by the ‘before’ and ‘after’ periods.

The reductions in injury accident frequency in the 20mph zones (43% all accidents, 56% KSI accidents) are substantially greater than the trends on unclassified roads within London, which if the average ‘before’ and ‘after’ periods are taken as 5 years (1<sup>st</sup> September 1992 to 31<sup>st</sup> August 1997) and 3 years (1<sup>st</sup> November 1998 to 31<sup>st</sup> October 2001) respectively, show a 4% reduction in all accidents and a 12% reduction in KSI accidents (see Table 3.3).

**Table 3.3 Accidents on all unclassified roads in London**

	No of accidents		No of years		Accs/year		% diff. Before to after
	Before	After	Before	After	Before	After	
All injury accidents	30112	17400	5	3	6022	5800	-3.7
KSI accidents	4681	2470	5	3	936	823	-12.1

Making full allowance for these trends on unclassified roads (i.e. assuming that they have been brought about by other factors than 20 mph zones – improved education and training for example) the present results for 20mph zones in London represent an overall reduction in injury accidents of 41% and a 50% reduction of accidents involving serious or fatal injury (both changes remain statistically significant). In reality, however, the 20 mph zones will have contributed to some of the accident reductions on unclassified roads within London; and the present results for the 20 mph zones are best interpreted as bringing about:

- a reduction of between 41% and 43% for all injury accidents.
- a reduction of between 50% and 56% for accidents involving fatal or serious injury.

### 3.6.2 Boundary roads

The reductions in injury accident frequency on the boundary roads outside the 20 mph zones (2.3% all accidents, 1.9% KSI accidents) are not substantially different from the trends on 'A' and 'B' classified roads within London, which if the average 'before' and 'after' periods are taken as 5 years (December 1991 to November 1996) and 3 years (June 1998 to May 2001) respectively show a 0.5% reduction in all accidents and a 3.6% reduction in KSI accidents. (see Table 3.4)

**Table 3.4 Accidents on all 'A' and 'B' class roads in London**

	No of accidents		No of years		Accs/year		% diff. Before to after
	Before	After	Before	After	Before	After	
All injury accidents	136117	81244	5	3	27223	27081	-0.5
KSI accidents	21199	12264	5	3	4240	4088	-3.6

Making full allowance for these trends on 'A' and 'B' roads, the present results for the boundary roads represent an overall reduction in injury accidents of 1.8% and an increase of 1.7% in accidents involving serious or fatal injury. Both changes are small and not statistically significant and still indicate that little, if any, accident migration is taking place from the 20 mph zones.

### 3.7 Regression to the mean

'Regression to the mean' (or 'bias by selection') is a statistical phenomenon that also needs to be considered in 'before' and 'after' studies, if, what appear to be, above average accident sites are treated. It recognises that high accident frequencies in one year are likely to be followed by lower ones the next year, even if there is no intervention, or treatment, due to random fluctuation.

Regression to the mean was not thought likely to be a major problem with this study as many of the areas will not have been selected for 20mph zones because of high accident rates (six zones had no accidents in the 5 year 'before' period). An additional safeguard was that long (5 year) 'before' periods were used. These give more reliable estimates of the 'true' underlying accident frequencies before the schemes were implemented and reduce the likelihood of overstating the effect of the treatment (in this case 20mph zones) on accidents by more than a few per cent. (DfT, 2001).

The use of a 'control' (of similar, untreated roads) can also help to assess the 'true' effect of a measure. However, identifying similar roads is not always easy and some further investigations were carried out to ascertain whether the roads chosen for 20mph zones were representative of the 'control' roads (other unclassified roads in London) before they were treated.

First, the proportions of accidents involving the various different types of road users were compared for 20mph zone roads and the non-20mph zone roads. Second, the proportions of accidents that resulted in fatal or serious injury were compared for 20mph zone roads and non-20mph zone roads, and for different road user types. These two investigations revealed broadly similar accident patterns (with the rather surprising exception that the roads that were chosen for 20mph zones had a much higher KSI casualty ratio for powered two-wheeler casualties). Third, for each 20mph zone, the number of 'before' accidents was plotted against the percentage change in accident frequency observed 'after' the 20mph zones were installed. There was no clear evidence that the sites with the highest accident frequencies 'before' achieved the greatest percentage reductions.

Finally, data were obtained about unclassified road lengths in London and numbers of accidents/km/year were calculated, as shown in Table 3.5 below.

**Table 3.5: Accidents on unclassified roads in London**

		Accidents per year per km			Accidents per year per km		
		All	Saved	% saved	KSI	Saved	% saved
All unclassified roads	Before	0.58			0.090		
	After	0.56	0.021	3.7%	0.079	0.011	12%
20 mph zones	Before	1.31			0.22		
	After	0.74	0.57	43%	0.097	0.13	56%
Non 20 mph zones	Before	0.56			0.087		
	After	0.55	0.0077	1.4%	0.079	0.0080	9%

The table shows that in terms of accident frequency per km, the sites selected for 20mph zones did have the largest values. Further, these values did not reduce to those observed on non-20mph zone roads after treatment.

These findings may have consequences for the future installations of 20mph zones in London and these are discussed further in section 7.

## 4 Impact on casualties

The numbers of 'before' and 'after' road user casualties (all ages) that resulted from reported injury accidents within each of the seventy eight 20 mph zones are given in Appendix E. The numbers of child road user casualties for each of the seventy eight 20 mph zones are given in Appendix F.

### 4.1 Changes in annual casualty frequency

Table 4.1 contains details of the 'before' to 'after' changes in road user casualties within 20 mph zones in London. During the 'before' period, there were 1936 reported road user casualties (all categories) in 4680 site months, giving an overall 'before' casualty frequency of about 5.0 casualties per year per site. During the 'after' period, there were 650 reported road user casualties (all types) in 2930 site months, giving an overall 'after' casualty frequency of about 2.7 casualties per year per site.

The overall annual casualty frequency has reduced by 46% (2.30 casualties per year per 20 mph zone) between the 'before' and 'after' periods. This reduction in casualties is highly statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

**Table 4.1 Casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff Before to after	Stat Signif
	Before	After	Before	After	Before	After		
All casualties	1936	650	4680	2930	4.964	2.662	-46.4	Yes
KSI casualties	308	77	4680	2930	0.790	0.315	-60.1	Yes

## 4.2 Severity of injury

Fatalities or serious injuries are grouped together as killed and seriously injured (KSI) casualties. Table 4.1 contains details of the changes in KSI casualties following the introduction of the 20 mph zones in London.

During the 'before' period there were 308 KSI casualties (7 fatal and 301 serious) in 4680 site months giving an overall 'before' KSI casualty frequency of about 0.80 casualties per year per zone.

During the 'after' period there were 77 KSI accidents (4 fatal and 73 serious) in 2930 site months giving an overall 'after' KSI accident frequency of about 0.32 casualties per year per zone.

The annual frequency of KSI accidents has reduced by 60% (0.48 accidents per year per 20 mph zone) between the 'before' and 'after' periods. This reduction in accidents is statistically significant at the 95% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The 'before' severity ratio (proportion of total injury accidents that are fatal and serious) was 0.159. The 'after' severity ratio (KSI casualties/all reported casualties) reduced to 0.118. This reduction is also highly statistically significant.

## 4.3 Age and class of road user casualty

### 4.3.1 Pedestrians

Table 4.2 contains details of the 'before' to 'after' changes in pedestrian casualties within 20 mph zones in London.

**Table 4.2 Pedestrian casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff. Before to after	Stat. Signif.
	Before	After	Before	After	Before	After		
All casualties	536	202	4680	2930	1.374	0.827	-39.8	Yes
KSI casualties	125	39	4680	2930	0.321	0.160	-50.2	Yes

During the 'before' period there were 536 pedestrian casualties in 4680 site months giving an overall 'before' casualty frequency of about 1.37 casualties per year per zone.

During the 'after' period there were 202 pedestrian casualties in 2930 site months giving an overall 'after' casualty frequency of about 0.83 casualties per year per zone.

The annual frequency of pedestrian casualties has reduced by 40% (0.55 casualties per year per 20 mph zone) between the 'before' and 'after' periods. This reduction in casualties is statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The corresponding number of KSI pedestrian casualties were 125 'before' (0.32 casualties per year per zone) and 39 pedestrian casualties 'after' (0.16 casualties per year per zone) giving a reduction of 50% (0.16 casualties per year per zone) which was statistically significant at the 95% level.

The average 'before' severity ratio (proportion of total injury casualties that are fatal and serious) was 0.233. The 'after' severity ratio (KSI casualties/all reported casualties) reduced to 0.193. This change was not statically significant.

### 4.3.2 *Child pedestrians*

Table 4.3 contains details of the 'before' to 'after' changes in child pedestrian casualties within 20 mph zones in London.

**Table 4.3 Child pedestrian casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff. Before to after	Stat. Signif.
	Before	After	Before	After	Before	After		
All casualties	291	94	4680	2930	0.746	0.385	-47.9	Yes
KSI casualties	73	18	4680	2930	0.187	0.074	-60.6	Yes

During the 'before' period there were 291 child pedestrian casualties in 4680 site months giving an overall 'before' casualty frequency of 0.75 casualties per year per zone.

During the 'after' period there were 94 child pedestrian casualties in 2930 site months giving an overall 'after' casualty frequency of 0.39 casualties per year per zone.

The annual frequency of child pedestrian casualties has reduced by 48% (0.36 casualties per year per 20 mph zone) between the 'before' and 'after' periods. This reduction in casualties is statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The corresponding number of KSI child pedestrian casualties were 73 'before' (0.19 casualties per year per zone) and 18 child pedestrian casualties 'after' (0.07 casualties per year per zone) giving a reduction of 60.6% (0.11 casualties per year per zone) which was statistically significant at the 95% level.

The average 'before' severity ratio (proportion of total injury casualties that are fatal and serious) was 0.251. The 'after' severity ratio (KSI casualties/all reported casualties) reduced to 0.191. This change was not statistically significant.

### 4.3.3 *Pedal cyclists*

Table 4.4 contains details of the 'before' to 'after' changes in pedal cyclist casualties within 20 mph zones in London.

**Table 4.4 Pedal cyclist casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff. Before to after	Stat. Signif.
	Before	After	Before	After	Before	After		
All casualties	250	105	4680	2930	0.641	0.430	-32.9	Yes
KSI casualties	38	12	4680	2930	0.097	0.049	-49.6	Yes

During the 'before' period there were 250 pedal cyclist casualties in 4680 site months giving an overall 'before' casualty frequency of 0.64 casualties per year per zone.



During the ‘after’ period there were 105 pedal cyclist casualties in 2930 site months giving an overall ‘after’ casualty frequency of 0.43 casualties per year per zone.

The annual frequency of pedal cyclist casualties has reduced by 33% (0.21 casualties per year per 20 mph zone) between the ‘before’ and ‘after’ periods. This reduction in casualties is statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The corresponding number of KSI pedal cyclist casualties were 38 ‘before’ (0.10 casualties per year per zone) and 12 pedal cyclist casualties ‘after’ (0.05 casualties per year per zone) giving a reduction of 49.6% (0.05 casualties per year per zone) which was statistically significant at the 95% level.

