Report
June 2021

People Friendly Streets - Journey Lengths and Times Analysis

Islington Council
24079401

steer

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1 Introduction

1.1 This report outlines the methodology and the findings of an investigation into the impacts of Low Traffic Neighbourhoods (LTNs) traffic restrictions in Islington on journey times and lengths on car trips undertaken by people with disabilities (either as drivers or passengers).

1.2 The study is aimed at informing and shaping the potential introduction of exemptions to the motorised traffic restrictions introduced in 2020-2021 in several areas of the Borough as part of the People Friendly Streets (PFS) Programme. It will also inform exemption strategies for future LTN schemes in other areas of the Borough.

1.3 It is worth noting that, whilst this study has looked at trip patterns for people with disabilities as a homogeneous group, based on availability of data, it is recognised that people with different disabilities have different needs, movement patterns, views and opinions in regards to the impacts caused by Low Traffic Neighbourhoods, as highlighted in the Transport For All's report 'Pave the Way' (January 2021)[1].

1.4 Acknowledging the existing diversity in requirements, this analysis only shows part of the picture, based on available data. Engaging further with people with disabilities prior to implementation of exemption measures will be important to understand specific needs.

People Friendly Streets Programme

1.5 The People Friendly Streets programme has delivered a range of Low Traffic Neighbourhood schemes across Islington. Traffic restrictions have been introduced through experimental traffic orders, and no exemptions have been initially introduced (except for emergency services) for the following reasons:

- ***To maintain access to all streets,*** *the schemes have been designed so that all residents can access their homes. The only thing that may change in some circumstances is the route they have to take.*
- ***To create a safer environment for people to walk, wheel and cycle.*** *By preventing all motor vehicle trips through camera-controlled filters (except for emergency vehicles) the scheme will make the environment feel much safer and make it much more likely that local people will begin to travel more by active means.*
- ***To reduce congestion and air pollution on the main roads.*** *The objective of people friendly streets is to reduce the overall number of trips. This will only happen if some car trips are replaced by walking, wheeling or cycling.*

Report Structure

1.6 This investigation included two tasks:

[1] https://www.transportforall.org.uk/wp-content/uploads/2021/01/Pave-The-Way-full-report.pdf

- The main body of work involved the journey time and length analysis, using a range of data sources (including telematic traffic data), to identify the impacts of the restrictions on a range of trips representative of the typical travel patterns for people with disabilities.
- The second task involved a benchmarking exercise to provide an overview of what other London boroughs have done regarding exemptions strategies in the context of LTNs, and includes and interpretation of the potential effects of such exemptions on traffic conditions across the network and on travel costs for users.

1.7 This report contains the following chapters:

- Chapter 2 details the methodology of the journey times and lengths analysis
- Chapter 3 details the key findings of the analysis
- Chapter 4 provides an overview of what other boroughs have done regarding exemptions to LTNs
- Chapter 5 provides conclusions and recommendations

2 Methodology

Introduction

2.1 This chapter outlines the scope, data sources and process followed in undertaking the journey time and length analysis.

2.2 The purpose of the analysis is to understand the impact of LTN restrictions on car journeys undertaken by people with disabilities, by analysing the change in journey time and length between the pre- and post- implementation network configuration for a sample of LTNs.

2.3 The analysis was structured as follows:

- **Background analysis,** aimed at selecting the appropriate study areas and understanding the key characteristics of journeys made by these residents with disabilities (such as trip purpose, travel distance);
- **Identification of selected routes** to be assessed pre-and post-implementation of traffic restrictions, based on the findings of the previous stage;
- **Journey length and time analysis** along the selected routes, using available telematic traffic data

Stage 1 - Background analysis

2.4 As this study is intended to help set the convention for the allocation of exemptions to currently implemented LTNs, as well as any future similar scheme across the Borough, the analysis needs to cover a variety of LTN types and a range of journey types. This is important in order to obtain findings that are general and transferable as much as possible within the available data capability.

2.5 The Background Analysis set about ensuring:

- **The analysis covered a varied range of LTNs,** based on size and geometry of the LTN boundaries
- **The analysis covered a range of journey types**, focusing on those undertaken by car by people with disabilities

Further details on this are provided below.

Selection of study areas

2.6 Following a desktop review and discussions with Islington council, a representative sample of three LTNs were selected as shown in the table and image below. Geometry and size of the boundaries were the key criteria guiding the selection process. The selected LTNs include a small, medium, and large neighbourhood.

2.7 Moreover, in order to capture a wide range of destinations and journeys across the Borough, the three LTNs have been selected so that they are sufficiently isolated from each other (e.g.

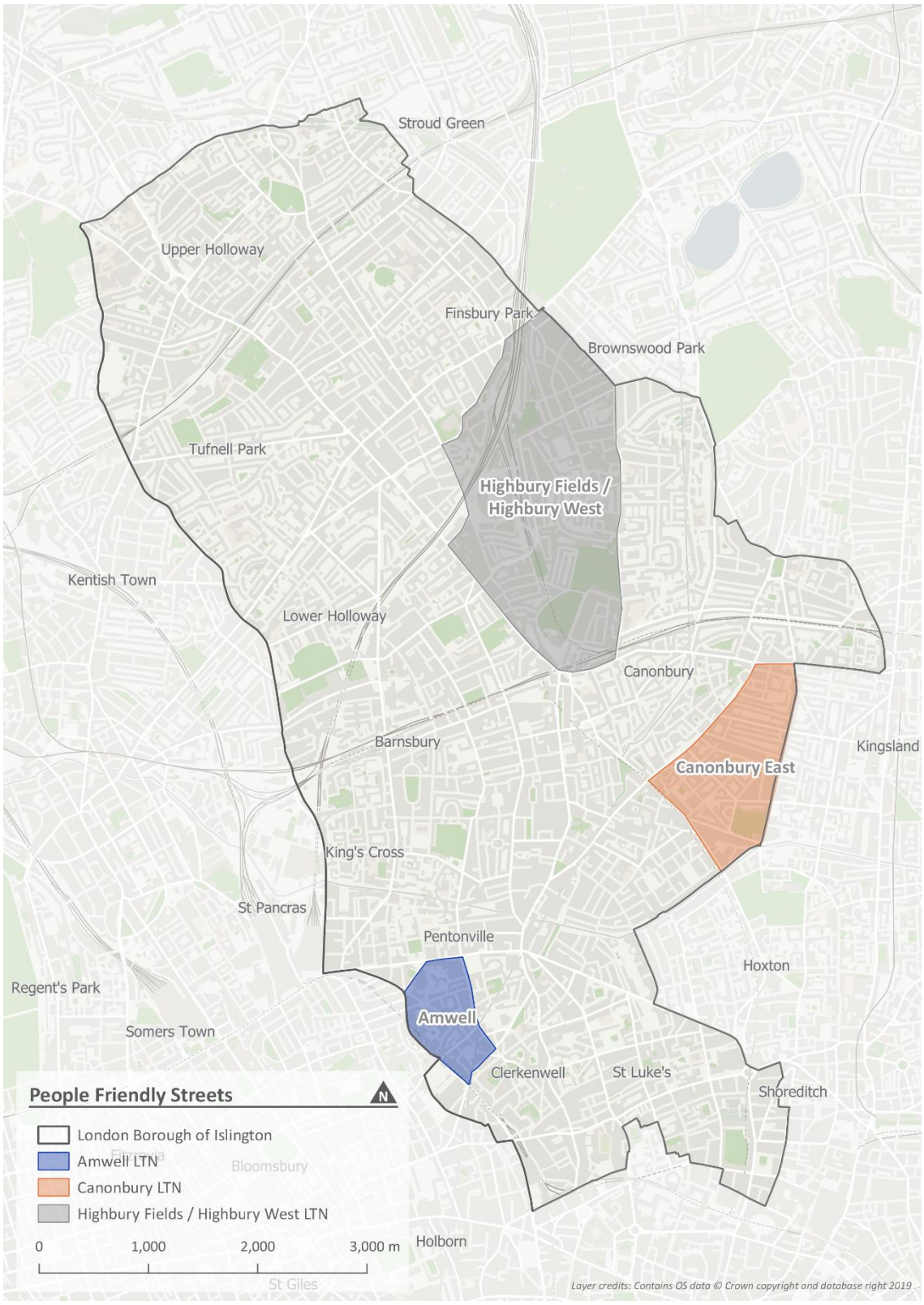
none of the study areas share a boundary road). A map of these selected LTNs is provided in Figure 2.1.

2.8 The analysis presented in the following pages of this report has investigated the impacts of each of the three LTNs individually, without taking into account potential cumulative effects on traffic redistribution.

Table 2.1: List of selected LTNs

LTN type	Selected LTNs (PFS Neighbourhoods)
Large	Highbury (Highbury Fields + Highbury West) PFS
Medium	Canonbury East PFS
Small	Amwell PFS

Figure 2.1: Map of the selected LTNs



Assessing a range of journey types

2.9 Since the aim of the study is to assess the impact on journeys undertaken by people with disabilities, it is important that the sample of journeys analysed reflects the pattern of journey lengths and destinations undertaken in Islington by people with disabilities, travelling by car (as passengers or drivers).

2.10 This was achieved through analysis of the London Travel Demand Survey (LTDS) data. It is a survey undertaken by Transport for London every year to understand travel habits of people living in London, including people with disabilities. The survey analyses a sample of over 18million trips every year, and as such it provides a comprehensive picture of travel patterns.

2.11 It is worth noting that, focusing on trips undertaken by Islington residents with disabilities, the size of the sample is only a small proportion of the overall sample. However, this is considered the best data source available which links travel patterns such as journey lengths and trip purpose to demographic characteristics.

2.12 The data used in this analysis covers the period 2016-2019. Table 2.2 provides modal split for all users and for people with disabilities in Islington. The investigation has focused on car users (drivers and passengers).

Table 2.2: London Travel Demand Survey (2016-19) – trips by mode

Mode	All users	People with disabilities (Islington)
Walk	42.0%	41.2%
Pedal cycle	4.9%	1.2%
Car Driver	7.4%	8.9%
Car passenger	6.2%	16.7%
Motorcycle	0.1%	0.0%
Van	0.3%	0.2%
Bus (public)	14.3%	14.4%
Underground	15.0%	11.4%
National Rail train	4.9%	1.7%
Taxi - London black cab	0.8%	1.7%
Taxi - other/minicab	1.6%	1.5%
London Overground	2.2%	1.1%

2.13 This analysis provided the understanding of the key characteristics of journeys made by this specific group of residents (such as trip purpose, travel distance) and ensure that the pool of journeys selected in the next stage of the project reflects such patterns. In particular:

- Understanding the range of journey lengths undertaken by people with disabilities included in the LTDS informed the **selection of thresholds for short, medium and long journeys** and allowed to select journeys providing a similar split;
- Similarly, the range and split of trip purposes (leisure, education, shopping…) by disabled car users in Islington included in the LTDS informed the **selection of origins/destinations** for the journeys.

Journey Length

2.14 Table 2.3 below shows the findings of the LTDS analysis. Here there is a breakdown of journey lengths with thresholds chosen to define journey types. This also includes all car users for comparison (those not classed as having a disability).

2.15 As the analysis focuses on trips starting and/or ending within the Borough of Islington, journey length is capped at 8.0 km, and longer journeys are not included in the analysis: since the dataset used for the analysis only included streets located within the Borough boundaries, any longer journeys would likely include roads outside of the borough and as such could not be assessed. Similarly, trips shorter than 0.6km have been excluded from the analysis as the coverage of the available data did not allow an exhaustive analysis of very short trips.

2.16 Based on the distribution of trip lengths in the database, trips are divided into short, medium and long trips. Thresholds are established for the three groups, with the aim of achieving a balanced split among the three groups.

