

Cross River Partnership

20mph Speed Limits – Analysis of Impact of 20mph Limits Final Report

May 2017





CROSS RIVER PARTNERSHIP

ANALYSIS OF IMPACT OF 20MPH LIMITS RESEARCH REPORT Cross River Partnership (CRP)

Type of document (version) Confidential

Project no: 70026918 Date: May 2017

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QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Issue			
Date	31 May 2017			
Prepared by	C Rossetti			
Signature	Cesa Rosson .			
Checked by	R Vasek			
Signature	Robert VoseR			
Authorised by	G Higgs			
Signature	flug			
Project number	70026918			
Report number	1			
File reference	\\uk.wspgroup.com\Centra I Data\Projects\700269xx\7 0026918 - Impacts of 20mph Limits\C Documents\Reports			

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EXECUTIVE SUMMARY

COMMISSION

WSP | Parsons Brinckerhoff has been commissioned by Cross River Partnership (CRP) to undertake an analysis of the impacts of the introduction of 20mph speed limits in central London and, specifically, the effect of 20mph limits on drivers' propensity to drive at speeds over 30mph.

CRP has commissioned this study to answer two main questions:

- "What are the impacts of 20mph limits on drivers before and after scheme implementation?"; and
- "Are the impacts observed considered to be statistically significant?"

The consideration of the statistical significance of the results relates to whether any observed change in speed could have happened by chance, or if there is a statistically significant factor associated with this change.

DATA COLLECTION AND ANALYSIS

In liaising with the eight central London Boroughs, it was established that 'before' and 'after' data could readily only be made available for the London Borough (LB) of Southwark and LB Camden for 2013-2015 and 2013-2016 respectively. Borough-wide 20mph limits have been introduced in both Boroughs relatively recently and this means that an insufficient period has elapsed since the 20mph limits were introduced to obtain collisions data. Most of the 20mph zones were introduced before 2013/2014 and therefore 'before' data was not available specifically for these areas.

We have also undertaken a brief literature review of relevant previous studies which were undertaken to assess the impacts of 20mph speed limits

For purpose of the analysis, the roads types were divided into four different groups:

- Limits: 20mph speed limit roads marked by signs/markings-only which were already 20mph before the introduction of 20mph limits borough-wide;
- Zones: 20mph speed limit roads indicated by boundary signing and physical traffic-calming measures such as speed humps, chicanes and road narrowing. These were already 20mph before the introduction of 20mph limits borough-wide;
- Others: roads were neither in a 20mph limit or 20mph zone category before the introduction of 20mph limits borough-wide. All of the speed survey sites in this category were on 30mph roads; and
- All Areas: all the roads combined (i.e. Limits, Zones and Other).

The Mann-Whitney U-Statistic test was then used to describe whether the change in speed between the 'before' and 'after' sample data is statistically significant (i.e. whether it was likely or unlikely to have occurred by chance). Additionally, the impact of 20mph limits specifically on drivers that exceeded the original 30mph speed limit before the 20mph limit was introduced, was also reviewed.

CONCLUSIONS OF DATA ANALYSIS

LB Southwark

Across all 86 sites the mean and 85th percentile speeds reduced from 21.6mph to 19.8mph and from 27.8mph to 25.6mph respectively. This is a reduction of 1.8mph and 2.2mph respectively. The mean and 85th percentile traffic speeds across zones, limits and other sites are all around 2 mph lower than before the borough-wide 20mph limit was introduced.

The reduction in speed was found to be statistically significant for roads within the 20mph Limits and Others category (i.e. roads that were not in a zone category before LB Southwark became a borough-wide 20 mph limit on the 16th March 2015).

However, it was not found to be statistically significant for roads with 20mph Zones category, which appears counter-intuitive and it is likely to be due to a limited amount of only 10 data sample sites available for the 20mph Zones. It may be that if the average speed reduction had been observed across more sites then it may also have been significant since the reduction in average speed were similar to the other categories. This explanation is re-enforced particularly because, when the data is reviewed on an aggregated level across All Areas (Limits, Zones and Others) it demonstrates a statistically significant reduction in average speeds of approximately 1.8 mph.

The data shows that there was a significant reduction in the proportion of drivers travelling at over 30mph before and after the introduction of the scheme, at the 90% confidence level. The proportion of drivers travelling over 30mph reduced by 6%. The LB Southwark study therefore indicated that the implementation of 20mph schemes is an effective way of reducing the proportion of vehicles travelling in excess of 30mph.

However, the 'After' speed for eight of the sites is greater than 24mph which indicates that they are not suitable for signed-only 20mph limits (without the introduction some other form of speed reducing feature). Six of these locations previously had 30mph speed limits and two were already subject to 20mph speed limits.

The speed reduction achieved in LB Southwark of around 2mph would therefore add additional credence to the current DfT guidance that signed-only 20mph speed limits are suitable for roads where the mean speed is already at or below 24mph. This is because, although the average reduction in mean speed for the Other (30mph) sites was 1.8mph (which would imply the acceptable prior speed could be around 25mph), the reduction range for individual sites was between -7.5mph and -0.1mph.

LB CAMDEN

For the LB Camden study, the data indicates that the implementation of the borough-wide 20mph limit in December 2013 appears to have resulted in a negligible change in vehicle speed; however the change is not statistically significant.

Of the three year comparisons, the 2013 to 2016 analysis has showed the greater variance in before and after average speed, with a reduction in mean and 85th percentile speed of 0.4mph and 0.3mph respectively. When the data is analysed across all road types, there is a decrease of 2.0% and 3.5% in the proportion travelling at over 20mph and 25mph respectively. However, the analysis shows the result is still not statistically significant.

DISCUSSION ON SUITABILITY OF 20MPH LIMITS

The reduction in average speed from the introduction of the borough-wide 20mph speed limit in LB Southwark is line with the 1-2mph reduction that has been reported for the other schemes that

are referred to in the literature review. However, the fact that there was a similar reduction in speed across the pre-existing 20mph limits, 20mph zones and previous 30mph limits is unexpected.

This may signify that the wider coverage of 20mph limits within LB Southwark, neighbouring boroughs and elsewhere in London has led to a cultural change in driving behaviour. Alternatively, it may be that localised factors were at least partly responsible in reducing vehicle speed in the areas that were previously 20mph limits/zones. Such factors include increased traffic congestion in these areas or additional or modified speed reduction measures (e.g. replacing speed cushions with humps). There is considerable variability between the results for individual Automatic Traffic Count (ATC) sites, which is partly why the data for 20mph zones is not statistically significant. The variability indicates that localised factors are likely to be influencing speeds in addition to the introduction of the borough-wide 20mph limits.

Whilst not statistically significant, it is interesting to note that the average speed for LB Camden ATC locations was not appreciably different between 2013 and 2016, especially when compared to the difference in speed that was experienced in LB Southwark. There may be many reasons for this, not least the fact that the results are not statistically reliable. LB Camden is arguably more densely populated and carries more through traffic than LB Southwark, with the result that it suffers from high levels of congestion over longer periods of the day/week - although the average speeds for the LB Camden and LB Southwark ATCs are similar.

In general, congestion has worsened in central London over the last few years. It has been widely reported that this is largely due to the impacts of construction work associated with development and transport schemes including cycle route improvements. So compared to LB Southwark, higher levels of congestion in LB Camden may be limiting the extent to which the introduction of the 20mph limits has reduced traffic speed.

As well as reducing the likely incident of collisions, a reduction in vehicle speed is likely to also reduce the severity of collisions. The Royal Society for the Prevention of Accidents (RoSPA) reported that if a pedestrian is hit by a vehicle travelling at 20mph there is a 2.5% chance that they will be fatally injured, compared to a 20% chance at 30mph.

An actual or perceived reduction in vehicle speed is likely to have a positive impact on the number of people walking and cycling. An increase in journey time from reduced vehicle speed and compliance with 20mph limits across wide-areas may act as deterrents to driving and ultimately lead to mode shift away from the car.

In addition, lower vehicle speeds are likely to create streets where crossing movement is easier, vehicle noise is less prominent and the general dominance of traffic is reduced – all factors which create environments which are more conducive to walking and cycling and lead to an overall improvement in the liveability of neighbourhoods. Therefore, the introduction of borough-wide 20mph limits may lead to a positive cultural shift in travel behaviour.

In the 'Study into 20mph Zones in Southwark' undertaken by MVA Consultancy in 2009, in response to a survey of residents, 56% of respondents said that they feel that road safety is better, 49% of respondents felt that problems with traffic speeds is better, whilst 45% and 30% of respondents felt that the ease of crossing the road and the general visual appearance of the area are better.

In comparison, in a survey conducted by Ealing Council for six of its 20mph zones, about 45% of residents felt that the zones have been effective in reducing speeds, 33% considered that traffic volumes have reduced and 34% felt that walking is now safer.

In a research study undertaken in 2002 for the 20mph zones within Hull, residents were asked to comment on the success of the zone within which they live. 25% of residents said that they walk

or cycle more, 80% think that the zones are a good idea, 78% think that traffic speeds have reduced and 50% think it is a more pleasant place to live.

The research above relates to 20mph Zones rather than 20mph limits, but none-the-less indicates that the perception of benefits from speed reduction can be significant.

The results of the ATC surveys have been reported at an aggregate level. However, it is important to note that traffic speed did not reduce at all sites, and the average speed after the implementation of the borough-wide limits for some locations remains relatively high.

The 2012 Department of Transport (DfT) guidance 'Setting Local Speed Limits' advises that if the mean speed is already at or below 24 mph on a road, introducing a 20 mph speed limit through signing alone is likely to lead to general compliance with the new speed limit. Overall, traffic speeds in central London are lower than outer London and most other parts of the UK and as such the streets in the CRP constituent boroughs are more suitable for the introduction of 20mph limits.

Where existing traffic speeds are higher for some streets, this does not mean that a borough should not introduce a signed-only 20mph speed limit. Rather, consideration should be given to whether 20mph limits using signs alone are appropriate for these streets or whether additional localised interventions are required, such as physical or psychological traffic calming measures, area-wide treatment, access restrictions or speed enforcement. The introduction of 20mph limits may provide opportunities for introducing complementary walking, cycling and or public realm improvements within borough streets as part of a more holistic approach that is in line with the TfL Healthy Streets objectives. These complementary measures may also assist with the attenuation of traffic speed.

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1 INTRODUCTION

1.1 INTRODUCTION

1.1.1 WSP | Parsons Brinckerhoff has been commissioned by Cross River Partnership (CRP) to undertake an analysis of the impacts of the introduction of 20mph speed limits in central London and, specifically, the effect of 20mph limits on drivers' propensity to drive at speeds over 30mph.

1.2 BACKGROUND AND OBJECTIVES

1.2.1 Across England there are over two thousand 20mph speed limit/zone schemes in operation, most of which are 20mph zones. In London, more than a quarter of all roads are now 20mph and within the Central London Congestion Charging Zone (i.e. Inner Ring Road) 50% of all roads are subject to a 20mph limit. **Figure 1-1** below shows the locations of these roads, accurate as of June 2016:





1.2.2 Whilst such schemes are gaining popularity within local, regional and central Government, there is little evidence regarding their impacts on speed attenuation, journey times and collision reduction, and also on residents' perceived impact on noise as well as the overall liveability of their local area. In addition, there is a lack of advice on if, when, why and where 20mph limits or zones should be introduced, how they should be designed and how far the schemes should extend.