The average ‘before’ severity ratio (proportion of total injury casualties that are fatal and serious) was 0.152. The ‘after’ severity ratio (KSI casualties/all reported casualties) reduced to 0.114.

#### 4.3.4 *Child pedal cyclists*

Table 4.5 contains details of the ‘before’ to ‘after’ changes in child pedal cyclist casualties within 20 mph zones in London.

**Table 4.5 Child pedal cyclist casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff.	Stat.
	Before	After	Before	After	Before	After	Before to after	Signif.
All casualties	97	25	4680	2930	0.249	0.102	-58.8	Yes
KSI casualties	16	4	4680	2930	0.041	0.016	-60.1	No

During the ‘before’ period there were 97 child pedal cyclist casualties in 4680 site months giving an overall ‘before’ casualty frequency of 0.25 casualties per year per zone.

During the ‘after’ period there were 25 child pedal cyclist casualties in 2930 site months giving an overall ‘after’ casualty frequency of 0.10 casualties per year per zone.

The annual frequency of child pedal cyclist casualties has reduced by 59% (0.15 casualties per year per 20 mph zone) between the ‘before’ and ‘after’ periods. This reduction in casualties is statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The corresponding number of KSI child pedal cyclist casualties were 16 ‘before’ (0.041 casualties per year per zone) and 4 child pedal cyclist casualties ‘after’ (0.016 casualties per year per zone) giving a reduction of 49.6% (0.025) which was not statistically significant at the 95% level.

The average ‘before’ severity ratio (proportion of total injury casualties that are fatal and serious) was 0.165. The ‘after’ severity ratio (KSI casualties/all reported casualties) reduced to 0.160.

#### 4.3.5 *Powered two wheelers*

Table 4.6 contains details of the ‘before’ to ‘after’ changes in powered two wheeler casualties within 20 mph zones in London.

**Table 4.6 Powered two wheeler casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff.	Stat.
	Before	After	Before	After	Before	After	Before to after	Signif.
All casualties	207	77	4680	2930	0.531	0.315	-40.6	Yes
KSI casualties	54	11	4680	2930	0.138	0.045	-67.5	Yes

During the 'before' period there were 207 powered two wheeler casualties in 4680 site months giving an overall 'before' casualty frequency of 0.53 casualties per year per zone.

During the 'after' period there were 77 powered two wheeler casualties in 2930 site months giving an overall 'after' casualty frequency of 0.32 casualties per year per zone.

The annual frequency of powered two wheeler casualties has reduced by 41% (0.22 casualties per year per 20 mph zone) between the 'before' and 'after' periods. This reduction in casualties is statistically significant at the 95% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance (see Table 8).

The corresponding number of KSI powered two wheeler casualties were 54 'before' (0.138 casualties per year per zone) and 11 powered two wheeler casualties 'after' (0.045 casualties per year per zone) giving a reduction of 67.5% (0.093 casualties per year per zone) which was statistically significant at the 95% level.

The average 'before' severity ratio (proportion of total injury casualties that are fatal and serious) was 0.261. The 'after' severity ratio (KSI casualties/all reported casualties) reduced to 0.143.

#### 4.3.6 Car occupants

Table 4.7 contains details of the 'before' to 'after' changes in car occupant casualties within 20 mph zones in London.

**Table 4.7 Car occupant casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff.	Stat.
	Before	After	Before	After	Before	After	Before to after	Signif.
All casualties	870	233	4680	2930	2.231	0.954	-57.2	Yes
KSI casualties	82	12	4680	2930	0.210	0.049	-76.6	Yes

During the 'before' period there were 870 car occupant casualties in 4680 site months giving an overall 'before' casualty frequency of 2.23 casualties per year per zone.

During the 'after' period there were 233 car occupant casualties in 2930 site months giving an overall 'after' casualty frequency of 0.95 casualties per year per zone.

The annual frequency of car occupant casualties has reduced by 57% (1.28 casualties per year per 20 mph zone) between the 'before' and 'after' periods. This reduction in casualties is statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The corresponding number of KSI car occupant casualties were 82 'before' (0.21 casualties per year per zone) and 12 car occupant casualties 'after' (0.05 casualties per year per zone) giving a reduction of 76.6% (0.16 casualties per year per zone) which was statistically significant at the 95% level.

The average 'before' severity ratio (proportion of total injury casualties that are fatal and serious) was 0.094. The 'after' severity ratio (KSI casualties/all reported casualties) reduced to 0.051.

#### 4.3.7 Child car occupants

Table 4.8 contains details of the 'before' to 'after' changes in child car occupant casualties within 20 mph zones in London.

**Table 4.8 Child car occupant casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff. Before to after	Stat. Signif.
	Before	After	Before	After	Before	After		
All casualties	75	23	4680	2930	0.192	0.094	-51.0	Yes
KSI casualties	3	1	4680	2930	0.008	0.004	-46.8	No

During the 'before' period there were 75 child car occupant casualties in 4680 site months giving an overall 'before' casualty frequency of 0.19 casualties per year per zone.

During the 'after' period there were 23 child car occupant casualties in 2930 site months giving an overall 'after' casualty frequency of 0.09 casualties per year per zone.

The annual frequency of child car occupant casualties has reduced by 51% (0.10 casualties per year per 20 mph zone) between the 'before' and 'after' periods. This reduction in casualties is statistically significant at the 99% level using the chi-square test with 1 degree of freedom showing that the reduction is unlikely to be due to chance.

The corresponding number of KSI child car occupant casualties were 3 'before' (0.008 casualties per year per zone) and 1 child car occupant casualty 'after' (0.004 casualties per year per zone) giving a reduction of 46.8% (0.004 casualties per year per zone) which was not statistically significant at the 95% level.

The average 'before' severity ratio (proportion of total injury casualties that are fatal and serious) was 0.040. The 'after' severity ratio (KSI casualties/all reported casualties) increased to 0.043.

#### 4.3.8 Goods vehicle occupants

Table 4.9 contains details of the 'before' to 'after' changes in goods vehicle occupant casualties within 20 mph zones in London.

**Table 4.9 Goods vehicle occupant casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff. Before to after	Stat. Signif.
	Before	After	Before	After	Before	After		
All casualties	36	15	4680	2930	0.092	0.061	-33.4	No
KSI casualties	4	3	4680	2930	0.008	0.012	+19.8	No

During the ‘before’ period there were 36 goods vehicle occupant casualties in 4680 site months giving an overall ‘before’ casualty frequency of 0.092 casualties per year per zone.

During the ‘after’ period there were 15 goods vehicle occupant casualties in 2930 site months giving an overall ‘after’ casualty frequency of 0.061 casualties per year per zone.

The annual frequency of goods vehicle occupant casualties has reduced by 33% (0.031 casualties per year per 20 mph zone) between the ‘before’ and ‘after’ periods. This reduction in casualties is not statistically significant using the chi-square test with 1 degree of freedom showing that the reduction is likely to be due to chance.

The corresponding number of KSI goods vehicle occupant casualties were 4 ‘before’ (0.008 casualties per year per zone) and 3 goods vehicle occupant casualties ‘after’ (0.012 casualties per year per zone) giving an increase of 19.8% which was not statistically significant at the 95% level.

The average ‘before’ severity ratio (proportion of total injury casualties that are fatal and serious) was 0.111. The ‘after’ severity ratio (KSI casualties/all reported casualties) increased to 0.20.

#### 4.3.9 Bus and coach occupants

Table 4.10 contains details of the ‘before’ to ‘after’ changes in bus and coach occupant casualties within 20 mph zones in London.

**Table 4.10 Bus and coach occupant casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff.	Stat.
	Before	After	Before	After	Before	After	Before to after	Signif.
All casualties	18	14	4680	2930	0.046	0.057	+24.2	No
KSI casualties	2	0	4680	2930	0.005	0.000	-100	No

During the ‘before’ period there were 18 bus and coach occupant casualties in 4680 site months giving an overall ‘before’ casualty frequency of 0.046 casualties per year per zone.

During the ‘after’ period there were 14 bus and coach occupant casualties in 2930 site months giving an overall ‘after’ casualty frequency of 0.057 casualties per year per zone.

The annual frequency of bus and coach occupant casualties has increased by 24% (0.011 casualties per year per 20 mph zone) between the ‘before’ and ‘after’ periods. This increase in casualties is not statistically significant using the chi-square test with 1 degree of freedom showing that the increase is likely to be due to chance.

The corresponding number of KSI bus and coach occupant casualties were 2 ‘before’ (0.005 casualties per year per zone) and 0 bus and coach occupant casualties ‘after’ (0.000 casualties per year per zone) giving a decrease of 100% which was not statistically significant at the 95% level.

The average ‘before’ severity ratio (proportion of total injury casualties that are fatal and serious) was 0.111. The ‘after’ severity ratio (KSI casualties/all reported casualties) decreased to zero.

#### 4.3.10 All child casualties

Table 4.11 contains details of the ‘before’ to ‘after’ changes in all child casualties within 20 mph zones in London.

**Table 4.11 All child casualties in 20 mph zones in London (78 zones)**

	No of casualties		No of months		Cas/year/site		% diff. Before to after	Stat. Signif.
	Before	After	Before	After	Before	After		
All casualties	475	146	4680	2930	1.218	0.598	-51.0	Yes
KSI casualties	95	24	4680	2930	0.244	0.098	-59.6	Yes

During the 'before' period there were 475 child casualties in 4680 site months giving an overall 'before' casualty frequency of 1.22 casualties per year per zone.

During the 'after' period there were 146 child casualties in 2930 site months giving an overall 'after' casualty frequency of 0.60 casualties per year per zone.

The annual frequency of all child casualties has decreased by 51% (0.62 casualties per year per 20 mph zone) between the 'before' and 'after' periods. This decrease in casualties is statistically significant, at the 99% level, using the chi-square test with 1 degree of freedom showing that the decrease is not likely to be due to chance.

The corresponding number of KSI child casualties were 95 'before' (0.244 casualties per year per zone) and 24 child casualties 'after' (0.098 casualties per year per zone) giving a reduction of 59.6% (0.15 casualties per year per zone) which was statistically significant at the 95% level.

The average 'before' severity ratio (proportion of total injury casualties that are fatal and serious) was 0.200. The 'after' severity ratio (KSI casualties/all reported casualties) decreased to 0.164.

#### 4.4 Summary of casualty changes after installation of 20 mph zones, by road user

Table 4.11a below draws together the results for all casualties from the preceding sections and show broadly similar reductions in all categories except bus/coach occupants. This category and goods vehicle occupant casualties were the only changes which were not statistically significant.