Table 2.3: London Travel Demand Survey (2016-19) - car trips length analysis

		All car users	Car users with Disability
Journey Type	**Length in km (Thresholds)**	**Average**	**Average**
Short	Greater than 0.6 km & less than 1.5 km	36%	41%
Medium	Greater than 1.5 km & less than 4.0 km	41%	29%
Long	Greater than 4.0 km & less than 8.0 km	22%	31%
		100.0%	**100.0%**

Trip Purpose

2.17 Table 2.4 below shows the breakdown by trip purposes. It provides a breakdown of journey purposes highlighting what proportion of journeys were taken by car users with disabilities. Once again, the sample analysed only includes trips undertaken by Islington residents with disabilities (a sample of approximately 2,500 trips across 2016-2019). People with disabilities appear to travel by car mainly to visit other residential addresses (relatives and friends), retail/leisure destinations, health centres/hospitals.

2.18 Values in Table 2.3 and Table 2.4 were used later in the route identification stage of the analysis as benchmarks.

Table 2.4: London Travel Demand Survey (2016-19) car trips - purpose analysis

	All car users	Car users with Disability
Purpose	**Average**	**Average**
Visit friends/relatives at home	18%	47%
Entertainment/Shopping/Leisure	34%	27%
Drop off/pick up	17%	6%
Education	4%	6%
Health or medical visit	1%	5%
Personal business / Other	7%	4%

Worship or religious observance	1%	3%
Work - Usual workplace	10%	2%
Work - Other	8%	0%
	100%	**100%**

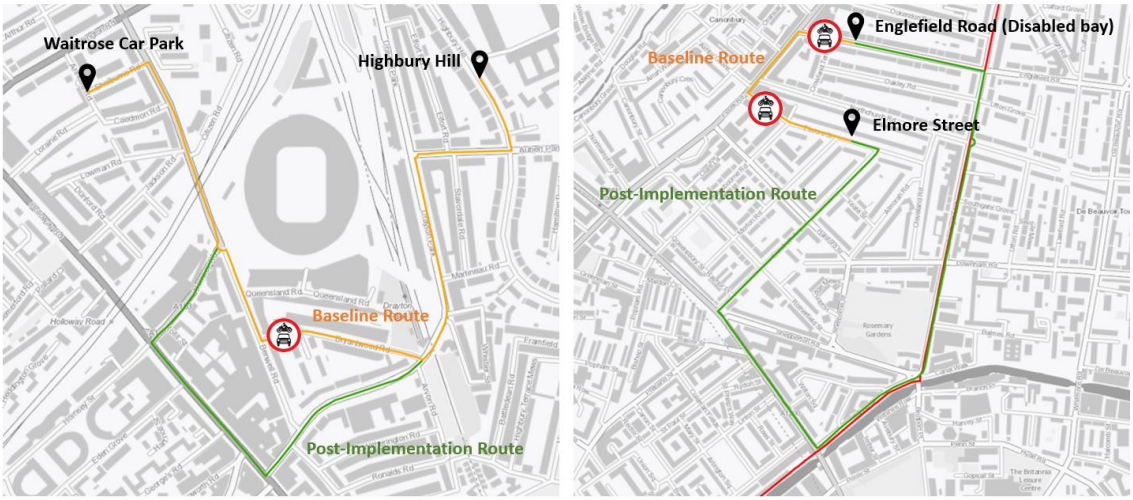
Stage 2 - Identification of selected routes

2.19 The second stage in the analysis consists of the identification of a representative pool of Origin/Destination pairs for each study area, to be investigated pre-and post- implementation. Each O/D pair can then be assigned two routes (with and without restrictions in place):

- **Baseline routes** – routes before schemes were introduced as part of the People Friendly Street Neighbourhoods programme
- **Post Implementation routes** - routes after schemes were introduced as part of the People Friendly Street Neighbourhoods programme

2.20 Figure 2.2 below shows to examples of baseline and post-implementation routes in Highbury and Canonbury, affected by the introduced traffic restrictions.

Figure 2.2: Examples of pre- and post-implementation routes



Origins and Destination Assignment

2.21 The location of the journey origins and destination (ODs), play a key role in representing typical journeys made by car users with disabilities as they define the end to end points of the journeys.

2.22 To ensure a representative analysis for each of the three LTNs, an appropriate number of origin and destination pairs (ODs) were distributed across the study areas depending on the size of the selected LTNs.

2.23 The size and geometry of the neighbourhoods and the availability of alternative routes are all factors restricting the number of permutations on journeys through the LTNs. Table 2.5 shows the number of OD pairs selected for each area. Small LTNs have fewer streets and fewer restriction points, and therefore fewer route permutations – they thus require fewer routes to ensure a comprehensive analysis.

Table 2.5: Number of routes for each PFS

People Friendly Street Neighbourhood Size	People Friendly Street Neighbourhoods	Number of routes (ODs pairs)
Small PFS	Amwell PFS	35
Medium PFS	Canonbury East PFS	58
Large PFS	Highbury (Highbury Fields and Highbury West) PFS	74

2.24 As described above in Stage 1, the selection of O/D pairs has been informed by the results of the LTDS analysis, with start and end locations selected to match the profile of journey lengths and purposes identified as part of the background analysis. This ensure fair representation of real-life journeys made by car user with disabilities.

2.25 Locations in Islington which are of interested to vehicle users with disabilities were used as reference points during the assigning of ODs. This included:

- Blue badge parking bays
- Supermarkets / shopping districts
- Transport hubs
- Medical centres
- Schools and education hubs with parking
- Parks and recreational areas

2.26 The selection of O/D pairs has also been influenced by the availability of traffic data: telematic data used for the Stage 3 analysis does not provide coverage for several minor roads within the Borough. As such, locations have been selected along those streets that provided accurate data coverage to ensure robustness in the analysis.

Creation of road networks using GIS analysis

2.27 Once Origin/Destination pairs have been selected, the identification of routes is carried out through the creation of two distinct road networks for each study area (using ArcGIS network analysis):

Baseline - The first represents the road network prior to the introduction of the schemes and did not include the PFS restrictions – it enables the calculation of 'baseline' routes from each origin to each of the destinations;
Post Implementation – By adding into the network analysis the restrictions introduced as part of the PFS programme in each area (the changes introduced as part of each LTN have been considered in isolation, and the cumulative effect of the simultaneous introduction of multiple LTNs have not been assessed). With the restrictions in place, the 'post implementation' route could be calculated.

2.28 Routes are determined as the quickest route between two points using telematic data embedded in ArcGIS (*Street Pro Speed Profiles* from the data provider *Precisely*). Whilst the quickest route available between two points might change throughout the course of the day due to varying traffic conditions, the routes used for the analysis are based on average travel time values. For ease of comparison and analysis, the quickest routes determined through this step have been used in the analysis for all time intervals, without distinction.

2.29 As expected, whilst ODs are fixed between the 'Baseline' and 'Post Implementation', the routes between the two points can be altered by the introduction of the PFS schemes. The next stage of the analysis illustrates how these changes impact journey lengths and times.

2.30 The following pages include maps displaying the distribution and coverage of routes for the 'Baseline' in blue (without PFS restrictions) and 'Post implementation' in pink (with PFS restrictions). The changes introduced by the restrictions are clearly visible on the maps.

2.31 Please see:

- Figure 2.3: 'Baseline' routing of small PFS (Amwell PFS)
- Figure 2.4: 'Post implementation' routing of small PFS (Amwell PFS)
- Figure 2.5: 'Baseline' routing of medium PFS (Canonbury East PFS)
- Figure 2.6: 'Post implementation' routing of medium PFS (Canonbury East PFS)
- Figure 2.7: 'Bassline' routing of large PFS (Highbury PFS)
- Figure 2.8: 'Post implementation' routing of large PFS (Highbury PFS)

Figure 2.3: 'Baseline' routing of small PFS (Amwell PFS)

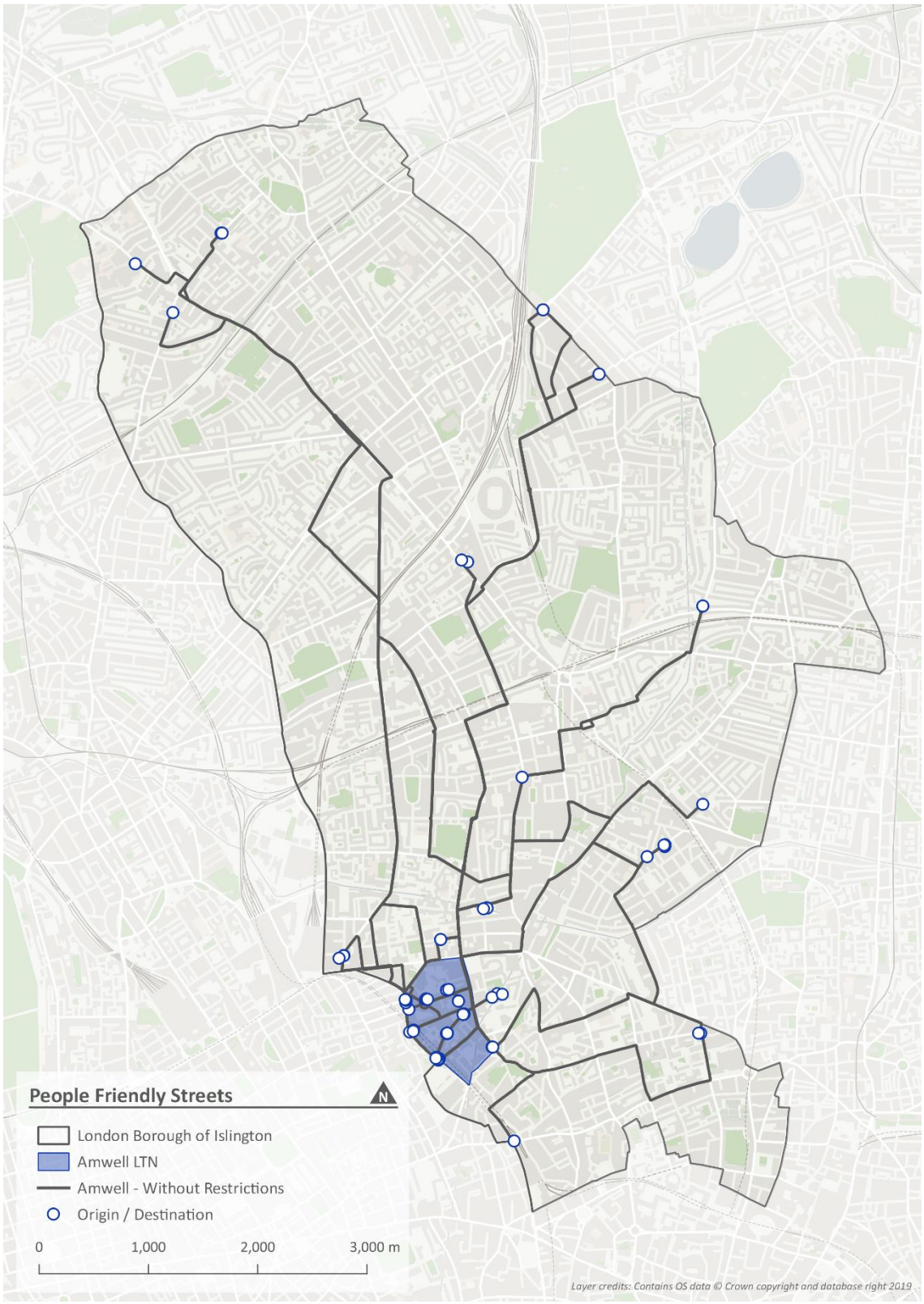


Figure 2.4: 'Post implementation' routing of small PFS (Amwell PFS)

