Emergency Active Travel Tranche 1: Cowley LTN Evaluation report

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Emergency Active Travel Tranche 1: Cowley LTN Evaluation report

Executive summary

This report covers analysis across a series of key areas, both within the Low Traffic Neighbourhoods (LTNs) themselves, and on their boundary roads (defined as the roads immediately surrounding the LTNs, which are not impacted by the traffic restrictions imposed).

The pandemic made this evaluation particularly challenging, as we could not rely on historic trends. Over the preceding year, there were periods of lockdown, schools and university closures, furloughed positions and a high number of employees working from home. This was followed by a much less constrained picture, whereby 15 million people in the UK had received the first dose of their COVID vaccinations by mid-February, and 32 million doses were received by mid-April. This change alone allowed significantly more freedom of movement and associated increases in traffic levels were seen generally. The challenge has been to isolate the effect of LTNs from other factors.

Where possible, a baseline for monitoring sources has been set before COVID-19. This was combined with comparison sites, used to better understand how Low Traffic Neighbourhoods have impacted the area, by comparing the changes in travel patterns with other locations that would reflect other confounding factors, such as COVID restrictions. The key conclusions from this analysis are given below:

Primary effects: LTN area
- Car counts within the LTNs have decreased by 42% in March through November from 2019 and in proportion to traffic flow changes in comparison sites. From July through November, this proportional reduction in car counts is even greater, at 51.2%.
- There was an initial settling period for the schemes, up to two months after implementation.
- Pedestrian volumes within the LTNs have increased by 19% in March through November from 2019, in proportion to pedestrian volume changes in comparison sites.
- Cycling volumes within the LTNs increased by 22.5% in March through November from 2019, in proportion to cycling volume changes in comparison sites, once pre-LTN trends were factored out. It is worth noting, however, that cycling levels in the LTNs started off comparably significantly lower than in control areas in relation to 2019 levels.
- Vehicle speed data suggest that traffic speeds have increased within the LTNs between 2019 and 2021. This should be considered in future schemes.

- Overall, within LTNs we have found the intervention to have a pronounced positive effect, with significant decrease in car traffic and a relative increase in active travel.

Secondary effects: LTN boundary roads
- We have found car traffic volumes on boundary roads to have increased by 3.1% compared with 2019 levels, in proportion to control sites. However, this is an average number and the effect at specific times might be more pronounced and can be seen to be different in locations. Rose Hill North has experienced the greatest increase in traffic of the roads monitored (10.8%).
- Data from bus services suggest that the PM peak outbound bus services have been negatively impacted, in comparison to control routes, for routes on both Cowley and Iffley Roads.
- Air quality data indicates that while air pollution (levels of NO2) in March through October has reduced on LTN boundary roads by 8% since pre-COVID levels, it has done so less than in comparison sites, which have experienced a 17% reduction on average, suggesting a relative 9% increase in air pollution.
- South Central Ambulance Service (SCAS) Optima Predict emergency response simulation found that impact on SCAS performance at the local level is minimal.
- Overall, on the boundary roads, we find that on average there has been a small comparative increase of overall car traffic (3.1%) which is likely to be more pronounced during peak times and has impacted relative air quality levels and bus services, but not emergency services.

Additionally, perception surveys were deployed to assess changing perceptions and responses to the LTNs' implementation over time. It should perhaps be noted that public perceptions of increased traffic and/or reduced air quality may be partly due to the public comparing a period of extremely low traffic in 2020 and early 2021.

Key findings from this survey are:

- LTNs have been a polarising topic, and over time people have moved to either strongly support or oppose them.
- The positive aspects often quoted include the attractiveness of the LTN area, reduction in traffic noise, improved air quality, higher perception of safety for cyclists due to reduced car traffic, and increased social interaction.
- Street space taken by parked cars was highlighted as a barrier to social interaction.
- There was a general acknowledgement of trade-offs, with some residents recognising that while LTN residents experience the benefits, others experience potential downsides.
- The most common objection relates to the reduced convenience and ease of travel by car. This was linked to complains about longer and more complicated car journeys.
- There is a recognition of increased cycling and reduced car travel in LTNs, as well as an increase in bus travel. Walking has also increased, supported by the creation of a more attractive area and with less noise.

- Concerns were raised that reduced passing traffic might create an unsettling environment, particularly after dark. Special care needs to be taken in ensuring the LTNs create lively areas that are and feel safe.

Overall, the LTNs seem to be an effective measure to improve active travel and the quality of life of their residents with far-reaching implications. However, there are important learnings to consider, regarding the increased traffic volumes in boundary roads and inconvenience to some car users.

Two unintended consequences to incorporate in future proposals are the impact on public transport, which might be supported to mitigate the extra traffic demand on boundary roads causing delays to services, and creating vibrant communities within LTNs.

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Introduction

To provide assurance, capture learnings and guide future decision making, Oxfordshire County Council set out an extensive evaluation framework of the active travel interventions. This work was led by the Innovation HUB's Future of Mobility team, and was conducted in collaboration with leading universities, businesses and City and other County Council teams.

This evaluation framework was originally established for the DfT funded Tranche 2 Emergency Active Travel Fund intervention. The Cowley LTNs were funded under Tranche 1 of the Emergency Active Travel Fund and therefore were originally out of scope. However, due to the overlap with the Tranche 2 Active Travel schemes such as the East Oxford LTNs and Quickways, the framework has been extended for a bespoke evaluation to capture learnings and inform decision making.

Due to the period during which the interventions took place, and of the COVID pandemic effects, there are significant variations and complications in the data analysis. This report uses the metrics suggested in the original submission, along with ones raised in interactions with local stakeholders.

In the following sections the methodology and evaluation, using individual metrics, will be presented first. These relate to traffic volume, speed, air quality, public transport and emergency services. The noise pollution work is still underway, and we have provided an update in the appendices. Then, we will look at the analysis of the surveys undertaken, especially regarding travel choices, attitudes towards cycling and walking, and perception of safety. We close with our conclusion combining the individual metrics and with some recommendations for future schemes.

Background

From March 2021, Oxfordshire County Council introduced a trial of three Low Traffic Neighbourhoods (LTNs) within the Cowley area. A Low Traffic Neighbourhood is an area where through-traffic is prevented so that residents can enjoy a quieter neighbourhood and feel safer when they walk, cycle or go by wheelchair[i].

This meant the introduction of traffic filters at specific points across Church Cowley, Temple Cowley and Florence Park. Traffic filters are either planters or bollards, (see Appendix A for a map of locations). Note, camera-controlled filters were not in place during the period of analysis for this report, but are included in the locations map.

The Cowley LTNs were introduced using Experimental Traffic Regulation Orders (ERTOs) following approval by the council in January 2021[ii]. This enables a potential maximum 18-month trial deployment, allowing the Council and residents to assess the impacts before a decision is made regarding their permanency. A decision will be made whether to continue the trial deployment in February 2022, and whether to make it permanent towards the end of the 18-month trial, should the decision in February be to continue the trial.

Low Traffic Neighbourhoods (LTNs) were proposed for Oxford in the Oxford Local Cycling and Walking Infrastructure Plan (LCWIP)[iii] – approved by cabinet in March 2020 – as an effective way of promoting walking and cycling, in line with Council's objectives of public health, decongestion, climate change and air quality, and in line with central government policy. The chronic congestion issues Oxford faces cannot be overcome by building new roads, and a step change in modal shift from private cars to active travel (walking and cycling) is needed.

Temple Cowley, Church Cowley and Florence Park (Cowley) were chosen as priority areas in response to residents' complaints about traffic and to improve the cycle routes running through the neighbourhoods.

In May 2020, in response to the COVID-19 pandemic, the Government issued statutory guidance[iv] as an update to the 2004 Traffic Management Act (TMA)[v] requiring councils to take measures to reallocate road space to promote cycling and walking, including the use of filters to create LTNs.

In July 2020, the Government issued 'Gear Change'[vi], which set out the Government's policies to promote cycling and walking and included an ambition for a roll-out of LTNs across the country. The government committed to spending £2bn in supporting active travel schemes through funding to local authorities. So far, two tranches of funding have been awarded.

The Cowley LTNs were originally proposed as part of the first tranche of Emergency Active Travel Funding, to support requirements under the TMA. Due to resourcing and funding issues, implementation was delayed. The time was used to develop the schemes in more detail with local resident groups and local members.

Following further Government guidance, issued in November 2020, emphasising the need for consultation with the public to ensure local support for the Active Travel

measures, the Council decided to conduct an informal consultation with the public and other stakeholders prior to implementation. This was undertaken in tandem with its statutory obligation to consult with emergency services and other statutory consultees.

Individual metric discussion

COVID-19 and lockdowns have significantly changed travel patterns from March 2020. These changes present a significant confounding factor in monitoring the impact of the LTNs. While COVID-19 impacts have been factored into evaluation methods, caution should be taken in drawing conclusions.

The metrics used for the evaluation are presented below. The key metrics relate directly to the success criteria of the scheme, while additional metrics were recognised as equally important and were included later on. There has also been considerable work on evaluating the impact or monitoring the deployment of other interventions funded by the same grant, such as School Streets, which is out of scope of this report.

Key Metrics	Additional Metrics	Out of scope
• Volume of different modes • Vehicle Speed Change • Perceived Safety • Air Quality (AQ)	• Noise pollution • Emergency Response times • Bus time reliability	• EDI- undertaken by other team • School Streets or Wayfinding • Monitoring of scheme deployment

Figure 1 Metrics used for the evaluation

These metrics used data of numerous sources, ensuring a like-for-like analysis to minimise errors. Direct, and Difference-in-Difference comparisons were used as appropriate and feasible, and an outline of these methodologies is given later in this report, where first used.

Sensor data collection and analysis	Telematic data analysis	Surveys	Information from other services
• Percentage change in walking cycling and cars, modal shift • Air Quality measures • Noise pollution	• Speed analysis • Journey Time	• Perception of Safety • Perception of improvement	• Emergency Services delay • Public Transport reliability

Figure 2 Metrics to date mapping

First, we examine the metrics based on data analysis, before moving to survey analysis.

While other areas of the county may have been impacted by the LTN interventions, we will focus on two types of regions:
- **Primary effects**, on the location that the LTNs were implemented ("LTNs")
- **Secondary effects**, on areas that might be impacted because of the LTN implementation. The main secondary effects we will consider roads adjacent to the LTNs (hereafter referred to as "boundary roads").

Road User Volumes

Both LTNs and boundary roads have been monitored by Vivacity Labs object identification sensors since early 2019. These sensors count and classify a variety of road users including cars, pedestrians and cyclists, using machine vision. No personal data is collected, and the raw images of the camera are not used.

Vehicle counts from 2019 have been set as baseline and the year 2020 has been excluded, as due to COVID-19 it does not represent a period of "Business as Usual".

LTN Boundary Roads

In this evaluation, one Vivacity Labs sensor has been selected from the boundary road for each LTN.

Sensors were selected based on completeness of data during the periods of interest (February-November, 2019 and 2021). These sensors are located at:

- B480 (Cowley Rd) southeast of Marsh Rd
- A4158 (Henley Ave) northwest of Church Cowley Rd
- B4495 (Hollow Way) northeast of Oxford Rd
- B4495 (Church Cowley Rd) at Rymers Ln
- A4158 (Rose Hill Rd) at Ashhurst Way

COVID-19 measures have impacted traffic flows across Oxford in 2021. To account for this, several comparison sites were monitored in other similar areas of Oxford that would have experienced minimal impacts attributable to the LTNs. These sites include

- A4165 (Banbury Road) south of Marston Ferry Road
- A4144 (Abingdon Rd) south of Weirs Ln
- A420 (London Road) east of Headley Way
- B4495 (Headley Way) at London Rd
- A4165 (Banbury Rd) north of A40
- A4144 (Woodstock Rd) south of A40

LTN Area

Vivacity Labs sensors are also monitoring locations within the LTNs. Sensors were selected based on completeness of data during the periods of interest (February-November, 2019 and 2021). These sensors are located at:

- Rymers Ln at Church Cowley Road (Florence Park LTN)
- Cowley Rd north of Newman Rd (Church Cowley LTN)
- Long Ln at Newman Rd (Church Cowley LTN)

COVID-19 measures have impacted traffic flows across Oxford in 2021. To account for this, comparison sites were monitored in other similar roads in Oxford that would have experienced minimal impacts attributable to the LTNs. These sites include:

- Windmill Rd north of St Leonard's Rd
- Ashhurst Way at Rose Hill Rd
- Moreton Rd at Banbury Rd
- Minns Business Park at West Way