**Table 4.11a: Summary of casualty changes after installation of 20 mph zones, by road user**

Road user type	20zones (78zones) (unadjusted)	Statistically significant?
Pedestrian casualties/year/site	-40%	Yes
Child pedestrian casualties/year/site	-48%	Yes
Cyclist casualties/year/site	-33%	Yes
Child cyclist casualties/year/site	-59%	Yes
Powered 2-wheeler casualties/year/site	-41%	Yes
Car occupant casualties/year/site	-57%	Yes
Child car occupant casualties/year/site	-51%	Yes
Goods vehicle occupant casualties/year/site	-33%	No
Bus/coach occupant casualties/year/site	+24%	No
Child casualties/year/site	-51%	Yes
<b>All casualties/year/site</b>	<b>-46%</b>	Yes
<b>All KSI casualties/year/site</b>	<b>-60%</b>	Yes

## 4.5 Comparison with trends for casualties on roads in London

The results in Sections 4.1, 4.2 and 4.3 indicate that the 20mph zones in London have had a large impact on casualties within their boundaries. However some adjustments to the magnitude of the changes are required to allow for general underlying changes in casualty frequency on unclassified roads within London during the time covered by the 'before' and 'after' periods.

### 4.5.1 All casualties

Table 4.12 gives details of the changes in casualty frequency (all severities) on unclassified roads in London during similar 'before' and 'after' periods to those used in the analysis of the 20 mph zone casualty data. Casualty frequency (all severities) on unclassified roads in London was reduced for all road users (3% ), for child casualties (15%), for pedestrians (7%) and for pedal cyclists (15%), and increased for powered two wheelers (40%).

**Table 4.12 Road user casualties (all severities) on unclassified roads in London**

	No of casualties		No of years <sup>1</sup>		Casualties/year		% diff. Before to after
	Before	After	Before	After	Before	After	
All road users	35061	20434	5	3	7012.2	6811.3	-2.9
Children <sup>2</sup>	7718	3926	5	3	1543.6	1308.7	-15.2
Pedestrians	9117	5111	5	3	1823.4	1703.7	-6.6
Pedal cyclists	3979	2025	5	3	795.8	675	-15.2
Powered two wheelers	2886	2421	5	3	577.2	807	+40%

Note 1. The average 'before' and 'after' periods are taken as 5 years (1<sup>st</sup> September 1992 to 31<sup>st</sup> August 1997) and 3 years (1<sup>st</sup> November 1998 to 31<sup>st</sup> October 2001).

Note 2. Child pedestrians, child pedal cyclists and child car passengers.

Without adjustment for trends on unclassified roads, the present results for 20mph zones in London represent the following reductions in casualty frequency (all severities): all road users 46%, children 51%, pedestrians 40%, pedal cyclists 33% and powered two wheelers 41%. (see Table 4.13). Making full allowance for the trends on unclassified roads, that is assuming that they have been brought about by other factors than 20 mph zones – improved education and training for example or, as is the case of powered two wheelers, an increase in traffic or the amount of travel, the reductions in casualty frequencies (all severities) for 20mph zones in London are revised as follows: all road users 45%, children 42%, pedestrians 36%, pedal cyclists 21% and powered two wheelers 58%.

Note: for powered two wheeler casualties, the effect of the adjustment for trends in casualties on unclassified roads is to increase the magnitude of the estimated reduction due to the installation of the 20 mph zones. This is because the frequency of powered two wheeler casualties increased on unclassified roads between 'before' and 'after' periods.

**Table 4.13 Correction of casualty frequency (all severities) in 20 mph zones, taking into account the casualty trends on all unclassified roads in London**

	Reduction in casualty frequency in 20 mph zones	
	Without correction for trends on all unclassified roads in London	With correction for trends on all unclassified roads in London
All road users	46%	45%
Children	51%	42%
Pedestrians	40%	36%
Pedal cyclists	33%	21%
Powered two wheelers	41%	58%

In reality, however, the 20 mph zones will have contributed to some of the casualty reductions on unclassified roads within London; and the present results are best interpreted as 20 mph zones bringing about a reduction between the two values above – for example, a reduction of between 45% and 46% for all road user casualties (all severities).

#### 4.5.2 *Fatal and serious (KSI) casualties*

Table 4.14 gives details of the changes in KSI casualty frequency on unclassified roads in London during similar ‘before’ and ‘after’ periods to those used in the analysis of the 20 mph zone casualty data. KSI casualty frequency on unclassified roads in London was reduced for all road users (13%), for child casualties (27%), for pedestrians (18%) and for pedal cyclists (28%), and increased for powered two wheelers (52%).

Without adjustment for trends on unclassified roads, the present results for 20mph zones in London represent the following reductions in reduction in KSI casualty frequencies: all road users 60%, children 60%, pedestrians 50%, pedal cyclists 50% and powered two wheelers 68% (see Table 4.15). Making full allowance for these trends on unclassified roads, that is assuming that they have been brought about by other factors than 20 mph zones – improved education and training for example or, as is the case of powered two wheelers, increase in traffic and travel, the reductions in KSI casualties in 20mph zones in London are revised as follows: all road users 54%, children 45%, pedestrians 39%, pedal cyclists 30% and powered two wheelers 79%.

Note: for powered two wheeler casualties, the effect of the adjustment for trends in KSI casualties on unclassified roads is to increase the magnitude of the estimated reduction due to the installation of the 20 mph zones. This is because the frequency of powered two wheeler KSI casualties increased on unclassified roads between ‘before’ and ‘after’ periods.

**Table 4.14 Road user KSI casualties on unclassified roads in London**

	No of casualties		No of years <sup>1</sup>		Casualties/year		% diff. Before to after
	Before	After	Before	After	Before	After	
All road users	5050	2630	5	3	1010.0	876.7	-13.2
Children <sup>2</sup>	1486	650	5	3	297.2	216.7	-27.1
Pedestrians	1892	933	5	3	378.4	311	-17.8
Pedal cyclists	551	237	5	3	110.2	79	-28.3
Powered two wheelers	473	431	5	3	94.6	143.7	+51.9%

Note 1. The average 'before' and 'after' periods are taken as 5 years (1<sup>st</sup> September 1992 to 31<sup>st</sup> August 1997) and 3 years (1<sup>st</sup> November 1998 to 31<sup>st</sup> October 2001).

Note 2. Child pedestrians, child pedal cyclists and child car passengers.

**Table 4.15 Correction of KSI casualty frequency in 20 mph zones for casualty trends on all unclassified roads in London**

	Reduction in KSI casualty frequency in 20 mph zones	
	Without correction for trends on all unclassified roads in London	With correction for trends on all unclassified roads in London
All road users	60%	54%
Children	60%	45%
Pedestrians	50%	39%
Pedal cyclists	50%	30%
Powered two wheelers	68%	79%

In reality, however, the 20 mph zones will have contributed to the casualty reductions on unclassified roads within London; and the present results are best interpreted as 20 mph zones bringing about a reduction between the two values above – for example, a reduction of between 54% and 60% for all road user KSI casualties.



## **5 Traffic speeds and flows in 20mph zones**

### **5.1 Speeds 'after' 20 mph zones were installed**

It is important that vehicle speeds are measured in the 'after' period to determine if the average speeds have been reduced to below 20 mph. Information on the 'after' mean speed of vehicles (at and between) measures was available for only 22 zones. The average 'after' mean speed was calculated for each zone (see Table 5.1). The range of average 'after' mean speeds for the zones was 12.7 to 19.9 mph with an overall average of 16.6 mph. It is not known whether the speeds in these 22 zones were representative of all zones.

### **5.2 'Before' to 'after' changes in traffic flows**

There was very little information provided by the London Boroughs on 'before' and 'after' traffic flows within the 20 mph zones in London.

Traffic flow data was obtained for 11 of the zones (see Table 5.2) and this showed an average reduction of 15% in traffic flow following the introduction of the 20 mph zones. However the data were quite variable with changes in traffic flow ranging from an increase of 9% to a reduction of 52% .

### **5.3 'Before' to 'after' changes in speeds and accident frequencies**

An analysis of the change in speed and change in accidents was carried out for 14 zones that had the relevant data on 'before' and 'after' vehicle speeds. The average reduction in mean speeds was about 9 mph and the average reduction in injury accident frequency was about 60 %. Although these changes are the results from a limited number of 20 mph zones in London, they are similar to those reported in TRL 215 (Webster and Mackie, 1996) who found that the national averages were a speed reduction of 9.3 mph and an injury accident reduction of 58%.

**Table 5.1 'After' speeds in 20 mph zones in London**

<b>Borough</b>	<b>Zone No</b>	<b>Mean (at / between) 'after' speed (mph)</b>
City of London	26	12.7
Hackney	38	17.7
Hackney	39	17.1
Hackney	40	17.1
Hammersmith	41	19.6
Harrow	47	17.1
Hillingdon	48	14.6
Hillingdon	49	16.3
Hillingdon	50	19.9
Hounslow	51	15.9
Hounslow	52	13.7
Kingston	55	16.3
Lambeth	65	16.9
Newham	74	19.2
Newham	75	15.8
Redbridge	81	14.0
Redbridge	82	15.0
Richmond	88	16.6
Southwark	92	19.1
Southwark	93	19.2
Sutton	101	17.1
Tower Hamlets	102	15.2
Overall average		16.6

**Table 5.2 Traffic flow changes in 20 mph zones in London**

	Zone No	Vehicles per day		%
		'before'	'after'	change
Hammersmith	41	6000	6000	0%
Harrow	47	4346	2683	-38%
Hillingdon*	48	708	343	-52%
Hillingdon*	50	912	702	-23%
Kingston	55	2001	1897	-5%
Newham	75	2431	2407	-1%
Redbridge	81	4087	4467	9%
Richmond	88	1890	1800	-5%
Richmond	89	978	762	-22%
Richmond	90	10616	9415	-11%
Sutton**	101	181	147	-19%
		Average		-15%

NB \*2 hour samples, \*\*Average flow per hour

**Table 5.3 Differences in speed and accidents in 20 mph zones in London**

Borough	Zone no	Speed diff	Change in
		(mph)	acc freq (%)
Bromley	15	0.2	-100
City of London	26	-2.2	0
Hammersmith	41	-8.9	-88.9
Harrow	47	-8.0	-76.2
Hillingdon	49	-7.8	-62.5
Hillingdon	50	-13.4	-27.3
Hounslow	51	-16.1	-100
Kingston	55	-11.0	-78.6
Lambeth	65	-7.1	-52.4
Redbridge	81	-6.0	0
Richmond	88	-8.4	-100
Richmond	89	-16.4	-22.2
Sutton	101	-12.5	-73.7
Tower Hamlets	102	-10.3	-63.6
Average		-9.1	-60.4

## 6 Comparison with previous work

A summary of the previous work discussed in the introduction to this report is given in Table 6.1.

**Table 6.1 Comparison of results with previous work**

	DfT	Hull	TfL
Change in injury accidents	-61%	-56%	-43%
Change in KSI accidents	-70%	-90%	-56%
Change in Pedestrian casualties	-63% <sup>1</sup>	-54%	-40%
Change in Child casualties	-67% <sup>1</sup>	-64%	-51%
Change in child pedestrian casualties	-70% <sup>1</sup>	-74%	-48%

Note 1. These figures were for accidents not casualties.

The table shows that the two previous studies gave broadly similar results to those obtained during this investigation. All three studies show reductions of at least 40% with the greatest reductions observed in the percentages of accidents resulting in fatal and serious injuries.

## 7 Summary, conclusions and future work

This review of 20 mph zones in London for LAUA has found that the frequency of injury accidents and road user casualties and the severities of casualties within the zones were substantially reduced. Previous research has also shown that the 20 mph zone concept introduced by the Department for Transport has been extremely successful in substantially reducing average vehicle speeds and injury accidents in the areas where they have been installed.