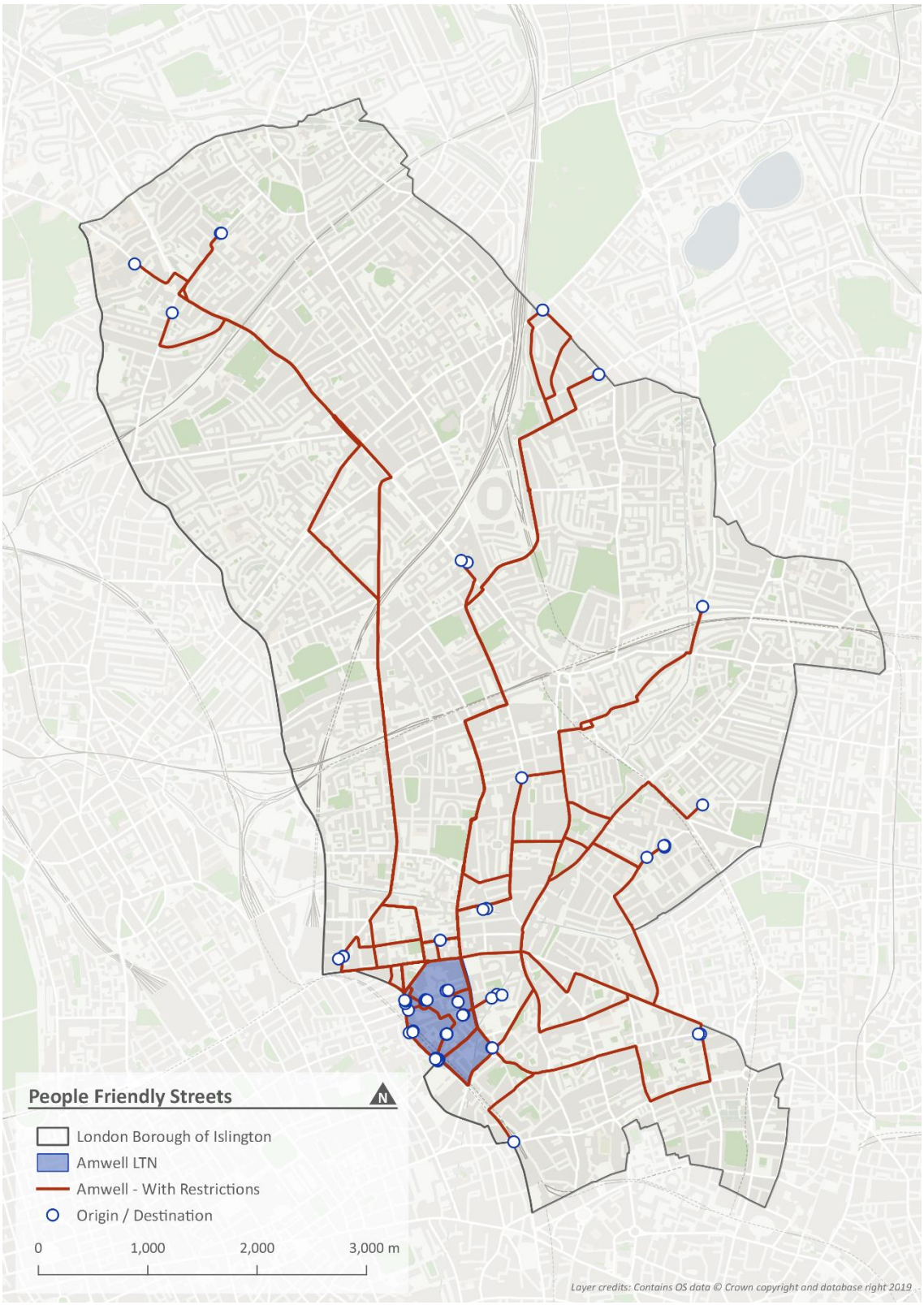


Figure 2.5: 'Baseline' routing of medium PFS (Canonbury East PFS)

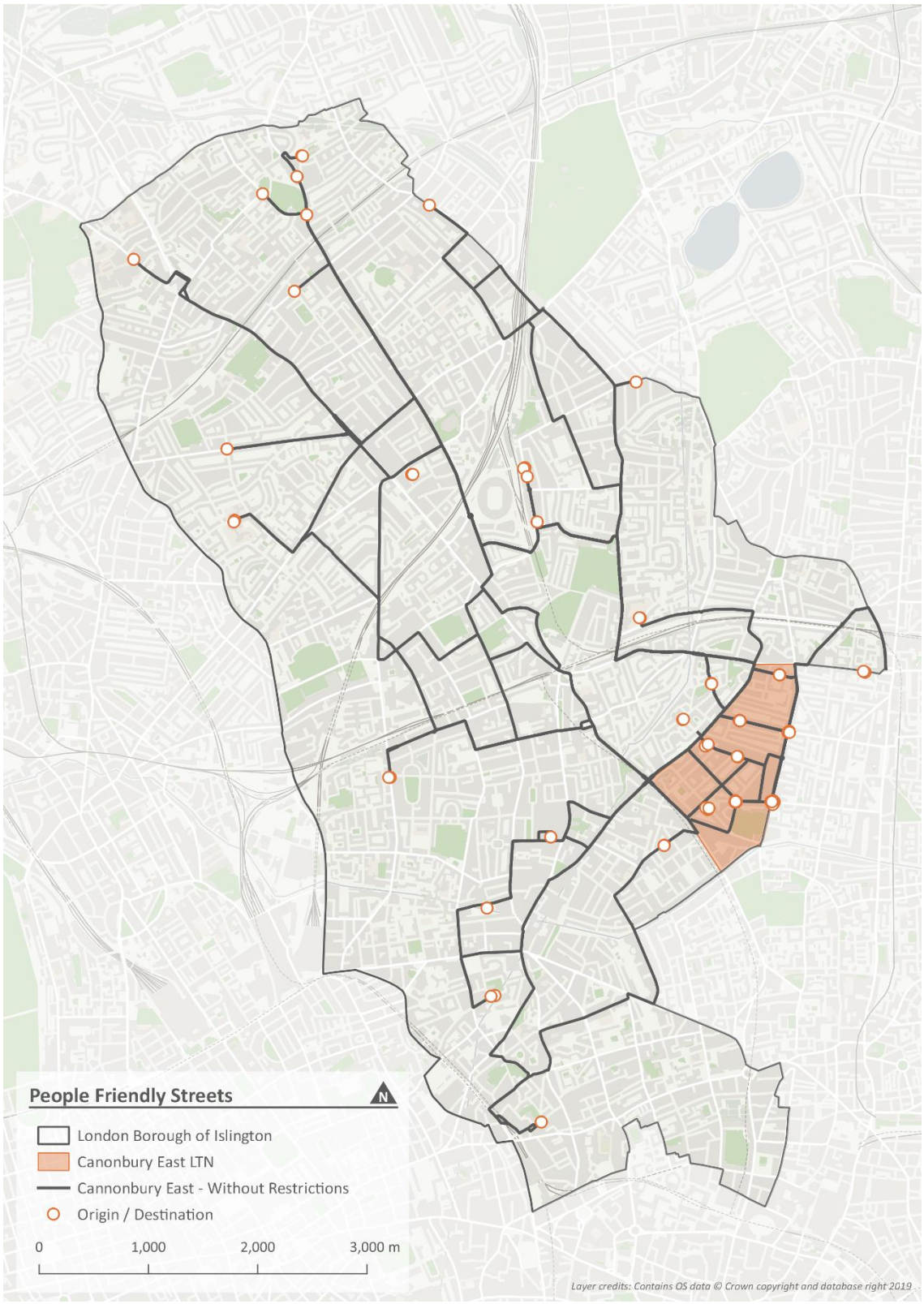


Figure 2.6: 'Post implementation' routing of medium PFS (Canonbury East PFS)

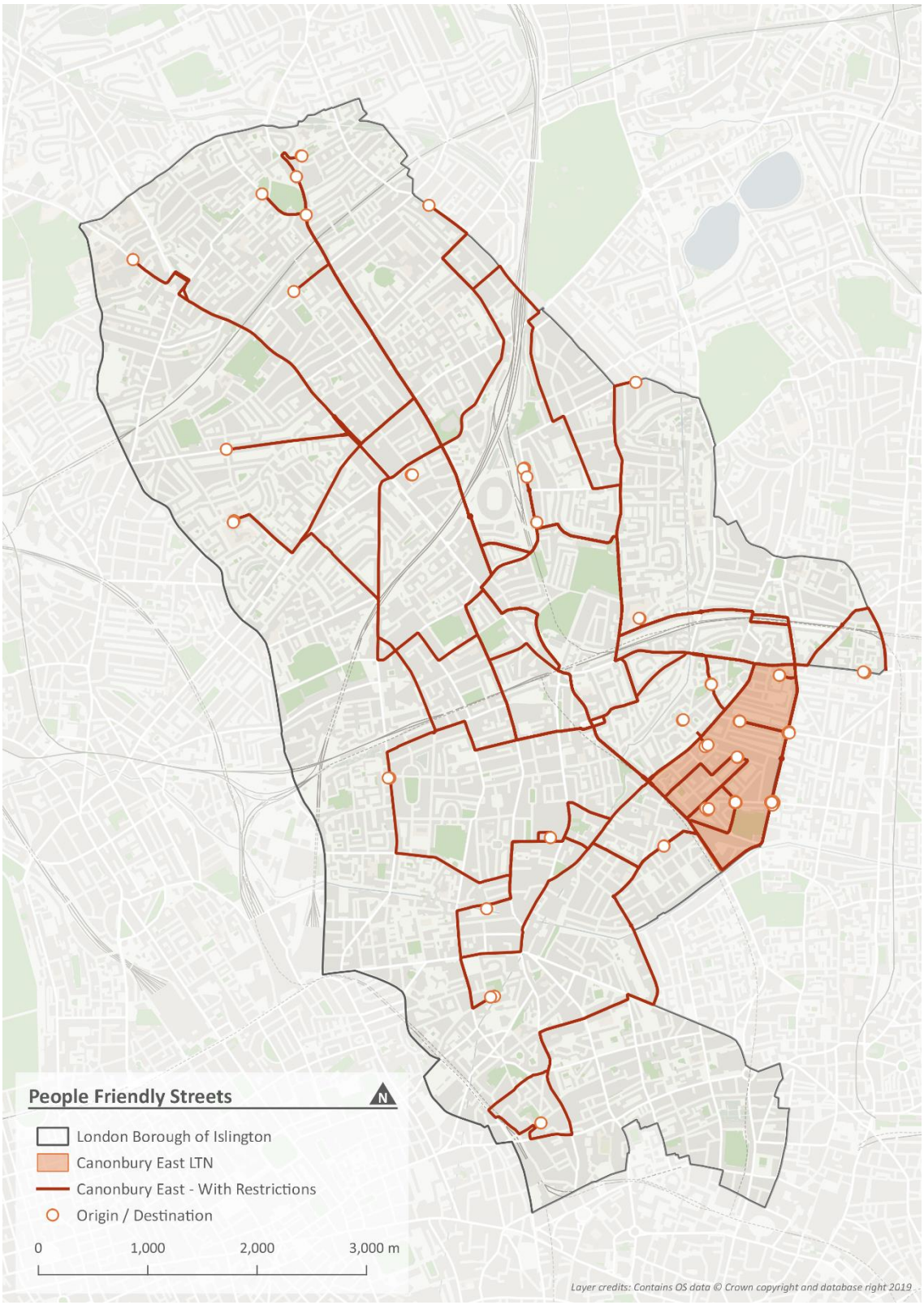


Figure 2.7: 'Bassline' routing of large PFS (Highbury PFS)