- 1.2.3 A recent change in legislation now allows the creation of **20mph limit** areas with **signage** and **road markings** alone, without **traffic calming** as is required for **20mph zones**. This enables local authorities to introduce 20mph limits in larger areas at low cost. However, the key question remains regarding the extent to which limits alone reduce vehicle speed.
- 1.2.4 Cross River Partnership (CRP) is central London's largest public private partnership and has been delivering regeneration projects in the capital since 1994. CRP represents eight central London boroughs. These boroughs are at different stages of introducing 20mph limits/zones; this is summarised below.
 - LB Camden borough-wide 20mph limit (includes 20mph zones);
 - LB Southwark– borough-wide 20mph limit (includes 20mph zones);
 - LB Islington borough-wide 20mph limit (includes 20mph zones);
 - City of London– borough-wide 20mph limit;
 - LB Lambeth borough-wide 20mph limit (includes 20mph zones);
 - LB Wandsworth implementation of borough-wide 20mph limit due to be completed soon (will include existing 20mph zones);
 - RB Kensington & Chelsea has one 20mph zone; and
 - City of Westminster- planning to trial 20mph zone on certain streets in 2017.

1.2.5 **Figure 1-2** below shows the boroughs represented by CRP.



Figure 1-2: London Boroughs Represented by CRP

1.2.6 The Central London Sub Regional Transport Partnership (CLSRTP) is a collective of transport specialists from eight central London boroughs convened by Cross River Partnership on behalf of Transport for London (TfL). The partnership specifically looks at the Healthy Streets approach to transport, encouraging behaviour change and active travel and delivering interventions that make key areas more accessible and pleasant.

1.3 AIM OF STUDY

- 1.3.1 As identified in the study brief, CRP has commissioned this study to answer two main questions:
 - "What are the impacts of 20mph limits on drivers before and after scheme implementation?"; and
 - "Are the impacts observed considered to be statistically significant?"
- 1.3.2 The consideration of the statistical significance of the results relates to whether any observed change in speed could have happened by chance, or if there is a statistically significant factor associated with this change.
- 1.3.3 In addition, the aim was, where possible, to identify the relative impacts of 20mph limits versus 20mph zones and to understand the extent to whether there is a correlation between a change in vehicle speed and the incident of collisions.

1.4 STUDY EXTENT AND SCOPE

- 1.4.1 The aspiration was to obtain speed and collision data for as many of the eight central London boroughs as possible. The speed data was to be obtained in the form of Automatic Traffic Count (ATC) data, which is usually collected for a period of one or two weeks when used for scheme monitoring purposes. Boroughs also collect ATC data for selected roads on a continuous basis and this is used for ongoing borough-wide monitoring of traffic speed and flow.
- 1.4.2 To be meaningful for this study, the ATC data needed to be available for a period before the 20mph limits/zones were introduced and also after they were implemented. To provide reliable results, collisions data needs to be available for a minimum of 3-years before and after implementation of the limits/zones.
- 1.4.3 In liaising with the boroughs, it was established that 'before' and 'after' data could only readily be made available for LB Southwark and LB Camden for 2013-2015 and 2013-2016 respectively. Borough-wide 20mph limits have been introduced in both Boroughs relatively recently and this means that an insufficient period has elapsed since the 20mph limits were introduced to obtain collisions data. Most of the 20mph zones were introduced before 2013/2014 and therefore 'before' data was not available specifically for these areas.
- 1.4.4 Analysis of ATC data has been undertaken in order to identify the change in speed since the borough-wide 20mph limits were introduce and to identify the degree to which these results are statistically significant. The change in speed is identified separately for areas which, prior to the introduction of the 20mph borough-wide limits, had 20mph zones, had 20mph limits and 30 mph limits. Further information on the data collection methodology in provided in Chapter 2.
- 1.4.5 We have also undertaken a brief literature review of relevant previous studies which were undertaken to assess the impacts of 20mph speed limits and this is documented in Chapter 4.

2 DATA COLLECTION

2.1 LB SOUTHWARK DATA COLLECTION

2.1.1 Data was collected by a third party survey company on behalf of Southwark Council using ATC equipment that recorded traffic volumes and average speeds at 15 minute intervals throughout 24 hours of the day for two continuous weeks in November of 2013 and November 2015, which are periods before and after the implementation of the borough-wide 20mph speed limit in March 2015. We were provided with the original ATC data (i.e. the data provided direct from the survey company), as opposed to a data summary.

2.2 LB CAMDEN DATA COLLECTION

- 2.2.1 Data was collected by a third party survey company on behalf of Camden Council. Unlike for LB Southwark, LB Camden did not provide the original data files and instead provided a summary table for the years of 2013, 2014, 2015 and 2016. LB Camden implemented a borough-wide 20mph limit in December 2013.
- 2.2.2 It was highlighted by Camden Council that the 2013 data sample (our only "before" data available for comparison) was not as robust and reliable as the following years of data due to the following reasons:
 - From 2014 onwards consultants were required to check the data being collected during the survey to ensure that data capture errors were minimised. Data collection problems in 2013 were therefore higher than subsequent years and even the rigorous cleaning process that was applied to data from 2014 could not produce reliable data through cleaning retrospectively to all the 2013 data sites.
 - Not all sites surveyed in 2013 involved collection for at least a 2-week period. This not only makes cleaning less reliable, but data was not collected on some weekend days. From 2014 onwards if data collection problems arose for some sites (and were observed during the course of the survey) consultants held loops down for longer than 2 weeks to ensure that data collection was as rigorous as possible and that the cleaned data derived would be robust.
 - The template used by LB Camden to create the summary table for the 2013 data has some errors (which this study could not evaluate do to the fact we did not received the original data), hence the percentage count of traffic above 20 mph and 25 mph might not be accurate.
- 2.2.3 The summary table provided by LB Camden highlighted that 30 of the 97 sites are unreliable and as such we excluded these from our analysis.

3 DATA ANALYSIS

3.1 PROCEDURAL OVERVIEW

- 3.1.1 For the purposes of the analysis, the type of roads were divided into four different groups:
 - Limits: 20mph speed limit roads marked by signs/markings-only which were already 20mph before the introduction of 20mph limits borough-wide;
 - Zones: 20mph speed limit roads indicated by boundary signing and physical traffic-calming measures such as speed humps, chicanes and road narrowing. These were already 20mph before the introduction of 20mph limits borough-wide;
 - Others: roads were neither in a 20mph limit or 20mph zone category before the introduction of 20mph limits borough-wide. All of the speed survey sites in this category were on 30mph roads; and
 - All Areas: all the roads combined (i.e. Limits, Zones and Other).
- 3.1.2 The Mann-Whitney U-Statistic test was then used to describe whether the change in speed between the 'before' and 'after' sample data is statistically significant (i.e. whether it was likely or unlikely to have occurred by chance). Additionally, the impact of 20mph limits specifically on drivers that exceeded the original 30mph speed limit before the 20mph limit was introduced was also reviewed. Further detail regarding the Mann-Whitney U-Statistic test is located in Appendix B.

3.2 LB SOUTHWARK DATA ANALYSIS

- 3.2.1 For the purpose of the analysis, the type of roads were divided into the four different groups detailed previously, prior to LB Southwark becoming a borough-wide 20mph limit on 16th March 2015.
- 3.2.2 In total, speed data collected from 86 different sites within LB Southwark were analysed. More specifically, the data comprises 10 sites that are within 20mph *Zones*, 20 sites with 20mph *Limits* and 56 sites that previously had 30mph speed limits, referred to as *Others*. On 16th March 2015 all streets within the borough became 20mph limits, although the pre-existing 20mph zones remain (so still have traffic calming). All roads that are subject to the 20mph limit are managed by LB Southwark, so this excludes 'red routes' which are the responsibility of Transport for London (TfL).
- 3.2.3 **Table 3-1** below provides details on the 'Before' and 'After' measurements for each category. The min/max/average speed for each site was calculated across the 24-hr, 14-day period. The results in the table below are the average of the min/max/average for all of the sites within the limit/zone/other/all categories.

	Speed (AVERAGED ACROSS THE LIMIT/ZONE/OTHER/ALL SITES)								
Түре	Before			After			Difference		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
Limits		-	· · · · ·		•			=	
Limits (Mean Speed)	14	29	22.6	16	26	20.6	2	-3	-2.0
Limits (85%tile)	17	34	27.8	20	31	25.6	3	-3	-2.2
Zones			<u> </u>					-	
Zones (Mean Speed)	15	24	19.6	8	22	17.7	-7	-2	-1.9
Zones (85%tile)	19	31	24.2	10	28	22.0	-9	-3	-2.2
Others									
Other (Mean Speed)	11	31	21.7	13	28	19.9	2	-3	-1.8
Other (85%tile)	13	36	26.8	16	33	24.8	3	-3	-2.0
All Areas	All Areas								
All (Mean Speed)	11	31	21.6	8	28	19.8	-3	-3	-1.8
All (85%tile)	17	34	27.8	20	31	25.6	3	-3	-2.2

Table 3-1: Summary results for the "before" and "after" average traffic speeds in LB Southwark across all areas studied.

The overall average mean & 85th%tile traffic speed have reduced by 1.8mph and 2.2mph respectively. The mean and 85th%ile traffic speeds across zones, limits and other site are all around 2 mph lower than before the borough-wide 20mph limit was introduced.

- 3.2.4 The results in Table 3-1 generally concur with the other schemes discussed in Chapter 4, which observe a 1-2 mph reduction in the 85th percentile or mean speed after implementation of 20mph schemes, and is slightly greater than the 1 mph reduction in average speeds forecast by using the DfT guidelines for introducing 20mph speed limits.
- 3.2.5 In order to investigate whether the change in speed between the 'before' and 'after' sample data is statistically significant (i.e. whether it was likely or unlikely to have occurred by chance), a Mann-Whitney U-Statistic test was carried out.

Table 3-2 below summarises the results of the statistical significance test.

Type	Mann-Whitney Significance Test						
IYPE	2-tailed significance value ^[1]	1-tailed significance value ^[2]	Significance at 95% confidence level ^[3]	Significant at 90% confidence level ^[4]			
Limits							
Limits (Mean Speed)	0.027	0.013	Yes	Yes			
Limits (85%tile)	0.027	0.014	Yes	Yes			
Zones							
Zones (Mean Speed)	0.496	0.248	No	No			
Zones (85%tile)	0.473	0.236	No	No			
Others							
Other (Mean Speed)	0.033	0.016	Yes	Yes			
Other (85%tile)	0.019	0.010	Yes	Yes			
All Areas							
All (Mean Speed)	0.004	0.002	Yes	Yes			
All (85%tile)	0.027	0.014	Yes	Yes			

Table 3-2: Mann-Whitney U statistic test result on the Mean and 85% tile for the "before" and "after" traffic speeds in LB Southwark across all areas studied.

Note:

[1] For the 2-tailed test a significance value of less than 0.1 would indicate a change;

[2] For the 1- tailed test a significance value of less than 0.5 would indicate whether the change is statistically significant;

[3] A statistically significant decrease in speeds is noted between the before and after recordings at the 95% confidence level if the 1-tailed test has a significance value of less than 0.025;

[4] A statistically significant decrease in speeds is noted between the before and after recordings at the 90% confidence level if the 1-tailed test has a significance value of less than 0.05.

- 3.2.6 The Mann-Whitney U test investigated the average speed reduction based on the different road categories (i.e. limits, zones and others) as well as all categories combined (all areas). It was found that the change in speed for the limits and others areas is statistically significant and therefore unlikely to have occurred by chance. However, the speed reduction observed on roads within the 20mph zones was not found to be statistically significant. Only a limited amount of 10 data sample sites were available for the 20mph zones and it may be that if the average speed reduction had been observed across more sites then it may also have been significant. Particularly because, when the data is reviewed on an aggregated level across all areas it demonstrates a statistically significant reduction in average speeds of approximately 1.8 mph.
- 3.2.7 It might have been expected that speeds in the 20mph zones and pre-existing 20mph limits would have reduced by less (or not at all) compared to the 'other' (30mph) sites, particularly for the zones as they have traffic calming. As the results are not statistically significant then it is not possible to identify whether, with more sites say, the reduction of speed would have been less compared to the 'other' sites.
- **3.2.8 Graph 3-1** below shows the percentage of vehicles travelling at different speed bins across all the 86 monitored sites both 'before' and 'after' the 20mph scheme implementation.