The results of the present study are summarised in Table 7.1 and as follows:

1. There are about one hundred and thirty seven 20 mph zones in London (2003). Most of the zones are in residential areas with over half containing schools or colleges. The main traffic calming measures used within the zones are road humps, raised junctions and speed cushions. On average, the measures are spaced between 50 and 95 metres apart.
2. The overall average 'after' mean traffic speeds within the 20 mph zones was about 17 mph (22 zones).
3. Mean traffic speeds have reduced by about 9 mph and traffic flows by about 15% since the installation of the 20 mph zones (note: only a limited amount of speed (14 zones) and flow (11 zones) data was available).
4. Allowing for background changes in accident frequency on unclassified roads in London, the installation of 20 mph zones in London has reduced the frequency of injury accidents within the zones by about 42% and reduced the frequency of accidents involving fatal or serious injury (KSI) by about 53% (78 zones).
5. The average ratios of KSI accidents to all injury accidents fell from 0.17 to 0.13 following the zone installations (78 zones).
6. Little, if any, accident migration is taking place from the 20 mph zones (38 zones).
7. Over the 'before' period, the numbers of accidents per km per year on 20mph zone roads were, on average, more than twice those on other unclassified roads in London .
8. Allowing for background changes in road user casualty frequency on unclassified roads in London, the installation of 20 mph zones in London has reduced the frequency of road user casualties within the zones by about 45% and reduced the frequency of fatal or serious (KSI) casualties by about 57% (78 zones).

9. The average ratios of KSI casualties to all casualties fell from 0.16 to 0.12 following the zone installations (78 zones).
10. The average annual reduction in fatal and serious (KSI) casualties per 20 mph zone is 0.48 (78 zones). This is equivalent to an annual saving of about 66 KSI casualties across all one hundred and thirty seven 20 mph zones in London (assuming similar average reductions). Considering each serious casualty, currently valued at £134,000 by DfT, implies savings of £8.84 million. In fact, savings are likely to have been greater as fatalities are valued at £1.19 million each but the prediction of absolute reductions in fatalities is unwise because of the small numbers involved.
11. There were statistically significant reductions in the KSI casualty frequency within the 20 mph zones for the following classes of road user: pedestrians (50%), child pedestrians (61%), pedal cyclists (50%), powered two wheelers (68%), car occupants (77%), and all child casualties (60%) [78 zones].
12. Allowing for background changes in KSI casualty frequency on unclassified roads in London, it is estimated that the installation of 20 mph zones has reduced the frequency of child KSI casualties within the zones between 45 and 60%, pedestrian KSI casualties between 39 and 50%, pedal cyclist KSI casualties between 30 and 50% and powered two wheeler casualties between 79 and 68% (78 zones).

**Table 7.1: Summary of key results**

		20zones (78zones) (unadjusted)	All Unclassified roads	Boundary roads (38 zones)	All A/B class roads
%change	All accidents/year/site	-43%	-4%	-2%	-1%
	KSI accidents/year/site	-56%	-12%	-2%	-4%
	All casualties/year/site	-46%	-3%		
	KSI casualties/year/site	-60%	-13%		
Average After speed (22zones)		17mph			
Average change in traffic flow (11 zones)		-15%			
Speed-accident change (14 zones)		-9mph with -60% accidents			

The results of this study are very encouraging, suggesting large accident and casualty savings. However, the results also leave many questions unanswered and so it is recommended that:

- further work is undertaken to assess the potential benefit of more extensive use of 20mph zones
- future schemes are more fully monitored and analysed, preferably in a comprehensive way, in order to better understand good practice
- an in depth study into the effect of 20mph zones on powered two-wheelers be undertaken.

The finding that the 20mph zone roads had the highest accident frequencies per km before installation needs to be explored further. We need to try and understand why the sites were chosen. Compared with the non-20mph zone roads, were the higher rates on the study roads due to choosing 20mph zone installations to be on roads with:

- more traffic?;
- more vulnerable road users?;
- higher speeds?;

- higher speed differentials between road users?;
- higher junction densities?; poorer designs?;
- adverse road geometric characteristics?;
- different road user behavioural factors?;
- adverse social deprivation factors?;
- different types of land use?

These types of questions should be tackled in order to assess whether the reductions observed in the current study are likely to be achievable on the remaining 97% of London's unclassified roads? And, if not, to what extent would lower reductions be cost-effective?

The amount of data readily available in the current study, particularly with regard to scheme costs, scheme design, traffic flows and speeds before and after installation, by road user type was insufficient to identify any relationships between zone design and effectiveness. An understanding of the effect of or changes in these types of data will help to identify the most effective type of zone, given the inherent road characteristics of any future site.

A further topic of interest is the effect of the 20mph zones on powered two-wheelers which, although the results suggested was very beneficial, is not fully understood. This is particularly pertinent given the national trend of increased travel by this mode (over the study period) and the likelihood that travel by powered two-wheelers will rise even faster in London following the introduction of congestion charging.

## 8 Acknowledgements

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## Appendix A

### 20 mph zones in London data

At February 2003

Zone no.	Borough	Location of zone	Approx date Implemented	Length of Roads km	Size of Area km <sup>2</sup>	Type of Zone	Other comments
1	Barking	Leys Avenue	Oct-00	0.24	0.01	Linear	Residential and school
2	Barking	Stevens Road area	Apr-01	3.20	0.25	Area	Residential and school
3	Barking	Oval Road area	Apr-01	1.24	0.06	Linear	Residential and school
4	Barnet	Broadfields Avenue	Feb-01	2.03	0.17	Area	Residential and school
5	Barnet	Byng Road & Wentworth Road	Apr-01	1.03	0.11	Area	Residential and schools
6	Barnet	Hampstead Garden Suburb	May-01	1.49	0.19	Area	Residential and school
7	Barnet	Adastral village	Jun-01	1.34	0.19	Area	Residential
8	Barnet	Mays Lane	Mar-02	1.49	0.08	Linear	Residential and schools
9	Barnet	St Mary's	Mar-02	5.15	0.57	Area	Residential and school
10	Barnet	Marble Drive	Mar-02	1.75	0.13	Area	Residential and schools
11	Barnet	Mill Hill County	Nov-02	2.11	0.21	Area	Residential and schools
12	Bexley	Barnes Cray Primary School	Apr-99	3.50	0.36	Area	Safe routes to school scheme
13	Bexley	Boundary Road, Erith	Apr-98	0.69	0.05	Area	Residential
14	Brent	Harlesden schools	Jan-00	1.38	0.14	Area	Safe routes to schools scheme
15	Bromley	Royston Road, Penge	Nov-01	0.83	0.05	Area	Residential
16	Bromley	Perry Hall Road, Orpington	Jan-96	0.16	0.01	Linear	School
17	Bromley	Grays Farm Road, Orpington	Feb-02	0.29	0.02	Linear	Residential and school
18	Bromley	High Street, St Mary Cray	Apr-02	1.81	0.21	Area	Town centre and school
19	Camden	St Andrews Area	May-94	1.30	0.12	Area	Residential
20	Camden	Regents Park Estate	Jul-00	3.71	0.30	Area	Residential and schools
21	Camden	West Kentish Town	Apr-02	5.62	0.40	Area	Residential and schools
22	Camden	Dartmouth Park	Apr-03	7.22	0.72	Area	Residential and schools
23	Camden	Burghley Road	Apr-02	1.34	0.15	Area	Residential and school
24	Camden	Lady Margaret Road	Apr-02	3.74	0.25	Area	Residential and school
25	Camden	Camden Square	Apr-03	4.72	0.32	Area	Residential and school
26	City of London	Watling Street	Jul-97	0.15	0.002	Linear	City centre
27	Ealing	Poets Corner	Mar-99	1.70	0.15	Area	Residential

Zone no.	Borough	Location of zone	Approx date Implemented	Length of Roads km	Size of Area km <sup>2</sup>	Type of Zone	Other comments
28	Ealing	Cuckoo Estate	Aug-98	7.20	0.62	Area	Residential
29	Ealing	Five Roads	Apr-02	1.12	0.08	Area	Residential
30	Enfield	Edmonton	Dec-94	7.70	0.47	Area	Residential
31	Enfield	Worlds End Lane area	Jan-01	1.60	0.13	Area	Residential and schools
32	Enfield	Haselbury Road area	Aug-00	5.62	0.47	Area	Residential
33	Enfield	Haselbury Road area phase2	Oct-02	3.45	0.38	Area	Residential
34	Enfield	Sandhurst Road area	May-00	2.11	0.19	Area	Residential and schools
35	Enfield	Orchard Road area	Mar-00	0.70	0.05	Area	Residential and school
36	Enfield	Princes Avenue area	Jun-01	9.69	1.08	Area	Residential and schools
37	Enfield	Monmouth Road area	Jul-02	4.77	0.31	Area	Residential
38	Hackney	Brooke Road	Jan-91	2.20	0.18	Area	Residential
39	Hackney	Hoxton area	Jan-99	6.40	0.73	Area	Residential
40	Hackney	Middleton Road area	Jan-99	9.10	1.10	Area	Residential
41	Hammersmith & Fulham	Emilyn Road	Jan-94	0.62	0.03	Linear	Residential
42	Haringey	Gladesmore, South Tottenham	Apr-96	5.00	0.32	Area	Residential
43	Haringey	North Tottenham, Phase 1	Nov-00	5.83	0.62	Area	Residential and school
44	Haringey	North Tottenham, Phase 2	Mar-01	3.76	0.36	Area	Residential and school
45	Haringey	North Tottenham, Phase 3	Nov-01	3.49	0.36	Area	Residential
46	Haringey	Napier Road	May-96	3.58	0.25	Area	Residential
47	Harrow	Little Stanmore	Jan-96	3.10	0.42	Area	Residential
48	Hillingdon	Whitethorn Estate	Dec-95	5.60	0.46	Area	Residential
49	Hillingdon	Hayes Park school area	Apr-01	1.57	0.19	Area	Residential and school
50	Hillingdon	Hayes Manor school area	Oct-01	1.52	0.15	Area	Residential and school
51	Hounslow	Chiswick Meadows	Apr-94	1.25	0.16	Linear	Commercial
52	Hounslow	Brentford area	May-97	3.00	0.31	Area	Residential
53	Hounslow	Alexandra School	Apr-02	1.60	0.18	Area	Residential and school
54	Islington	St Peter's Street	Apr-99	8.40	0.58	Area	Residential and school
55	Kingston	The Groves	Jan-91	2.30	0.20	Area	Residential
56	Kingston	Canbury area	Oct-02	4.59	0.29	Area	Residential