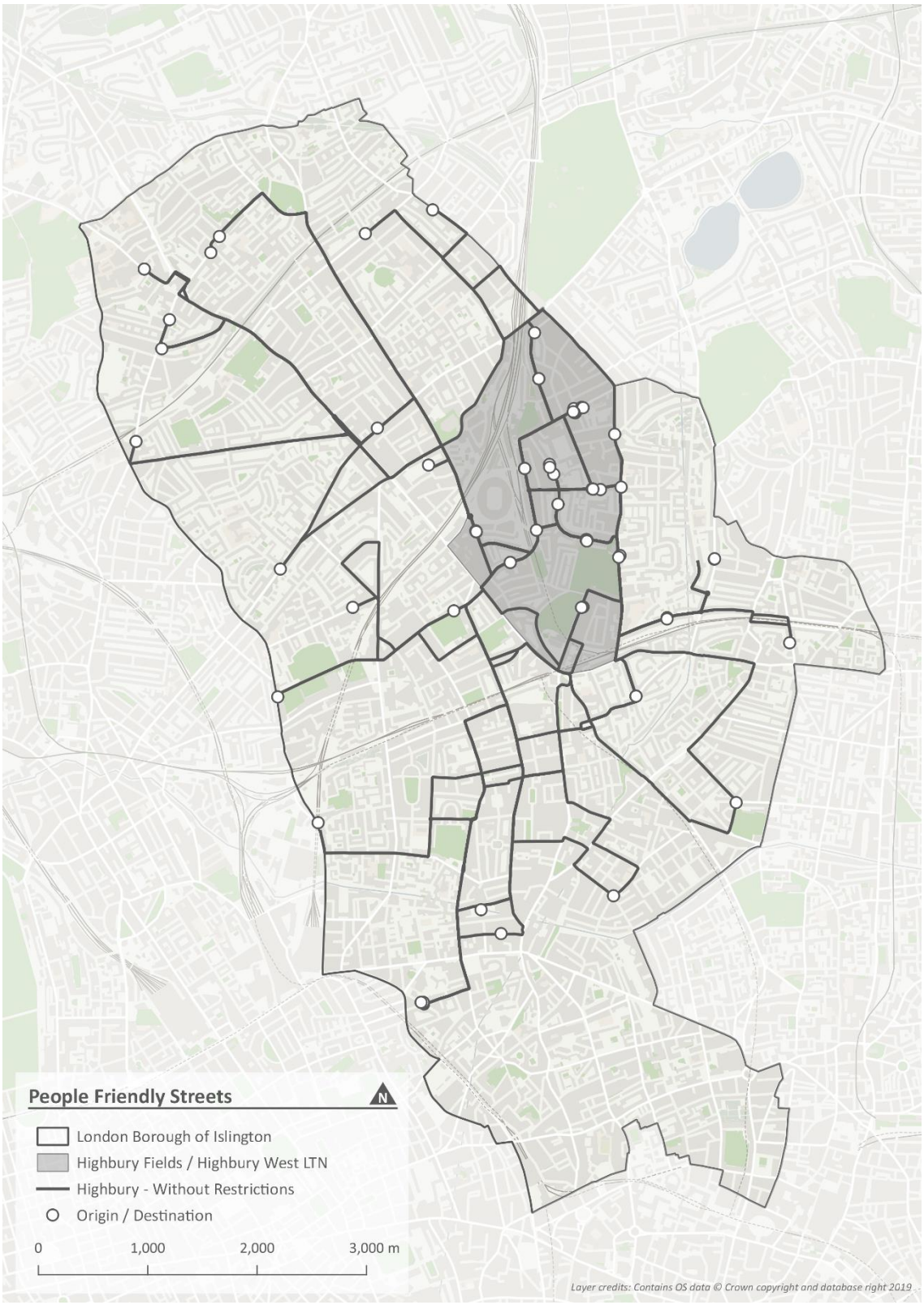
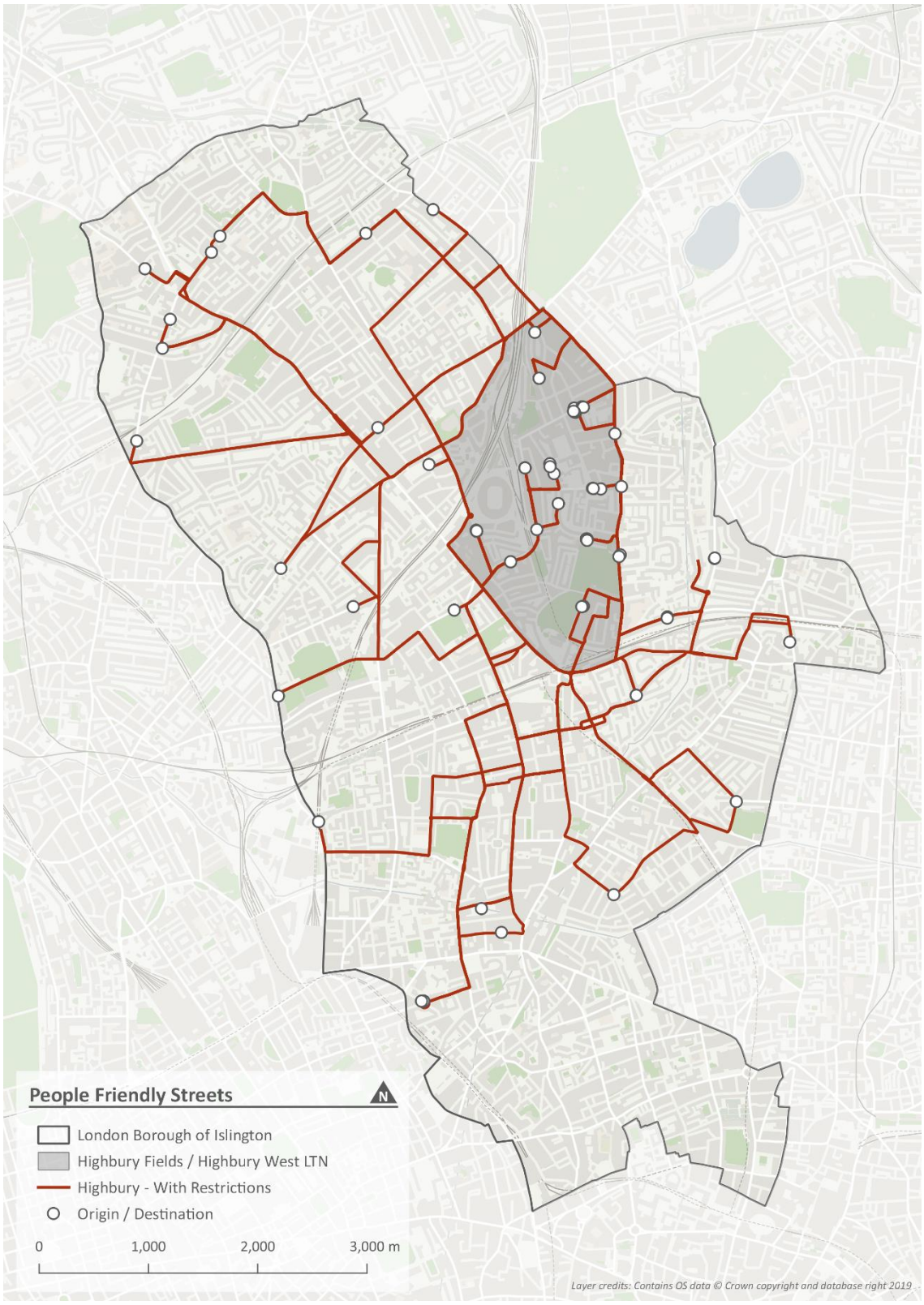


Figure 2.8: 'Post implementation' routing of large PFS (Highbury PFS)



Stage 3 - Journey length and time analysis

2.32 With the 'baseline' and 'post implementation' routes determined, the journey times and lengths can be calculated for each time period. This was achieved by overlaying INRIX Telematic data over the road network, providing journey time values for each road segment.

2.33 INRIX Road Analytics data is based on anonymised motorised traffic movement data from GPS devices and provides information on speed along each link in the road network based on recorded trips, therefore it is useful to provide indicative data on journey times. This data is sourced from both fixed GPS devices (i.e. in-car GPS systems) and mobile ones (i.e. apps on mobile phones). Several individual trip records are used to determine average speeds and average hourly travel times for all main roads in the network.

2.34 Travel time data has been extracted for the entire year of 2019 and averaged for each hour of the day. To assess the impact on journeys over different time periods throughout the day, several time periods are considered. This included the following time periods:

- AM peak 07:00 – 10:00
- Inter peak 10:00 – 16:00
- PM Peak 16:00 – 19:00
- All-day average 07:00 – 19:00

2.35 The analysis focuses on weekdays only, considering that journey times are likely to be higher due to higher traffic volumes on the network and, as such, they represent the worst-case scenario for all users.

2.36 Data for 2019 was used as this was representative of typical traffic patterns prior to COVID-19 and not affected by the introduction of PFS schemes. The same speed data was used for both 'before' and 'post implementation' analysis, this approach means the journey times changes are purely based on route choices and isolated from other changes in the network (including short-term disruptions such as roadworks) making them more directly comparable to one another.

2.37 It is important to note that, whilst using 2019 data for both 'before' and 'post implementation' analysis allows to isolate the impact of rerouting from other perturbations to traffic, it does not take into account effects to the wider network resulting from the introduction of the LTNs themselves, School Streets and other major transport schemes (for example the Old Street roundabout and Highbury Corner works). However, due to disruptions to traffic patterns relating to the Covid-19 pandemic, it has been considered preferable to avoid using 2020 and 2021 in the analysis. Future monitoring is recommended when more post-implementation data is available.

2.38 Using the routes created in ARCGIS and the INRIX journey time data, the difference in journey times and length between the two routes have been calculated. The averages for this are presented below.

Assumptions and limitations of the data

2.39 As mentioned above, it should be noted that telematic data used for this study does not provide 100% coverage of roads within the Borough. Data for major roads as well as key connectors within the residential neighbourhoods are included in the dataset and provide an accurate representation of traffic conditions. On the other hand, minor residential roads with very low vehicle traffic have a smaller pool of data records associated with them and the

Roadway Analytics software excludes them from the analysis due to the lack of reliability and representativity of the data.

2.40 In order to extend the analysis and increase the number of route permutations, the available INRIX data has been supplemented with average speed data from the Street Pro Speed Profiles dataset embedded in ArcGIS, for a small proportion of minor roads that were instrumental in the analysis of pre- and post- journey lengths and times. Unlike INRIX data, they are not time-specific and represent a speed value for typical daytime traffic levels. As this is used on minor residential roads, where congestion is not an issue, it is likely this is close to the true value. The integration was only required for 6% of the Borough road network.

3 Findings of the journey analysis

3.1 This section details the findings of the journey time and length analysis. Data is presented for each individual LTN, as well as an overview of all LTNs.

3.2 For clarity, some of definitions outlined in the previous chapters have been re-provided here, to aid interpretation of the following outputs:

- **Baseline routes** – routes developed using the network configuration available before schemes were introduced as part of the People Friendly Street Neighbourhoods programme
- **Post Implementation routes** - routes developed using the network configuration available after schemes were introduced as part of the People Friendly Street Neighbourhoods programme (the changes introduced as part of each LTN have been considered in isolation, and the cumulative effect of the simultaneous introduction of multiple LTNs have not been assessed).
- **Short Journeys** – Journeys between 0.6 km and 1.5 km
- **Medium Journeys** – Journeys between 1.5 km and 4 km
- **Long Journeys** – Journeys between 4 km and 8 km

3.3 Findings are firstly presented for each category of LTN (small, medium, large) analysed individually, and secondly analysed in aggregate.