Graph 3-1: Percentage of vehicles travelling at different speed bins for the 'before" and "after" scheme implementation across all the 86 monitored sites.

The data shows a reduction in the percentage of vehicles travelling at speeds in all bins above 25 mph following the implementation of the borough-wide 20 mph. Whilst the proportion of vehicles travelling at between 20 and 25 mph increased only slightly, noticeably more vehicles were measured travelling at speeds below 20 mph.

- 3.2.9 One CRP question concerned the impact of 20mph limits specifically on drivers that exceeded the original 30mph speed limit before the 20mph limit was introduced. In order to asses this, separate calculations and statistical analysis have been performed on sub-divisions of the raw data by dividing the data into drivers grouped by their speed ranges. This is shown in **Table 3-3** below.
- 3.2.10 In **Table 3-3**, the 'Before' and 'After' category for each sub-set represents the average percentage of drivers travelling within that speed range. Importantly, this percentage was calculated for *each individual site* and then an average within each category is computed so that results could be compared across the whole data set, following which the statistical test could be run. The table summarises these findings and shows the results of the statistical significance test.

Түрг	Average percentage count		VARIANCE	Mann-Whitney Significance Test				
1.1.2	Before (%)	After (%)	VARIANCE	2-tailed significance value ^[1]	1-tailed significance value ^[2]	Significance at 95% confidence level ^[3]	Significant at 90% confidence level ^[4]	
Limits			·					
< 15 mph	13%	18%	5%	0.042	0.021	Yes	Yes	
15-20 mph	21%	28%	8%	0.017	0.009	Yes	Yes	
20-25 mph	30%	31%	1%	0.766	0.383	No	No	
25-30 mph	25%	17%	-8%	0.020	0.010	Yes	Yes	
30-35 mph	9%	5%	-4%	0.035	0.017	Yes	Yes	
> 35 mph	3%	2%	-1%	0.066	0.033	No	Yes	
Zones								
< 15 mph	23%	32%	9%	0.450	0.225	No	No	
15-20 mph	32%	31%	-1%	1.000	0.500	No	No	
20-25 mph	28%	26%	-2%	0.705	0.353	No	No	
25-30 mph	25%	17%	-8%	0.020	0.010	Yes	Yes	
30-35 mph	9%	5%	-4%	0.035	0.017	Yes	Yes	
> 35 mph	1%	1%	-1%	0.705	0.353	No	No	
Others								
< 15 mph	20%	26%	6%	0.066	0.033	No	Yes	
15-20 mph	22%	25%	3%	0.181	0.090	No	No	
20-25 mph	25%	27%	2%	0.205	0.102	No	No	
25-30 mph	21%	17%	-4%	0.117	0.059	No	No	
30-35 mph	4%	2%	-2%	0.406	0.203	No	No	
> 35 mph	3%	2%	-2%	0.205	0.102	No	No	
All Areas								
< 15 mph	18%	25%	7%	0.008	0.004	Yes	Yes	
15-20 mph	23%	27%	3%	0.070	0.035	No	Yes	
20-25 mph	27%	28%	1%	0.399	0.199	No	No	
25-30 mph	21%	16%	-5%	0.015	0.008	Yes	Yes	
30-35 mph	8%	4%	-3%	0.022	0.011	Yes	Yes	
> 35 mph	3%	1%	-2%	0.071	0.036	No	Yes	
Red cells indicate growth in a total number of vehicles travelling at the specific speed range.								

Table 3-3: Mann-Whitney U statistic test results for the percentage of "before" and "after" vehicles travelling at specific speed ranges across all studied areas in LB of Southwark.

Red cells indicate growth in a total number of vehicles travelling at the specific speed range. Green cells indicate a reduction.

3.2.11 This analysis shows that specifically for drivers that exceeded the original 30mph limit, the implementation of the 20mph zone did significantly reduce their average speed, across all survey zones, at the 90% confidence level.

The proportion of drivers travelling between 30-35mph reduced by 4%, and those travelling above 35mph reduced by 2%. There was therefore an overall reduction in 6% of cars travelling above 30 mph after the implementation of the scheme.

3.2.12 **Table 3-4** and **Table 3-6** identify the number of ATC sites whose speed was <20mph, 20mph-24mph and >24mph before and after the borough-wide 20mph speed limit was introduced. **Table 3-4** is particularly pertinent because the DfT Circular 01/2013, 'Setting Local Speed Limits', states that "*If the mean speed is already at or below 24 mph on a road, introducing a 20 mph speed limit through signing alone is likely to lead to general compliance with the new speed limit.*"

Түре	Total NUMBER OF	Mean speed	Number	Variance	
	SITES		Before	After	
		<20 mph	4	8	4
Limits	20	20 mph - 24 mph	8	10	2
		>24 mph	8	2	-6
	10	<20 mph	4	6	2
Zones		20 mph - 24 mph	6	4	-2
		>24 mph	0	0	0
	56	<20 mph	19	26	7
Others		20 mph - 24 mph	18	24	6
		>24 mph	19	6	-13
All		<20 mph	27	40	13
	86	20 mph - 24 mph	32	38	6
		>24 mph	27	8	-19

 Table 3-4: Mean speed summary by category across all sites studied in LB of Southwark.

Red cells indicate growth in a total number of sites with the specific speed range.

Green cells indicate a reduction.

- 3.2.13 In the *Other* group there were 18 sites within 20 mph 24 mph category before the scheme was implemented. After implantation, 13 of the sites stayed with the same category and 5 sites dropped to the <20 mph category.
- **Table 3-5** provides context by indicating the minimum and maximum speed reduction ranges across the road types.

Түрг	Speed reduc (Mi	Average Speed Reduction	
	From	То	(MPH)
Limits	-5.8	-0.6	-2.0
Zones	-7.2	-0.8	-1.9
Others	-7.5	-0.1	-1.8
All Areas	-7.5	-0.1	-1.8

Table 3-5: Range of speed reduction across all areas studied in LB of Southwark.

Table 3-6: 85th percentile speed	d summary of monitored	sites by category acr	oss all sites studied.
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Түре	Total NUMBER OF	85 [™] Percentile	Number	Variance	
	SITES		Before	After	
		<20 mph	1	0	-1
Limits	20	20 mph - 24 mph	2	5	3
		>24 mph	17	15	-2
Zones	10	<20 mph	2	2	0
		20 mph - 24 mph	2	3	1
		>24 mph	6	5	-1
	56	<20 mph	6	10	4
Others		20 mph - 24 mph	9	12	3
		>24 mph	41	34	-7
		<20 mph	9	12	3
All	86	20 mph - 24 mph	13	20	7
		>24 mph	64	54	-10

Red cells indicate growth in a total number of sites with the specific speed range. Green cells indicate a reduction.

3.2.15 Furthermore, a reduction in mean speed is observed across all 86 monitored sites, as summarised in **Table 3-7** below:

Mean Speed	Before 20 mph implementation (number of sites)	After 20 MPH IMPLEMENTATION (NUMBER OF SITES)	
< 20 mph	27	40	
≥ 20 mph to ≤ 24 mph	32	38	
> 24 mph to ≤ 30 mph	26	8	
> 30 mph	1	0	

Table 3-7: Number of monitored sites by specified mean speed range across all 86 sites studied in LB of Southwark.

3.2.16 **Graph 3-2** below, identifies the number of sites in each category where the average speed is/was >24mph, 20mph-24mph and <20mph.



Graph 3-2: Absolute Value of sites within each mean speed band

- 3.2.17 As shown in **Graph 3-2**, the After speed for eight of the sites is greater than 24mph which indicates that they are not suitable for signed-only 20mph limits (without the introduction of some other form of speed reducing feature). Table 3-2 shows that six of these locations previously had 30mph speed limits and two were already subject to 20mph speed limits.
- 3.2.18 The Department for Transport Circular 01/2013, Setting Local Speed Limits' notes that:

"Research into signed-only 20 mph speed limits shows that they generally lead to only small reductions in traffic speeds. Signed-only 20 mph speed limits are therefore most appropriate for areas where vehicle speeds are already low. This may, for example, be on roads that are very narrow, through engineering or on-road car parking. If the mean speed is already at or below 24 mph on a road, introducing a 20 mph speed limit through signing alone is likely to lead to general compliance with the new speed limit."

- 3.2.19 Whilst there is no clear industry-wide definition of the term 'general compliance', we understand that this relates in part to the inherent enforcement equipment tolerance, which is typically 10%+2mph (although this depends on precise equipment used). The research referred to in the DfT Circular found that that signed-only 20mph limits lead to only small reductions in speed: about 1 mph on average based on previous research. Therefore, for a location with a 30mph+ speed limit which had a mean speed of 24mph, the introduction of signed-only 20mph limits is likely to reduce the mean speed to between 23mph-24mph. This would be within the 20mph + 4mph (10% +2mph) tolerance = 24mph, and therefore would be generally compliant with the speed limit.
- 3.2.20 The speed reduction achieved in LB Southwark of around 2mph would therefore add additional credence to the current DfT guidance that signed-only 20mph speed limits are suitable for roads where the mean speed is already at or below 24mph. This is because, although the average reduction in mean speed for the Other (30mph) sites was 1.8mph (which would imply the acceptable prior speed could be around 25mph), the reduction range for individual sites was between -7.5mph and -0.1mph.

3.3 LB CAMDEN DATA ANALYSIS

- 3.3.1 For the purpose of the analysis, the types of roads were divided into the groups detailed previously, before LB Camden became a borough-wide 20mph limit on December 2013.
- 3.3.2 In total, speed data collected from 45 different sites within the LB Camden were analysed. More specifically, the data comprises 26 sites within 20mph *Zones*, 2 sites that had pre-existing 20mph *Limits* and 17 sites that previously had 30mph speed limits, referred to as *Other*s.
- 3.3.3 Only two 20mph limits were introduced prior to the borough-wide 20mph: Haverstock Hill (most of this road except the southern section) and Mill Lane (the western section only), therefore a statistical analyses within the *Limits* category only was not possible.
- **Table 3-8** summarises the average speed reduction and provides context by indicating the minimum and maximum speed reduction ranges across the road types.

Түре	Speed reduction Range (mph)		MEAN SPE	Average Speed reduction			
	From	То	Before	After	(мрн)		
		2013 - 2	2014				
Limits	-3.32	-1.20	23.81	23.21	-0.60		
Zones	-4.77	-0.10	20.25	20.29	+0.04		
Others	-6.16	-0.30	23.52	23.57	+0.05		
All Areas	-6.16	-0.10	22.06	22.04	-0.02		
		2013 – 2	2015				
Limits	-1.92	-0.70	23.81	23.65	-0.15		
Zones	-5.21	-0.20	20.25	20.30	+0.05		
Others	-4.32	-0.30	23.52	23.36	-0.16		
All Areas	-5.21	-0.30	22.06	22.04	-0.02		
2013 – 2016							
Limits	-3.56	-0.60	23.81	22.87	-0.94		
Zones	-8.09	-0.20	20.25	20.06	-0.19		
Others	-6.52	-0.40	23.52	23.57	-0.05		
All Areas	-8.09	-0.20	22.06	21.65	-0.41		

Table 3-8: Summary of average speed reduction and speed reduction range for all road types.

3.3.2 Table 3-9 below summarises the average speeds and percentage of traffic throughout the years for the roads classified as Limits.