Zone no.	Borough	Location of zone	Approx date Implemented	Length of Roads km	Size of Area km <sup>2</sup>	Type of Zone	Other comments
57	Kingston	Carlisle Close area	Jul-02	0.65	0.08	Area	Residential
58	Kingston	Winey Park, Chessington	Mar-02	1.09	0.11	Area	Residential
59	Kingston	Tolworth Area	Jul-94	3.35	0.24	Area	Residential
60	Kingston	Dukes Avenue, New Malden	May-00	3.88	0.32	Area	Residential
61	Kingston	Elm Road, Chessington	Oct-01	2.84	0.23	Area	Residential
62	Kingston	Cambridge Road, New Malden	Oct-01	2.44	0.15	Area	Residential
63	Kingston	Grove area, Kingston	Jul-01	3.85	0.38	Area	Residential and school
64	Kingston	Town centre, Kingston	May-03	2.47	0.25	Area	Town centre
65	Lambeth (& Southwark)	Upper Ground/Belvedere Road	Jan-98	2.20	0.16	Area	Commercial
66	Lewisham	Glenbow Road	Jan-02	4.33	0.44	Area	Residential
67	Lewisham	North Downham	Jan-02	8.02	0.87	Area	Residential
68	Lewisham	Manor Lee	Jan-02	8.70	1.00	Area	Residential
69	Lewisham	Rushey Green West	Dec-01	4.00	0.28	Area	Residential
70	Lewisham	Rushey Green East	Jul-02	6.60	0.70	Area	Residential
71	Lewisham	St John's	Sep-02	3.75	0.36	Area	Residential
72	Merton	North Mitcham	Jan-95	3.40	0.25	Area	Residential and school
73	Merton	Wimbledon Town centre	Apr-00	0.38	0.03	Area	Town centre
74	Newham	Upton Residential Haven	Sep-01	5.15	0.36	Area	Residential and schools
75	Newham	Little Ilford Residential Haven	Dec-00	7.54	0.50	Area	Residential and schools
76	Newham	Plasnet Residential Haven	Apr-02	14.54	1.28	Area	Residential and schools
77	Redbridge	St Peters & Pauls schools	Jul-98	0.64	0.10	Area	Residential and schools
78	Redbridge	Cleveland Primary School	Jul-98	1.38	0.11	Area	Residential and schools
79	Redbridge	Wanstead school	Jul-01	0.44	0.03	Area	Residential and schools
80	Redbridge	Manford school	Jul-01	0.67	0.07	Area	Residential and schools
81	Redbridge	Glenarm College	Dec-01	0.46	0.04	Area	Residential and schools
82	Redbridge	Mansfield Road	Jan-02	0.26	0.01	Linear	Residential and schools
83	Redbridge	Mossford Green School	Feb-02	0.44	0.02	Area	Residential and schools
84	Redbridge	Eastcourt school	Jun-02	0.40	0.02	Area	Residential and schools
85	Redbridge	Uphall school	Nov-02	0.50	0.04	Area	Residential and schools
86	Redbridge	Fairlop school	Dec-02	0.39	0.03	Area	Residential and schools

Zone no.	Borough	Location of zone	Approx date Implemented	Length of Roads km	Size of Area km <sup>2</sup>	Type of Zone	Other comments
87	Redbridge	Newbury Park school	Jan-03	0.21	0.01	Linear	Residential and schools
88	Richmond	Kew	Dec-89	0.74	0.04	Area	Residential
89	Richmond	Heatham area	Feb-00	1.84	0.17	Area	Residential and college
90	Richmond	Petersham	Jan-01	2.30	0.21	Area	Residential, schools, main road
91	Richmond	Wykeham estate area	Jul-02	1.13	0.11	Area	Residential and school
92	Southwark	Court area	Jan-95	5.08	0.42	Area	Residential
93	Southwark	West Walworth	Jan-95	3.95	0.56	Area	Residential and schools
94	Southwark	The Hamlets, Dulwich	Jan-97	3.96	1.06	Area	Residential and schools
95	Southwark	St James's, Bermondsey	Feb-02	3.97	0.80	Area	Residential and school
96	Southwark	Dunstan's, East Dulwich	Feb-02	6.29	1.61	Area	Residential and school
97	Southwark	Waverley	Apr-03	12.40	2.08	Area	Residential and school
98	Southwark	Barset	Apr-03	10.30	1.50	Area	Residential and school
99	Southwark	Consort	Apr-03	6.60	1.16	Area	Residential and school
100	Southwark	Bellenden	Apr-03	7.89	1.07	Area	Residential and school
101	Sutton	Worcester Park	Nov-91	14.30	1.91	Area	Residential and school
102	Tower Hamlets	Stepney, St Mary's	Jan-93	1.15	0.07	Area	Residential and commercial
103	Tower Hamlets	Wilmot Street	Apr-01	0.77	0.03	Area	Residential and school
104	Tower Hamlets	Clark Street	Mar-02	0.26	0.01	Linear	Residential
105	Tower Hamlets	Cephas Street area	Apr-02	2.78	0.16	Area	Residential and school
106	Tower Hamlets	Redcoat	May-02	3.75	0.27	Area	Residential and schools
107	Waltham Forest	Greenleaf area	Sep-94	4.28	0.27	Area	Residential and college
108	Wandsworth	Tooting	Mar-96	5.65	0.42	Area	Residential
109	Wandsworth	Balham	Nov-96	1.49	0.09	Area	Residential
110	Wandsworth	Lytton Grove	Apr-98	0.60	0.03	Linear	Residential and school
111	Wandsworth	Brenda Road area	Dec-01	0.50	0.02	Area	Residential and schools
112	Wandsworth	Broomwood Road	Jul-00	0.98	0.05	Linear	Residential and school
113	Wandsworth	Prince of Wales Drive area	Apr-00	6.35	0.45	Area	Residential and schools
114	Wandsworth	Cabul Road	Jan-00	0.36	0.02	Area	Residential and school
115	Wandsworth	Magdalen Road area	Mar-01	9.81	0.97	Area	Residential and school

Zone no.	Borough	Location of zone	Approx date Implemented	Length of roads km	Size of Area km <sup>2</sup>	Type of Zone	Other comments
		Total		390.55	39.92		
		Average		3.40	0.35		

**Appendix B. 20 mph zones in London measures data**  
At February 2003

Zone No.	Borough	Location of zone	Round top hump	Flat Top Hump	Raised Junction	Speed Cushion	Chicane	Other measures	Spacing of measures (metres)
1	Barking	Leys Avenue	Yes	Yes					35 to 63
2	Barking	Stevens Road area	Yes	Yes					35 to 90
3	Barking	Oval Road area	Yes	Yes					45 to 110
4	Barnet	Broadfields Avenue		Yes		yes		Mini rbts	50 to 80
5	Barnet	Byng Road & Wentworth Road		Yes					na
6	Barnet	Hampstead Garden Suburb		Yes					na
7	Barnet	Adastral village		Yes				Red crossing points	40 to 100
8	Barnet	Mays Lane		Yes					53 to 80
9	Barnet	St Mary's		Yes					73 to 150
10	Barnet	Marble Drive		Yes					48 to 90
11	Barnet	Mill Hill County		Yes	Yes				40 to 200
12	Bexley	Barnes Cray Primary School	Yes	Yes	Yes				45 to 100
13	Bexley	Boundary Road, Erith	Yes						33 to 50
14	Brent	Harlesden schools	Yes	Yes					70
15	Bromley	Royston Road, Penge			Yes				100 to 200
16	Bromley	Perry Hall Road, Orpington						VMS sign	na
17	Bromley	Grays Farm Road, Orpington		Yes		Yes			57 to 107
18	Bromley	High Street, St Mary Cray		Yes		Yes			65 to 100
19	Camden	St Andrews Area	Yes	Yes					40 to 50
20	Camden	Regents Park Estate	Yes		Yes	Yes			na
21	Camden	West Kentish Town	Yes	Yes	Yes	Yes			na
22	Camden	Dartmouth Park	Yes	Yes	Yes	Yes			Na
23	Camden	Burghley Road	Yes	Yes					Na
24	Camden	Lady Margaret Road	Yes	Yes					Na
25	Camden	Camden Square	Yes	Yes	Yes	Yes			Na
26	City of London	Watling Street		Yes	Yes				55
27	Ealing	Poets Corner	Yes						60 to 100

Zone No.	Borough	Location of zone	Round Top hump	Flat top hump	Raised Junction	Speed Cushion	Chicane	Other measures	Spacing of Measures (metres)
28	Ealing	Cuckoo Estate	Yes	Yes					50 to 115
29	Ealing	Five Roads		Yes	Yes				Na
30	Enfield	Edmonton		Yes	Yes				38 to 75
31	Enfield	Worlds End Lane area	No information available						Na
32	Enfield	Haselbury Road area							Na
33	Enfield	Haselbury Road area phase2							Na
34	Enfield	Sandhurst Road area							Na
35	Enfield	Orchard Road area							na
36	Enfield	Princes Avenue area							na
37	Enfield	Monmouth Road area							na
38	Hackney	Brooke Road	Yes						na
39	Hackney	Hoxton area		Yes	Yes	Yes			40 to 125
40	Hackney	Middleton Road area	Yes	Yes	Yes	Yes			30 to 80
41	Hammersmith & Fulham	Emlyn Road					Yes	Rumble strips	35 to 45
42	Haringey	Gladesmore area	Yes		Yes	Yes			38 to 63
43	Haringey	North Tottenham, Phase 1	Yes			Yes			53 to 105
44	Haringey	North Tottenham, Phase 2	Yes			Yes			53 to 105
45	Haringey	North Tottenham, Phase 3	Yes			Yes			30 to 80
46	Haringey	Napier Road		Yes	Yes	Yes			80 to 100
47	Harrow	Little Stanmore	Yes			Yes			25 to 75
48	Hillingdon	Whitethorn Estate	Yes	Yes	Yes				35 to 120
49	Hillingdon	Hayes Park school area	Yes	Yes		Yes			40 to 100
50	Hillingdon	Hayes Manor school area		Yes		Yes			40 to 65
51	Hounslow	Chiswick Meadows	Yes						60 to 70
52	Hounslow	Brentford area		Yes	Yes				88 to 109
53	Hounslow	Alexandra School	Yes						65 to 110
54	Islington	St Peter's Street	Yes						40 to 84
55	Kingston	The Groves	Yes						60 to 75
56	Kingston	Canbury area	No information available						na
57	Kingston	Carlisle Close area							na

Zone No.	Borough	Location of zone	Round Top hump	Flat top hump	Raised Junction	Speed Cushion	Chicane	Other measures	Spacing of measures (metres)
58	Kingston	Winey Park, Chessington							na
59	Kingston	Tolworth Area	Yes	Yes					60 to 85
60	Kingston	Dukes Avenue, New Malden	No information available						na
61	Kingston	Elm Road, Chessington							na
62	Kingston	Cambridge Road, New Malden							na
63	Kingston	Grove area, Kingston							na
64	Kingston	Town centre, Kingston							na
65	Lambeth (& Southwark)	Upper Ground/Belvedere Road		Yes	Yes	Yes			45 to 60
66	Lewisham	Glenbow Road	Yes	Yes		Yes			30 to 130
67	Lewisham	North Downham	Yes	Yes	Yes	Yes			50 to 150
68	Lewisham	Manor Lee	Yes	Yes	Yes	Yes		Mini rbts	50 to 150
69	Lewisham	Rushey Green West	Yes	Yes	Yes	Yes			50 to 100
70	Lewisham	Rushey Green East	Yes	Yes	Yes	Yes			20 to 80
71	Lewisham	St John's	Yes	Yes	Yes	Yes			30 to 130
72	Merton	North Mitcham	Yes	Yes	Yes				68 to 115
73	Merton	Wimbledon Town centre		Yes	Yes				50 to 70
74	Newham	Upton Residential Haven	Yes			Yes			30 to 80
75	Newham	Little Ilford Residential Haven	Yes	Yes		Yes			54 to 85
76	Newham	Plasnet Residential Haven	Yes	Yes					33 to 80
77	Redbridge	St Peters & Pauls schools		Yes					40 to 75
78	Redbridge	Cleveland Primary School		Yes					40 to 80
79	Redbridge	Wanstead school		Yes					40 to 75
80	Redbridge	Manford school		Yes					40 to 87
81	Redbridge	Glenarm College		Yes					50 to 70
82	Redbridge	Mansfield Road		Yes					60 to 70
83	Redbridge	Mossford Green School		Yes					40 to 65
84	Redbridge	Eastcourt school		Yes					50 to 65
85	Redbridge	Uphall school		Yes					50 to 65
86	Redbridge	Fairlop school		Yes					60 to 65
87	Redbridge	Newbury Park school		Yes					45 to 60