Small LTN (Amwell People Friendly Streets)

3.4 The data below represents the findings of the journey length and time analysis on routes affected by the introduction of a Small LTN. This analysis includes the assessment of 34 routes across the Amwell PFS.

Change in average journey length

3.5 The data in Table 3.1 shows the average change in journey length, across the whole day (07:00-19:00). Due to the restrictions introduced to create the LTN, overall journey lengths increase by 6%. The analysis shows, short journeys increased in length by the most in terms of percentage and absolute values, 23%. Medium journeys increased by an average of 4%. Long journeys increased by 3% on average.

Table 3.1: Change in average journey length (Small LTN) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1km)	(>1km&<4km)	(>4km&<8km)	
Baseline (metres)	770	2,918	5,299	2,594
Post Implementation (metres)	947	3,042	5,478	2,753
Change (metres)	178	124	178	159
Change (%)	23%	4%	3%	6%

Change in average journey time

3.6 The data in This has most likely to do with the fact that medium and long journeys have a wider potential pool of alternative routes to choose from by approaching the LTN from further away, rerouting in advance of the restrictions and finding an efficient route to the destination.

3.7 Table 3.2 shows the average change in journey time across the whole day (07:00-19:00). As the outputs indicate, short journeys experienced the largest increase in journey times, increasing 126%. This is more than double the 'baseline' journey time and equates to just under 2 minutes.

3.8 As the trip length increases the total additional journey time decreases. This has most likely to do with the fact that medium and long journeys have a wider potential pool of alternative routes to choose from by approaching the LTN from further away, rerouting in advance of the restrictions and finding an efficient route to the destination.

Table 3.2: Change in average journey time (Small LTN) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1km)	(>1km&<4km)	(>4km&<8km)	
Baseline (mins)	1.4	13.0	21.3	10.2
Post Implementation (mins)	3.2	14.0	21.5	11.3
Change (mins)	1.8	1.0	0.2	1.1
Change (%)	126%	7%	1%	11%

Medium LTN (Canonbury East People Friendly Streets)

3.9 The data below represents the findings of the journey length and time analysis on routes affected by the introduction of a Medium LTN. This analysis includes the assessment of 58 routes across the Canonbury East PFS.

Change in average journey length

3.10 The data in Table 3.3 shows the average change in journey length, across the whole day (07:00-19:00). Overall journey lengths increase by 12%. This is disproportionately distributed across the short, medium and long Journeys. Short journeys have been adversely impacted, as journey lengths have increased by 89%, equating to 0.8km. Medium journeys increased by an average 11%, or 0.3km; and long journeys did not show any significant change (2%).

Table 3.3: Change in average journey length (Medium LTNs) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1km)	(>1km&<4km)	(>4km&<8km)	
Baseline (metres)	922	2,726	5,246	3,104
Post Implementation (metres)	1,742	3,014	5,371	3,530
Change (metres)	820	288	125	427
Change (%)	89%	11%	2%	14%

Change in average journey time

3.11 The data in Table 3.4 shows the average change in journey time across the whole day (07:00-19:00). The outputs show an increase in journey time across all journey lengths of about 3 to 4 minutes.

3.12 When looking at the increase as proportion of the total trip time, short journeys experienced the largest increase in journey times, 91%. Medium journeys increase by 39% and long journeys by 25%.

Table 3.4: Change in average journey time (Medium LTNs) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1km)	(>1km&<4km)	(>4km&<8km)	
Baseline (mins)	3.7	9.8	16.0	10.2
Post Implementation (mins)	7.1	13.6	20.0	14.0
Change (mins)	3.4	3.8	4.0	3.8
Change (%)	91%	39%	25%	37%

Large LTN (Highbury People Friendly Street)

3.13 The data below represents the findings of the journey length and time analysis on routes affected by the introduction of a large LTN. This analysis includes the assessment of 74 routes across the Highbury Fields PFS and Highbury West PFS.

Change in average journey length

3.14 The data in Table 3.5 shows the average change in journey length, across the whole day (07:00-19:00). Overall journey lengths increase by 25%. The greatest impact is to short journeys which on average increases by about 2km (275%), almost quadruples in length. Medium journeys show a negligible difference in journey length. Long journey experience an average increase of 0.3km (6%).

Table 3.5: Change in average journey length (Large LTNs) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1km)	(>1km&<4km)	(>4km&<8km)	
Baseline (metres)	761	2,761	4,460	2,549
Post Implementation (metres)	2,871	2,799	4,746	3,187
Change (metres)	2,109	37	287	638
Change (%)	277%	1%	6%	25%

Change in average journey time

3.15 Data in Table 3.6 shows the average change in journey time for the assessed Large LTN, across the whole day (07:00-19:00). Again, short journeys are the worst affected, with an average increase of 8 minutes to journey time. Medium journeys also see a significant increase of 17%, this is less than 3 minutes delay. The increase in journey time for long journeys is 6% or 1.2 minutes.

Table 3.6: Change in average journey time (Large LTNs) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1km)	(>1km&<4km)	(>4km&<8km)	
Baseline (mins)	3.0	9.9	19.7	9.4
Post Implementation (mins)	10.8	12.3	20.9	12.7
Change (mins)	7.9	2.5	1.2	3.3
Change (%)	265%	25%	6%	35%

Overview of all LTN journeys

3.16 Since LTN-specific outputs can be influenced by a range of factors relating to street network geometry, selection of routes, presence of additional barriers reducing the availability of alternative routes (e.g. railway lines, rivers), the analysis is also presented using all 150 journeys analysed in aggregate. The data below represents the findings of the journey length and time analysis for all three LTNs combined (Amwell PFS, Canonbury East PFS and Highbury PFS). The outputs here show trends as averages across all types of LTN in the analysis.

3.17 As previously mentioned, the changes introduced as part of each LTN scheme have been considered in isolation, and the cumulative effect of the simultaneous introduction of multiple LTNs have not been assessed.

Change in average journey length

3.18 The data in Table 3.7 shows the average change in journey length for all journeys in the analysis, across the whole day (07:00-19:00). Due to the restrictions introduced as part of the LTNs, overall journey lengths increase by 17%. As the analysis shows, short journeys increased in length by the most, both in terms of percentage and absolute values, 118% and 974m respectively. Medium journeys increased by 4%, or about 119m. Long journeys increase by 3%, or 163m on average.

3.19 This has largely to do with the fact that medium and long journeys have a wider potential pool of alternative routes to choose from, rerouting in advance of the restrictions. Short journeys, most of which are undertaken within the LTN's boundaries, have to undertake far more circuitous routes to avoid the restrictions.

Table 3.7: Change in average journey length (All LTNs) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1.5km)	(>1km&<4km)	(>4km&<8km)	
Baseline (metres)	825	2,774	5,140	2,751
Post Implementation (metres)	1,799	2,893	5,302	3,216
Change (metres)	974	119	163	465
Change (%)	118%	4%	3%	17%

Change in average journey time

3.20 The data in Table 3.8 shows the average change in journey time for each type of journey length assessed. This is for all journeys in the analysis, across the whole day (07:00-19:00).

3.21 The average increase is under 3 minutes across all journey lengths. However, this has a much more significant impact on short journeys than medium and long journeys: these journeys

increase by over 4 minutes on average, more than doubling the journey time. As the trip length increases the total additional journey time appears to decrease, as medium journeys and long journeys are not as negatively impacted. Again, this is in terms of both percentage and absolute values.

Table 3.8: Change in average journey time (All LTNs) (2019)

	Short Journeys	Medium Journeys	Long Journeys	Total
	(>0.6km&<1km)	(>1km&<4km)	(>4km&<8km)	
Baseline (mins)	2.7	10.3	17.8	9.9
Post Implementation (mins)	6.9	12.9	20.5	12.9
Change (mins)	4.1	2.6	2.7	3.0
Change (%)	151%	25%	15%	30%

3.22 Figure 3.1 shows the percentage change in journey time for each LTN and for each type of journey length. For further context Table 3.9 shows the additional values associated with the figure. This clearly illustrates short journeys experienced the largest impact across all LTN sizes. The graph also clearly highlights that the impact (on short journeys in particular) is amplified as LTNs increase in size.

Figure 3.1: Percentage change in journey time, given by different journey lengths within each LTN size

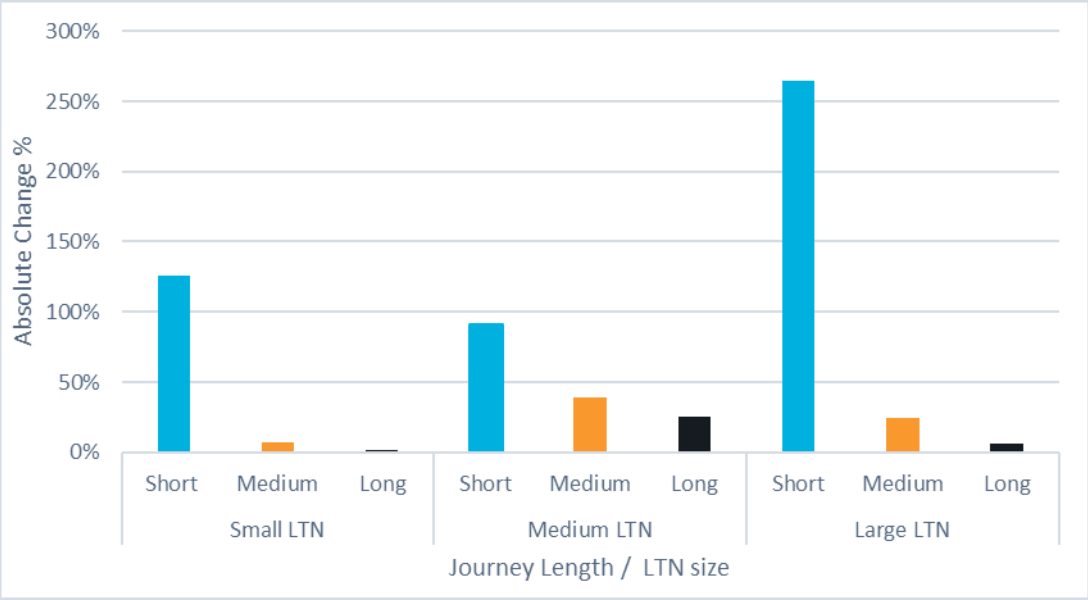


Table 3.9: Change in Journey time, given by different journey lengths within each LTN size (2019)

	Small LTN			Medium LTN			Large LTN		
Journey length	**Short**	**Medium**	**Long**	**Short**	**Medium**	**Long**	**Short**	**Medium**	**Long**
Baseline (mins)	1.4	13.0	21.3	3.7	9.8	16.0	3.0	9.9	19.7
Post imp. (mins)	3.2	14.0	21.5	7.1	13.6	20.0	10.8	12.3	20.9
Change (mins)	1.8	1.0	0.2	3.4	3.8	4.0	7.9	2.5	1.2
Change (%)	126%	7%	1%	91%	39%	25%	265%	25%	6%