Table 3-9: Summary and variance of average speeds and percentage of traffic for 20mph limits in LB Camden, 2013-2016.

Limits	2013 (before)	2014 (AFTER)	Variance (2013-2014)	2015 (After)	Variance (2013-2015)	2016 (After)	Variance (2013-2016)
Speed							
Average	23.81	23.21	-0.60	23.65	-0.15	22.87	-0.94
85%tile	27.68	25.57	-2.11	27.60	-0.08	26.84	-0.84
Percentage Count							
>20 mph	77.6%	74.1%	-3.5%	76.7%	-1.0%	73.1%	-4.5%
>25 mph	42.0%	37.5%	-4.5%	39.8%	-2.2%	33.5%	-8.5%

3.3.3 This table indicates that there was a reduction in the proportion of traffic travelling at above 20mph and above 25mph after the introduction of the borough 20mph limit. The biggest variance is seen in the proportion of traffic travelling above 25mph in 2016 compared to 2013, it being 8.5% less.

3.3.4 In order to investigate whether the change in speed between the 'before' and 'after' sample data is statistically significant (i.e. whether it was likely or unlikely to have occurred by chance), a Mann-Whitney U-Statistic test was carried out, using the data for zones and other roads. **Table 3-10** below summarises the results of the statistical significance test on data for the year 2014.

			Mean	Speed									
Түре	Befc	ore Sch (2013)	eme	Afte	er Sche (2014)	eme	Variance	Mann Whitney Significance					
	Min	Мах	Average	Min	Мах	Average		2-tailed significance value	2-tailed 1-tailed significance significance value value		Significant at 90% confidence level		
Zones													
Mean	12.34	25.44	20.25	15.97	26.36	20.29	0.05	0.914	0.457	No	No		
<mark>85%tile</mark>	14.46	29.58	24.01	17.26	30.51	23.76	-0.25	0.573	0.286	No	No		
Others													
Mean	17.56	30.81	23.52	16.52	29.23	23.57	0.05	0.883	0.442	No	No		
<mark>85%tile</mark>	20.60	35.20	27.50	18.39	33.75	26.92	-0.58	0.738	0.369	No	No		
All Area	III Areas												
Mean	12.34	30.81	22.06	14.71	30.31	22.04	0.03	<mark>)3</mark> 0.898 0.449 No No					
<mark>85%tile</mark>	14.46	35.20	25.95	18.05	34.94	26.06	-0.45	0.962 0.481 No No					

Table 3-10: Mann-Whitney U statistic test result on the Mean and 85% tile for the 2013 "before" and 2014 "after" traffic speeds in LB Camden across the 20mph zones and other roads studied.

- 3.3.5 Although the data show a decrease in average speed at the 85th percentile for 20mph zones and other roads for the year after the introduction of the borough-wide 20mph limit, this is not found to be statistically significant.
- **Table 3-11** below summarises the results of the statistical significance test on data for the year 2015.

Table 3-11: Mann-Whitney U statistic test result on the Mean and 85% tile for the 2013 "before" and2015 "after" traffic speeds in LB Camden across the 20mph zones and other roads studied.

			Mean	Speed										
Түре	Befo	re Sch (2013)	eme	Afte	er Sche (2015)	eme	Variance		Vhitney Significance	CANCE				
	Min	Max	Average	Min	Max	Average		2-tailed 1-tailed Significant Significant significance value value						
Zones														
Mean	12.34	25.44	20.25	14.33	24.36	20.30	0.05	0.983	0.492	No	No			
85%tile	14.46	29.58	24.02	16.82	28.56	24.19	0.16	0.927	0.464	No	No			
Others														
Mean	17.56	30.81	23.52	16.87	30.31	23.36	-0.11	0.922	0.461	No	No			
85%tile	20.60	35.20	27.50	20.35	34.94	27.42	-0.07	7 0.902 0.451 No No						

Түре	MEAN SPEED VARIAN						VARIANCE	NCE MANN WHITNEY SIGNIFICANCE					
All Area	All Areas												
Mean	12.34	30.81	22.06	14.71	30.31	22.04	-0.02	0.898	0.449	No	No		
<mark>85%tile</mark>	14.46	35.20	25.95	18.05	34.94	26.06	0.11	0.962	0.481	No	No		

- 3.3.7 In this case the data indicates that in the case of zones and all areas the average speed at the 85th percentile actually increased by a very small amount over the two years, but again this was not found to be a statistically significant result.
- **Table 3-12** below summarises the results of the statistical significance test on data for the year 2016.

Table 3-12: Mann-Whitney U statistic test result on the Mean and 85% tile for the 2013 "before" and2016 "after" traffic speeds in LB Camden across the 20mph zones and other roads studied.

			Mean	Speed								
Түрғ	Before Scheme (2013) After Scheme (2016)				eme	Variance		Mann Whitne	ey Significance			
	Min	Max	Average	Min	Max	Average		2-tailed significance value	1-tailed significance value	Significant at 95% confidence level	Significant at 90% confidence level	
Zones												
Mean	12.34	25.44	20.25	15.08	24.05	20.06	-0.24	0.570	0.285	No	No	
85%tile	14.46	29.58	24.09	18.58	28.81	24.05	-0.04	0.581	0.290	No	No	
Others												
mean	17.56	30.81	23.52	16.52	29.23	23.57	0.05	0.883	0.442	No	No	
85%tile	20.60	35.20	27.50	19.34	34.11	27.04	-0.46	0.677	0.338	No	No	
All Area	as											
Mean	12.34	30.81	22.06	15.08	29.73	21.65	-0.41	0.463	0.232	No	No	
85%tile	14.46	35.20	25.95	18.58	34.11	25.68	-0.27	0.532	0.266	No	No	

The change in mean and 85% tile speed is negligible between 2013 and after the boroughwide 20mph limit was introduced. However, these results are not statistically significant.

- 3.3.9 In **Table 3-12**, the 'Before' and 'After' category for each sub-set here represents the average percentage of drivers travelling within that speed range. The table summarises these findings and shows the results of the statistical significance test.
- 3.3.10 It is important to note that unlike Southwark where six different speed ranges bins could be analysed, with the LB Camden data set this study were restricted to analysing the percentage count of vehicles travelling at over 20 mph and over 25 mph, which was already computed by LB Camden for the sites.

Түре	Average Perci	entage Count	Variance	CE Circuiticance						
	Before (2013)	After (2014)		2-tailed significance value	2-tailed 1-tailed ificance value significance value c		Significant at 90% confidence level			
Zones										
>20 mph	52.8%	51.1%	-1.7%	0.71	0.35	No	No			
>25 mph	19.9%	19.5%	-0.4%	0.82	0.41	No	No			
Others										
>20 mph	71.3%	70.0%	-1.3%	0.967	0.484	No	No			
>25 mph	41.1%	41.4%	0.3%	0.958	0.479	No	No			
All Areas										
>20 mph	63.2%	61.7%	-1.5%	0.678	0.339	No	No			
>25 mph	31.6%	31.6%	0.0%	0.905	0.453	No	No			
Re	d cells indi	cate growth	in a tot	al number of ve	hicles travelling	at the specific	speed range.			

Table 3-13: Mann-Whitney U statistic test results for the average percentage count of vehicles travelling at specific speed ranges across LB Camden for 2013 and 2014.

Red cells indicate growth in a total number of vehicles travelling at the specific speed range. Green cells indicate reduction.

- 3.3.11 **Table 3-13** indicates that for the 20mph zones there was a very small decrease of -0.4% in the proportion of vehicles travelling at over 25mph after the implementation of the borough-wide 20mph limit but without recourse to an equivalent wider data set like that available for Southwark, it is not possible to explain the cause of this decrease (however it may be due to an increase in the proportion of vehicles travelling at lower speed) and the analysis shows the result is not statistically significant. When the data is analysed across all road types, there is no change before and after in the proportion travelling at over 25mph. The result is not statically significant.
- 3.3.12 **Table 3-14** below compares 2013 with 2015. It indicates that for the 20mph zones there was a very small increase of 0.3% in the proportion of vehicles travelling at over 25mph after the implementation of the borough-wide 20mph limit but for the same reason as it is not possible to explain the cause of this increase and the analysis shows the result is not significant. When the data is analysed across all road types, there is a very small decrease of 1% in the proportion travelling at over 25mph. The result is also not statistically significant.

Түрғ	Average Perci	entage Count	VARIANCE		Mann Whitn	ey Significance	
	Before (2013)	After (2015)		2-tailed significance value	1-tailed significance value	Significant at 95% confidence level	Significant at 90% confidence level
Zones							
>20 mph	52.2%	54.1%	1.8%	0.779	0.389	No	No
>25 mph	19.7%	20.0%	0.3%	0.836	0.418	No	No
Others							
>20 mph	71.3%	71.1%	-0.2%	0.986	0.493	No	No
>25 mph	41.1%	39.4%	-1.6%	0.774	0.387	No	No
All Areas							
>20 mph	63.2%	63.3%	0.1%	0.947	0.473	No	No
>25 mph	31.6%	30.6%	-1.0%	0.841	0.421	No	No
Re	d cells indic	cate growth	in a tot	al number of ve	ehicles travellin	g at the speci	fic speed range.

 Table 3-8: Mann-Whitney U statistic test results for the average percentage count of vehicles travelling at specific speed ranges across LB Camden for 2013 and 2015.

Green cells indicate reduction

3.3.13 **Table 3-15** below compares 2013 with 2016. It indicates that for the 20mph zone there was a decrease of -2.3% and -2.6% in the proportion of vehicles travelling at over 20mph and 25mph respectively after the implementation of the borough-wide 20mph limit. Again it is not possible to confidently explain the cause. The result was not found to be statistically significant.

Table 3-9: Mann-Whitney U statistic test results for the average percentage count of vehicles travelling at specific speed ranges across LB Camden for 2013 and 2016.

Түре	Average Perci	entage Count	Variance		Mann Whitn	ey Significance	
	Before (2013)	After (2016)		2-tailed significance value	1-tailed significance value	Significant at 95% confidence level	Significant at 90% confidence level
Zones							
>20 mph	53.4%	51.1%	-2.3%	0.602	0.301	No	No
>25 mph	20.2%	17.7%	-2.6%	0.460	0.230	No	No
Others							
>20 mph	71.3%	69.5%	-1.7%	0.911	0.456	No	No
>25 mph	41.1%	36.7%	-4.3%	0.522	0.261	No	No
All Areas							
>20 mph	63.2%	61.2%	-2.0%	0.590	0.295	No	No
>25 mph	31.6%	28.1%	-3.5%	0.368	0.184	No	No

Red cells indicate growth in a total number of vehicles travelling at the specific speed range. Green cells indicate reduction. Of the three year comparisons, the 2013 to 2016 analysis has showed the greater variance in before and after average percentage count. When the data is analysed across all road types, there is also a decrease of 2.0% and 3.5% in the proportion travelling at over 20mph and 25mph respectively. However, the analysis shows the result is still not statistically significant.

- 3.3.14 For simplicity, the above data analysis has been undertaken for the aggregate data (i.e. over 24hrs and for the whole week). However, in order to understand whether there is a variation in speed reduction across different periods of the day and week, we have undertaken further analysis using data disaggregated for:
 - \rightarrow Weekdays (Mon Fri);
 - \rightarrow Saturday;
 - \rightarrow Sunday.

And further into two time periods:

- \rightarrow Day (Peak): 7am to 6:59pm;
- → Night (Off-peak): 7pm 6:59am.
- 3.3.15 **Tables 3-16 to 3-18** below summarise the results of the statistical significance when comparing disaggregated mean speeds for 2013 with subsequent years up to 2016. The analysis has not been undertaken for the ATC sites that previously had 20mph speed limits as there are only 2 sites.