Data analysis

LTN Boundary Roads

To monitor the impacts of LTN barriers on vehicle volume, the number of cars passing each sensor in both directions have been combined to calculate a daily average for each month from February through November for Cowley LTN boundary roads and comparison sites.
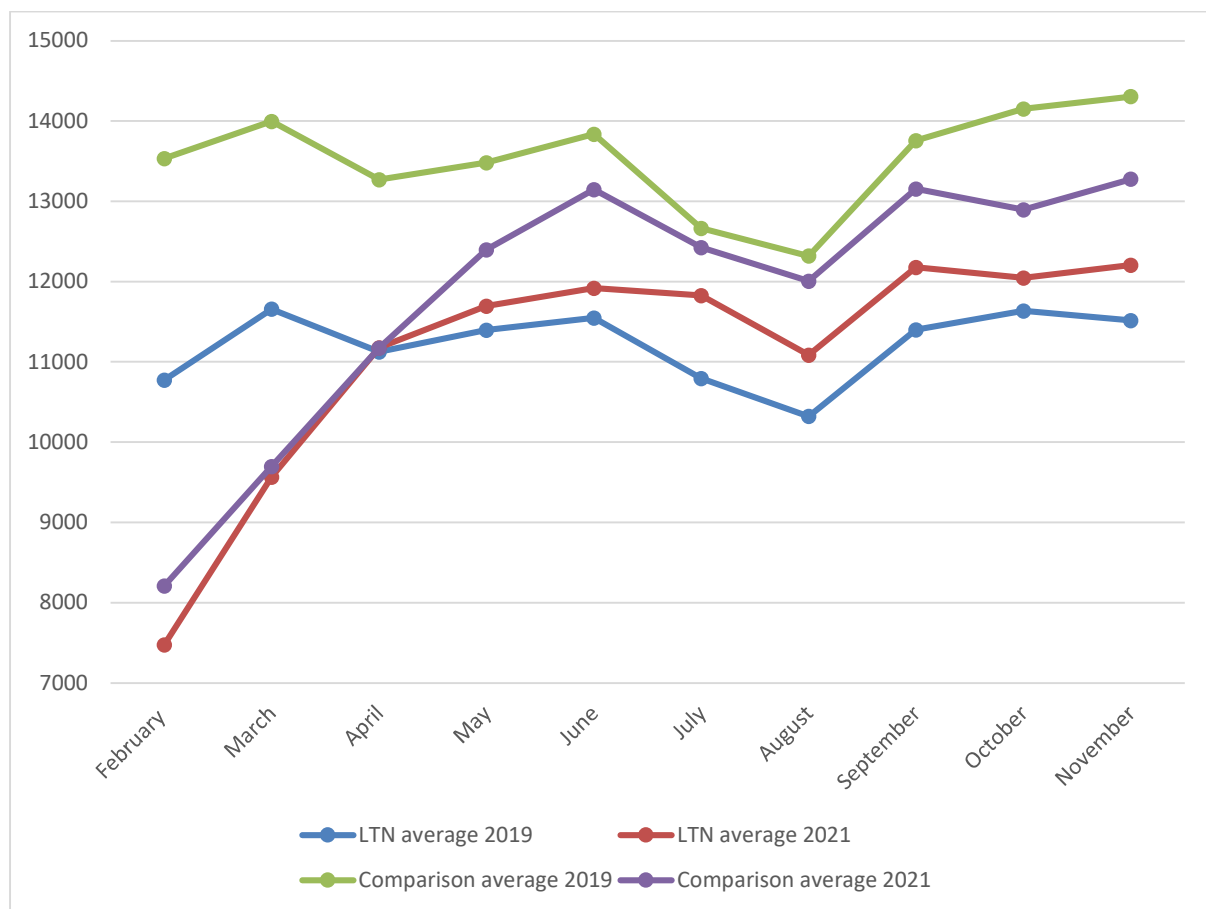
Figure 4 Average daily car counts, Cowley LTN Boundary Roads and Comparison sites, 2019 and 2021

Average daily car counts increased on both the Cowley LTN boundary roads and control sites between February and June 2021 as traffic returned to a more normal pattern following the removal of COVID-19 measures implemented in winter 2020-21. This period coincided with the installation of Cowley LTN barriers in March and April.

From July, traffic volume in 2021 stabilised, roughly tracking traffic volume from 2019. From May 2021, traffic volume on Cowley LTN boundary roads have

exceeded 2019 levels while the average traffic volume at control sites have not reached 2019 levels.

To evaluate the impact of the LTNs on traffic volume, the percent change in traffic volume has been calculated for LTN boundary roads from 2019 to 2021. To account for COVID-19, the percent change in traffic volume has been similarly calculated at control sites. The percent change at control sites from 2019 to 2021 has been deducted from the percent change on LTN boundary roads, creating a "difference-in-difference" metric to help account for variation in Oxford traffic flows over time due to COVID-19 measures.

The following formula has been used to calculate the difference in difference, for each mode (cars, pedestrians or cyclists) separately:

(Change in Volume at intervention area compared to 2019) - (Change in Volume at control area compared to 2019)
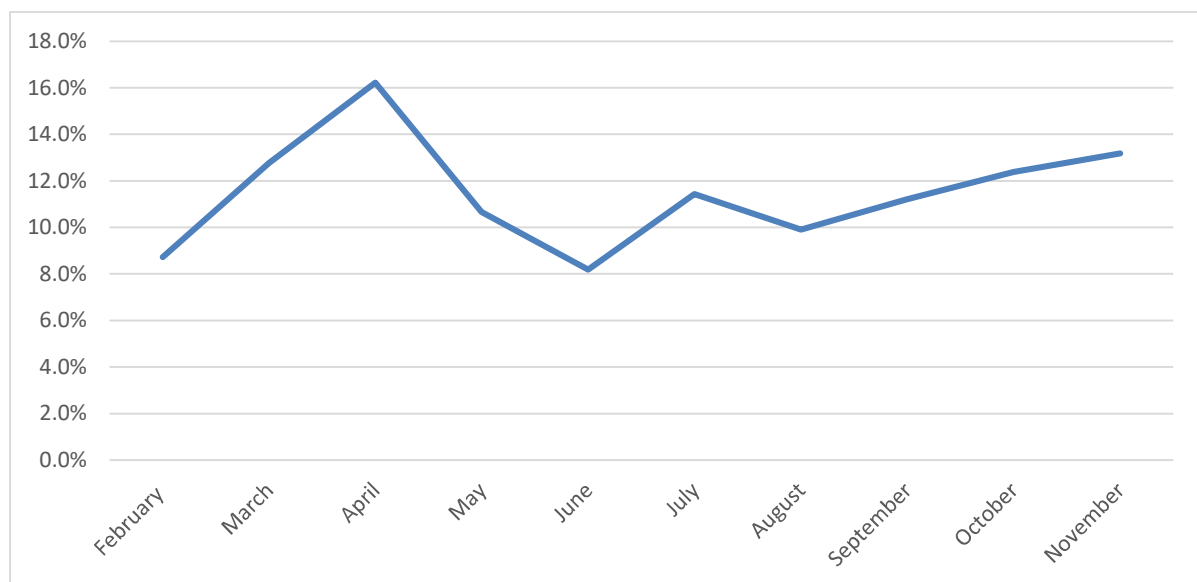
Figure 5 Difference in monthly average change LTN boundary roads to comparison sites (average daily cars)

In February, before any LTN measures were put in place, Cowley LTN boundary roads experienced 8.7% more traffic than comparison sites in proportion to 2019 traffic levels. This appears to be an outlier and suggests that other factors are likely to be impacting on the comparative increased traffic levels on the boundary roads compared to comparison sites. We should therefore be cautious in attributing all of the additional traffic to the LTN.

In March and April, when LTN barriers were installed, there was a significant proportional increase in traffic flows with the difference increasing to a peak of 16.2% in April, which implies that some of the additional traffic was, initially at least, generated by the implementation of the LTNs. This is a significant finding, but not surprising as a "settling period" is predicted in literature, during which time people change their travel habits. While two months is not unusual, this may have been extended by the gradual roll out of the schemes.

Following the initial implementation period, the difference in 2021 traffic volume as compared to 2019 decreased to 8.2% in June, before slowly increasing to 13.2% in November. Overall, from March through November 2021, traffic volume has increased by 11.8% from 2019, in proportion to traffic volume changes in comparison sites. If we deduct the initial difference in difference figure of 8.7% (already apparent in February) from this 11.8%, we might cautiously deduce that 3.1% of additional traffic on these roads is generated via the LTNs.

This analysis is for overall traffic flows on LTN boundary roads; however, traffic flow changes are not consistent across all LTN boundary roads or during all times (peak times are likely to be more severely impacted). While traffic levels have remained below 2019 levels on Henley Ave and Church Cowley Rd, from March through November, traffic levels on Hollow Way, Rose Hill Rd and Cowley Rd were between 105.4% and 107.5% of 2019 levels. It is worth noting, however, that even where traffic is lower than 2019 levels, it is still comparatively higher than it is in control areas (though not necessarily entirely due to the LTNs, as outlined above).
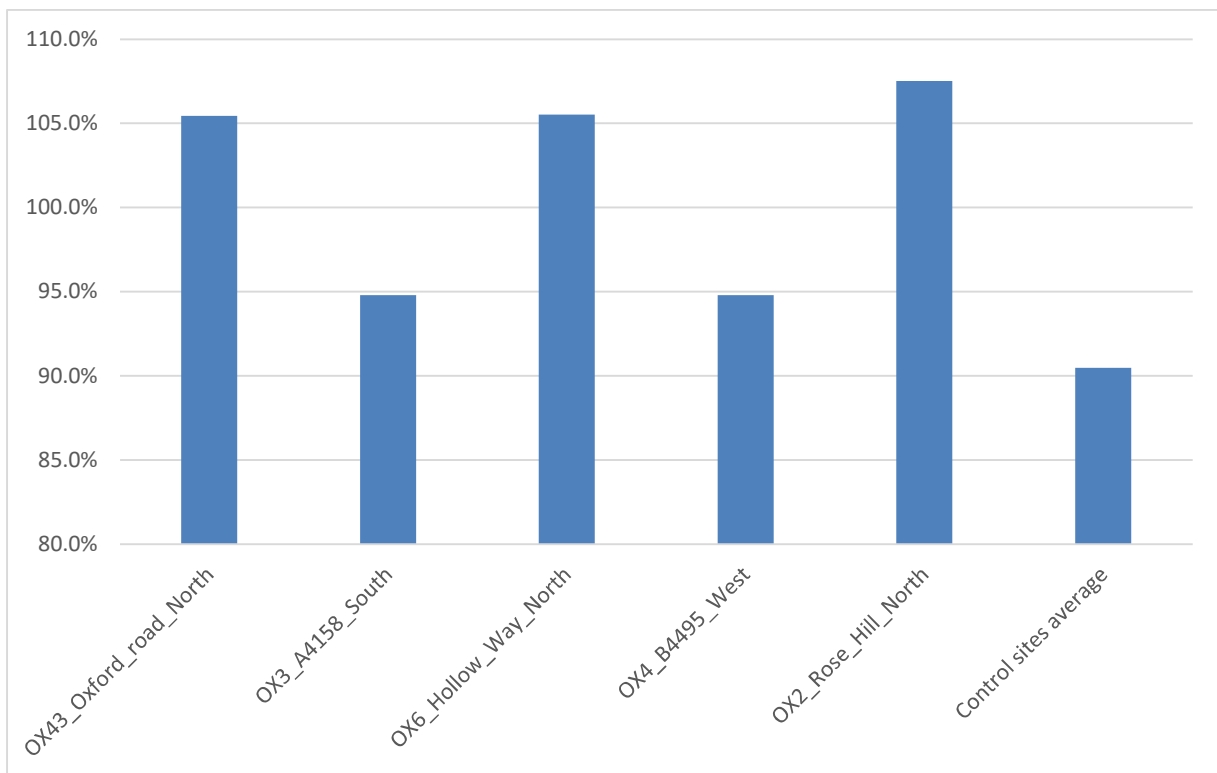
Figure 6 Change in daily car counts during March through November 2019 and 2021

When factored against the control sites and adjusted to remove the influence of outliers, the impact seems to have been most significant on Rose Hill North (seeing a relative 10.8% increase in traffic volume), whilst Hollow Way North experienced a relative improvement in traffic volume (-8.4%) following LTN implementation. See figure 7.
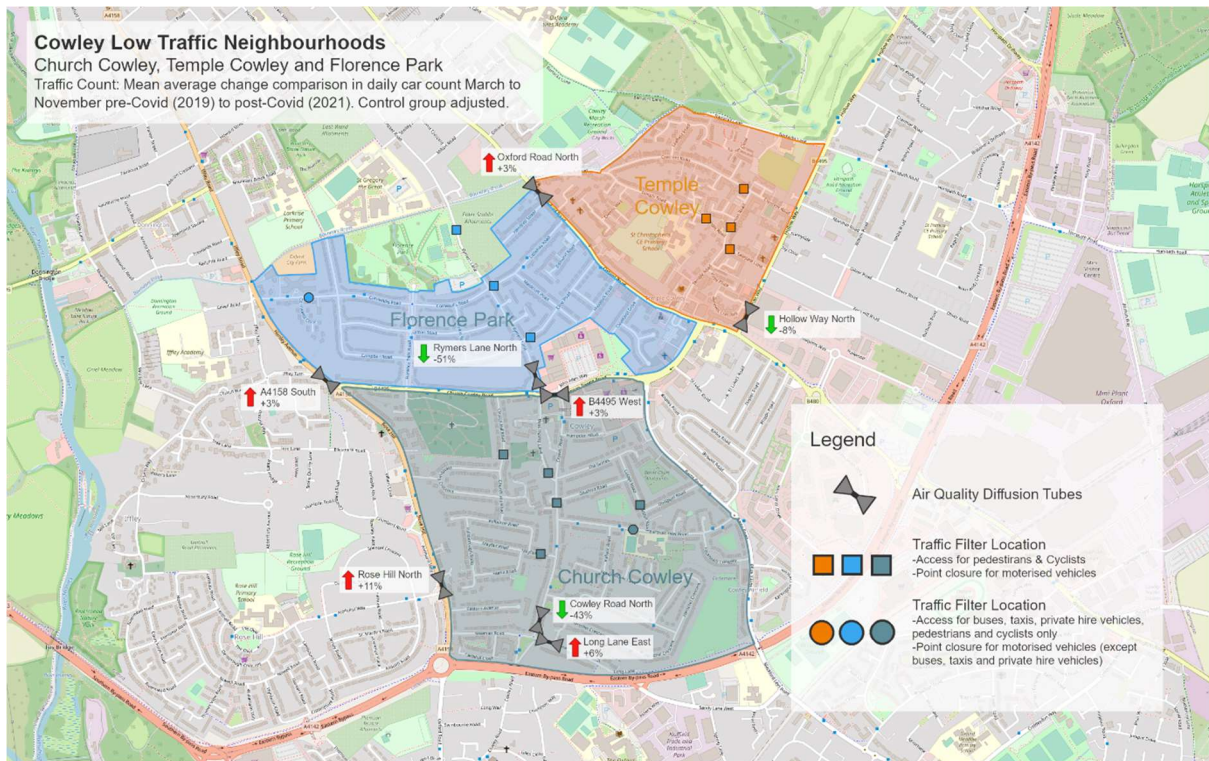
Figure 7 - Mean average traffic count change in daily cars, March to November 2021 compared to 2019

LTN Area

To evaluate the impacts of LTN barriers on road user volume, the number of cars, pedestrians and cyclists passing each sensor in both directions have been used to calculate a daily average for each type of road user each month from February through November for sensors within the Cowley LTNs and comparison sites. Car, pedestrian and cyclist counts are addressed separately in the sections below.