Change in average journey time by peak

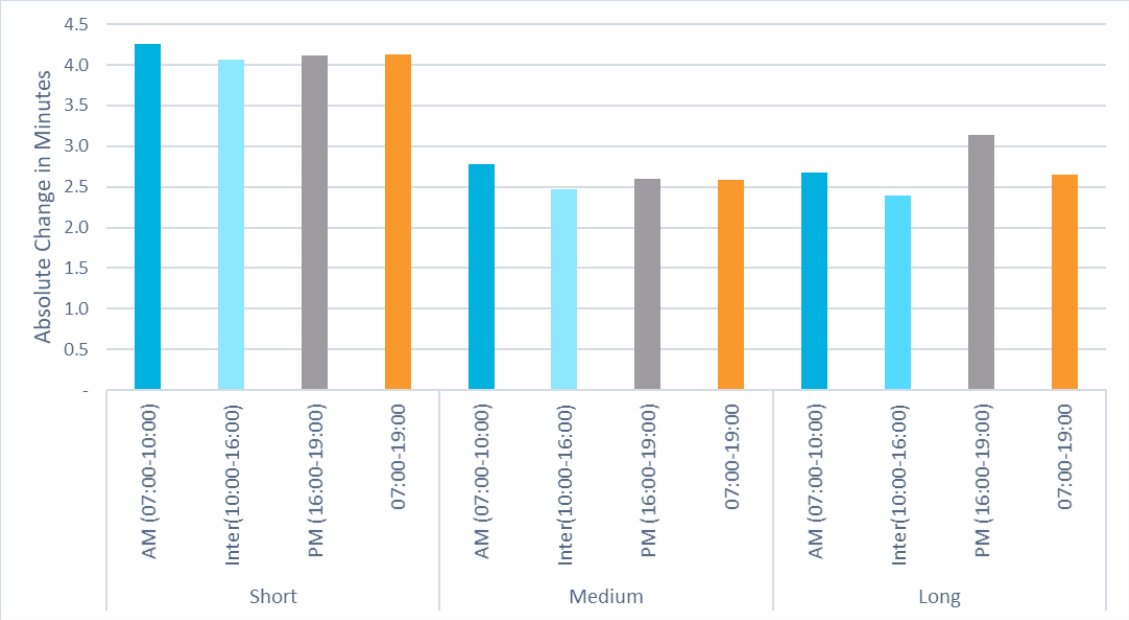
3.23 The data in Table 3.10 shows the average change in journey time for each peak assessed for all LTNs, as well as the average over the whole day (07:00-19:00). The comparison of journey time impacts across the different time of day show little variation between peaks.

Table 3.10: Change in average journey time by peak (All LTNs) (2019)

	AM (07:00-10:00)	Inter (10:00-16:00)	PM (16:00-19:00)	All day (07:00-19:00)
Baseline (mins)	10.0	9.6	10.2	9.9
Post-Implementation (mins)	13.2	12.5	13.3	12.9
Change (mins)	3.1	2.9	3.1	3.0
Change (%)	31%	30%	30%	30%

3.24 Figure 3.2 shows the variation in journey time increase during different traffic peaks. Travel time does not show significant variation for short journeys, however as journey length increases, the external background traffic conditions appear to have a greater influence on journey times, making hourly fluctuations marginally more evident.

Figure 3.2: Change in journey time across different peaks, given by different journey lengths



Change in average journey time by origin/destination

3.25 Table 3.11 shows the change in average journey time by origin/destination across all LTNs, dividing all journeys into three categories:

- Trips which start and end outside the LTN
- Trips which either start or end within the LTN
- Trips which both start and end within the LTN

3.26 In the sample considered, trips starting and ending outside LTNs are generally longer trips that those originating or ending within the LTNs.

3.27 The analysis illustrates that journeys with both origin or destination within the LTNs experienced the largest impact. Journey time impacts increase if journeys start or end within an LTN, and increase further if they both start and end within one.

3.28 As other data has shown, short journeys have been impacted the most severely, findings here a consistent with those elsewhere in this analysis. This is because journeys which start and end within an LTN are almost all classed as short journeys in baseline conditions.

Table 3.11: Change in journey time broken down by starting point (in an LTN)

	Start and end outside LTN	Start or End within LTN	Start and End within LTN	Total
Baseline (mins)	14.2	11.1	2.7	9.9
Post-Implementation (mins)	15.1	13.9	7.6	12.9
Change (mins)	0.8	2.7	4.8	3.0
Change (%)	6%	25%	177%	30%

Summary for an overview of all journeys

3.29 Generally, the outputs indicate the short journeys are severely impacted both in terms of journey length and journey time, whilst medium and long journey do not record significant changes in journey length and time.

3.30 Short journeys increase in length an average of 118%, more than doubling. In terms of absolute numbers, short journeys also had to travel the largest additional length, close to 1km extra. Whilst the average lengths of medium journeys and long journeys also increased, the impacts were not as significant.

3.31 Short journeys experience the greatest average increase in journey time (151%), more than doubling. Medium journeys increased by nearly 25%; and long journeys by nearly 15%.

3.32 These findings confirm how the proposed strategy addresses one of the main objectives of the People Friendly Streets programme, which is to encourage residents to leave their cars behind for shorter journeys, by making the streets more pleasant and safer to walk and cycle, use buggies and wheelchairs.

4 Informing the introduction of exemptions

Introduction

4.1 This chapter provides further information based on the benchmarking and literature review, aimed at informing the selection of an exemption strategy that is proportionate to the outcomes of the analysis on journey times and lengths impacts.

4.2 It explores the approaches taken in other Boroughs in regards to exemption strategies for LTNs; it provides commentary on the impacts of exemptions on traffic flows along residential streets and on the combined impacts of the simultaneous implementation of multiple LTNs; and it provides guidance on the assessment of costs connected to an increase in journey times and lengths.

Approach taken in other Boroughs

4.3 The table below provides a summary of approaches taken by other Boroughs regarding exemptions to LTNs.

4.4 The most common approaches taken by Local Authorities are the following, in order from the most to the least common:

- Only Blue Badge Holders living within the LTNs are allowed to apply for a specific permit to drive through the proposed restrictions;
- All Blue Badge Holders are allowed to apply for a permit;
- All residents of the LTN or of a defined list of streets are allowed to apply for a permit;
- No vehicles are exempted from the measure except for Emergency services and, where necessary, waste lorries;

Borough	Approach to exemptions
Camden	**Arlington Road Area** The LTN scheme has been introduced through Experimental Traffic Orders in September 2020. The following vehicles are exempt from the restrictions to motorised traffic introduces in the area: • Pedal Cycles • Any vehicle acting on behalf of a Police Constable or Unformed traffic warden • Emergency Vehicles • Waste lorries • Council Vehicles in pursuance of statutory purposes **Neighbourhood of the future (Netherhall Gardens/Maresfield Gardens)** A longer list of exemptions has been developed for the Neighbourhood of the Future scheme. This scheme differs from a traditional LTNs as the traffic restriction are only in place during school start and end time, making the proposal more similar to a School Street scheme.

Borough	Approach to exemptions
	• Residents of the affected roads, including those with driveways; • Businesses with valid parking permits registered to an address in the Healthy School Street zone; • Blue badge holders who need to visit a residential or business address in the Healthy School Street Zone. Blue badge holders cannot be given an exemption simply to drive through the HSS zone on their journey from A to B; • Carers who need to visit an address in the HSS zone as a carer for a resident; • Vehicles providing transport to Special Educational Needs and Disabilities (SEND) schools in the borough or delivering SEND pupils to those schools in the Healthy School Street zone; • School coaches and/or private minibuses (e.g. those funded by NW3 School Run Group) providing transport to pupils attending schools in the HSS; • Pure electric vehicles (0g/km CO_2); • Refuse vehicles.
Croydon	**Broad Green LTN** All residents can apply for LTN Driving permits. Eligibility is based on registration on the electoral roll or by a named Council Tax Bill. It is stated that no permits or exemptions will be provided for visitors.
Ealing	**Low Traffic Neighbourhoods** • Emergency Vehicles and Waste Collection vehicles will maintain access • Blue Badge Holders residing within the LTN can apply for a specific permit (this is free of charge) but requires them to apply by supplying proof of residency and vehicle registration document
Lewisham	**Lewisham and Lee Green LTN** Camera enforced restrictions are in place at 5 locations with different exemptions at each: • Manor Lane – all vehicles can pass barring HGVs • Manor Park – Driving southbound is prohibited for all vehicles. • Ennerdale Road – Driving east to west is prohibited. • Dermody Road – Driving east to west is prohibited. • Leahurst Road – Driving east to west is prohibited. Driving west to east is prohibited for HGVs Exemptions are available for all Blue Badge Holders who are residents in Lewisham; they need to submit a request for a specific permit supplying blue badge number, address and vehicle registration documents.
Hounslow	**South Chiswick LTN** All residents within a list of addresses included in the LTN can apply for permits based on their vehicle's registration address. There is no specific exemption for Blue Badge Holders.
Hackney	**Low Traffic Neighbourhoods** No exemptions are currently available to any categories, other than emergency vehicles, buses (at bus gates) Exemptions for people with disabilities are currently under review at specific locations.
Southwark	**Dulwich and Walworth LTNs** Southwark Council has recently (April 2021) granted Blue Badge holders an exemption to drive through modal filters and Bus Gates in Low Traffic Neighbourhoods in Dulwich and Walworth.

Borough	Approach to exemptions
	The exemption is limited to Blue Badge holders living within two defined LTN areas and is not open to Blue Badge holders who may want to drive through the LTN as part of a longer journey. Blue Badge holders may nominate one vehicle for exemption – either their own or a carer's.
Tower Hamlets	**Low Traffic Neighbourhoods** The existing LTNs have been classified using an ABC system, based on a range of criteria such as presence of key attractors (school, green spaces), geographical characteristics, air quality, journey time impact. Each category has been assigned a different exemption strategy: A - blue badge holder living within the restricted areas B - all blue badge holders and registered carers C – all of B plus electric vehicles and electric taxis

4.7 A recent survey was undertaken by the London Technical Advisers Group (LoTAG) among London Boroughs, to investigate the approaches taken in the development of LTNs. Eight local authorities responded to the questionnaire anonymously, with an equal split between Inner and Outer Boroughs.

4.8 One of the questions relates to the type of exemptions introduced (see results below); most respondents highlighted that exemptions were only in place for emergency vehicles and waste lorries.

What types of users / vehicles are exempt from camera enforcement? (Sample of 8)

	Responses	Percentage
Emergency vehicles on blue lights	7	88%
Emergency vehicles on routine patrols	6	75%
Council refuse & re-cycling vehicles	6	75%
Buses	3	38%
Carers visiting residents	1	13%
NHS staff	1	13%
Car club vehicles	1	13%
Blue Badge holders	1	13%
Licensed taxis (black cabs)	1	13%
Residents	1	13%
Private hire vehicles (minicabs)	0	0%

4.9 The response to the survey paints a different picture from the one provided in the summary table summarizing experience in seven Boroughs, however the pool of local authorities might be different. Other findings of the survey include:

- In only 1 of 8 cases, all or most point closures are enforced using cameras
- In 3 out of 8 cases the point closure was introduced using bollards, in 5 cases without any physical barriers

Impacts of exemptions on traffic flows along residential streets

4.10 The key objective of the People Friendly Streets schemes is to make neighbourhoods better and safer, for living, working and playing, for everyone. This is achieved by reducing traffic

dominance on residential streets and creating more space for everyone to enjoy their neighbourhoods as they walk, wheel and cycle around.

4.11 The reduction in traffic on residential roads is achieved by removing some of the potential shortcuts using residential roads as alternative to principal roads and encouraging people to undertake shorter trips by active modes, whilst access to all addresses is maintained for residents, businesses and visitors. The impact on such trips is an increase in journey length and time, but not a limitation on the trips themselves.

4.12 As such, whilst the introduction of exemptions could be perceived as a way to allow more traffic to use the streets, this is not necessarily true in all scenarios.

4.13 Exemptions targeted at users living in the neighbourhood would not necessarily add any additional journey on the residential network, as those vehicles would be routing through the residential streets in the LTNs independently from the presence of restrictions. Potentially, the exemption would actually make some of these trips shorter by avoid long rerouting (as those observed in the analysis of the Amwell PFS), reducing the overall impact on the neighbourhood.