Table 3-16: Mann-Whitney statistic test result on the Disaggregated Mean Speed for the 2013 "before" and 2014 "after" traffic speeds in LB Camden across the 20mph zones and other roads studied.

	Mean	Speed										
Turan					IVIANN	VUNITINET SIGNIFICANCE						
I YPE	Before	After	VARIANCE	2-tailed	1-tailed	Significant	Significant					
	(2013)	(2014)		value	value	at 95% confidence level	at 90% confidence level					
	•			Zon	es							
				Pea	ak							
Weekdays	19.1	19.2	0.16	0.792	0.396	No	No					
Saturday	20.0	20.0	0.02	0.895	0.448	No	No					
Sunday	20.0	19.8	-0.22	0.573	0.286	No	No					
				Off-P	eak							
Weekdays	21.0	21.1	0.10	0.895	0.448	No	No					
Saturday	21.3	21.1	-0.17	0.682	0.341	No	No					
Sunday	21.7	21.4	-0.24	0.682	0.341	No	No					
				Oth	ers							
Peak												
Weekdays	21.1	21.0	-0.09	0.766	0.383	No	No					
Saturday	22.0	21.7	-0.32	0.646	0.323	No	No					
Sunday	22.1	21.0	-1.07	0.268	0.134	No	No					
				Off-P	eak							
Weekdays	23.4	23.4	0.08	0.841	0.421	No	No					
Saturday	23.2	23.2	0.01	0.910	0.455	No	No					
Sunday	24.0	23.5	-0.53	0.615	0.308	No	No					
				All Ai	reas							
		:		Pea	ak		1					
Weekdays	20.1	20.1	0.04	0.979	0.489	No	No					
Saturday	21.0	20.9	-0.15	0.786	0.393	No	No					
Sunday	21.1	20.5	-0.63	0.221	0.111	No	No					
				Off-P	eak							
Weekdays	22.2	22.2	0.06	0.905	0.452	No	No					
Saturday	22.3	22.2	-0.13	0.749	0.375	No	No					
Sunday	22.9	22.5	-0.42	0.442	0.221	No	No					

Table 3-1	0: Mann-\	Whitney	statistic test	result	on the Di	saggreg	ated Mean	Speed for	the 2013	
"before"	and 2015	"after"	traffic speeds	in LB	Camden	across t	he 20mph :	zones and	l other roads	
studied.										

	Mean	Speed			MANN	WHITNEY SIGNIFICANCE						
TVDF	Poforo	Aftor	VADIANCE									
1112	(2013)	(2015)	VANANCE	2-tailed significance	I-tailed significance	at 95%	at 90%					
				value	value	confidence level	confidence level					
				Zon	es							
				Pea	ak							
Weekdays	19.1	19.2	0.13	0.692	0.346	No	No					
Saturday	20.0	20.0	0.01	0.803	0.402	No	No					
Sunday	20.0	19.9	-0.11	0.994	0.497	No	No					
				Off-P	eak							
Weekdays	21.0	21.0	0.03	0.878	0.439	No	No					
Saturday	21.3	21.1	-0.17	0.731	0.365	No	No					
Sunday	21.7	21.6	-0.04	0.936	0.468	No	No					
				Othe	ers							
Peak												
Weekdays	21.1	21.2	0.10	0.858	0.429	No	No					
Saturday	22.0	21.7	-0.35	0.709	0.355	No	No					
Sunday	22.1	21.9	-0.17	0.901	0.451	No	No					
				Off-P	eak							
Weekdays	23.4	23.4	0.08	0.970	0.485	No	No					
Saturday	23.2	23.2	-0.02	0.961	0.481	No	No					
Sunday	24.0	23.7	-0.28	0.654	0.327	No	No					
				All Ar	reas							
				Реа	ak							
Weekdays	20.1	20.2	0.13	0.660	0.330	No	No					
Saturday	21.0	20.9	-0.14	0.911	0.456	No	No					
Sunday	21.1	20.9	-0.13	0.958	0.479	No	No					
				Off-P	eak							
Weekdays	22.2	22.2	0.03	0.936	0.468	No	No					
Saturday	22.3	22.2	-0.13	0.711	0.356	No	No					
Sunday	22.9	22.7	-0.18	0.680	0.340	No	No					

Table 3-1	11: Mann-\	Whitney	statistic test	result	on the Di	saggreg	ated Mean	Speed for	the 2013
"before"	and 2016	"after"	traffic speeds	in LB	Camden	across t	he 20mph	zones and	other roads
studied.									

	Mean	Speed		Mann Whitney Significance											
Түре	Before (2013)	After (2016)	VARIANCE	2-tailed significance value	1-tailed significance value	Significant at 95% confidence level	Significant at 90% confidence level								
Zones															
Peak															
Weekdays	19.1	18.3	-0.74	0.210	0.105	No	No								
Saturday	20.0	19.4	-0.58	0.578	0.289	No	No								
Sunday	20.0	19.4	-0.66	0.371	0.186	No	No								
Off-Peak															
Weekdays	21.0	20.2	-0.73	0.319	0.159	No	No								
Saturday	21.3	20.2	-1.10	0.085	0.043	No	Yes								
Sunday	21.7	20.7	-1.02	0.131	0.066	No	No								
	Others														
Peak															
Weekdays	21.1	20.5	-0.60	0.472	0.236	No	No								
Saturday	22.0	21.5	-0.54	0.549	0.274	No	No								
Sunday	22.1	21.2	-0.89	0.312	0.156	No	No								
				Off-P	eak										
Weekdays	23.4	22.5	-0.84	0.302	0.151	No	No								
Saturday	23.2	22.6	-0.63	0.452	0.226	No	No								
Sunday	24.0	23.0	-1.07	0.200	0.100	No	No								
				All Ai	reas										
				Pea	ak										
Weekdays	20.1	19.4	-0.70	0.167	0.083	No	No								
Saturday	21.0	20.4	-0.59	0.363	0.181	No	No								
Sunday	21.1	20.3	-0.75	0.187	0.094	No	No								
				Off-P	eak										
Weekdays	22.2	21.4	-0.80	0.160	0.080	No	No								
Saturday	22.3	21.4	-0.91	0.086	0.043	No	Yes								
Sunday	22.9	21.8	-1.06	0.051	0.026	No	Yes								

The tables above show that for disaggregated time periods, there is a generally a greater reduction in average speed during off-peak time periods and on Saturday and Sunday. This suggests that congestion (during the peak period on weekdays) may be limiting the extent to which the 20mph borough-wide speed limit has had a speed reducing impact.

4 LITERATURE REVIEW

4.1 TRAFFIC SPEED TRENDS IN LONDON

- 4.1.1 To provide context for the change in speed that was experienced in Camden and Southwark as a result of the borough-wide 20mph limits, we have identified temporal changes in speed for inner/outer London and London-wide below.
- 4.1.2 As shown in Extract 4-1 below, the average speed on A-roads in the morning peak period for London as a whole reduced year-on year from 2011 to 2015 (Source: TfL, Total Vehicle Delay for London 2014-2015):



Extract 4-1: Average Vehicle Speeds, by Region

4.1.3 It is also noted that "The DfT have suggested that recent falls in average speeds across London may be partly attributed to a reduction in speed limits in some London boroughs due to the introduction of the 20mph speed limits, as well as an increase in traffic levels".

Additionally, "Congestion in London has risen noticeably between the years of 2012 and 2015 with journey times in Central London increasing by 12% annually" (Source: London First).

4.1.4 The DfT, using the National Road Traffic Survey, also releases data regarding journey times, for various classifications of streets. The Extract 4-2 below summarises London journey times between 2012 and 2015 for FRC3 roads. The Functional Road Class (FRC) system is a hierarchal definition used by traffic specialists to describe a road's strategic national importance on a consistent basis across the world, where for this study, the FRC3 roads represent all smaller streets.





4.1.5 The above shows that, compared to outer London, central London has experienced a larger increase in journey times and a worsening of conditions for all hours of the day. In Central London, between 2012 and 2015 evening peak travel times have increased almost 30% (from 24 to 30 minutes), morning peak travel times have increased almost 40% (from 21 to 29 minutes) and midday period travel times have increased almost 40% (from 21 to 29 minutes).

4.2 CASE STUDY LITERATURE OVERVIEW

- 4.2.1 There are a number of studies that conclude that the introduction of 20mph limits and zones reduces casualty rates. Grundy (2009) showed that in London, the introduction of 20mph zones has led to a 42% reduction in road casualties after correcting for the underlying trend, with the greatest reduction of serious injuries and deaths seen for younger children. A study by Atkins (2010) investigated roads in Portsmouth and found that the introduction of 20mph sign-only limits (with no traffic calming) led to a 22% reduction in casualties, compared to a national reduction of 14% in comparable areas. A study in Sweden (Rosen and Sander, 2009) found that the risk of fatal injury at 50 kph (31.1 mph) is twice as high as at 40kph (24.8 mph) and five times as high as 30 kph (18.6 mph).
- 4.2.2 Brake (2015) suggests that as a worst-case scenario, it is reasonable to expect that every 1mph reduction in average speed translates to a 6% reduction in crashes and collisions in these areas.
- 4.2.3 However, although councils tend to agree that the implementation of 20mph limits is likely to lead to a reduction in average speed, they differ in their perception of whether the reduction is big enough, given the modest 1-2 mph average reduction reported in many studies, to have a significant effect on road safety. Differing perceptions have led councils to prioritise spending differently; for example, one council decided to invest in cycle lanes rather than introduce a 20 mph limit. In this instance the council felt that average speeds across many roads in the borough were below 20mph and the expense of introducing a borough-wide limit was not justified.

Some studies have identified changes in traveller behaviour following the introduction of 20mph initiatives. A study of a traffic calming scheme in a deprived community on the outskirts of Glasgow found that 20% of residents said they walked more as a result of the scheme (Morrison, 2004). In Bristol, the results of the inner south pilot found that walking and cycling had increased by 12% within the 20mph limits (Bristol City Council, 2011).

4.3 SPECIFIC CASE STUDY REVIEW

4.3.1 A summary of the most pertinent 20mph case studies is provided in Table 4.1 below.

case study Location	IMPLEMENTED	ΙΜΡΑCΤ
London Borough of Islington	Borough-wide 20mph limit	On non-Principal Roads there was an average reduction of 1mph . On the Principal Road network before and after implementation of the 20 mph limit showed the average speed went down 1mph from 23mph to 22mph . The 85th percentile speed fell from 28 to 27mph. (Source: Steer Davies Gleave, 2014)
London Borough of Kingston Upon Thames	20mph limits in various locations across neighbourhoods within the Borough	20mph speed limit areas resulted in 7.8% reduction in average speeds. Significant reduction in pedestrian and child accidents. (Source: Steer Davies Gleave, 2014)
City of London	Borough-wide 20mph limit.	The speed data was collected at 46 comparable sites. The surveys showed that the average speed was 1.5 mph lower than before the scheme was introduced. There was also a reduction in the number of sites with a mean speed above 20 mph. This reduced from 16 mph to 7 mph at the monitored sites. (Source: City of London, 2015)
Portsmouth City Council	20mph limit covering the majority of residential roads	 The average speed across all sites reduced by 0.9 mph. At sites where the average 'before' speed was greater than 24 mph the average speed reduced by 7 mph. 14 sites were found to still have average speeds between 24 mph and 29 mph after the schemes were implemented. (Source: Atkins, 2010)

Table 4-1: 20mph Case Studies

5 SUMMARY AND CONCLUSIONS

5.1 INTRODUCTION

5.1.1 WSP | Parsons Brinckerhoff has been commissioned by Cross River Partnership (CRP) to undertake an analysis of the impacts of the introduction of 20mph speed limits in central London and, specifically, the effect of 20mph limits on drivers' propensity to drive at speeds over 30mph.