Traffic Volume

Traffic counts in 2019 were relatively similar in both the Cowley LTNs and comparison sites, averaging 4083 and 4245 per day respectively. Following the implementation of LTNs, there was a marked and sustained reduction in car counts within the Cowley LTNs.
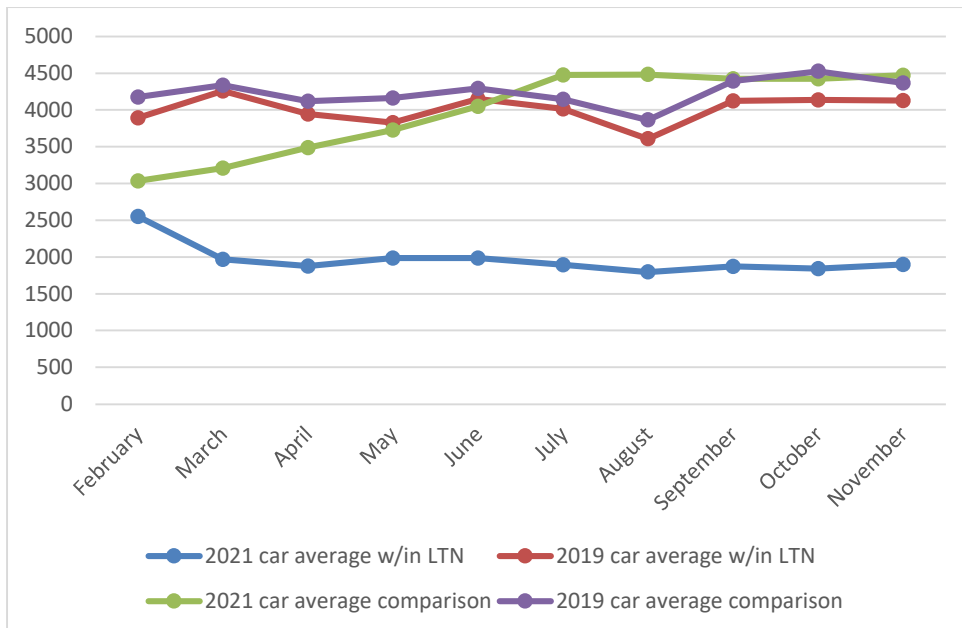
Figure 8 Average daily car counts, within Cowley LTN and Comparison sites, 2019 and 2021

While comparison sites saw a continued increase in car counts in 2021 until July, sites within the Cowley LTN dropped in March and stayed at this lower level through November. Comparison sites plateaued at around 4450 cars/day from July to November, car counts within the LTNs have averaged 1860 cars/day during the same period.

Overall, from March through November, car counts within the Cowley LTNs during 2021 were 47.3% of car counts in the same period during 2019 while car counts at comparison sites were 96.2%. Using comparison sites as a reduction factor, car counts within the LTNs have decreased by 48.9% from 2019, in proportion to traffic flow changes in comparison sites; adjusted to factor out pre-LTN differences in February, the decrease is 42%. From July through November, this proportional reduction in car counts is even greater, at 51.2%.

Of the monitoring sites within the Cowley LTNs, the most impactful decrease in car counts has been experienced on Cowley Road north of Newman Road. Between March and November 2019, car counts at this site averaged 7,237 per day, dropping to 3,312 per day in 2021. Long Lane East, however, has seen a slight increase in traffic levels, more in keeping with the boundary roads; this may be because the traffic restrictions without the camera filter in place at the time of analysis, allow this road to be used as a through-route from Barns Road via Bartholomew Road.

Pedestrian Volume

Pedestrian volumes during 2019 were significantly higher in comparison sites than they were within the Cowley LTNs, averaging 593 and 395 per day respectively between March and November.

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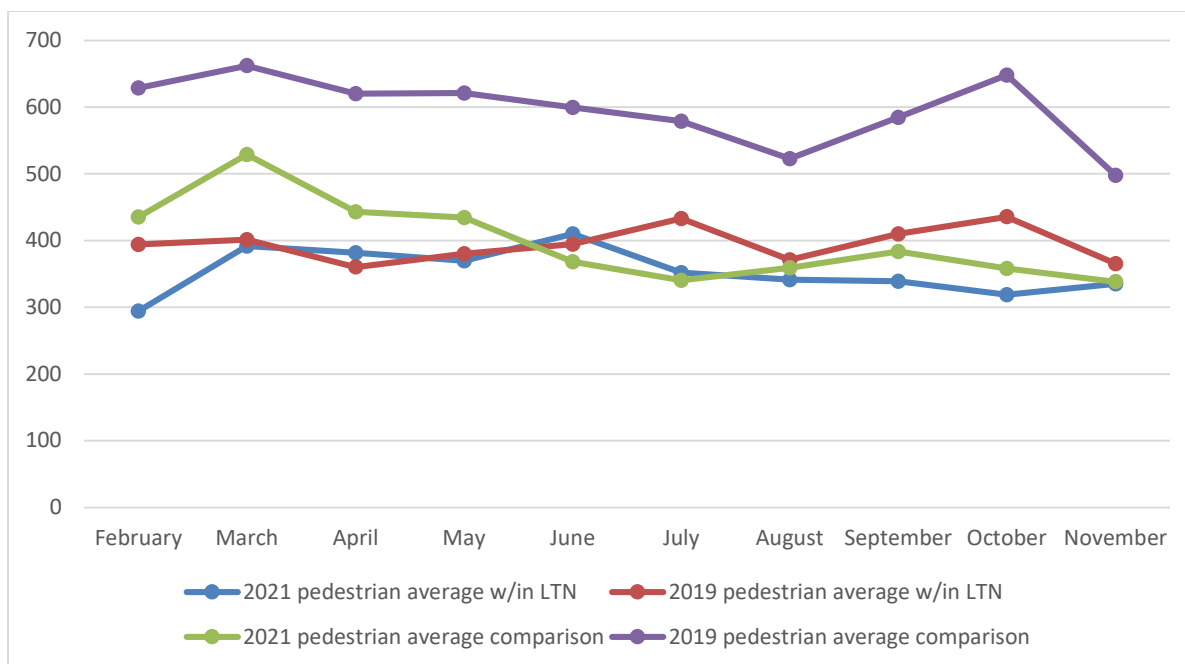
Figure 9 Average daily pedestrian counts, within Cowley LTN and Comparison sites, 2019 and 2021

While pedestrian volumes at comparison sites were significantly lower in 2021 as compared to 2019, pedestrian volumes within the Cowley LTN experienced a much smaller drop and at times exceeded 2019 levels.

Overall, from March through November, pedestrian volumes within the Cowley LTNs during 2021 were 91.2% of pedestrian volumes in the same period during 2019 while pedestrian volumes at comparison sites were 66.6%. Using comparison sites as a reduction factor, and adjusting to remove pre-LTN differences in February, pedestrian volumes within the LTNs have increased by 19% from 2019, in proportion to pedestrian volume changes in comparison sites.

Cycling

Cycling volumes during 2019 were significantly lower in comparison sites than they were within the Cowley LTNs, averaging 128 and 248 per day respectively between March and November.
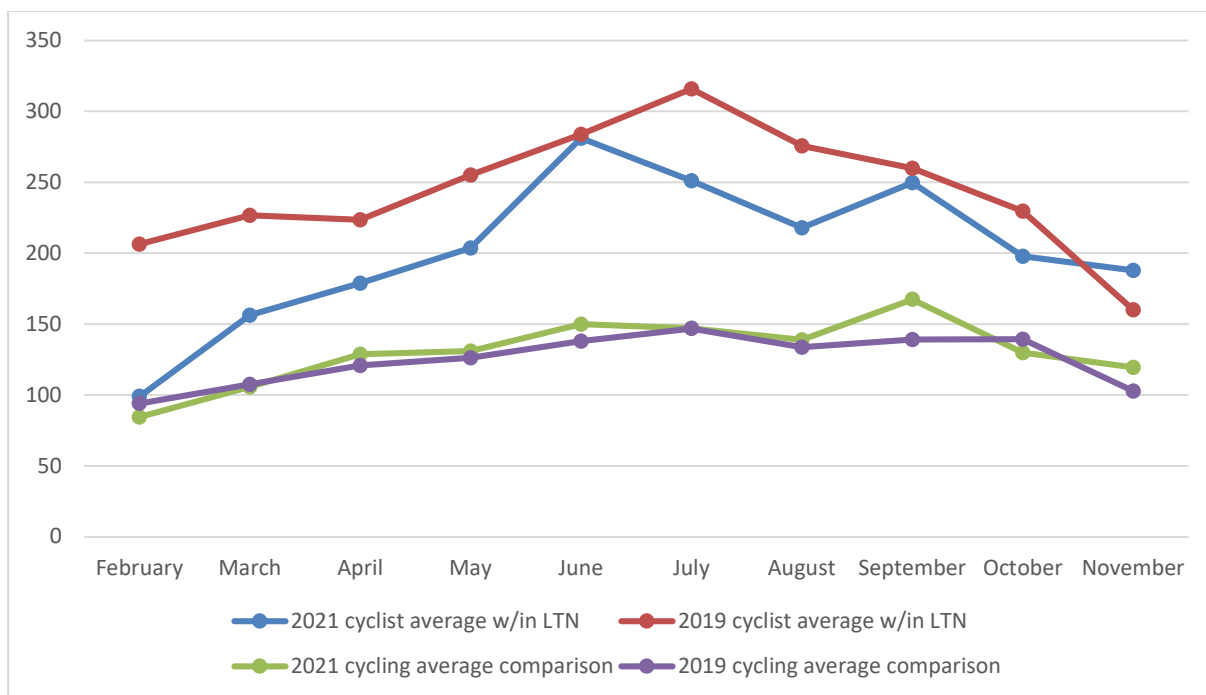
Figure 10 Average daily cycling counts, within Cowley LTN and Comparison sites, 2019 and 2021

While cycling volumes in comparison sites are very similar in 2019 and 2021, cycling volumes within the Cowley LTNs have had a more complex trajectory. In February 2021, before LTN barriers were put in place, cycling volumes in the Cowley LTNs were 48% of 2019 volumes while at comparison sites volumes were 89.8% of 2019. Similarly to car traffic counts on boundary roads, this pre-existing difference-in-difference indicates that external factors are influencing this lower cycling level in the Cowley LTNs compared to control sites.

Following the installation of LTN barriers, cycling counts within the Cowley LTN steadily increased from these much lower volumes at a greater rate than comparison sites until June, when Cowley LTN volumes reached the same volumes as 2019.

Overall, from March through November, cycling volumes within the Cowley LTNs during 2021 were 86.3% of cycling volumes in the same period during 2019 while cycling volumes at comparison sites were 105.5%. Including the effect on comparison sites, cycling volumes within the LTNs appear to have decreased by 19.3% from 2019, in proportion to cycling volume changes in comparison sites.

However, these lower cycling volumes within the LTNs should be taken in the context of proportionally much lower volumes in February, before barriers were put in place, which were already showing a proportional decrease in cycling of -41.7% compared to control sites. As such, if we factor out this -41.7% which pre-dated the LTNs, the LTNs can be shown to have had a positive impact on cycling levels within them – increasing relative cycling levels by 22.5% over the March to November period. By November, in fact, cycling levels were just starting to slightly exceed 2019 levels for the same month. This proportional increase in cycling within the LTN compared to control sites is shown below:

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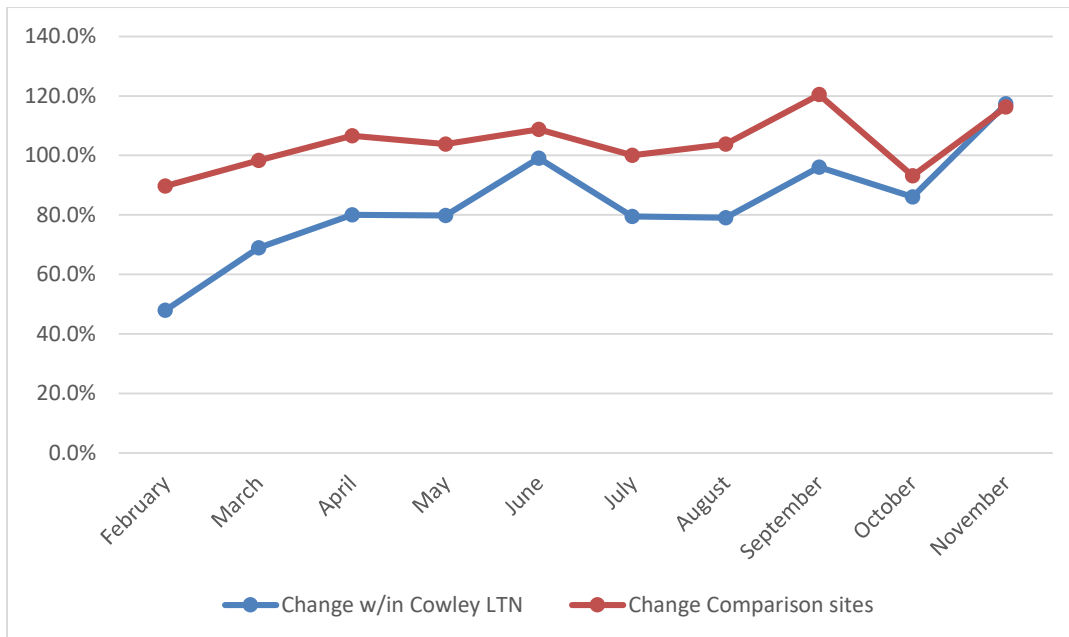
Figure 11 Change in monthly average cycling count 2019 to 2020 within Cowley LTN and comparison sites

Cycling telematics

One of the primary objectives of LTNs is to increase levels of cycling by making roads within the LTNs safer and more appealing to cycle by reducing car traffic levels. Among the Oxford Cycle & Walking Network, the Cowley LTNs are expected have the greatest impact on Oxford Cycling Route (OCR)16, which runs through both Florence Park and Church Cowley LTNs, mainly along Littlemore Rd, Beauchamp Lane, and Rymers Ln (see figure 12 below). To understand the impact of the LTN barriers on cycling levels on this key corridor, a section of OCR 16 in the centre of the Florence Park LTN was monitored along Rymers Ln between Campbell Rd and Florence Park using data from Strava.