Zone No.	Borough	Location of zone	Round top hump	Flat Top hump	Raised Junction	Speed Cushion	Chicane	Other measures	Spacing of measures (metres)
88	Richmond	Kew	Yes						55 to 88
89	Richmond	Heatham area	Yes	Yes					75
90	Richmond	Petersham		Yes				VMS sign	80 to 160
91	Richmond	Wykeham estate area		Yes					50 to 100
92	Southwark	Court area	Yes			Yes			40 to 145
93	Southwark	West Walworth	Yes			Yes			25 to 87
94	Southwark	The Hamlets, Dulwich	Yes			Yes			62 to 135
95	Southwark	St James's, Bermondsey	Yes	Yes		Yes			48 to 97
96	Southwark	Dunstan's, east Dulwich				Yes			41 to 97
97	Southwark	Waverley				Yes			34 to 135
98	Southwark	Barset				Yes			32 to 92
99	Southwark	Consort		Yes		Yes			38 to 75
100	Southwark	Bellenden				Yes			na
101	Sutton	Worcester Park	Yes	Yes		Yes			70 to 105
102	Tower Hamlets	Stepney, St Mary's		Yes	Yes		Yes		40 to 116
103	Tower Hamlets	Wilmot Street		Yes		Yes			na
104	Tower Hamlets	Clark Street		Yes		Yes			na
105	Tower Hamlets	Cephas Street area		Yes		Yes			na
106	Tower Hamlets	Redcoat		Yes		Yes			na
107	Waltham Forest	Greenleaf area	Yes	Yes	Yes				45 to 90
108	Wandsworth	Tooting	Yes	Yes		Yes			na
109	Wandsworth	Balham	Yes	Yes					na
110	Wandsworth	Lytton Grove		Yes		Yes			na
111	Wandsworth	Brenda Road area	No information available						na
112	Wandsworth	Broomwood Road							na
113	Wandsworth	Prince of Wales Drive area							na
114	Wandsworth	Cabul Road							na
115	Wandsworth	Magdalen Road area							na

Zone No.	Borough	Location of zone	Round top hump	Flat top hump	Raised Junction	Speed Cushion	Chicane	Other measures	Spacing of measures (metres)
		No. of zones with measure	49	70	26	42	2		
		Measures known at 95 zones	95	95	95	95	95		
		Zones with measure	52%	74%	27%	44%	2%		



### Appendix C Accidents in London 20 mph zones

Zone no.	Borough	Location of zone	Before					After							
			Accident severity			Annual Freq.	All	Months	Accident severity			Annual freq.			
			Fatal	Serious	Slight				Fatal	Serious	Slight		All		
1	Barking	Leys Avenue	60	0	0	4	0.8	4	0	0	27	0	0	0	0.0
2	Barking	Stevens Road area	60	0	2	6	1.6	8	2	1	21	0	1	1	1.1
3	Barking	Oval Road area	60	0	0	4	0.8	4	0	0	21	0	0	0	0.0
4	Barnet	Broadfields Avenue	60	0	1	4	1.0	5	1	0	23	0	0	3	1.6
5	Barnet	Byng Road & Wentworth Road	60	0	0	0	0.0	0	0	0	21	0	0	0	0.0
6	Barnet	Hampstead Garden Suburb	60	0	1	7	1.6	8	1	0	20	0	0	1	0.6
7	Barnet	Adastral village	60	0	0	3	0.6	3	0	0	19	0	0	1	0.6
12	Bexley	Barnes Cray Primary School	60	0	6	22	5.6	28	6	1	45	0	1	13	3.7
13	Bexley	Boundary Road, Erith	60	0	0	0	0.0	0	0	0	56	0	0	1	0.2
14	Brent	Harlesden schools	60	0	2	15	3.4	17	2	0	35	0	0	5	1.7
15	Bromley	Royston Road, Penge	60	0	0	2	0.4	2	0	0	13	0	0	0	0.0
16	Bromley	Perry Hall Road, Orpington	60	0	0	0	0.0	0	0	0	60	0	0	0	0.0
19	Camden	St Andrews Area	60	0	3	13	3.2	16	3	0	60	0	0	3	0.6
20	Camden	Regents Park Estate	60	0	5	23	5.6	28	5	0	30	0	0	9	3.6
26	City of London	Watling Street	60	0	0	0	0.0	0	0	0	60	0	0	0	0.0
27	Ealing	Poets Corner	60	0	0	3	0.6	3	0	0	45	0	0	2	0.5
28	Ealing	Cuckoo Estate	60	0	5	25	6.0	30	5	1	52	0	1	24	5.8
30	Enfield	Edmonton	60	0	6	51	11.4	57	6	0	60	0	0	7	1.4
31	Enfield	Worlds End Lane area	60	0	0	7	1.4	7	0	2	23	0	2	1	1.6
32	Enfield	Haselbury Road area	60	0	1	7	1.6	8	1	0	28	0	0	1	0.4
34	Enfield	Sandhurst Road area	60	0	1	11	2.4	12	1	0	31	0	0	2	0.8
35	Enfield	Orchard Road area	60	0	0	5	1.0	5	0	0	33	0	0	1	0.4
36	Enfield	Princes Avenue area	60	0	8	50	11.6	58	8	1	19	0	1	16	10.7
38	Hackney	Brooke Road	60	0	2	14	3.2	16	2	0	60	0	0	9	1.8
39	Hackney	Hoxton area	60	0	10	47	11.4	57	10	6	48	1	6	30	9.3

Zone no.	Borough	Location of zone	Before					After						
			Accident severity			Annual Freq.	Months	Accident severity			Annual Freq.	Months		
			Fatal	Serious	Slight			All	Fatal	Serious			Slight	All
40	Hackney	Middleton Road area	60	0	11	68	79	15.8	48	0	10	43	53	13.3
41	Hammersmith & Fulham	Emlyn Road	60	0	0	9	9	1.8	60	0	0	1	1	0.2
42	Haringey	Gladesmore, South Tottenham	60	0	4	34	38	7.6	60	0	2	24	26	5.2
43	Haringey	North Tottenham, Phase 1	60	0	9	39	48	9.6	26	1	2	12	15	6.9
44	Haringey	North Tottenham, Phase 2	60	0	2	9	11	2.2	22	0	1	6	7	3.8
45	Haringey	North Tottenham, Phase 3	60	0	2	10	12	2.4	14	0	0	3	3	2.6
46	Haringey	Napier Road	60	0	3	18	21	4.2	60	1	1	17	19	3.8
47	Harrow	Little Stanmore	60	0	3	18	21	4.2	60	0	3	2	5	1.0
48	Hillingdon	Whitehorn Estate	60	0	6	24	30	6.0	60	0	3	14	17	3.4
49	Hillingdon	Hayes Park school area	60	0	3	5	8	1.6	21	0	1	0	1	0.6
50	Hillingdon	Hayes Manor school area	60	0	3	8	11	2.2	15	0	0	2	2	1.6
51	Hounslow	Chiswick Meadows	60	0	0	2	2	0.4	60	0	0	0	0	0.0
52	Hounslow	Brentford area	60	0	0	5	5	1.0	60	0	3	6	9	1.8
54	Islington	St Peter's Street	60	2	20	80	102	20.4	45	0	5	31	36	9.6
55	Kingston	The Groves	60	0	2	12	14	2.8	60	0	0	3	3	0.6
59	Kingston	Tolworth Area	60	0	2	5	7	1.4	60	0	0	4	4	0.8
60	Kingston	Dukes Avenue, New Malden	60	0	5	3	8	1.6	32	0	0	1	1	0.4
61	Kingston	Elm Road, Chessington	60	0	1	5	6	1.2	15	0	0	0	0	0.0
62	Kingston	Cambridge Road, New Malden	60	0	1	5	6	1.2	15	0	0	0	0	0.0
63	Kingston	Grove area,Kingston	60	0	4	28	32	6.4	17	0	0	3	3	2.1
65	Lambeth (&Southwark)	Upper Ground/Belvedere Road	60	0	5	37	42	8.4	60	0	4	16	20	4.0
66	Lewisham	Glenbow Road	60	0	6	12	18	3.6	12	0	0	4	4	4.0
67	Lewisham	North Downham	60	1	7	38	46	9.2	12	0	0	4	4	4.0
68	Lewisham	Manor Lee	60	0	7	51	58	11.6	12	0	1	6	7	7.0
69	Lewisham	Rushey Green West	60	0	3	34	37	7.4	13	0	1	5	6	5.5
72	Merton	North Mitcham	60	0	0	8	8	1.6	60	0	2	4	6	1.2
73	Merton	Wimbledon Town centre	60	0	3	19	22	4.4	33	0	1	10	11	4.0
74	Newham	Upton Residential Haven	60	1	6	40	47	9.4	16	0	0	4	4	3.0
75	Newham	Little Ilford Residential Haven	60	0	15	74	89	17.8	25	1	3	18	22	10.6
77	Redbridge	St Peters & Pauls schools	60	0	1	3	4	0.8	54	0	1	2	3	0.7