5.2 LB SOUTHWARK

- 5.2.1 Across all 86 sites the mean and 85th percentile speeds reduced from 21.6mph-19.8mph and from 27.8mph-25.6mph respectively. This is a reduction of 1.8mph and 2.2mph respectively. The mean and 85th percentile traffic speeds across zones, limits and other sites are all around 2 mph lower than before the borough-wide 20mph limit was introduced.
- 5.2.2 The reduction in speed was found to be statistically significant for roads within the 20mph *Limits* and *Others* category (i.e. roads that were not in a zone category before LB Southwark became a borough-wide 20 mph limit on the 16th March 2015).
- 5.2.3 However it was not found to be statistically significant for roads with 20mph *Zones* category, which is counter-intuitive and it is likely to be due to a limited amount of only 10 data sample sites available for the 20mph *Zones* and it may be that if the average speed reduction had been observed across more sites then it may also have been significant since the reduction in average speed were similar to the other categories. This explanation is re-enforced particularly because, when the data is reviewed on an aggregated level across *All Areas (Limits, Zones* and *Others*) it demonstrates a statistically significant reduction in average speeds of approximately 1.8 mph.
- 5.2.4 The data shows that there was a significant reduction in the proportion of drivers travelling at over 30mph before and after the introduction of the scheme, at the 90% confidence level. The proportion of drivers travelling over 30 mph reduced by 6%. The LB Southwark study therefore provides supporting evidence that the implementation of 20mph schemes is an effective way of reducing the proportion of vehicles travelling in excess of 30mph.
- 5.2.1 However, the 'After' speed for eight of the sites is greater than 24mph which indicates that they are not suitable for signed-only 20mph limits (without the introduction some other form of speed reducing feature). Six of these locations previously had 30mph speed limits and two were already subject to 20mph speed limits.
- 5.2.2 The speed reduction achieved in LB Southwark of around 2mph would therefore add additional credence to the current DfT guidance that signed-only 20mph speed limits are suitable for roads where the mean speed is already at or below 24mph. This is because, although the average reduction in mean speed for the Other (30mph) sites was 1.8mph, which would imply the acceptable prior speed could be around 25mph.

5.3 LB CAMDEN

5.3.1 For the LB Camden study, the data indicates that the implementation of the borough-wide 20mph limit in December 2013 appears to have resulted in a negligible change in vehicle speed; however the change is not statistically significant.

5.4 OVERALL SUCCESS AND SUITABILITY OF 20MPH LIMITS

SPEED REDUCTION

- 5.4.1 The reduction in average speed from the introduction of the borough-wide 20mph speed limit in Southwark is line with the 1-2mph reduction that has been reported for the other schemes that are referred to in the literature review. However, the fact that there was a similar reduction in speed across the pre-existing 20mph limits, 20mph zones and previous 30mph limits is unexpected.
- 5.4.2 This may signify that the wider coverage of 20mph limits within Southwark, neighbouring boroughs and elsewhere in London has led to a cultural change in driving behaviour. Alternatively, it may be that localised factors were at least partly responsible in reducing vehicle speed in the areas that were previously 20mph limits/zones. Such factors include increased traffic congestion in these areas or additional or modified speed reduction measures (e.g. replacing speed cushion with humps). There is considerable variability between the results for individual ATC sites, which is partly why the data for 20mph zones is not statistically significant. The variability indicates that localised factors are likely to be influencing speeds in addition to the introduction of the borough-wide 20mph limits.
- 5.4.3 Whilst not statistically significant, it is interesting to note that the average speed for the Camden ATC locations was not appreciably different between 2013 and 2016, especially when compared to the difference in speed that was experienced in Southwark. There may be many reasons for this, not least the fact that the results are not statistically reliable. Camden is arguably more densely populated and carries more through traffic than Southwark, with the result that it suffers from high levels of congestion over longer periods of the day/week although the average speeds for the Camden and Southwark ATCs are similar.
- 5.4.4 In general, congestion has worsened in central London over the last few years. It has been widely reported that this is largely due to the impacts of construction work associated with development and transport schemes including cycle route improvements. So compared to Southwark, higher levels of congestion in Camden may be limiting the extent to which the introduction of the 20mph limits has reduced traffic speed.

COLLISIONS

- 5.4.5 Research undertaken for the DETR in 2000 (Taylor, Lynam and Baruya) showed that reducing the speed of the fastest drivers would yield the greatest benefits in reducing death and injury. The reduction in 6% of drivers travelling over 30mph in Southwark from the introduction of the borough-wide 20mph limits is positive in this regard.
- 5.4.6 The same study reported that the percentage reduction in accident frequency achievable per 1mile/h reduction in average speed is between 2-7%. More specifically, this is about 6% for urban roads with low average speeds. Based on this, the collision frequency in Southwark should reduce by approximately 12%.
- 5.4.7 As well as reducing the likely incident of collisions, a reduction in vehicle speed is likely to also reduce the severity of collisions. The Royal Society for the Prevention of Accidents (RoSPA) reported that if a pedestrian is hit by a vehicle travelling at 20 mph there is a 2.5% chance that they will be fatally injured, compared to a 20% chance at 30 mph.

WALKING, CYCLING & LIVEABILITY OF NEIGHBOURHOODS

- 5.4.8 An actual or perceived reduction in vehicle speed is likely to have a positive impact on the number of people walking and cycling. An increase in journey time from reduced vehicle speed and compliance with 20mph limits across wide-areas may act as deterrents to driving and ultimately lead to mode shift away from the car.
- 5.4.9 In addition, lower vehicle speeds are likely to create streets where crossing movement is easier, vehicle noise is less prominent and the general dominance of traffic is reduced all factors which create environments which are more conducive to walking and cycling and lead to an overall improvement in the liveability of neighbourhoods. Therefore, the introduction of borough-wide 20mph limits may lead to a positive cultural shift in travel behaviour.
- 5.4.10 In the 'Study into 20mph Zones in Southwark' undertaken by MVA Consultancy in 2009, in response to a survey of residents, 56% of respondents said that they feel that road safety is better, 49% of respondents felt that problems with traffic speeds is better, whilst 45% and 30% of respondents felt that the ease of crossing the road and the general visual appearance of the area are better.
- 5.4.11 In comparison, in a survey conducted by Ealing Council for six of its 20mph zones, about 45% of residents felt that the zones have been effective in reducing speeds, 33% considered that traffic volumes have reduced and 34% felt that walking is now safer.
- 5.4.12 In a research study undertaken in 2002 for the 20mph zones within Hull, residents were asked to comment on the success of the zone within which they live. 25% of residents said that they walk or cycle more, 80% think that the zones are a good idea, 78% think that traffic speeds have reduced and 50% think it is a more pleasant place to live.
- 5.4.13 The research above relates to 20mph Zones rather than 20mph limits, but none-the-less indicates that the perception of benefits from speed reduction can be significant.

SUITABILITY OF 20MPH LIMITS

- 5.4.14 The results of the ATC surveys have been reported at an aggregate level. However, it is important to note that traffic speed did not reduce at all sites, and the average speed after the implementation of the borough-wide limits for some locations remains relatively high.
- 5.4.15 The 2012 DfT guidance 'Setting Local Speed Limits' advises that if the mean speed is already at or below 24mph on a road, introducing a 20mph speed limit through signing alone is likely to lead to general compliance with the new speed limit. Overall, traffic speeds in central London are lower than outer London and most other parts of the UK and as such the streets in the CRP constituent boroughs are more suitable for the introduction of 20mph limits.
- 5.4.16 Where existing traffic speeds are higher for some streets, this does not mean that a borough should not introduce a signed-only 20mph speed limit. Rather, consideration should be given to whether 20mph limits using signs alone are appropriate for these streets or whether additional localised interventions are required, such as physical or psychological traffic calming measures, area-wide treatment, access restrictions or speed enforcement. The introduction of 20mph limits may provide opportunities for introducing complementary walking, cycling and or public realm improvements within borough streets as part of a more holistic approach that is in line with the TfL Healthy Streets objectives. These complementary measures may also assist with the attenuation of traffic speed.