Figure 12 - OCR 16 cycle route, running through Church Cowley and Florence Park LTNs

Two comparison sites, on Oxford cycling routes a similar distance from the city centre along residential roads similar roads to Rymer's Lane were also monitored:

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- Jack Straw's Lane (OCR 11)
- Charlbury Road (OCR 5)

Routes were monitored with Strava cycling telematics data. Strava provides anonymised cycling journey data from a mobile app that accesses a mobile device's GPS tracking device. Although there are many individuals providing data, they are still a small proportion of overall cyclists. Moreover, the sample is self-selecting (people who volunteer their data) and thus prone to bias towards some behaviours. Thus, we only use this here indicatively.

In the route segments analysed, one or more trip in any direction was totalled for each month. When compared to the cycling counts from Vivacity Labs sensors, those represented in Strava accounted for 5.4% of cyclists on Rymers Ln at Church Cowley Rd.
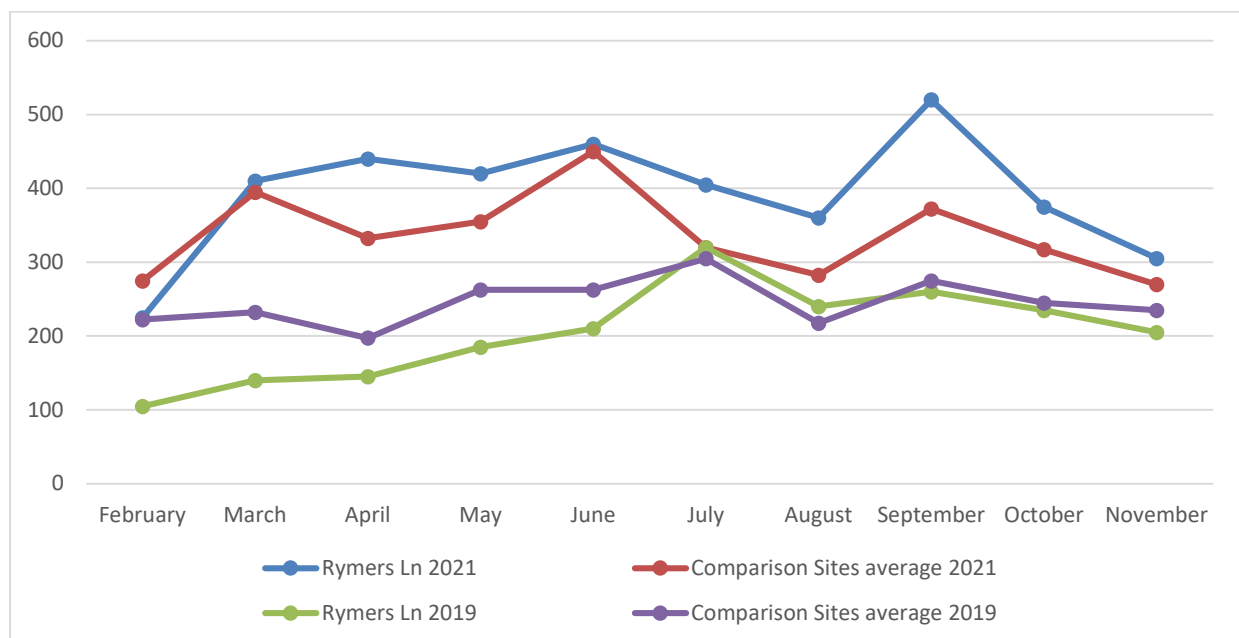
Figure 13 Total monthly Strava cycling volumes, within Rymers Ln and Comparison sites, 2019 and 2021

Overall, Strava cycling numbers have increased between 2019 and 2021. In comparison sites, the number of cycling trips recorded between March and November increased from 2019 to 2021 by 39%. Cycling trips recorded on Rymer's Lane increased by 90%. When the increase in comparison sites is discounted against the increase on Rymer's Lane, cycling trips increased by 51%.

This data has some differences from the data from sensors however, which suggest decreases in cycling in the area compared to 2019 levels in absolute terms. This discrepancy may be explained by:

1) Overall Strava membership has increased between 2019 and 2021 – this will lead to additional journeys being tracked, but does not necessarily suggest an increase in the number of journeys being undertaken.

2) Strava is more commonly used by leisure cyclists than commuter cyclists. It is possible that leisure cycling has increased within the LTN area between 2019 and 2021, but this increase has been off-set by the COVID-related decrease in commuter cycling in terms of absolute numbers of cycling trips.

However, it is important to note the positive trend from existing Strava users.

Journey Time

Telematics data were used relating to trips' origin and destination, and speed. This data was collected by INRIX via the use of GPS tracking of vehicles, mainly using SatNAV systems in vehicles. As such, it only accounts for a portion of trips within an area (usually between 4-12% of total vehicles) and provides an indication of proportional numbers and speeds of traffic. Trips correspond to locations of vehicular movement, along with their speeds. Speed data corresponds to speed and journey time at road segments.

The road segments defined by INRIX primarily correspond to references related to OpenStreetMap and were kept consistent across 2019 and 2021.

The journey time information is also averaged across different time-windows, such as AM Peak (7:45 AM to 9:45 AM), PM Peak (3:45 PM – 5:45 PM) and Inter-peak (rest of day apart from AM and PM peak). The below tables show the journey times on the boundary roads of the Florence Park LTN, selected as indicative. In particular, the data is for Iffley Road and Cowley Road. The map below shows the segments with the highest quality of speed data.
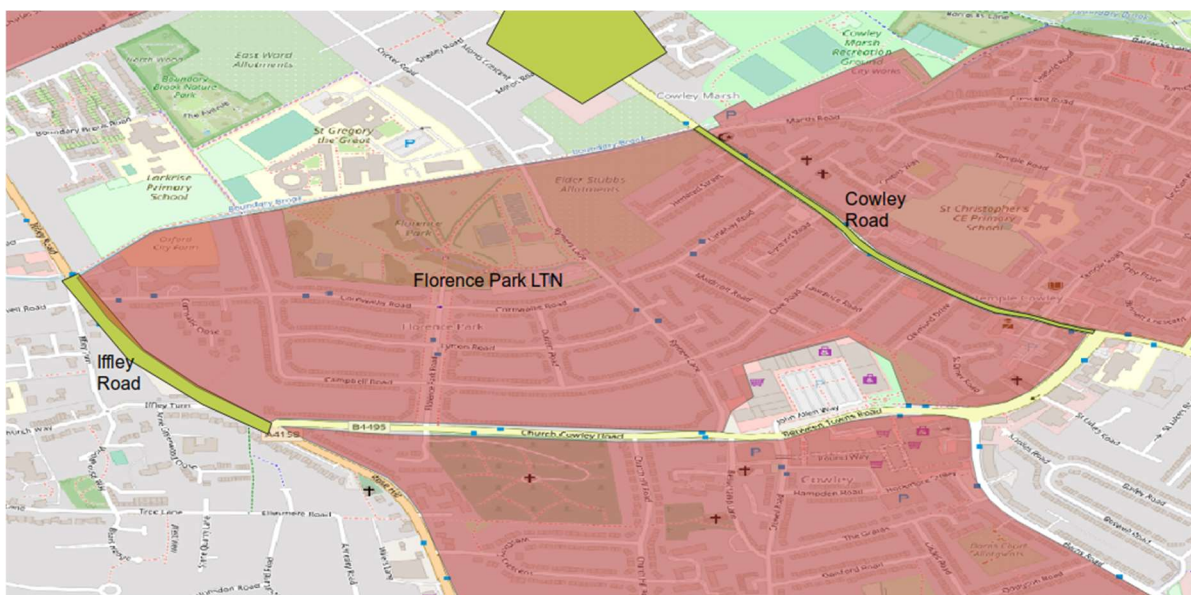
Figure 14 Map of Florence Park LTN and boundary roads being analysed

Road	Year	Full Day	AM Peak	PM Peak	Interpeak
IFFLEY ROAD (N)	2019	1.21	1.36	1.34	1.18
IFFLEY ROAD (N)	2021	1.41	1.79	1.68	1.35
IFFLEY ROAD (S)	2019	1.16	1.2	1.26	1.15

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IFFLEY ROAD (S)	2021	1.3	1.38	1.44	1.28
COWLEY ROAD (W)	2019	1.63	1.9	1.82	1.58
COWLEY ROAD (W)	2021	1.53	1.51	1.64	1.52
COWLEY ROAD (E)	2019	1.64	1.77	1.77	1.61
COWLEY ROAD (E)	2021	1.61	1.62	1.96	1.58

Figure 15 Journey Times (minutes) for April (2019, 2021)

Road	Year	Full Day	AM Peak	PM Peak	Interpeak
IFFLEY ROAD (N)	2019	1.23	1.56	1.36	1.18
IFFLEY ROAD (N)	2021	1.5	2.22	1.99	1.37
IFFLEY ROAD (S)	2019	1.16	1.21	1.27	1.14
IFFLEY ROAD (S)	2021	1.33	1.39	1.54	1.3
COWLEY ROAD (W)	2019	1.5	1.8	1.64	1.46
COWLEY ROAD (W)	2021	1.54	1.55	1.7	1.52
COWLEY ROAD (E)	2019	1.61	1.74	1.84	1.57
COWLEY ROAD (E)	2021	1.6	1.68	1.89	1.56

Figure 16 Journey Times (minutes) for June (2019, 2021)
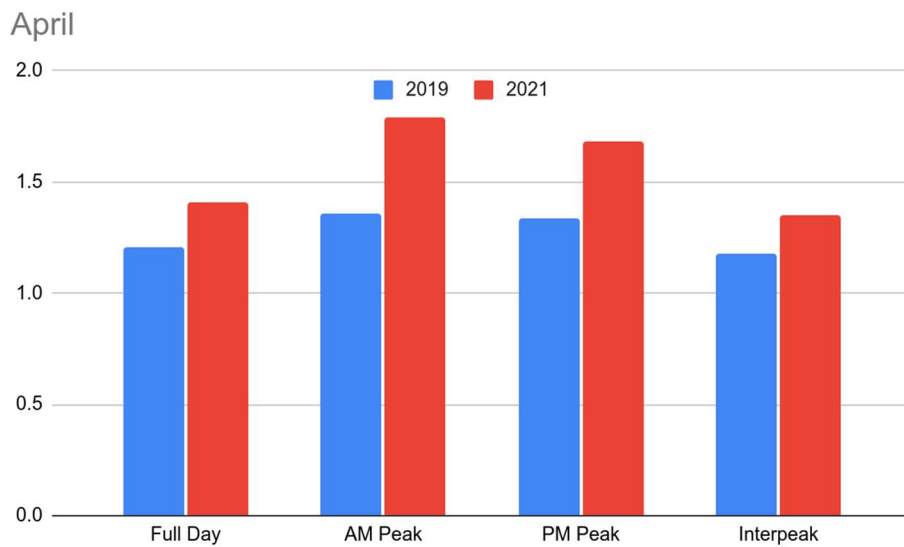
Figure 17 Comparison of Journey Times for Iffley Road (N), 2019 to 2021

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April
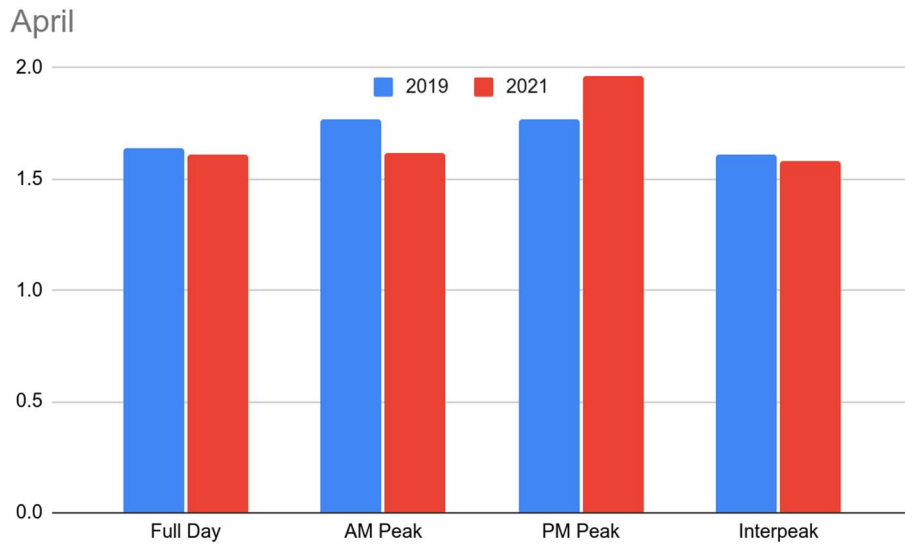
Figure 18 Comparison of Journey Times for Cowley Road (E), 2019 to 2021

Iffley Road shows an increase in journey times in both directions, whereas Cowley Road generally shows a decrease in or similar journey times for most times of the day, excepting the PM peak in both directions, and inter peak west-bound during June. Thus, we cannot clearly deduce what the effect has been on car journey time due to the LTNs, as it should be symmetric between the two.

Comparison sites are not appropriate for speed analysis, as even without interventions, we would not expect increased speed in one location to indicate a change in another.