4.14 On the other hand, exemptions could increase motorised traffic flows by reducing the incentive to switch modes. As such, it may be appropriate to limit exemptions to users that may find it disproportionately difficult to switch to non-car modes of travel.

4.15 The only net increase in car movements in this scenario would be observed along the street(s) where the restriction is in place, but it is likely to be counterbalanced by decreases along other routes.

4.16 Exemptions allowing certain types of vehicles (e.g. all Blue Badge Holders, Taxis etc.) to drive through a LTN even if their origin and destination are outside the area, can result in an overall increase in the number of trips in the LTNs.

4.17 Whilst it is extremely difficult to determine how many vehicles traveling on a typical street would undermine the benefit realisation of the low traffic neighbourhood scheme by compromising a safe environment for pedestrians and cyclists, TfL's Healthy Streets Check for Designers provides a set of thresholds that should be used in assessing the quality of the street environment for cyclists, pedestrians and users in general.

4.18 In particular, the key figures quoted in the tool are:

- 500 vehicles/hour is the maximum bi-directional peak flow recommended on streets where cyclists share the carriageway with motorised traffic;
- 200 vehicles/hour is the maximum bi-directional peak flow recommended on streets where pedestrians can perform uncontrolled crossing safely;
- 55 vehicles/hour is considered the maximum bi-directional peak flow that minimises the impact of traffic on noise values (<58 dB)

4.19 Based on the objectives of the People Friendly Streets schemes, prioritising both pedestrians and cyclists, it is recommended that 200 vehicles/hour should be considered a target for all streets within the LTNs, with the aim of achieving even lower volumes on some of the quieter roads.

Combined impacts of LTNs on journey times

4.20 This study has focused on assessing the impacts of restrictions on journey lengths and times across three selected LTNs, using 2019 speed data to quantify both pre- and post-implementation results, separating the impacts of individual LTNs. As such, this work has not taken into account the cumulative impact resulting from any potential reassignment of traffic across the road network as effect of the LTNs introduced so far across the Borough.

4.21 The main rationale behind this methodology is that many of the impacts currently observed on the road network are short-term impacts, determined by the immediate response to the introduction of the new schemes and severely affected by the disruptions to travel patterns caused by the Covid-19 pandemics: as such, a neutral approach focusing on pre-implementation journey times (2019) was deemed preferable. By making use of 2019 data, unaffected by the perturbations caused by the Covid-19 pandemics, this study aims at minimising the short-term changes in travel times and focuses on the route choice - related changes, which will remain applicable in the longer term.

4.22 It is recommended that combined impacts relating to the simultaneous introduction of PFSs, as well as the impacts of potential exemptions to the restrictions, should be monitored and assessed regularly going forward, with more traffic data becoming available and the coverage of telematic data becoming more extensive and detailed.

4.23 In particular it is recommended that a review of traffic data (including considerations on cumulative impacts) should be when undertaken 12 months' worth of data unaffected by lockdowns is available (most likely mid-2022) and repeated 12 months after. This is in line with the recommendations from DfT on post-implementation monitoring (1 year and 2 years after implementation). These reviews can be timed in parallel with other scheduled monitoring exercises, finding efficiencies in the gathering and analysis of data.

4.24 A consistent policy, with LTNs rolled out across the entire Borough, can potentially have a more substantial impact on people decisions in regard to modal choices, supporting the realisation of the objective set by the People Friendly Streets schemes of encouraging the replacement of car trips with walking, wheeling or cycling trips.

Future reviews of the impacts of restrictions and exemptions on congestion levels

4.25 The long-term effect mentioned above might not be easily appreciated at this early stage of the roll-out process and will require regular monitoring and review of traffic data to understand impacts of restrictions and exemptions. These should be conducted at regular intervals throughout the roll-out programme and after completion.

4.26 This study has highlighted the challenges of gathering reliable and comprehensive traffic data: whilst the telematic data used for this study presented some gaps in coverage that required the integration of different data sources, the coverage of telematic data has improved since 2019 and will allow more detailed and accurate analysis of travel patterns in the future.

4.27 Islington Council is currently rolling out a monitoring strategy which includes analysis of telematic data supplemented by on-street traffic surveys across the Borough road network.[2] These data can feed into in the definition and future review of exemption strategies.

[2] Monitoring reports are published for each area included in the PFS programme and available online.

Impacts of restrictions and exemptions on travel costs

4.28 Increases in journey time can impact cost in a variety of ways:

- Increased fuel costs,
- Increased maintenance cost;
- Costs associated with loss of time;
- Costs associated with alternative mode of travel; and
- Quantifiable benefit associated with modal shift to active travel.

4.29 It is assumed that the journeys considered for exemption, undertaken by car by people with disabilities, may be particularly difficult to be undertaken by a different mode. As such the quantifiable benefits associated with modal shift to active travel and the cost associated with alternative modes have not been analysed in detail.

4.30 This report does not provide an assessment of the cost of journey time increases resulting from the changes introduced on the road network by the three PFSs under investigation, however it provides an indication of the tools available for such assessments.

4.31 It is important to highlight that monetary costs only represent a proportion of the costs and impacts that users (and specifically people will disabilities) can experience as effect of a change in their travel patterns. These should be captured by an Equality Impact Assessment to be undertaken prior to the implementation of each LTN scheme.[3]

Fuel and Maintenance

4.32 The use of the road system by private cars and lorries gives rise to operating costs for the user. These include the obvious costs of fuel, oil and tyres, and an element of vehicle maintenance. Guidance for the estimation of these costs are provided by the Department for Transport as part of the Transport Analysis Guidance for Business Cases (TAG) and by HMRC. Both cost models are outlined below and can be considered in the assessment of journey time impacts.

4.33 TAG Unit 3.5.6 provides guidance for the assessment of vehicle fuel and maintenance cost[4]. Fuel consumption is estimated using a function of the form:

$$L = a + bv + cv^2 + dv^3$$

Where:

L = consumption, expressed in litres per kilometre;

v = average speed in kilometres per hour;

and a, b, c, d are parameters defined within TAG Unit 3.5.6 for each vehicle category

4.34 Based on typical parameters for an average car, and on an average speed of 20mph, the value of L is 0.093 litre/km.

[3] EqIAs have been already undertaken for all LTNs introduced as part of the PFS programme and are available on Islington Council's website.

[4] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/940962/tag-a1-1-cost-benefit-analysis.pdf

4.35 HMRC Government guidance[5] outlines an amount that employees can be paid to cover fuel and maintenance costs when driving for business purposes. This is summarised in the table below:

Table 4.1: Values of Mileage Allowance Payments

	First 10,000 miles	Above 10,000 miles
Cars and vans	45p	25p
Motorcycles	24p	24p
Bikes	20p	20p

Source: HMRC Guidance

Value of Time

4.36 Time spent travelling is valued in WebTAG, the Department for Transport's standard on transport analysis guidance.

4.37 Table 4.2, below, provides the values of working travel time savings per person, by mode, that should be used in transport appraisal. The recommended values for all non-working trips are shown in Table 4.3. The values given in this table are averages which include retired persons in the calculations.

Table 4.2: Value of Working Time per person (£ per hour)

Vehicle Occupant	Resource Cost	Perceived Cost	Market Price
Car driver	22.74	22.74	27.06
Car passenger	17.25	17.25	20.52
LGV (driver or passenger)	10.24	10.24	12.18
OGV (driver or passenger)	12.06	12.06	14.35
PSV driver	12.32	12.32	14.66
PSV passenger	13.97	13.97	16.63
Taxi driver	10.89	10.89	12.96
Taxi/Minicab passenger	21.96	21.96	26.13
Rail passenger	26.86	26.86	31.96
Underground passenger	22.08	22.08	26.28
Walker	17.54	17.54	20.88
Cyclist	17.47	17.47	20.78
Motorcyclist	19.42	19.42	23.11
Average of all working persons	22.75	22.75	27.07

Table 4.3: Value of Non-Working Time per person (£ per hour)

Purpose	Resource Cost	Perceived Cost	Market Price
Commuting	5.72	6.81	6.81
Other	5.08	6.04	6.04

[5] https://www.gov.uk/expenses-and-benefits-business-travel-mileage/rules-for-tax

5 Conclusions and Recommendations

5.1 This report has provided an assessment of the impacts of the introduction of People Friendly Streets schemes on journey times and lengths undertaken by car by people with disabilities.

5.2 As mentioned in the introduction, traffic restrictions have been introduced as part of the PFS programme through experimental traffic orders, and no exemptions have been initially introduced (except for emergency services) for the following reasons:

- ***To maintain access to all streets,*** *the schemes have been designed so that all residents can access their homes. The only thing that may change in some circumstances is the route they have to take.*
- ***To create a safer environment for people to walk, wheel and cycle.*** *By preventing all motor vehicle trips through camera-controlled filters (except for emergency vehicles) the scheme will make the environment feel much safer and make it much more likely that local people will begin to travel more by active means.*
- ***To reduce congestion and air pollution on the main roads.*** *The objective of people friendly streets is to reduce the overall number of trips. This will only happen if some car trips are replaced by walking, wheeling or cycling.*

5.3 These aims have to be considered also in light of the Council's commitment towards a fairer Islington, outlined in the principles of the Fairer Together Islington Partnership, including:

- *Everyone – whatever their background – has a decent chance for a long and healthy life, lived on their own terms;*
- *Older people and vulnerable users live healthier, happier, longer and more independent lives;*
- *Everyone feels connected and having as much social contact as they want;*
- *People live healthy, independent lives, with access to good quality care and support when they need it.*

5.4 Whilst the introduction of the LTNs is being undertaken following the principle of retaining accessibility to all streets, the changes brought to some journeys can affect the ability to travel and access services for the most vulnerable residents. It is also important to recognise that people with different disabilities have different needs, movement patterns, views and opinions in regards to the impacts caused by Low Traffic Neighbourhoods: whilst some might be impacted by the loss in accessibility, some might be disproportionately by high volumes of traffic. It is important that the potential impacts are investigated and mitigated where possible.

5.5 The findings of the analysis show that the introduction of restrictions to motorised vehicles has an impact on the length and time of journeys undertaken by people with disabilities, with the potential result of making their everyday life harder. Moreover, the study has found that

the impact of the restrictions on short journeys is significantly higher than the impact on long journeys, in all scenarios (small, medium and large PFS).

5.6 Based on this outcome and on the review of the scheme objectives, as well as on comparison with other Boroughs, it is recommended that an exemption covering only Blue Badge Holders residing in each LTN would provide an appropriate balance between fulfilling the PFS Scheme objectives and mitigating the impact on journeys undertaken by people with disabilities.

5.7 Journeys to/from further afield (including journeys between two separate LTNs) appear to be proportionally less impacted by proposed restrictions: retaining the current restrictions for those travelling not living within the LTN and travelling from further afield is considered an acceptable compromise to be made in order not to jeopardise the success of the traffic reduction scheme.

5.8 Engaging with people with disabilities prior to implementation of exemption measures will be important to understand specific needs and impacts in more detail. Moreover, engagement with neighbouring Boroughs should be pursued in order to coordinate exemption strategies where possible: this would greatly reduce the risks of misunderstandings and increase levels of compliance.

5.9 It is recommended that combined impacts relating to the simultaneous introduction of PFSs, as well as the impacts of potential exemptions to the restrictions, should be monitored and assessed regularly going forward, with more traffic data becoming available and the coverage of telematic data becoming more extensive and detailed. Data for these further reviews and assessments is already being collected as part of the monitoring exercise for each LTN.