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Appendix A

SUMMARY TABLE FOR ALL ROADS ANALYSED IN THE STUDY



Туре	Site No. Location.	Direction.	Date Speed Limit	All Motor Vehicles	Speed Bin	Speed Bin	Speed Bin Speed Bin	Speed Bin	Speed Bin	Speed Bin	Speed Bin	Speed Bin Sp	Speed Bin	Mean Speed	85%	Date Speed Limit (mph)	All Motor Vehicles	Speed Bin	Speed Bin	Speed Bin Spe	ed Bin Speed Bin	n Speed Bin	Speed Bin	Speed Bin	Speed Bin S	eed Bin Mean Speed	85%
Zones	96 Ashbourne Grove, Att - LC4, OSGR: TQ 33756 75015	Two way	Nov-13 30	4897	595	1519	1963 666	108	15	5	2	0	0	15.7	20.1 No	Nov-15 20	5322	509	1803	2179	00 83	13	35-40	1	0	0 15.75	20.05
Other	62 Barnham Street <30mph> - 0SGR TQ 33344 79998	Two way	Nov-13 30	8820	2448	6000	292 4	2	0	0	0	0	0	11.1	13 No	Nov-15 20	13970	549	1690	3670 5	165 2135	575	113	27	6	0 18.15	23.4
Other	1 Barry Road, Att - LC25, OSGR: TO 34153 74391 A Pergene Perg Att - LC25, OSGR: TO 34153 74391	Two way	Nov-13 30	54519	178	731	2535 11431	22026	12621	3528	999	294	164	28	32.9 No	Nov-15 20	60562	404	1617	7817 21	035 19998	7015	1875	499	181	98 25.05	30.2
Other	3 Borough Road, Att // S. 3056: TO 31888 79475	Two way	Nov-13 30	76244	1260	3673	8218 19949	26623	12197	3254	689	159	68	25.4	31.3 No	Nov-15 20	67071	3644	13923	23742 18	385 5582	1146	206	68	12	16 18.25	23.6
Limits	100 Brenchley Gardens, Att - LC32, OSGR: TQ 35859 74778	Two way	Nov-13 30	50806	164	271	1273 7781	21208	14845	3934	920	271	136	29	33.6 No	Nov-15 20	57813	377	644	3565 17	308 23640	9299	2200	525	157	75 26.45	31.1
Limits	5 Brunel Road, Att - Uc 252, OSGR: TQ 35402 79851 6 Brunel Road, Att - Uc 252, OSGR: TQ 35402 79851	Two way North	Nov-13 30	47654	279	2527	9547 19797	11866	2836	568	135	45	32	23	27.7 No	Nov-15 20	54536	450	3369	13376 21	961 11575	2861	667	161	56	28 22.45	27.3
Limits	7 Cambervell Road, Att - Post, OSGR: TO 32451 77184	Two-way	Nov-13 30	146019	1704	9798	20268 36938	47004	21865	6021	1557	524	275	25.05	31.2 No	Nov-15 20	138032	1112	7757	23939 46	660 39808	13785	3463	980	318	166 24	29.55
Other	107 Carlton Grove, Att - Telepole, OSGR: TQ 34761 77005	Two way	Nov-13 30	14619	360	1543	4204 5583	2326	498	67	10	1	2	20.8	25.9 No	Nov-15 20	138032	1112	7757	23939 46	660 39808	13785	3463	980	318	166 24	29.55
Other	8 Champion Park, Att - LC, OSGR: TO 32910 76091	Two way	Nov-13 30	83495	333	1470	7110 24839	35259	11682	2103	446	114	87	25.9	30.4 No	Nov-15 20	82326	799	4255	15930 33	374 21632	4896	994	249	93	35 23.05	27.85
Other	97 Cirester heid strote, Att - Hee, USAR: 10 23653 74914 79 Chilton Growe, attached to Lamo Column No.6 - OSCB+ 10 35903 78815	Two way	Nov-13 30	5801	223	770	1932 1844	744	217	31	11	3	0	20	25.5 No	NOV-15 20	4521	403	1300	3133 2	90 01	65	1	0	0	0 17.3	22
Other	89 Cicely Road, Att - Ic 5, OSGR: TQ 34367 76499	Two way	Nov-13 30	986	58	211	302 243	135	24	5	2	0	0	18.9	25.3 No	Nov-15 20	1446	121	390	439 3	38 104	22	6	ō	ō	0 16.4	22.25
Other	86 Cobourg Road, Att - Vic 7, OSGR: TQ 33649 78095	Two way	Nov-13 30	3404	144	645	1188 912	357	92	33	9	3	0	19.1	24.8 No	Nov-15 20	4164	192	939	1509 9	83 400	86	24	8	4	2 17.8	23.3
Limits	108 Commercial Way, Att - LC32, OSCR: TO 34394 77288	Two way	Nov-13 30	31133	177	1118	4678 12536	9048	2727	634	145	40	16	24.1	28.9 No	Nov-15 20	30242	306	2286	9191 11	902 4929	1236	269	71	22	15 21.45	26.15
Other	9 Crostel Road, Att - Raillinas, OSGR: 10 32755 72762	Two way	Nov-13 30	97780	707	2822	6571 17556	37005	23472	6874	1895	527	255	27.7	33.1 No	Nov-15 20	89606	1124	2813	9522 30	02 005 005 005	10740	2826	757	246	128 25.3	30.45
Other	11 Crystal Palace Parade, Att - LC, OSGR: TQ 33922 71381	Two way	Nov-13 30	205889	1644	6802	18460 66190	86873	22457	2939	363	61	16	25.05	29.3 No	Nov-15 20	197507	4608	12607	27058 69	271 63109	16851	2978	569	121	28 23.55	28.65
Other	12 Denmark Hill, Att - No Left Turn Sign, OSGR: TO 32614 76143	Two way	Nov-13 30	152016	14383	32470	38795 32600	21492	8178	2155	491	133	109	19.1	26.8 No	Nov-15 20	160895	15560	38973	47212 34	725 17016	4662	1150	254	74	88 18	24.75
Other	13 Deminal Ymin, Arther Cost, Frid S2121 19222 14 Doa Kennel Hill, Att. Tree, OSGR: TO 337379 75449	Two way	Nov-13 30	135077	4170	16158	34488 41749	25813	8978	2612	722	149	58	21.6	27.85 No	Nov-15 20	127479	70262	12245	26097 35	228 30941	14113	3646	866	211	35 20.35	26.5
Other	16 Dulwich Wood Park, Att - LC, OSGR: TQ 33476 71494	Two way	Nov-13 30	125261	958	1249	2858 12119	46645	43115	14245	2853	681	409	29.9	34.9 No	Nov-15 20	170957	3859	11806	24817 64	601 50932	12102	2117	393	92	35 23.15	28.3
Limits	17 East Dulwich Grove, Att - LC3, 0528: TO 33466 75032	Two way	Nov-13 30	98656	467	3351	10618 32457	37045	11458	2418	527	189	94	25.1	30 No	Nov-15 20	104161	2127	15397	41446 34	982 8157	1436	368	104	26	33 19.35	23.6
Other	18 East Dulwich Koad, Att - VC, OSAK: 10 34200 / 541 / 60 Elliotte Daue - 30mehs - 07620 TO 31801 / 3944	Two way	NOV-13 30 Nov-13 30	123465	1818	/514	24540 50138	29763	/442	1562	380	93	59	15.3	27.7 NO 19.5 No	NOV-15 20	1244/2	6304	13504	30456 45	55/ 1/211 93 181	3749	5	229	59	4/ 20.25	25.5
Other	19 Evilina Road, Att - LC, OSGR: TO 35208 76027	Two way	Nov-13 30	81076	663	3213	11061 33071	24915	6329	1348	315	86	39	24	28.6 No	Nov-15 20	74276	564	2727	11283 30	864 21751	5381	1170	338	117	49 23.8	28.3
Other	104 Flodden Road, Att - LC07, OSGR: TQ 32019 76869	Two way	Nov-13 30	28097	327	1991	7508 11615	5220	1146	222	38	6	6	21.8	26.4 No	Nov-15 20	39924	1392	7520	16309 11	161 2809	508	99	18	6	6 18.55	23.15
Other	20 Forest Hill Road, Att - Roadname sign, OSGR: TQ 34825 74444 75 Conferent Structure 1 algorization No. 2, OCC, TQ 32400 70045	Two way	Nov-13 30	88519	2274	5848	13191 29989	25971	8489	1964	489	136	66	23.6	29.3 No 21.3 No	Nov-15 20	81331	2709	12655	22542 24	800 12804	3938	1142	342	107	83 20.6	26.6
Other	101 Gallery Road, Att - Railings, OSGR: TO 32968 73384	Two way	Nov-13 30	19198	96	323	2230 9144	6069	1065	157	15	12	79	24.2	27.7 No	Nov-15 20	61336	769	2667	11013 27	783 15395	2947	470	105	35	28 22.8	27.2
Other	95 Glenngarry Road, Att - Telepole1259, OSGR: TQ 33438 74796	Two way	Nov-13 30	1162	96	365	475 175	30	5	0	0	0	0	16	20.6 No	lov-15 20	1654	215	564	652 1	86 15	3	0	0	0	1 15.05	19.25
Zones	22 Grange Road <30mph - OSGR 10 33772 78950 34 Centra Male - Stamph - OSGR 10 33772 78950	Two way	Nov-13 30	84320	640	5997	31171 35116	9646	1418	222	33	9	18	20.6	24.6 No	Nov-15 20	98682	1904	10952	35243 36	597 11129 102 4040	2161	377	78	19	22 20.15	24.6
Limits	24 Globe Vale Solimity - Volar (2006) 7557 25 Half Moon Lane <30moh - Rallinas - OSCR TO 32380 74397	Two way	Nov-13 30	74856	755	5895	18322 22329	19533	5991	1393	395	122	86	22.9	28.6 No	Nov-15 20	84274	1585	9499	26005 28	213 14505	3216	822	220	74	50 21	26.4
Other	70 Hampton Street, attached to Lamp Column No.4 - OSGR: TQ 31927 78781	West	Nov-13 30	7350	1033	3747	2060 370	81	20	4	1	0	0	13.9	17.7 No	lov-15 20	6349	1060	3258	1607 3	10 59	16	2	0	0	0 13.6	17.2
Limits	26 Hanover Park <30mph - OSGR T0 34315 76589 67 Hanover Park <30mph - OSGR T0 34315 76589	Two way	Nov-13 30	37924	440	4975	11470 14233	5617	893	198	52	20	15	20.6	25.5 No	lov-15 20	39938	429	4586	15769 14	208 4085	649	128	38	11	4 19.8	24.05
Other	94 Hilboro Road Att - LO2 OKGR: TO 33282 7487	Two way	Nov-13 30	3706	211	1130	1911 415	29	1	0	0	0	0	16	19.5 No	lov-15 20	4606	267	1375	2109 7	12 107	12	3	0	0	0 16.4	20.25
Other	80 Ilderton Road, Att - Vc 19, OSGR: TO 35176 78164	Two way	Nov-13 30	82834	4186	5784	7838 16713	27006	14653	4231	1156	338	167	25	32 No	lov-15 20	94154	4903	8091	12404 26	521 27575	10126	2737	771	234	112 23.45	29.65
Other	27 Lambeth road <30mph> - OSGR TO 31563 79366	Two way	Nov-13 30	105849	960	4467	12310 28125	36037	17508	4930	1067	217	120	25.7	31.5 No	lov-15 20	82411	2987	14690	21673 24	245 14807	3106	471	115	22	19 19.7	24.95
Limits	26 Lambern Road, attached to Lamp Countil - Colors: 10 31565 75322 31 Lordshin Lane South of Cheven Lin Road. South of Helper Road. North of Hansler Road, attached to Lamo Column - OSCR- TO 33592 74423	Two way	Nov-13 30	92220	412	2201	2602 905 8428 24379	34662	15998	4164	1101	326	159	26.4	21.5 NO 31.5 No	lov-15 20	89932	587	4570	13317 31	156 27265	9633	2445	593	203	4 14.25	29.5
Limits	32 Lordship Lane South of Overhill Road, South of Heber Road, North of Hansler Road, attached to Lamp Column No. 19 - OSGR: TO 33658 74864	Two way	Nov-13 30	73151	1384	7819	21046 23309	12574	4498	1333	406	164	99	21.5	27.5 No	lov-15 20	92659	2295	12868	30745 29	597 12334	3374	871	269	87	79 20.35	25.7
Limits	30 Lordship Lane South of Overhill Road, South of Heber Road, North of Hansler Road, attached to railings - OSGR: TO 34109 73602 23 Lower Devel OCCI TO 21300 70452	Two way	Nov-13 30	149640	2649	10296	22700 49766	48119	12762	2380	524	118	70	23.6	28.9 No	lov-15 20	155744	6522	17592	33176 50	927 34839	8989	2004	513	186	126 21.6	27.5
Zones	33 LDWeF Rold Osok (10 35160 / 9453 71 Mandela Way, attached to Jam Column No 16 - OSGR- TO 33416 78730	Two way	Nov-13 30	22424	4003	2931	4473 4855	5399	2977	1014	295	101	43	24.7	30.65 NO 31.1 No	lov-15 20	24297	9203	3862	5678 67	95 4372	20497	4004	130	40	90 23.1 18 21.1	29.45
Other	105 Marmount Road, Att - parking post, OSGR: TO 3408 75846	Two way	Nov-13 30	13635	312	1341	3581 4903	2652	682	106	20	2	1	21.4	26.8 No	lov-15 20	17664	568	2195	5584 60	03 2478	611	126	22	2	2 18.7	23.7
Limits	35 Marshalsea Road North of Minit St junction, attached to Lamp Column No.2 - OSGR: TQ 32143 79953	Two way	Nov-13 30	81045	2976	17834	25602 22323	10112	1718	110	22	9	14	18.9	24.8 No	lov-15 20	101794	4299	27312	39622 24	339 4498	660	70	26	4	5 17.25	21.15
Other	98 Mellouine Grove, Att - LL26, USAK: LL3361 / 4802 90 Microsoff Eracit Att - LL26, USAK: LL3361 / 4802	Two way	NOV-13 30 Nov.13 30	11592	205	1405	3663 4209	14/4	332	//	8	0	0	20.4	25.3 NO 21.3 No	IOV-15 20	1/551	357	3444 396	330 1	1/ 1/40	334	59	0	2	0 19.2	24.15
Other	84 Nille Terrace, Att - s/p, OSGR: T0 33791 78110	Two way	Nov-13 30	9997	351	1418	2792 3233	1711	397	43	8	ō	0	20.4	26.2 No	lov-15 20	5986	1822	666	1658 22	41 1018	264	28	2	2	0 19.5	24.5
Other	36 Nunhead Lane Next to Cardon Road, attached to railings - OSGR: TQ 34584 75681	Two way	Nov-13 30	106787	3533	9448	19318 40367	26039	6138	1230	256	57	42	22.2	27.5 No	lov-15 20	108626	3880	9351	21063 42	513 24482	5364	1053	262	59	41 21.95	27.15
Other	85 Oakley Mace, Att - 5/p, Osak: TU 33/35 /8191 68: Owner Straat - 30mohs - (Ocg TO 31757 78974	Two way	NOV-13 30 Nov-13 30	8912	139	1042	2/61 3528 2007 535	1252	1/1	4	65	35	U 595	20.4	25.1 NO 28.9 No	IOV-15 20	12442	3/9	1956	3348 41	6/ 2049 07 289	4/0	45	1	1	0 20.35	26.25
Zones	38 Peckham Park Rd -30mph > - 05GR T0 34248 77320	Two way	Nov-13 30	57756	1038	6404	18844 23236	6795	1159	183	34	7	7	20.3	24.8 No	lov-15 20	59863	2699	14263	28982 12	292 1262	151	38	14	6	4 17.1	20.8
Limits	39 Peckham Rye (north of Nunhead) Just South of Whorlton Road, attached to post - OSGR: TQ 34385 75680	Two way	Nov-13 30	34383	188	1290	5197 11124	10977	4121	1102	232	67	18	24.7	30.2 No	lov-15 20	39239	1861	5600	11049 12	359 6066	1720	392	108	26	17 21.05	26.6
Other	40 Peckham Rye <30mph >- OSGR T0 24654 75415 41 Blowth Way <30mph >- OSGR T0 24654 75415	Two way	Nov-13 30 Nov-13 30	55046	1089	3123	8434 20482 2012 6107	15921	4726	973	193	51	23	23.5	28.9 No 31.5 No	lov-15 20 lov-15 20	55847	793	3818	11760 22 3808 80	360 12784 96 7676	3353	707	183	43	22 22.6	27.65
Other	42. Redrift Road <30mph> OSR TQ 35297 79441	Two way	Nov-13 30	47728	18	293	866 6163	21133	14141	3883	881	232	116	29.3	33.8 No	lov-15 20	50809	136	856	7238 19	335 16032	4967	1221	332	102	84 24.85	29.6
Other	93 Rye Hill Park, Att - LC17, OSGR: TQ 35220 75201	Two way	Nov-13 30	1112	160	534	358 41	2	0	0	0	0	0	13.7	17.2 No	lov-15 20	1629	252	1009	310 2	6 3	0	0	0	0	0 12.7	15.55
Limits	43 Rye Lane South of Chournert Road, attached to Lamp Column - OSGR: TO 34262 76135 88 Pue Lane, Att Bile stand (OGCP-TO 34140 76661	Two way North	Nov-13 30 Nov-13 30	25591	897	6080	9584 6255 3850 167	2088	377	67	26	16	7	18.2	23.5 Nov	lov-15 20 lov-15 20	24808	1367	8797	10069 35	30 824 30 824	145	24	4	6	3 16.2	20.2
Other	45 Salter Road <30mph>- 05GRTQ 36387 80225	Two way	Nov-13 30	31410	13	272	1533 2906	9861	10680	4409	1254	346	135	30.5	36 No	lov-15 20	32304	82	601	2523 73	03 11874	6784	2193	668	176	98 27.5	33.25
Other	61 Shand Street <30mph> - OSGR TQ 33267 80009	Two way	Nov-13 30	5094	704	1942	1668 588	108	7	0	0	0	0	14.8	19.7 No	lov-15 20	3741	539	1565	1006 4	7 101	16	8	2	0	0 14.9	20.1
Zones	82 Silwood Street, Att - tree, OSGR: T0 35265 78642 64 Smoothelide Att / COSCP: T0 33004 79881	Two way West	Nov-13 30 Nov-13 30	13082	911	5845	5173 971	124	18	7	2	0	0	15.1 18.7	18.6 Nov 23.5 Nov	lov-15 20	7399	6057	842	15 9013 22	7 0 31 245	0	1	0	2	6 7.9 0 16.9	9.6
Other	of allowing Art, Dr. Gook, 10 Sabo, 7504 91 Sometron Road, Att. (PS) oSGR: 10 3463 75344	Two way	Nov-13 30	2767	208	627	893 778	221	23	4	0	0	0	17.9	23.3 No	lov-15 20	2965	345	1013	1138 42	23 34	1	0	0	0	0 15.4	19.9
Other	46 South Croxted Road North of Church Road, attached to Lamp Column - OSGR: TQ 32795 72175	Two way	Nov-13 30	99419	1195	4906	10512 29007	38073	12020	2550	575	191	127	25	30 Nov	lov-15 20	106266	1945	6550	19635 422	26 27266	6432	1437	364	150	76 22.85	27.85
Other	49 Southwark Bridge Road / Lant Street, North of Southwark Street, attached to Lamp Column No.12 - OSGR: TO 31865 79492 47 Southwark Bridge Road / Lant Street, North of Southwark Street, attached to Lamp Column No.12 - OSGR: TO 31865 79492	Two way	Nov-13 30	26927	552	4993	6857 6906	5075	1841	503	123	27	16	21.1	28 Nov	lov-15 20	27521	1185	7641	8225 64	09 3002	749	186	41	5	7 18.4	24.05
Other	48 Southwark Bridge Road, attached to sign post - OSGR: TO 23170 80315	Two way	Nov-13 30	39615	2731	4661	8181 10546	8449	2796	653	205	103	378	21.4	28.4 Nov	lov-15 20	80510	1514	9556	24109 283	34 12987	3126	624	131	35	44 20.85	26.05
Zones	50 Southwark Park Road, Att - hump s/p, ÖSGR: TQ 33797 78895	Two way	Nov-13 30	48871	121	769	6377 24548	14494	2181	298	56	7	3	23.7	27.3 Nov	lov-15 20	84660	375	2357	18386 450	47 15812	2150	383	77	25	8 22.35	25.95
Zones	83 St Helena Road, Att - VC 11, OSGR: TO 35561 78633 106 Stiefordbins Chora Att - Two SCR: TO 35561 78643	Two way	Nov-13 30	2188	133	479	904 517	127	11	4	0	0	0	17.6	22.1 Nov	ov-15 20	2402	292	900	721 3	4 109	29	9	5	2	0 15.75	21.15
Zones	51 Sumer Road / St Georges Way, attached to Lamp Column No. 4 - OSGR: TO 33714 77672	Two way	Nov-13 30	100250	823	6159	20423 34478	26126	9601	1981	409	105	52	23.4	29.1 Nov	lov-15 20	114120	1207	7265	26730 534	01 22038	2925	377	54	10	22 21.8	25.9
Other	78 Surrey Quays Road, attached to Lamp Column No.37 - OSGR: TQ 35631 79509	Two way	Nov-13 30	32293	317	1922	6148 11474	8854	2845	561	120	24	6	23.4	28.9 Nov	lov-15 20	14752	158	742	2079 57	15 4390	1265	295	78	9	9 24	28.95
Other	77 Surrey Quays Road, attached to Lamp Column No.4 - OSGR: TQ 35224 79376	Two way	Nov-13 30	58306	1671	6614	17638 24187	6905	922	138	40	16	33	20.2	24.6 Nov	ov-15 20	54348	743	4786	13693 209	08 11204	2398	431	88	24	20 21.8	26.85
Other	ruz syperimim min, n.t u., uskik: 10.34214 /214 / 52 Trafalar Avenue South of Wallet Street, attached to liphts signpost - OSGR: TQ 33705 77936	Two way	rvdV-13 30 Nov-13 30	84567	227	2513	9147 27416	45923	21107	3408	345	92 71	43	20.4 24.8	29.5 Nov	ov-15 20 ov-15 20	93847 85304	305	6727	3/62 28 25008 36	24 42950 195 13081	14503	2703	574	25	oi 26.65 11 21.3	30.55
Limits	55 Village Way, attached to parking post - OSGR: TQ 32666 74407	Two way	Nov-13 30	60277	422	2946	7494 18438	22002	7210	1400	282	42	23	24.8	29.8 Nov	ov-15 20	66602	753	4390	13931 265	56 15901	3925	857	198	34	9 22.65	27.65
Limits	57 Walworth Rd <30mph- 05GR T0 32189 78583 f / Weinst Reid - Openh. 07067 X0 3209 78583	Two way	Nov-13 30	72437	1023	7425	14701 21755	18297	6723	1575	447	110	85	22.9	29.1 Nov	ov-15 20	119721	7917	25855	31421 331	19 15098	3878	999	301	91	100 18.85	24.25
Other	50 waworm koad < 30mph> - 036R TQ 31472 79585 59 Waterloo Rd <30mph> - 05GR TQ 31472 79585	Two way Two way	NOV-13 30 Nov-13 30	74942	3062	4488	40449 59223 11651 21297	24521 23881	4059 9893	2321	519	29 135	29 59	20.9	25./ Nov 30.4 Nov	ov-15 20 ov-15 20	66490	1488	∠oUb/ 8685	39326 410 15922 209	15400 13887	2680 4185	435 915	250	19 59	20 18.5 33 21.55	24.5
Other	92 Waveney Avenue, Att - LC03, OSGR: TO 34923 75277	Two way	Nov-13 30	1864	157	383	601 524	161	25	2	0	0	0	18	23.5 Nov	ov-15 20	2048	191	659	743 36	1 69	12	2	1	0	0 16.3	21.25
Other	eu viilioworook koad, attacned to raillings - USGR: 1Q 33866 77475	Two way	NOV-13 30	88794	895	4826	16049 36302	24501	5089	841	141	28	10	23	27.7 Nov	ov-15 20	97465	47441	4/79	1/817 355	28 27268	8654	1402	215	32	20 21.1	25.15