Vehicle Speed
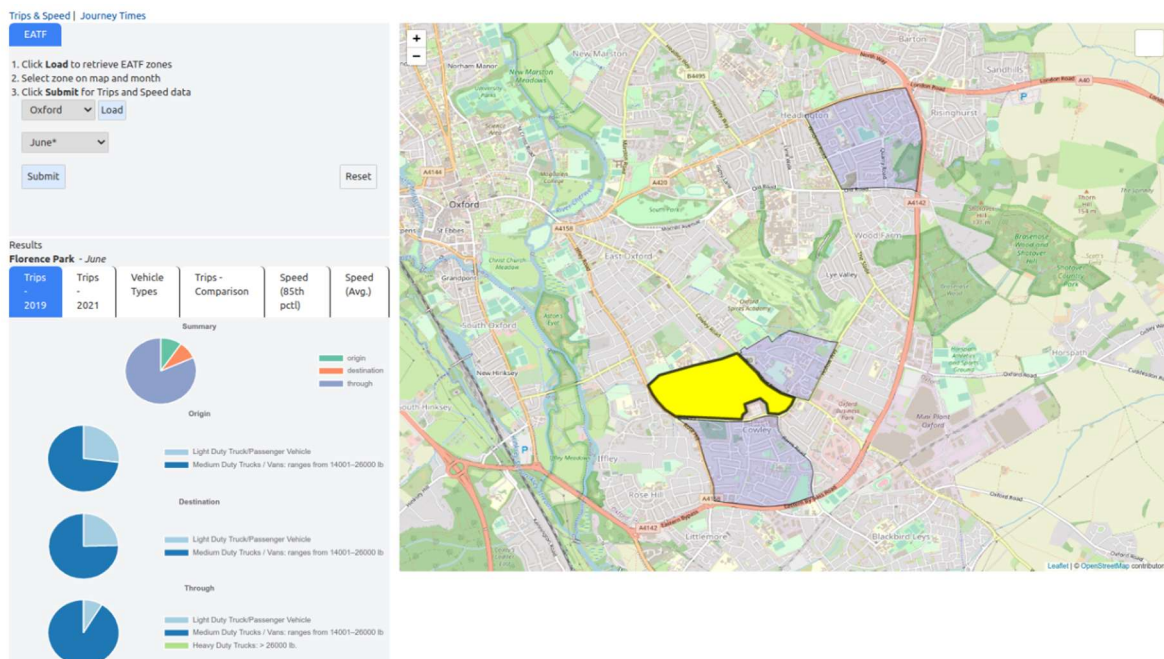
Figure 19 Bespoke dashboard created for the LTN evaluation

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The INRIX dataset provided is a useful resource to calculate the 85th percentile speed within LTN zones. The "85th percentile" speed is a speed at which 85% of traffic will be travelling at, or below, along a street or road (under free flow conditions). Typically, it is used as a standard to set the speed limit at a safe speed, minimising traffic collisions and promoting uniform traffic flow along a corridor.

The 85th percentile speed for the months of April and June was calculated from the INRIX telematics data through a bespoke dashboard, and split based on time windows.

Area	Year	Full Day	AM Peak	PM Peak	Interpeak
Florence Park	2019	25	19	24	26
Florence Park	2021	37	36	21	38
Church Cowley	2019	31	28	29	32
Church Cowley	2021	46	40	45	46
Temple Cowley	2019	29	28	25	29
Temple Cowley	2021	34	33	28	35
Headington Quarry	*2019*	*34*	*33*	*33*	*35*
Headington Quarry	*2021*	*42*	*43*	*47*	*42*

Figure 20 85th Percentile Vehicle Speed (mph) for April (2019, 2021)

Area	Year	Full Day	AM Peak	PM Peak	Interpeak
Florence Park	2019	23	19	26	23
Florence Park	2021	22	22	18	22
Church Cowley	2019	31	29	28	31
Church Cowley	2021	29	26	25	31
Temple Cowley	2019	26	23	24	27
Temple Cowley	2021	25	24	27	25
Headington Quarry	*2019*	*34*	*33*	*33*	*34*
Headington Quarry	*2021*	*34*	*34*	*30*	*34*

Figure 21 85th Percentile Vehicle Speed (mph) for June (2019, 2021)

The above tables in figures 20 and 21 show the 85th percentile speeds in the LTN zones and Control zone for the months of April and June in 2019 and 2021.
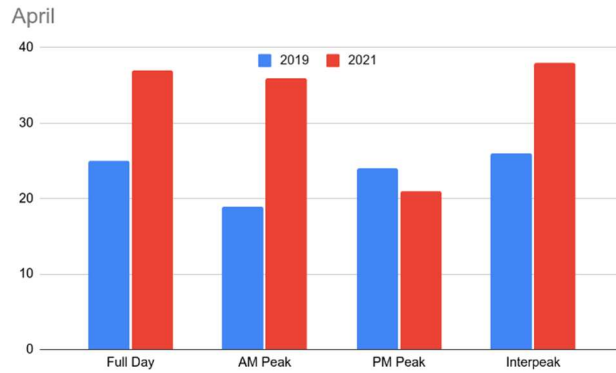
Figure 22 Comparison of 85th percentile speed for Florence Park LTN, April (2019 to 2021)
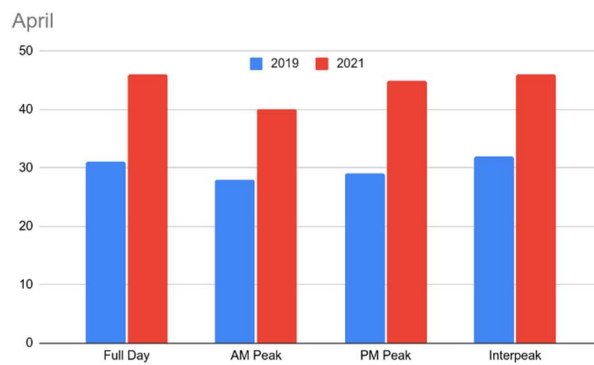
Figure 23 Comparison of 85th percentile speed for Church Cowley LTN, April (2019 to 2021)
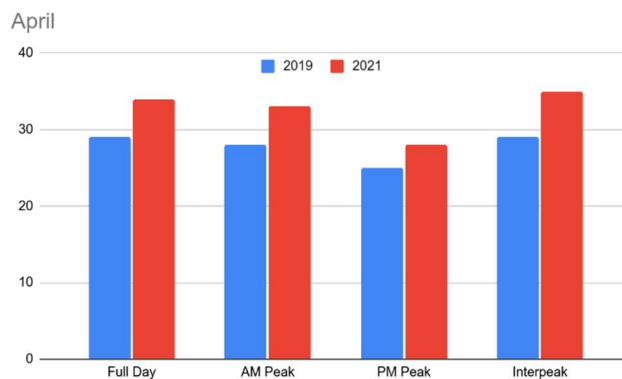
Figure 24 Comparison of 85th percentile speed for Temple Cowley LTN, April (2019 to 2021)

There is an increase in average speed across zones from 2019 to 2021, possibly due to the lower levels of traffic seen within the LTNs following implementation. This pattern of increased speed, however, is not consistently the case in the June data, once the LTNs were more established. If the reduction in traffic levels is driving the higher speeds alone, we might expect the pattern to continue into June; that it doesn't suggests that other factors may also be influencing traffic speeds within the LTNs.

Bus time impact

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There are a few sources for bus journey time data. These are the primary, directly from the bus operators (Stagecoach, Oxford Bus Company) and the open bus data service that provides journey time information through an API as part of Bus Open Data Services (BODS) (https://www.gov.uk/government/collections/bus-open-data-service), which also offer a dashboard, but this data is available only as early as February 2021.

Though BODS data might be useful to future evaluation, for the purpose of this evaluation, given the need to compare bus journey time data from 2019 to 2021, the data provided by Stagecoach bus operator was used. Data provided directly by an operator, and sense-checked by the council, offer the most detailed and reliable source, and we are grateful for their support.

The comparison was not restricted to the temporal element alone. Data for buses that travel on certain impacted segments of the LTN zones were compared with bus routes that travelled on control segments. The impacted bus routes are 1 (Cowley Road) and 3 (Iffley Road). The control bus route is 8 (Headington Road).
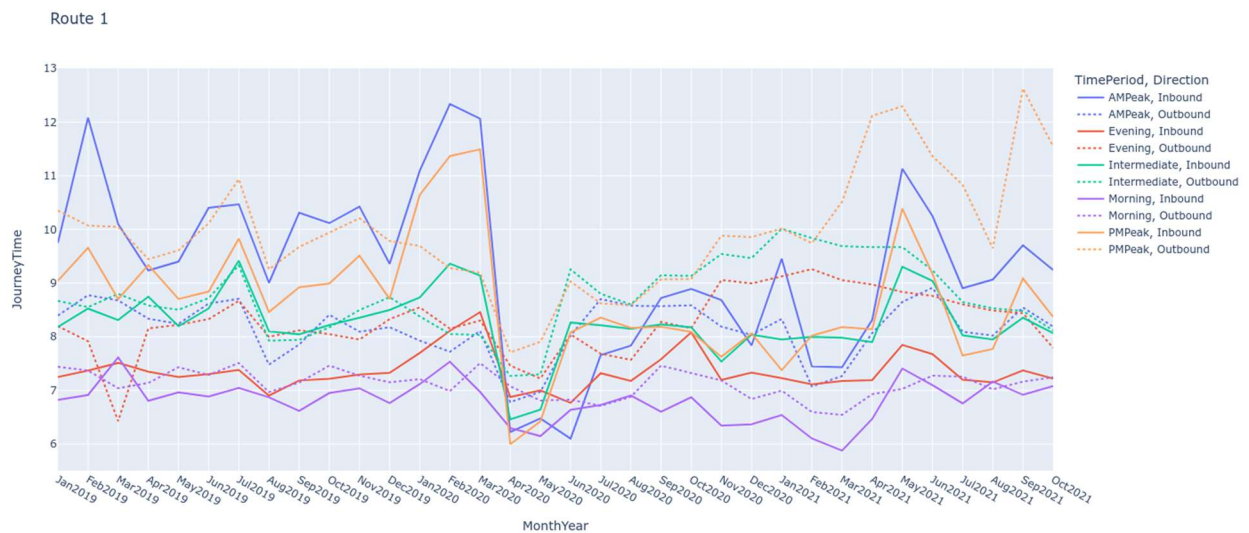
Figure 25 Bus Route 1 – Journey Times, 2019 – 21
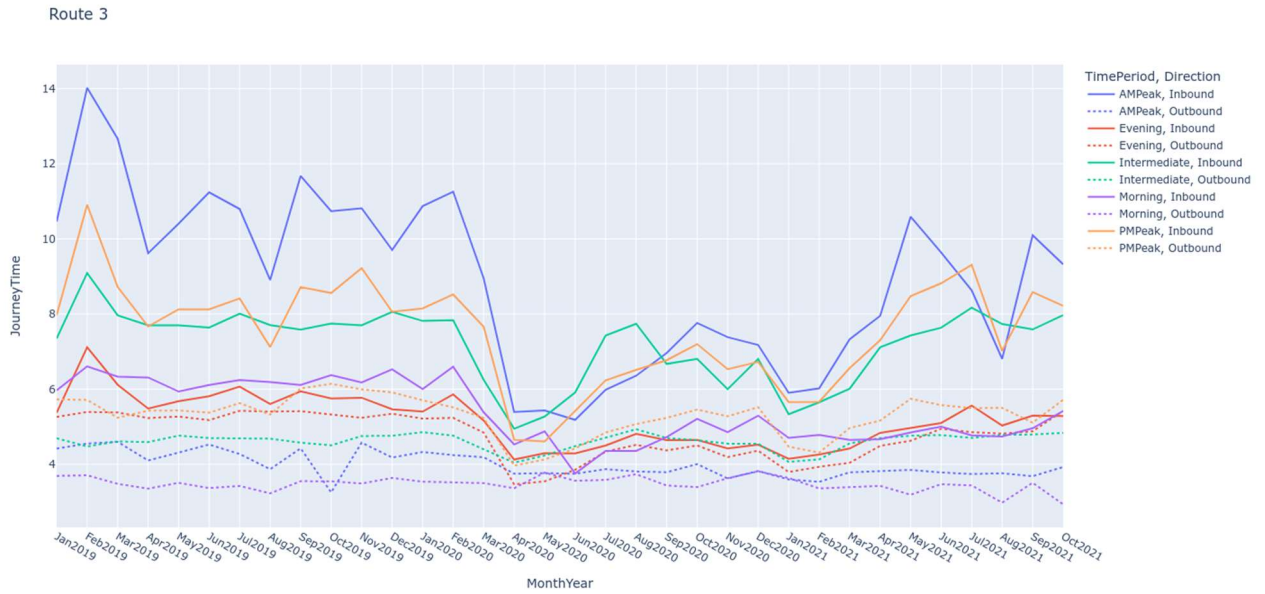
Figure 26 Bus Route 3 – Journey Times, 2019 – 21
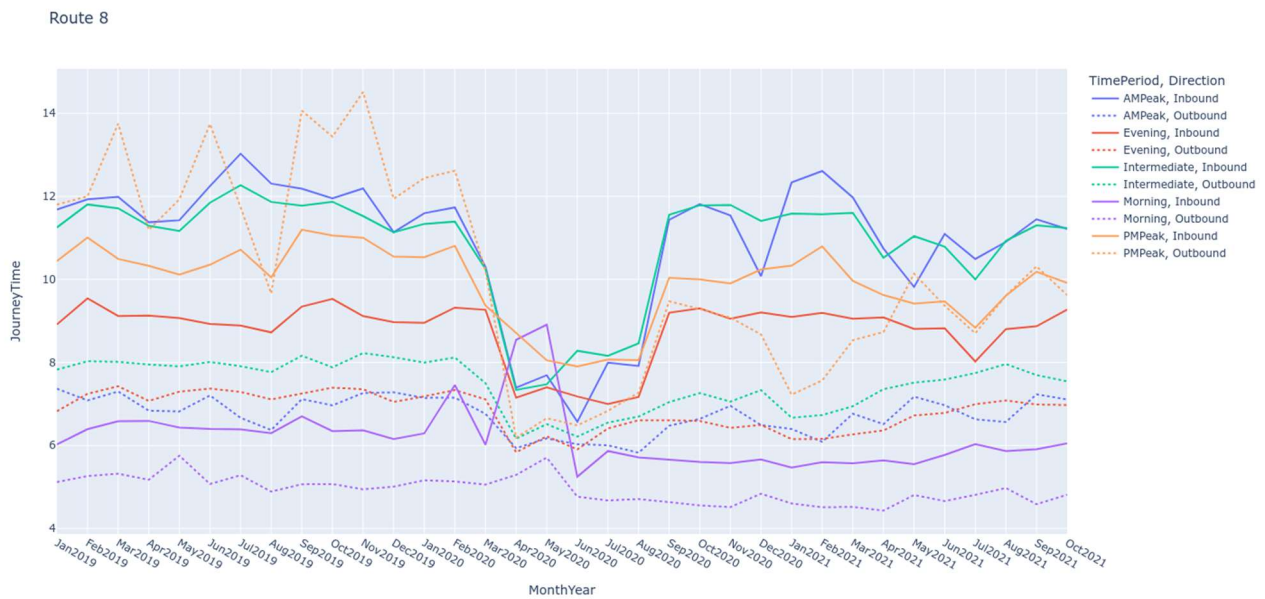
Figure 27 Bus Route 8 – Journey Times, 2019 – 21

The trends in journey times for both intervention and control routes show a similar trajectory. In order to do a more detailed comparison, the ratio of journey times for impacted and control routes was analysed, as shown below.