Appendix A - List of routes

Number	Route_ID	LTN	Easting- Origin	Northing -Origin	Easting- Destination	Northing -Destination
1	1	Small	531030.8	182915.1	531250.7	183383.3
2	2	Small	531250.6	183382.4	531032.7	182916.1
3	3	Small	531039.4	182663.7	531299.3	182593.1
4	4	Small	531030.2	182912.8	530611	183154.5
5	5	Small	530614.4	183147.7	531031.3	182910.9
6	6	Small	531321	182897.3	530819.1	182794.8
7	7	Small	530849.7	182677.5	532154.8	183698.7
8	8	Small	531291.7	182875.5	530994.4	182509.9
9	9	Small	531000.1	182518.9	531430.5	184132.7
10	10	Small	531229.6	183378	530992.5	182515.9
11	11	Small	530981.8	182526	531043.3	182913.9
12	12	Small	531040.7	182665.6	531302.9	182592.6
13	13	Small	532485.1	185283	530984.3	182525.3
14	14	Small	531042	182662	532116.7	186288.1
15	15	Small	532116.7	186288.1	531038.2	182663.1
16	16	Small	531037.3	182663.3	532485.7	185286
17	17	Small	532253.7	183758.9	530827.3	182666
18	18	Small	530847.3	182671.1	531130.3	182773.9
19	19	Small	530980.5	182520.6	532254.8	183769.8
20	20	Small	532249.6	183767.5	530912.4	182853.1
21	21	Small	531099.7	182850.2	530441.1	183092
22	22	Small	530439.7	183090.4	531100.8	182848.8
23	23	Small	532486.7	182701.7	530413.9	183075.6
24	24	Small	530413.4	183093.4	532474.4	182702.1
25	25	Small	531040.4	182663.2	531481.1	186793.7
26	26	Small	531481.1	186793.7	531037.6	182662.9
27	27	Small	531042.1	182666.1	529373	186724

Number	Route_ID	LTN	Easting- Origin	Northing -Origin	Easting- Destination	Northing -Destination
28	28	Small	529151.7	186995.9	531041.6	182666
29	29	Small	531349.9	182894.5	530802.3	182845.4
30	30	Small	530796.6	182850.1	532464.4	184005.1
31	31	Small	531439	182061.4	531129.2	182774.1
32	32	Small	529635.8	187183.1	530915	182856.8
33	33	Small	530924.1	182854.8	529641.8	187183.2
34	34	Small	531041.6	182665.1	531088.6	185348.8
35	35	Small	531054.1	185359.1	531041.2	182664.7
36	101	Medium	532655.1	184023.3	532097.2	186270.1
37	102	Medium	532116.7	186288.1	532649.3	184029.8
38	103	Medium	532655.8	184281.5	532663.7	184485.6
39	104	Medium	532662.6	184486.7	532655.4	184281.9
40	105	Medium	532656.3	184281	529939.4	186939.7
41	106	Medium	529948.4	186939.9	532654.6	184282.6
42	107	Medium	532656.1	184281.1	532495.2	184693.2
43	108	Medium	532495.2	184693.6	532655.4	184280.8
44	109	Medium	532663.5	184485.5	530088.4	187633.5
45	110	Medium	530083.9	187634.8	532660.1	184486.2
46	111	Medium	532654.7	184279.6	531393.6	185888.8
47	112	Medium	531400.9	185893.5	532654.6	184281.9
48	113	Medium	532871.3	184028.6	531415.7	185843.1
49	114	Medium	531415.7	185843.1	532858.6	184029
50	115	Medium	532647.1	184023.1	532883	184752.5
51	116	Medium	532884.8	184752.4	532650.8	184025
52	117	Medium	532868.4	184031.8	529700.9	185955.9
53	118	Medium	529700.9	185955.9	532864.9	184022.8
54	119	Medium	532495.8	184692.5	532864.4	184037
55	120	Medium	532862	184023.6	532495.6	184692.7
56	121	Medium	532940.3	184428.9	531285.6	182881.3
57	122	Medium	531307.8	182886.4	532946.1	184433.5
58	123	Medium	532946.3	184429	530670.5	184111.5
59	124	Medium	530679.4	184111.8	532944.7	184430.5
60	125	Medium	532653.2	184022.9	530818.2	187372

Number	Route_ID	LTN	Easting- Origin	Northing -Origin	Easting- Destination	Northing -Destination
61	126	Medium	530818.2	187372	532649.4	184025.7
62	127	Medium	532652.7	184026.6	531478.8	185586.7
63	128	Medium	531478.8	185586.7	532650.9	184023.2
64	129	Medium	532656.8	184281	530763.4	185838.5
65	130	Medium	530756.8	185838.3	532655.9	184281
66	131	Medium	532664.5	184486	532750.8	183803.6
67	132	Medium	532750.9	183803.1	532663.4	184486.5
68	133	Medium	532881.9	184753.3	531249.9	183382.6
69	134	Medium	531249.9	183382.8	532881.9	184753.3
70	135	Medium	532250.7	183766.6	533360.3	184785.4
71	136	Medium	533369.3	184781.2	532250	183764.6
72	137	Medium	532939.6	184426.6	532341.3	184486.2
73	138	Medium	532336.9	184483.5	532947.5	184426.8
74	139	Medium	532495.1	184694.1	532862.6	184014.2
75	140	Medium	532867.6	184021	532496.7	184691.3
76	141	Medium	532499.5	183984.1	529866.9	187412.5
77	142	Medium	529866.9	187412.5	532482.2	183986.1
78	143	Medium	532655.2	184280.4	529750.7	185542.4
79	144	Medium	529755	185551.4	532653.5	184282.2
80	145	Medium	532470.2	184336.9	532021.7	186397.3
81	146	Medium	532021.7	186397.3	532485.7	184346.9
82	147	Medium	532662.9	184486.6	532081	185055.5
83	148	Medium	532664.4	184485.9	532075	185056.8
84	149	Medium	532662	184487.9	532499.5	183984.1
85	150	Medium	532494.7	183976.5	532664.2	184485.2
86	151	Medium	532663.5	184485.5	531602.9	183796.4
87	152	Medium	531602.9	183796.4	532663.5	184485.5
88	153	Medium	532851.4	184031.4	529142.1	187020.7
89	154	Medium	529142.1	187020.7	532857.8	184029.7
90	155	Medium	532663.5	184485.5	531590.8	182173.1
91	156	Medium	531590.8	182173.1	532663.5	184485.5
92	157	Medium	532616.4	183849.6	530144.7	187296.1
93	158	Medium	530140.6	187224.7	532612.7	183848.8

Number	Route_ID	LTN	Easting- Origin	Northing -Origin	Easting- Destination	Northing -Destination
94	301	Large	531402	185890.7	532494.6	185403.6
95	302	Large	531333.5	185354.7	530839.8	187346.8
96	303	Large	531765.4	185495.9	529583.9	187071.4
97	304	Large	531716.2	186246.2	531333.5	185354.7
98	305	Large	531725.1	186245	530903	182841.3
99	306	Large	531754.5	185112.9	531468.8	186403.1
100	307	Large	531745.6	185109.4	530890.3	182841
101	308	Large	531796.6	185783.3	529318.6	186518.4
102	309	Large	531789.1	185784.6	531401.2	185891.8
103	310	Large	532163.3	186306.5	531019.4	185071.3
104	311	Large	532097.7	186270.7	531135.7	185523
105	312	Large	532102.8	186262.5	530277.6	183847.4
106	313	Large	532234.4	185064.2	531468.8	186403.1
107	314	Large	531957.4	185410.4	531596.7	185692.6
108	315	Large	531836.3	185782.3	529630.7	187164.5
109	316	Large	531132.5	185529.1	532935.9	184939.4
110	317	Large	531675.2	186216.1	530557.4	186098.7
111	318	Large	531669.9	186220.4	531218.3	183376.2
112	319	Large	531542.5	185918.1	531766.7	185492.3
113	320	Large	531544.1	185901.8	530854	185896.2
114	321	Large	532496.1	185406	531133.8	185527.4
115	322	Large	532097.2	186270.1	531478	185542.2
116	323	Large	531761.9	185496.1	531681.7	186214.9
117	324	Large	531134.2	185525.2	529358.7	186684.4
118	325	Large	531333.5	185354.7	531335.6	183243.6
119	326	Large	531793.5	185783.7	529185.5	185987.7
120	327	Large	532234.2	185056.8	531468.8	186403.1
121	328	Large	531596.7	185692.6	529207.6	186968.4
122	329	Large	531950.1	185400.3	530460.5	187202.3
123	330	Large	531763	185492	531568.2	185862.8
124	331	Large	531953.7	185799.1	530025.5	185283.5
125	332	Large	531766.1	185487.8	531437.8	186663.8
126	333	Large	532097.2	186270.1	530443.3	185076.3

Number	Route_ID	LTN	Easting- Origin	Northing -Origin	Easting- Destination	Northing -Destination
127	334	Large	531135.3	185524.8	532655.1	184023.3
128	335	Large	530029.6	184556.6	531672.9	186238.7
129	336	Large	532097.7	186270.7	529207.6	186968.4
130	337	Large	531468.8	186403.1	531970.5	183475.1
131	338	Large	532494.6	185403.6	531402	185890.7
132	339	Large	530839.8	187346.8	531333.5	185354.7
133	340	Large	529583.9	187071.4	531765.4	185495.9
134	341	Large	531333.5	185354.7	531716.2	186246.2
135	342	Large	530903	182841.3	531725.1	186245
136	343	Large	531468.8	186403.1	531754.5	185112.9
137	344	Large	530890.3	182841	531745.6	185109.4
138	345	Large	529318.6	186518.4	531796.6	185783.3
139	346	Large	531401.2	185891.8	531789.1	185784.6
140	347	Large	531019.4	185071.3	532163.3	186306.5
141	348	Large	531135.7	185523	532097.7	186270.7
142	349	Large	530277.6	183847.4	532102.8	186262.5
143	350	Large	531468.8	186403.1	532234.4	185064.2
144	351	Large	531596.7	185692.6	531957.4	185410.4
145	352	Large	529630.7	187164.5	531836.3	185782.3
146	353	Large	532935.9	184939.4	531132.5	185529.1
147	354	Large	530557.4	186098.7	531675.2	186216.1
148	355	Large	531218.3	183376.2	531669.9	186220.4
149	356	Large	531766.7	185492.3	531542.5	185918.1
150	357	Large	530854	185896.2	531544.1	185901.8
151	358	Large	531133.8	185527.4	532496.1	185406
152	359	Large	531478	185542.2	532097.2	186270.1
153	360	Large	531681.7	186214.9	531761.9	185496.1
154	361	Large	529358.7	186684.4	531134.2	185525.2
155	362	Large	531335.6	183243.6	531333.5	185354.7
156	363	Large	529185.5	185987.7	531793.5	185783.7
157	364	Large	531468.8	186403.1	532234.2	185056.8
158	365	Large	529207.6	186968.4	531596.7	185692.6
159	366	Large	530460.5	187202.3	531950.1	185400.3

Number	Route_ID	LTN	Easting- Origin	Northing -Origin	Easting- Destination	Northing -Destination
160	367	Large	531568.2	185862.8	531763	185492
161	368	Large	530025.5	185283.5	531953.7	185799.1
162	369	Large	531437.8	186663.8	531766.1	185487.8
163	370	Large	530443.3	185076.3	532097.2	186270.1
164	371	Large	532655.1	184023.3	531135.3	185524.8
165	372	Large	531672.9	186238.7	530029.6	184556.6
166	373	Large	529207.6	186968.4	532097.7	186270.7
167	374	Large	531970.5	183475.1	531468.8	186403.1

Control Information

Prepared by	Prepared for
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Steer project/proposal number	**Client contract/project number**
24079401	
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Version control/issue number	**Date**
V2.1 Final Issue	10 June 2021

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QUALITY SYSTEM CERTIFICATION
DNV·GL
ISO 9001:2015

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