Appendix B

OVERVIEW OF THE MANN-WHITNEY U-STATISTIC TEST



Mann-Whitney U test – Summary Description

The Mann-Whitney U test is a nonparametric test that allows two groups or conditions or treatments to be compared without making the assumption that values are normally distributed. So, for example, one might compare the speed at which two different groups of people can run 100 metres, where one group has trained for six weeks and the other has not.

The logic behind the Mann-Whitney test is to rank the data for each condition, in our case, "before" and "after" 20 mph scheme implementation, and then see how different the two rank totals are, and confirm whether this difference is large enough to be statistically significant (i.e. unlikely to have occurred by chance).

In this study we have two conditions, from two random and independent samples, with ordinal data (speed at which each car is travelling), which is why we are using the non-parametric Mann-Whitney test, rather than an independent measures t-test.

In more specific terms, each group contains a number of n observations. The Mann-Whitney test is based on the comparison of each observation from the "before" group with each observation from the "after" group.

According to this, the data must be sorted in ascending order. The data from each group are then individually compared together. The highest number of possible paired comparisons is thus: $(N_x N_y)$, where N_x is the number of observations in the first group and N_y the number of observations in the second. I f the two groups come from the same population, as stipulated by the null hypothesis, each datum of the first group will have an equal chance of being larger or smaller than each datum of the second gro up, that is to say a probability p of one half (1/2). In technical terms,

$$H_0: p(xi > yj) = \frac{1}{2}$$
 and,

 $H_1: p(xi > yj) \neq \frac{1}{2}$

Where xi is an observation of the first sample and yj is an observation of the second sample. The null hypothesis is rejected of one group is significantly larger than the other group, without specifying the direction of this difference.

The Mann-Whitney U test was chosen as it is one of the most powerful non-parametric tests (Landers, 1981), where the statistical power corresponds to the probability of rejecting a false null hypothesis as it does not depend on assumptions on the distribution (i.e. one does not need to postulate the data distribution of the target population). One can also use it when the condition of normality neither is met not realisable by transformations.

Moreover, one can use it when his sample is small and the data are ordinal. This test has thus good probabilities of providing statistically significant results when the alternative hypothesis applies to the measured reality. Even if it is used on average-size samples (between 10 and 20 observations) or with data that satisfy the constraints of the t-test, the Mann-Whitney U test has approximately 95% of the Student's t-test statistical power (Landers, 1981). By comparison with the t-test, the Mann-Whitney U is less at risk to give a wrongfully significant result when there is presence of one or two extreme values in the sample under investigation (Siegel and Castellan, 1988; Nachar, 2008)