Route 1, 8 - Journey Time (min)
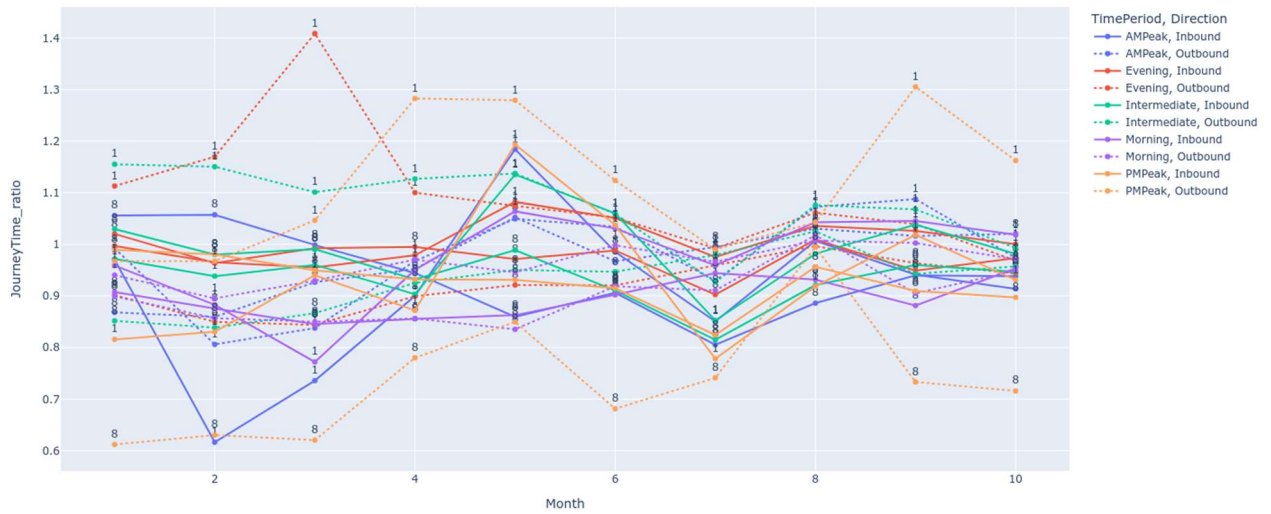
Figure 28 Bus Route 1, 8 – Journey Time ratio, 2019 vs 2021

As illustrated in Figure 28, most of the journey times follow a similar pattern. The only significant outliers are the PM-Peak Outbound and Evening Outbound journeys. In particular, PM-Peak Outbound journeys in the impacted routes were proportionally higher than the control routes. There was a small period in August when there was some convergence, but overall, there's a significant difference. On the other hand, Evening Outbound journeys followed a similar trajectory in all months of the year barring March, when the impacted route was much higher, which coincided with the start of the LTNs' implementation (though this does not necessarily imply causality).

To further understand the comparison between routes, a difference-in-difference of journey times analysis was done on the impacted and control routes.

Journey Times (difference-in-difference)

Figure 29 Bus Route 1, 8 – Journey Time (difference-in-difference), 2019 vs 2021

The difference-in-difference analysis demonstrates the findings of the earlier exercise, whereby the primary affected periods of the day were PM-Peak and in the Outbound direction. It also shows a similar convergence in the month of August and divergence in the month of March. The peak increase in journey time for the outbound PM peak was 57.2% in October.

However, it can be seen that there was already a significant difference in difference in February (35.5%), pre-dating the LTN installations, suggesting that not all of this impact on journey times for buses is due to the LTNs. The convergence in August also implies that other factors are influencing journey times on these different routes (which may be factors influencing the control route as well as or instead of the affected routes). Once we adjust for the pre-existing difference in difference, the peak increase in PM-peak journey time since LTN implementation is 21.7% - still a significant increase.

Air Quality

Air quality evaluation of the Cowley LTNs was undertaken utilising the existing air quality network, comprised primarily of diffusion tubes managed by Oxford City Council, the air quality authority for Oxford. We are grateful for the City Council's collaboration in this work.

Diffusive samplers (as described in paragraphs 7.185 – 7.210 of the Technical Guidance LAQM.TG(16)) are widely used for indicative monitoring of ambient nitrogen dioxide (NO2) in the context of regular Review and Assessment of local air quality levels by Local Authorities. This monitoring technique is particularly useful to give an indication of longer-term average NO2 concentrations and for highlighting areas of high NO2 (particularly when dealing with sources such as traffic emissions, which do not change much from day to day). Diffusion tubes take samples over an approximate 1-month period, hence producing a monthly mean value of NO2.

The diffusion tubes used for the purpose of assessing the impacts of LTNs were supplied and analysed in 2021 by an accredited laboratory (South Yorkshire Air Quality Samplers), using the 50% TEA in Acetone method. The laboratory is subject to quality assurance testing as part of their accreditation. This involves an independent comparison to other laboratories, under the independent AIR-PT scheme. The results of these inter-comparisons are publicly available for scrutiny.

All the diffusion tubes used in the 2021 monitoring campaign are being replaced according to DEFRA's 2021 diffusion tube monitoring calendar and within the ± 2 days due date tolerance.

Baseline for air quality monitoring has been set as 2017-2019. According to the city's latest Air Quality Annual Status Reports during the period 2017-2019 AQ levels seem to have plateaued in the city (annual mean NO2 levels across the city are very similar during this period). This gives us a certain degree of confidence for establishing an accurate air quality baseline – a calculated average obtained from all the available data for each site for the period 2017-2019 and considering only the period of interest (March to October). The year 2020 has been excluded as due to COVID-19 it does not represent a period of "Business as Usual".
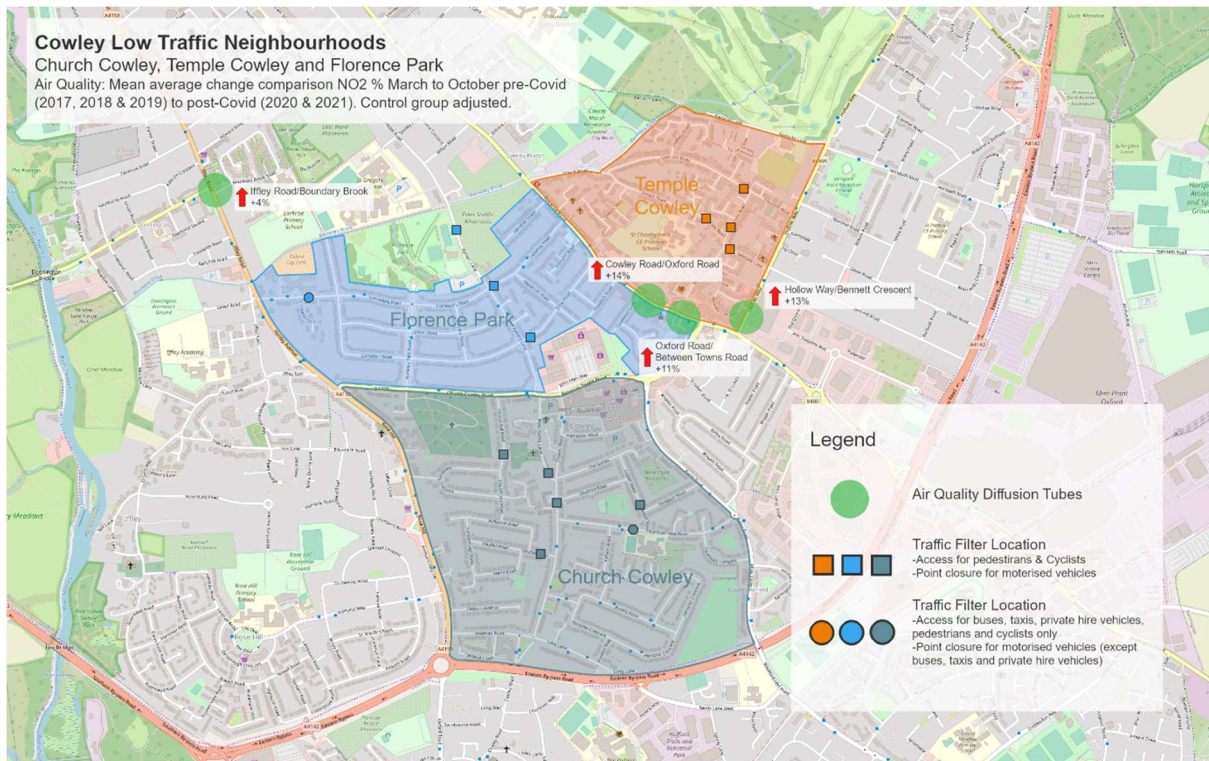
Figure 30 - Air quality diffusion tube locations, with mean average change in NO2 concentrations

Four diffusion tube sites were both relevant to the Cowley LTNs and collecting data for at least 1 year prior to COVID measures being put in place. All of these sites are on LTN boundary roads. For the months of March to October 2021, unratified monthly NO2 at these sites reduced by an average of 8% from the same monthly averages in 2017-2019.

Air quality in Oxford overall has improved following COVID-19 measures. To account for this, 5 comparison sites were identified across Oxford in areas not impacted by the Cowley LTNs. For the months of March to October 2021, unratified monthly NO2 at each these sites reduced between 16-19% from monthly averages for the same months in 2017-2019, resulting in an average 17% NO2 reduction. Since values from each of these comparison sites are quite close together, this provides a strong level of confidence in the average reduction in NO2 levels as 17%.

Using NO2 levels as a proxy for overall air pollution, air pollution in comparison sites has reduced by 17% from pre-COVID levels, while air pollution has reduced by 8% in monitoring areas on LTN boundary roads during the same time period. By applying air pollution improvements in comparison sites as a reduction factor, Cowley LTN boundary roads have experienced an average relative increase in air pollution levels of 9%. This increase is not the same across all areas, however, with the Cowley/Oxford road experiencing the most significant relative worsening in air quality (see figure 30).

Emergency Services Response Times

To understand the impact of the Cowley LTNs on emergency services, South Central Ambulance Service (SCAS) replicated LTN traffic filters as road closures in the Optima Predict event simulation platform.

The simulation reports the impact on mean response times using historical incident and response data from 01/03/2019 to 29/02/2020. Traffic filters on all 3 Cowley LTNs were simulated as a group. Analysis was conducted at local level, which is defined as within 1 mile of the LTNs. The simulation reports on the impact on NHS England ambulance response categories (see Figure 31).

NHS England ambulance response categories		
Category	Response	Response time to 90% of all incidents
CAT1	An immediate response to a life threatening condition, such as cardiac or respiratory arrest	15 minutes
CAT2	A serious condition, such as stroke or chest pain, which may require rapid assessment and/or urgent transport	40 minutes
CAT3	An urgent problem, such as an uncomplicated diabetic issue, which requires treatment and transport to an acute setting	2 hours
CAT4	A non-urgent problem, such as stable clinical cases, which requires transportation to a hospital ward or clinic	3 hours

Figure 31 Optima simulation reports on the impact on NHS England ambulance response categories

The simulation found that impact on SCAS performance at the local level is minimal. The table below shows the difference in seconds between the baseline and the combined LTN scenarios. Results show there is a negligible impact on urgent responses (CAT1, CAT2 and CAT3) and a moderate impact on non-urgent (CAT4) responses. CAT4 is highly sensitive given the very low number of calls (~1000 p/m) and the long durations. The average SCAS CAT4 response histrionically has been around 2 hours. The 144 second impact on this category should be taken in this context.

Scenario	CAT1	CAT2	CAT3	CAT4
Baseline	-	-	-	-
Combined LTNs	3 secs	6 secs	0 secs	144 secs

Figure 32 Results of simulation on impact of LTNs on response times, per category
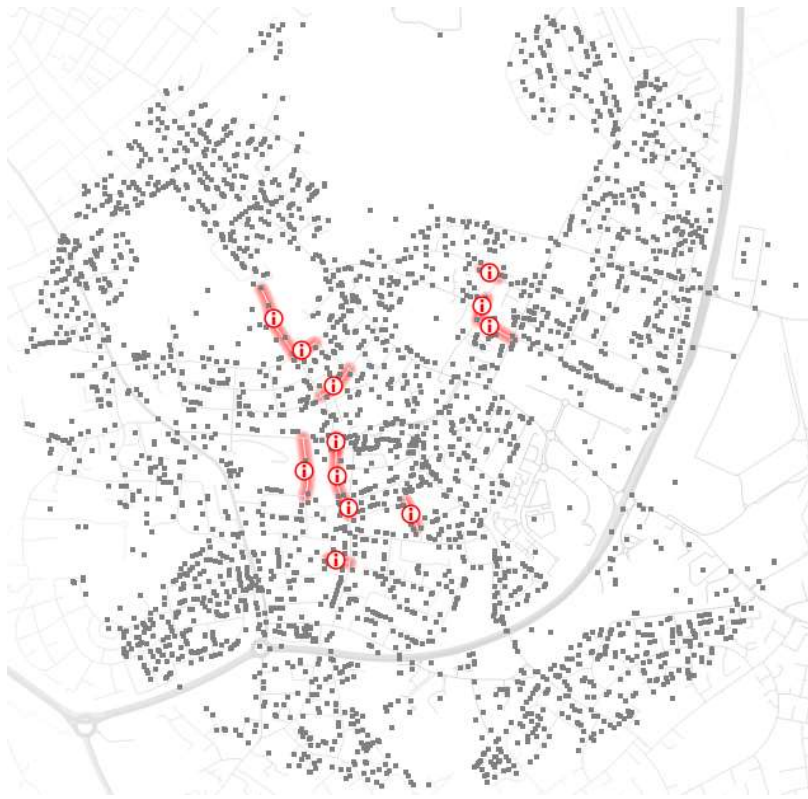
Figure 33 Simulated traffic filters on the Optima Predict event simulation platform

Survey and community feedback

Public perception surveys are being used to understand how perceptions, views, and behaviours change over time in the Cowley area. A baseline and a follow-up survey 6 months after full barrier implementation have been open to all, on Oxfordshire County Council's consultation platform. A final follow-up survey is planned 1 year after implementation.