Zone no.	Borough	Location of zone	Before					After						
			Accident severity			Annual Freq.	Months	Accident severity			Annual Freq.	Months		
			Fatal	Serious	Slight			All	Fatal	Serious			Slight	All
78	Redbridge	Cleveland Primary School	60	0	2	6	8	1.6	54	0	0	4	4	0.9
79	Redbridge	Wanstead school	60	0	0	0	0	0.0	18	0	0	0	0	0.0
80	Redbridge	Manford school	60	0	0	5	5	1.0	18	0	0	1	1	0.7
81	Redbridge	Glenarm College	60	0	2	8	10	2.0	12	0	0	2	2	2.0
82	Redbridge	Mansfield Road	60	0	0	1	1	0.2	12	0	0	0	0	0.0
88	Richmond	Kew	60	0	0	1	1	0.2	60	0	0	0	0	0.0
89	Richmond	Heatham area	60	0	3	6	9	1.8	35	0	0	4	4	1.4
90	Richmond	Petersham	60	1	4	19	24	4.8	24	0	0	7	7	3.5
92	Southwark	Court area	60	0	2	22	24	4.8	60	0	2	9	11	2.2
93	Southwark	West Walworth	60	0	16	40	56	11.2	60	0	3	37	40	8.0
94	Southwark	The Hamlets, Dulwich	60	0	4	16	20	4.0	60	0	2	6	8	1.6
101	Sutton	Worcester Park	60	0	16	41	57	11.4	60	0	3	12	15	3.0
102	Tower Hamlets	Stepney, St Mary's	60	0	8	14	22	4.4	60	0	4	4	8	1.6
103	Tower Hamlets	Willmot Street	60	0	0	1	1	0.2	21	0	0	2	2	1.1
107	Waltham Forest	Greenleaf area	60	0	7	57	64	12.8	60	0	1	6	7	1.4
108	Wandsworth	Tooting	60	0	4	23	27	5.4	60	0	0	15	15	3.0
109	Wandsworth	Balham	60	0	0	7	7	1.4	60	0	0	1	1	0.2
110	Wandsworth	Lytton Grove	60	0	2	2	4	0.8	57	0	0	3	3	0.6
111	Wandsworth	Brenda Road area	60	0	1	5	6	1.2	13	0	0	2	2	1.8
112	Wandsworth	Broomwood Road	60	0	2	10	12	2.4	30	0	0	1	1	0.4
113	Wandsworth	Prince of Wales Drive area	60	2	14	54	70	14.0	33	0	2	16	18	6.5
114	Wandsworth	Cabul Road	60	0	0	0	0	0.0	24	0	0	2	2	1.0
115	Wandsworth	Magdalen Road area	60	0	1	14	15	3.0	22	0	0	4	4	2.2
		Total	4680	7	275	1378	1660	332	2930	4	73	513	590	191

## Appendix D: Chi-squared test

Changes in the accident (and casualty) totals before and after the 20 mph zones were introduced were assessed using a standard Chi-Squared test. The test uses the number of accidents in the Before period to predict the expected number of accidents in the After period. The expected number is compared to the number that is actually observed and the significance of any difference is calculated.

### Method

The expected number of casualties in the After period is first calculated. This is the casualties per month in the Before period multiplied by the number of months in the After period. The difference between this value and the observed value is calculated. This is squared and divided by the expected number of casualties to obtain the Chi-Squared value. This calculation is shown in equation (1)

The Chi-Squared value is calculated as:

$$\frac{(\text{ExpectedValue} - \text{ObservedValue})^2}{\text{ExpectedValue}} \quad (1)$$

This Chi-Squared value can be looked up in standard statistical tables and a significance value obtained. Any value less than 0.05 is regarded as significant evidence of a change in the distribution. Any value of less than 0.01 is regarded as highly significant evidence of a change in the distribution.

### Example

	Before		After			Change	Chi <sup>2</sup> -value	Significance
	Casualties	Months	Months	Expected Casualties	Observed casualties			
20 mph zones (78 sites)	1936	4680	2930	1212	650	-46.4%	260.6	<0.001
Boundary roads (38 sites)	5367	2280	1554	3658	3551	-2.9%	3.132	0.077

In the 20 mph zone there were 1936 casualties in the 4680 months of the Before period, that is 0.414 casualties per month. Therefore, in the After period, which contains 2930 months, we would expect to observe  $2930 \times 0.4137 = 1212$  casualties. In fact we observed 650 casualties, 562 fewer than expected. We square 562 and divide by 1212 to obtain the chi-squared value of 260.6. This value can be looked up in a statistical table and is in fact so high that it is not listed. We can therefore conclude that there is very strong statistical evidence of a reduction in the casualty totals after the introduction of 20 mph zones. In the boundary roads a similar calculation produces a significance level of 0.077. This is not statistically significant.

## Appendix E Casualties in London 20 mph zones

Zone no.	Borough	Location of zone	Before					After							
			Ped.	Pedal cyclist	Power 2wheel	Other	Total	Annual Freq.	Months	Ped.	Pedal cyclist	Power 2wheel	Other	Total	Annual Freq.
1	Barking	Leys Avenue	0	2	0	2	4	0.8	27	0	0	0	0	0	0.0
2	Barking	Stevens Road area	1	1	0	11	13	2.6	21	1	0	1	2	1.1	
3	Barking	Oval Road area	1	2	0	2	5	1.0	21	0	0	0	0	0.0	
4	Barnet	Broadfields Avenue	3	1	0	1	5	1.0	23	1	1	0	3	1.6	
5	Barnet	Byng Road & Wentworth Road	0	0	0	0	0	0.0	21	0	0	0	0	0.0	
6	Barnet	Hampstead Garden Suburb	3	2	1	3	9	1.8	20	0	0	1	1	0.6	
7	Barnet	Adastral village	0	3	0	0	3	0.6	19	0	0	2	2	1.3	
12	Bexley	Barnes Cray Primary School	10	4	1	20	35	7.0	45	2	3	4	15	4.0	
13	Bexley	Boundary Road, Erith	0	0	0	0	0	0.0	56	0	0	1	1	0.2	
14	Brent	Harlesden schools	6	1	1	9	17	3.4	35	2	0	2	5	1.7	
15	Bromley	Royston Road, Penge	0	0	1	1	2	0.4	13	0	0	0	0	0.0	
16	Bromley	Perry Hall Road, Orpington	0	0	0	0	0	0.0	60	0	0	0	0	0.0	
19	Camden	St Andrews Area	8	1	3	4	16	3.2	60	0	3	0	3	0.6	
20	Camden	Regents Park Estate	10	3	6	9	28	5.6	30	3	3	1	2	3.6	
26	City of London	Watling Street	0	0	0	0	0	0.0	60	0	0	0	0	0.0	
27	Ealing	Poets Corner	0	1	0	2	3	0.6	45	0	0	2	2	0.5	
28	Ealing	Cuckoo Estate	7	5	0	25	37	7.4	52	8	1	3	17	6.7	
30	Enfield	Edmonton	10	5	5	55	75	15.0	60	5	0	1	7	1.4	
31	Enfield	Worlds End Lane area	1	0	0	7	8	1.6	23	2	0	1	3	1.6	
32	Enfield	Haselbury Road area	1	2	2	4	9	1.8	28	1	0	0	1	0.4	
34	Enfield	Sandhurst Road area	6	1	2	3	12	2.4	31	0	1	0	3	1.2	
35	Enfield	Orchard Road area	1	0	1	3	5	1.0	33	0	0	1	1	0.4	
36	Enfield	Princes Avenue area	14	5	5	47	71	14.2	19	1	3	5	20	12.6	
38	Hackney	Brooke Road	3	1	2	10	16	3.2	60	3	2	0	7	2.4	
39	Hackney	Hoxton area	36	5	6	15	62	12.4	48	18	0	1	20	9.8	

Zone no.	Borough	Location of zone	Before					After						
			Ped.	Pedal cyclist	Power 2wheel	Other	Total	Annual Freq.	Months	Ped.	Pedal cyclist	Power 2wheel	Other	Total
40	Hackney	Middleton Road area	39	14	8	35	96	19.2	48	15	6	33	60	15.0
41	Hammersmith & Fulham	Emlyn Road	2	1	1	7	11	2.2	60	0	0	0	1	0.2
42	Haringey	Gladesmore, South Tottenham	10	2	4	28	44	8.8	60	10	1	16	28	5.6
43	Haringey	North Tottenham, Phase 1	19	8	3	23	53	10.6	26	4	3	10	17	7.8
44	Haringey	North Tottenham, Phase 2	4	1	0	7	12	2.4	22	2	0	5	8	4.4
45	Haringey	North Tottenham, Phase 3	4	4	2	3	13	2.6	14	2	0	1	3	2.6
46	Haringey	Napier Road	10	2	2	9	23	4.6	60	6	3	11	23	4.6
47	Harrow	Little Stanmore	3	5	1	19	28	5.6	60	2	0	3	5	1.0
48	Hillingdon	Whithorn Estate	8	8	2	14	32	6.4	60	8	7	4	19	3.8
49	Hillingdon	Hayes Park school area	2	3	0	3	8	1.6	21	1	0	0	1	0.6
50	Hillingdon	Hayes Manor school area	3	1	3	4	11	2.2	15	1	0	1	2	1.6
51	Hounslow	Chiswick Meadows	0	0	1	1	2	0.4	60	0	0	0	0	0.0
52	Hounslow	Brentford area	4	1	0	1	6	1.2	60	3	5	1	9	1.8
54	Islington	St Peter's Street	40	17	20	30	107	21.4	45	11	8	11	38	10.1
55	Kingston	The Groves	4	5	2	8	19	3.8	60	2	1	0	3	0.6
59	Kingston	Tolworth Area	1	1	0	9	11	2.2	60	1	1	0	4	0.8
60	Kingston	Dukes Avenue, New Malden	1	1	0	8	10	2.0	32	0	0	1	1	0.4
61	Kingston	Elm Road, Chessington	2	3	0	1	6	1.2	15	0	0	0	0	0.0
62	Kingston	Cambridge Road, New Malden	0	2	0	5	7	1.4	15	0	0	0	0	0.0
63	Kingston	Grove area,Kingston	4	12	5	11	32	6.4	17	0	3	0	3	2.1
65	Lambeth (&Southwark)	Upper Ground/Belvedere Road	13	10	11	12	46	9.2	60	8	7	2	20	4.0
66	Lewisham	Glenbow Road	3	5	1	18	27	5.4	12	0	0	4	5	5.0
67	Lewisham	North Downham	15	0	6	48	69	13.8	12	1	0	1	4	4.0
68	Lewisham	Manor Lee	18	7	6	39	70	14.0	12	1	2	4	8	8.0
69	Lewisham	Rushey Green West	8	4	2	33	47	9.4	13	1	2	3	6	5.5
72	Merton	North Mitcham	3	1	2	8	14	2.8	60	2	2	3	7	1.4
73	Merton	Wimbledon Town centre	13	3	3	4	23	4.6	33	4	0	7	12	4.4
74	Newham	Upton Residential Haven	17	2	2	32	53	10.6	16	3	1	0	4	3.0
75	Newham	Little Ilford Residential Haven	40	12	3	49	104	20.8	25	12	0	14	27	13.0
77	Redbridge	St Peters & Pauls schools	1	2	0	2	5	1.0	54	1	1	1	3	0.7