In March 2021, (4/3/21 to 31/3/21) the Cowley LTN Perception Survey was hosted on eConsult, Oxfordshire County Council's consultation platform at the time. In total, 605 complete responses were received, including 399 from within the LTN areas.

In October and November (28/10/21 to 25/11/21) the Follow-Up Cowley LTN Perception Survey was hosted on Let's Talk Oxfordshire, Oxfordshire County Council's new consultation platform. Respondents from the baseline survey who consented to being re-contacted were emailed directly were contacted in order to understand how these responses may have changed after 6 months. In total, 536 complete responses were received, including 361 from within the LTN areas.

How representative are the perception surveys of the LTN catchment area population?
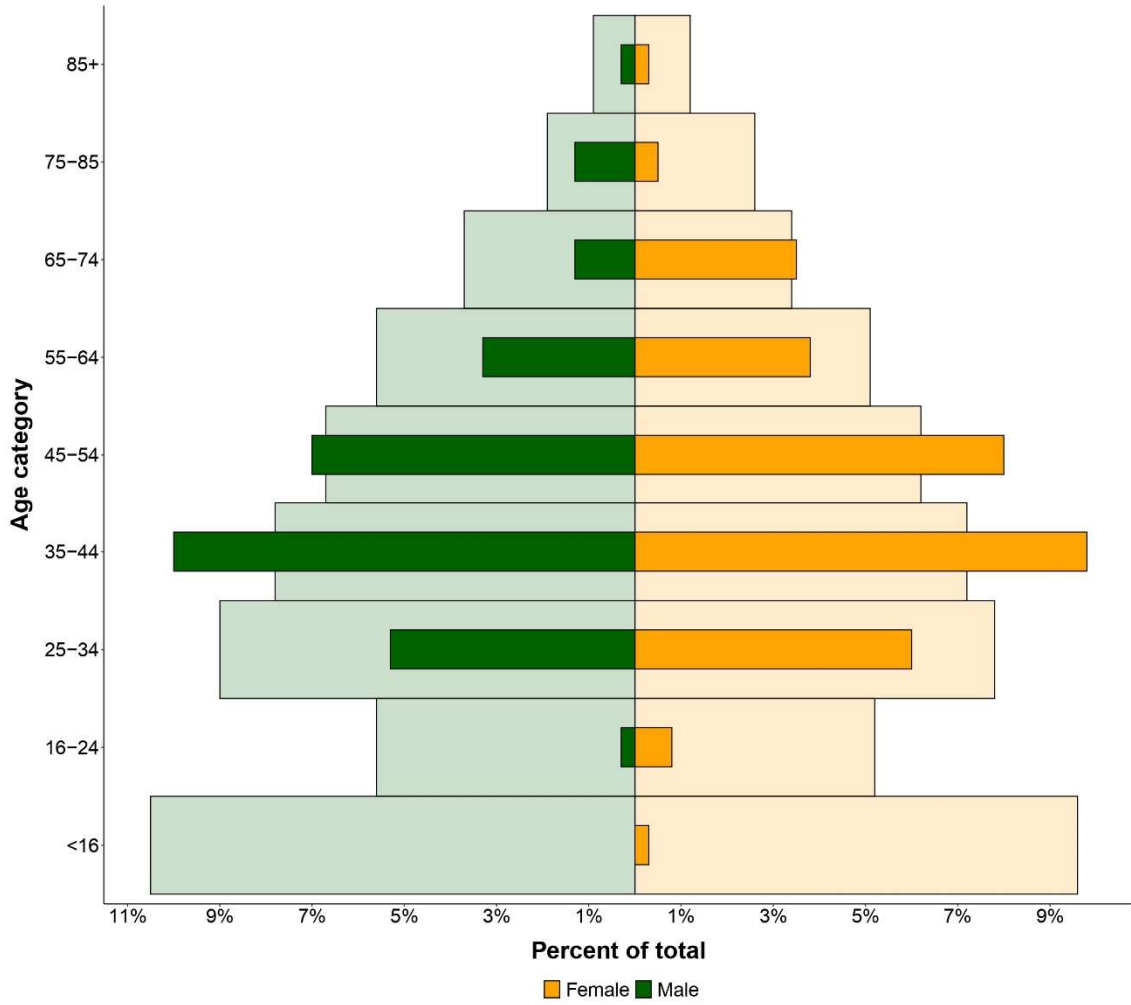
Figure 34 - Age/Gender split of baseline survey respondents compared with the LTN area population (ONS, 2020)
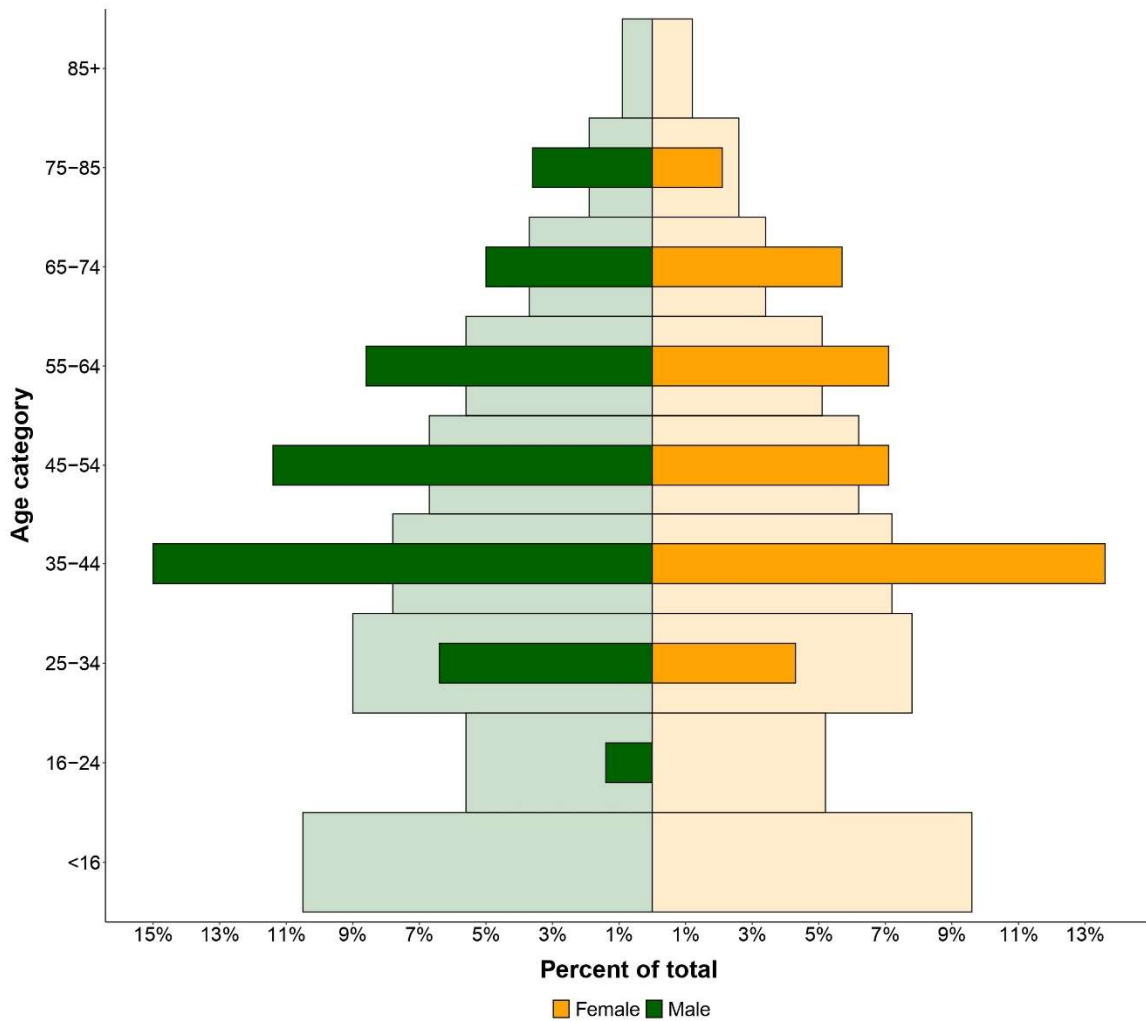
Figure 35 - Age/Gender split of post LTN deployment survey respondents, compared with the LTN area population (ONS 2020)

From the 399 responses analysed in the baseline survey, 60% of respondents provided their age and gender. In the post deployment survey, only 35% of respondents provided their age and gender. Figure 34 and Figure 35 show the % of age/gender split of the baseline and post-deployment survey respondents compared with the LTNs ONS population estimates (2020). Most responses were from the 35-44 and 45-54 age groups. Above the age of 54, gender was less representative of the ONS population distribution; with a bias towards female respondents aged 65-74, and then male responses aged 75-80. In the baseline survey, only the 16-24 age group was underrepresented when compared with ONS population, whilst the under 16 and over 80 LTN population were not represented in the survey responses. From the demographic information provided, the post-deployment survey like the baseline, was generally representative of the ONS LTN population. Only the under 16 and over 80 LTN population was not represented in the survey responses. The most responses were also from the 35-44 age group, with an even gender split, and over representative when compared with the ONS LTN population.
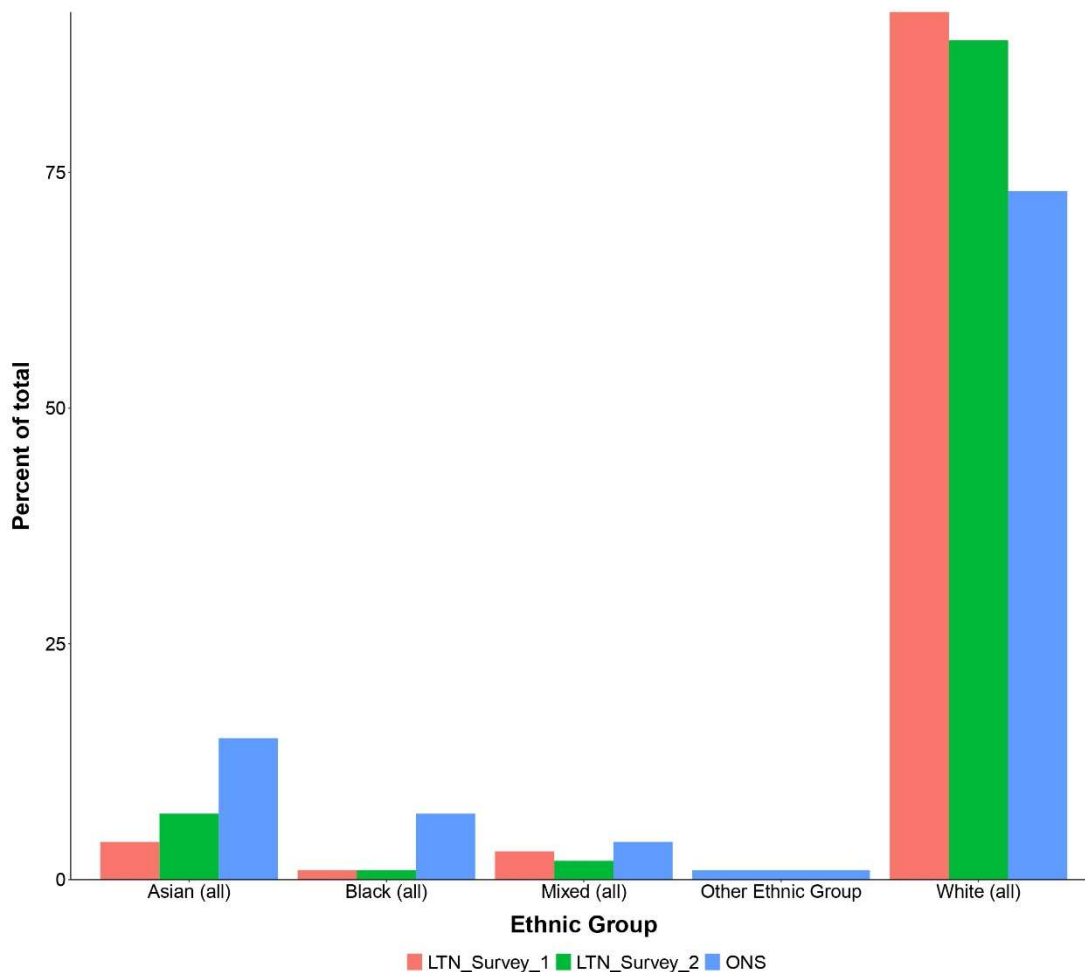
Figure 36 - Ethnicity of baseline and post-LTN deployment survey respondents, compared with the LTN areas census (2011)

As seen in Figure 36 above, the ethnicity of the survey respondents from both the baseline and post-deployments surveys are representative of the LTN catchment area according to 2011 census data. The LTN area is predominantly 'White', which is reflected in the survey responses. Responses from minority groups are also proportionality represented in line with the census, where the largest non-white ethnic group was 'Asian'.

Level of support for the LTNs

As seen in the figure below, support for the LTNs from the residents inside the LTNs has shifted from a neutral opinion to increase at the extremes of either fully support or strongly object.