Zone no.	Borough	Location of zone	Before					After						
			Ped.	Pedal cyclist	Power 2wheel	Other	Total	Annual Freq.	Months	Ped.	Pedal cyclist	Power 2wheel	Other	Total
78	Redbridge	Cleveland Primary School	2	2	0	4	8	1.6	54	3	0	4	7	1.6
79	Redbridge	Wanstead school	0	0	0	0	0	0.0	18	0	0	0	0	0.0
80	Redbridge	Manford school	4	0	1	0	5	1.0	18	0	0	1	1	0.7
81	Redbridge	Glenaim College	0	1	1	9	11	2.2	12	2	0	0	2	2.0
82	Redbridge	Mansfield Road	0	0	0	1	1	0.2	12	0	0	0	0	0.0
88	Richmond	Kew	1	0	0	0	1	0.2	60	0	0	0	0	0.0
89	Richmond	Heatham area	1	3	1	4	9	1.8	35	2	1	2	5	1.7
90	Richmond	Petersham	3	6	9	9	27	5.4	24	1	3	3	8	4.0
92	Southwark	Court area	4	7	5	8	24	4.8	60	0	6	6	14	2.8
93	Southwark	West Walworth	20	12	6	24	62	12.4	60	16	10	17	44	8.8
94	Southwark	The Hamlets, Dulwich	1	6	4	15	26	5.2	60	1	1	5	9	1.8
101	Sutton	Worcester Park	11	6	13	32	62	12.4	60	4	5	5	18	3.6
102	Tower Hamlets	Stepney, St Mary's	17	1	2	4	24	4.8	60	5	1	2	8	1.6
103	Tower Hamlets	Wilmot Street	1	0	0	0	1	0.2	21	2	0	0	2	1.1
107	Waltham Forest	Greenleaf area	21	2	5	56	84	16.8	60	5	1	1	7	1.4
108	Wandsworth	Tooting	6	4	3	18	31	6.2	60	3	3	6	15	3.0
109	Wandsworth	Balham	0	1	1	5	7	1.4	60	0	0	1	1	0.2
110	Wandsworth	Lytton Grove	3	0	1	1	5	1.0	57	0	0	1	3	0.6
111	Wandsworth	Brenda Road area	1	0	1	4	6	1.2	13	1	0	0	2	1.8
112	Wandsworth	Broomwood Road	2	2	4	7	15	3.0	30	0	0	1	1	0.4
113	Wandsworth	Prince of Wales Drive area	19	12	20	35	86	17.2	33	7	3	2	18	6.5
114	Wandsworth	Cabul Road	0	0	0	0	0	0.0	24	1	0	0	2	1.0
115	Wandsworth	Magdalen Road area	6	3	4	4	17	3.4	22	1	1	2	4	2.2
Total			536	250	207	943	1936	387	2930	202	105	266	650	210

## Appendix F Child casualties in London 20 mph zones

Zone no.	Borough	Location of zone	Before					After						
			Ped. cyclist	Pedal cyclist	Car	Other	Total	Annual freq.	Months	Ped. cyclist	Car	Other	Total	Annual Freq.
1	Barking	Leys Avenue	1	2	0	0	3	0.6	27	0	0	0	0	0.0
2	Barking	Stevens Road area	1	1	2	0	4	0.8	21	1	0	0	1	0.6
3	Barking	Oval Road area	1	1	0	0	2	0.4	21	0	0	0	0	0.0
4	Barnet	Broadfields Avenue	2	1	1	0	4	0.8	23	1	1	0	3	1.6
5	Barnet	Byng Road & Wentworth Road	0	0	0	0	0	0.0	21	0	0	0	0	0.0
6	Barnet	Hampstead Garden Suburb	1	0	0	0	1	0.2	20	0	0	0	0	0.0
7	Barnet	Adastral village	0	3	0	0	3	0.6	19	0	0	2	2	1.3
12	Bexley	Barnes Cray Primary School	8	1	1	0	10	2.0	45	0	0	0	0	0.0
13	Bexley	Boundary Road, Erith	0	0	0	0	0	0.0	56	0	0	0	0	0.0
14	Brent	Harlesden schools	5	0	0	0	5	1.0	35	1	0	0	1	0.3
15	Bromley	Royston Road, Penge	0	0	0	0	0	0.0	13	0	0	0	0	0.0
16	Bromley	Perry Hall Road, Orpington	0	0	0	0	0	0.0	60	0	0	0	0	0.0
19	Camden	St Andrews Area	5	0	0	0	5	1.0	60	0	0	0	0	0.0
20	Camden	Regents Park Estate	5	1	0	0	6	1.2	30	0	2	0	2	0.8
26	City of London	Watling Street	0	0	0	0	0	0.0	60	0	0	0	0	0.0
27	Ealing	Poets Corner	0	0	0	0	0	0.0	45	0	0	0	0	0.0
28	Ealing	Cuckoo Estate	2	3	1	0	6	1.2	52	3	0	4	7	1.6
30	Enfield	Edmonton	4	4	7	1	16	3.2	60	4	0	0	4	0.8
31	Enfield	Worlds End Lane area	0	0	1	0	1	0.2	23	1	0	0	1	0.5
32	Enfield	Haselbury Road area	1	1	0	0	2	0.4	28	0	0	0	0	0.0
34	Enfield	Sandhurst Road area	3	1	0	1	5	1.0	31	0	1	0	1	0.4
35	Enfield	Orchard Road area	0	0	0	0	0	0.0	33	0	0	0	0	0.0
36	Enfield	Princes Avenue area	5	3	0	0	8	1.6	19	0	1	2	3	1.9
38	Hackney	Brooke Road	3	1	2	0	6	1.2	60	1	0	0	1	0.2
39	Hackney	Hoxton area	14	0	0	0	14	2.8	48	6	0	3	10	2.5



Zone no.	Borough	Location of zone	Before					After						
			Ped.	Pedal cyclist	Car	Other	Total	Annual freq.	Months	Ped.	Pedal cyclist	Car	Other	Total
40	Hackney	Middleton Road area	28	2	0	2	32	6.4	48	5	2	0	9	2.3
41	Hammersmith & Fulham	Emlyn Road	1	0	0	0	1	0.2	60	0	0	0	0	0.0
42	Haringey	Gladesmore, South Tottenham	7	1	3	1	12	2.4	60	7	1	0	8	1.6
43	Haringey	North Tottenham, Phase 1	13	6	2	1	22	4.4	26	1	1	0	3	1.4
44	Haringey	North Tottenham, Phase 2	1	1	0	0	2	0.4	22	2	0	0	2	1.1
45	Haringey	North Tottenham, Phase 3	4	2	0	2	8	1.6	14	0	0	0	0	0.0
46	Haringey	Napier Road	4	0	1	0	5	1.0	60	3	0	2	5	1.0
47	Harrow	Little Stanmore	3	5	0	0	8	1.6	60	2	0	0	2	0.4
48	Hillingdon	Whitethorn Estate	6	4	1	0	11	2.2	60	7	1	0	8	1.6
49	Hillingdon	Hayes Park school area	1	3	0	0	4	0.8	21	1	0	0	1	0.6
50	Hillingdon	Hayes Manor school area	1	0	1	0	2	0.4	15	1	0	0	1	0.8
51	Hounslow	Chiswick Meadows	0	0	0	0	0	0.0	60	0	0	0	0	0.0
52	Hounslow	Brentford area	0	1	0	0	1	0.2	60	2	0	0	2	0.4
54	Islington	St Peter's Street	15	1	1	1	18	3.6	45	5	2	0	7	1.9
55	Kingston	The Groves	2	2	1	0	5	1.0	60	2	0	0	2	0.4
59	Kingston	Tolworth Area	0	1	2	0	3	0.6	60	0	1	0	1	0.2
60	Kingston	Dukes Avenue, New Malden	1	1	0	0	2	0.4	32	0	0	0	0	0.0
61	Kingston	Elm Road, Chessington	1	0	0	0	1	0.2	15	0	0	0	0	0.0
62	Kingston	Cambridge Road, New Malden	0	0	0	0	0	0.0	15	0	0	0	0	0.0
63	Kingston	Grove area,Kingston	2	1	0	1	4	0.8	17	0	0	0	0	0.0
65	Lambeth (&Southwark)	Upper Ground/Belvedere Road	2	0	0	0	2	0.4	60	1	1	0	2	0.4
66	Lewisham	Glenbow Road	2	3	3	0	8	1.6	12	0	0	0	0	0.0
67	Lewisham	North Downham	11	0	10	0	21	4.2	12	0	0	1	1	1.0
68	Lewisham	Manor Lee	8	3	5	0	16	3.2	12	0	1	0	2	2.0
69	Lewisham	Rushey Green West	2	1	1	0	4	0.8	13	0	1	0	1	0.9
72	Merton	North Mitcham	1	0	3	0	4	0.8	60	2	1	2	5	1.0
73	Merton	Wimbledon Town centre	0	1	1	0	2	0.4	33	1	0	1	2	0.7
74	Newham	Upton Residential Haven	11	1	6	0	18	3.6	16	3	1	0	4	3.0
75	Newham	Little Ilford Residential Haven	35	6	7	0	48	9.6	25	5	0	1	6	2.9

Zone no.	Borough	Location of zone	Before					After						
			Ped.	Pedal cyclist	Car	Other	Total	Annual freq.	Months	Ped.	Pedal cyclist	Car	Other	Total
77	Redbridge	St Peters & Pauls schools	0	2	0	0	2	0.4	54	1	0	0	2	0.4
78	Redbridge	Cleveland Primary School	2	1	0	0	3	0.6	54	1	0	0	1	0.2
79	Redbridge	Wanstead school	0	0	0	0	0	0.0	18	0	0	0	0	0.0
80	Redbridge	Manford school	2	0	0	0	2	0.4	18	0	0	0	0	0.0
81	Redbridge	Glenarm College	0	1	1	0	2	0.4	12	0	0	0	0	0.0
82	Redbridge	Mansfield Road	0	0	0	0	0	0.0	12	0	0	0	0	0.0
88	Richmond	Kew	1	0	0	0	1	0.2	60	0	0	0	0	0.0
89	Richmond	Heatham area	0	0	0	0	0	0.0	35	0	0	0	0	0.0
90	Richmond	Petersham	0	3	0	0	3	0.6	24	0	0	0	0	0.0
92	Southwark	Court area	2	2	0	0	4	0.8	60	0	1	0	1	0.2
93	Southwark	West Walworth	15	5	2	1	23	4.6	60	9	4	1	14	2.8
94	Southwark	The Hamlets, Dulwich	0	1	1	0	2	0.4	60	0	0	0	0	0.0
101	Sutton	Worcester Park	6	5	1	0	12	2.4	60	4	0	1	5	1.0
102	Tower Hamlets	Stepney, St Mary's	12	0	0	0	12	2.4	60	3	0	0	3	0.6
103	Tower Hamlets	Wilmot Street	1	0	0	0	1	0.2	21	2	0	0	2	1.1
107	Waltham Forest	Greenleaf area	13	1	1	0	15	3.0	60	1	0	0	1	0.2
108	Wandsworth	Tooting	2	2	2	0	6	1.2	60	1	0	1	2	0.4
109	Wandsworth	Balham	0	0	0	0	0	0.0	60	0	0	0	0	0.0
110	Wandsworth	Lytton Grove	2	0	0	1	3	0.6	57	0	0	0	0	0.0
111	Wandsworth	Brenda Road area	0	0	0	0	0	0.0	13	0	0	0	0	0.0
112	Wandsworth	Broomwood Road	1	0	0	0	1	0.2	30	0	0	0	0	0.0
113	Wandsworth	Prince of Wales Drive area	5	3	4	0	12	2.4	33	3	1	0	4	1.5
114	Wandsworth	Cabul Road	0	0	0	0	0	0.0	24	1	0	0	1	0.5
115	Wandsworth	Magdalen Road area	4	2	0	0	6	1.2	22	0	0	0	0	0.0
		Total	291.0	97.0	75	12	475	95	2930	94	25	23	146	47







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Review of 20 mph zones in London Boroughs