	Cowley Church	Temple Cowley	Florence Park
Strongly object	14.17	11.11	10.83
Object	-2.78	-2.78	-4.72
Neutral	-12.78	-6.94	-6.94
Tend to support	-10.00	-10.83	-10.56
Fully support	11.39	9.44	11.39

Figure 37 Cowley respondents, relative difference percentage by of support of LTNs, before and after deployment.
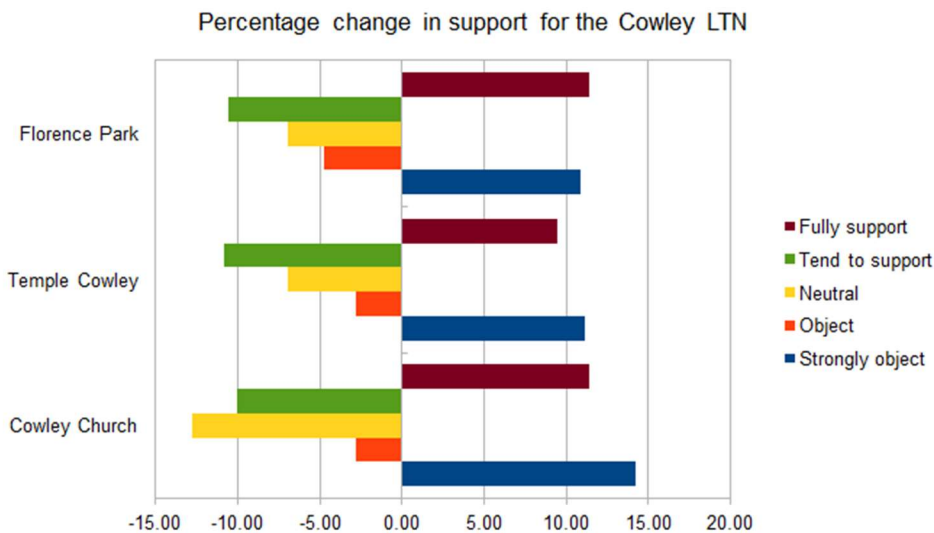
Figure 38 Cowley respondents, relative difference by percentage change, before and after deployment

Such views are further supported by open text responses from both surveys, which indicated that less than 40% of LTN residents' opinions have remained unchanged between the two surveys. There was an overall shift towards objecting against the intervention. However, it should be noted that such negative perceptions also included refinements and suggestions in relation to the LTNs' implementation.

In support of the LTNs, in the open-text responses there was a 9% relative swing in favour of supporting the LTNs. The most referenced benefits of the LTNs were in relation to the positive impact on the attractiveness of the area, such as: reduction in traffic noise, improved air quality, and perceptions of safety owing to less traffic, and how this has led to improvements to residents' quality of life. The most frequent of which, was cited as being able to walk and cycle as a family along with increased social interaction – conversation on quieter streets.

There was also an acknowledgement there are certain trade-offs, whereby respondents were aware that although they may directly benefit from the absence of traffic, other residents may experience potential downsides of increased traffic volumes.

How have travel patterns changed from before and after the deployment of the LTNs?

Percentage change in travel mode use
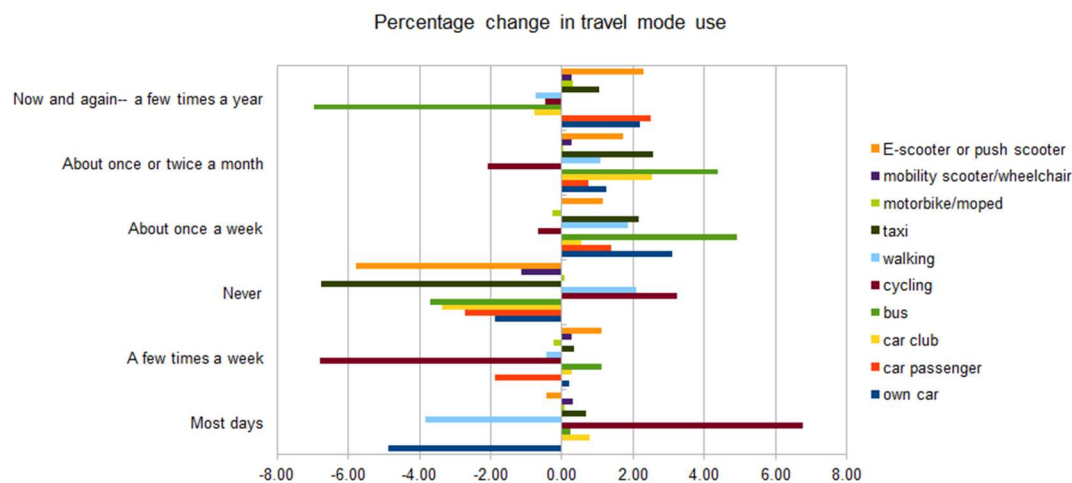
Figure 39 Cowley respondents, relative difference by percentage of travel mode behaviour change

The perception survey shows that after the deployment of the LTNs, cycling has had the largest relative increase, whilst travelling by car on most days has experienced the largest relative decrease. Initial results suggest that the LTNs have contributed to a positive shift towards active transport.

The survey also indicates a general increase in weekly travel by bus and reduction in car use on most days. These shifts are backed up by the empirical data described previously, which showed a significant reduction in car trips within the LTNs, and proportional increases in cycling since the implementation of the LTNs.

How have travel habits changed due to COVID-19 in March vs November 2021

In relation to the travel patterns and impact of the LTNs it is also important to consider how travel habits changed due to COVID-19 in March vs November '21.

	I cycle	I walk	I use public transport	I use the car
a lot more	0.86	-6.84	0.86	-1.13
more	-1.59	-7.96	3.14	0.37
the same	10.22	19.21	16.35	13.28
less	-7.53	-3.01	3.43	-8.42
a lot less	-1.96	-1.4	-23.77	-4.1

Figure 40 Cowley respondents, relative difference by percentage of how travel habits have changed due to COVID-19 in March vs Nov '21

Percentage change in travel patterns due to COVID-19
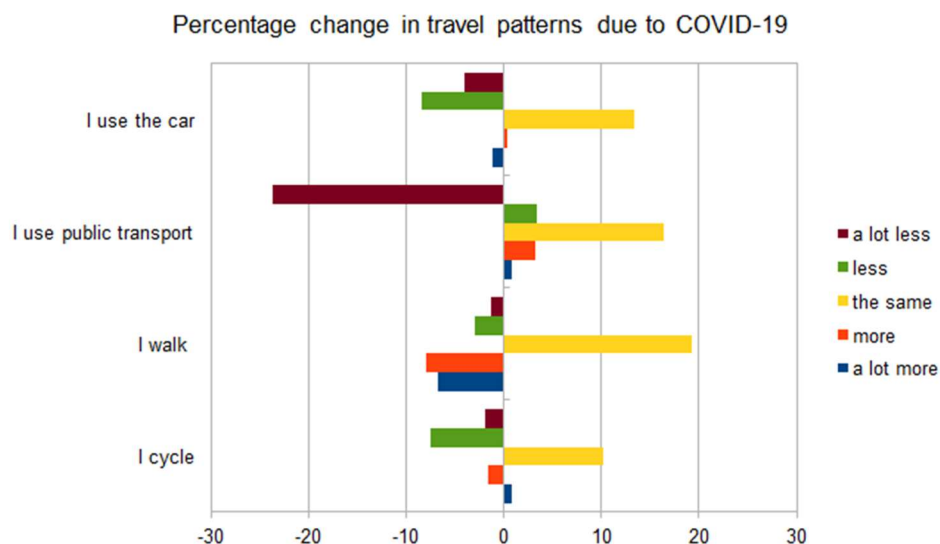
Figure 41 Cowley respondents, relative difference by percentage of how travel habits have changed due to COVID-19 in March vs November 2021

As seen in Figures 40 and 41, in general the modes by which respondents' travel are returning to the same levels before COVID-19. For instance, in terms of absolute responses for travel by public transport, the number of respondents travelling less has one of highest levels of reduction in addition to an increase in travelling the same or more.

In relation to active travel, survey responses indicate that cycling levels have experienced a relative increase, as indicated by a reduction in responses cycling less and a slight increase in respondents' cycling more when compared to walking. The changing context of COVID-19 in relation to understanding travel habits is essential in interpreting the impact of the LTNs on a modal shift towards active transport. For instance, trip-purpose influenced by working from home policies, change in daily routines as well as occupation types of residents could bias and skew the findings.

Changes in attitudes regarding cycling

	Cycling is unsafe because of traffic	My local area is safe for an 8-year old to cycle	There are special lanes, routes or paths for cycling	My local area is pleasant for cycling
Strongly agree	-8.4	2.7	-0.4	7.3
Agree	-10.5	14.4	5.5	12.0
Neutral	2.4	4.9	7.8	-1.9
Disagree	14.2	-1.7	-3.2	-15.8
Strongly disagree	2.2	-20.3	-9.7	-1.6

Figure 42 Cowley respondents, relative difference by percentage of attitudes towards cycling

Overall, there has been a positive shift in attitudes towards cycling, most notably in relation to perceptions of safety due to traffic. There has also been a significant increase in respondents who indicated that that the LTNs may have positively

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contributed to the attractiveness of the area and therefore conditions to encourage more cycling.

The open-text response in the survey provides further support in relation to LTNs' impact on perceptions of safety owing to a reduction in traffic as well as the area being more attractive for families to cycle together for leisure or school travel. Respondents particularly referenced, the 'transformation' of Littlemore Road as previously 'unsafe' and 'scary' when cycling with children before the LTN filter, and 'safer through the chicanes along Cricket Road/Rymers Lane'.

The survey also showed a relative increase in the percentage of respondents who thought the area was safe for an 8-year-old to cycle. The open-text comments also indicated that responses to this question may depend on how it is interpreted however: as children cycling with friends or alone and not accompanied by a parent. In this sense, individual parenting style and family behaviours, as well as social and contextual attitudes towards children and place, may need to be considered.

Changes in attitudes regarding walking

	Walking is unsafe because of traffic	My local area is safe for an 8-year old to walk alone	My local area is pleasant for walking	There are good quality pavements for walking	There are enough safe places to cross roads	My local area has enough places to stop and rest outdoors	There are places to walk to, such as shops, restaurants, leisure facilities
Strongly agree	-5.0	-2.8	3.9	-1.6	-1.3	-1.4	0.5
Agree	-14.1	13.9	9.9	3.0	11.7	0.8	-1.7
Neutral	-0.8	7.9	-6.1	0.9	2.4	5.1	-2.0
Disagree	9.3	-9.6	-9.5	-7.2	-14.3	-4.6	0.8
Strongly disagree	10.6	-9.3	1.8	4.8	1.6	-0.0	2.5

Figure 43 : Cowley respondents, relative difference by percentage of attitudes towards walking

The survey responses indicate an overall positive shift towards walking in the area, most notably in relation to the attractiveness and safety of the area owing to less noise and traffic volumes/speeds. Respondents in the open-ended text also commented on a new sense of enjoyment experienced from walking in the area, and the improvement the LTNs have made on their quality of life as result of no longer living on a 'through road'.

Changes in attitudes regarding crime and antisocial behaviour

	The area is unsafe because of the level of crime or antisocial behaviour	Air pollution caused by motor traffic is a problem in my area	I regularly stop and talk with people in my local area	Getting to where I want to go by car is quick and easy
Strongly agree	1.2	-2.8	0.4	-13.8
Agree	-7.8	-8.7	-4.3	-18.7
Neutral	2.8	5.6	-1.2	-2.7

| Disagree | -2.2 | 5.3 | -1.0 | 5.3 |
| Strongly disagree | 6.1 | 0.6 | 6.0 | 30.0 |

Figure 44 Cowley respondents, relative difference by percentage of attitudes towards crime and anti-social behaviour, air pollution, social-interaction, and travel by car

As seen in Figure 44, there is a higher relative increase in disagreement that the area is unsafe owing to crime or antisocial behaviour, indicating that the respondents' perceived levels of safety or fear of antisocial behaviour has reduced since the deployment of the LTNs.

There was a small relative increase in the level of strong agreement that the area is perceived as unsafe. The open-text comments may offer some insight into this view. Female respondents expressed feeling unsafe when walking home on their own due to the absence of vehicles and activity. Similarly, some respondents also noted that the filters tended to become meeting points for youth groups to 'hang around' and whilst their behaviour was not always anti-social, their presence was intimidating to those walking by. Other respondents also commented on the anti-social behaviour of e-scooters and mopeds in the area as contributing factors to feeling unsafe, as well as safety concerns from the increase in delivery mopeds going through the filters at high speed.

Changes in attitudes regarding air quality

Survey responses indicate there has been an overall improvement in the perception of air pollution since the deployment of the LTNs. There is also an equal relative increase in the percentage difference of neutral responses. In the open-text comments, a number of respondents recognised that while they have directly benefitted from what they perceived as 'displacement of traffic' to the outer areas, other residents – on the periphery or main roads – may experience an increase in air-pollution as a consequence of any potential displaced traffic. Whilst the comments state air-pollution and air-quality as factor, when interpreting these responses, there are unknowns about the influence of sound and perceptual cues, which people may automatically interpret as an increase in air-pollution. For instance, traffic noise or presence of more vehicles.

Changes in attitudes regarding social interaction

As seen in figure 44, social interaction – as indicated by 'people regularly stopping to interact with people in their local area' – has generally decreased since the deployment of the LTNs. This relative decline may also be explained by external factors such as seasonality (between surveys) or change in routine behaviours and temporal aspects owing to COVID-19. In the open-text responses, where social interaction has been discussed, the LTNs have been largely credited by respondents for their impact – decrease of traffic noise – on enabling conversations with other residents. The lack of street space owing to parked cars was attributed as the main barrier to social interaction.

Changes in attitudes regarding car travel

The largest objection to the LTNs, as seen in figure 44, relates to convenience and ease of travel by car. There was a significant relative decrease in the number of respondents who found getting to their destinations was quick and easy by car compared to before the LTNs were deployed.

Similarly, increased travel time owing to extending travel routing and inconvenience were cited as the most objectionable and negative trade-offs in the open text responses. Inconvenience was also the main reason a respondent from the linked survey changed their view from support to a negative perception of the LTNs between surveys.

Next steps

Provided funding is available, the following steps are suggested for evaluation of LTN schemes in Oxford:

Cowley LTNs
Monitoring of the Cowley LTNs to continue and update the evaluation to feed into July CMD reporting. This update should include:

- Updates to road user volumes.
- Updates to Air Quality analysis.
- Completion of noise impact analysis by the OxAria research project with the University of Birmingham and Oxford University.
- Update on traffic speed
- Final public survey analysis including findings from a 1-year follow-up LTN Perception Survey.

If resource allows, it would be possible to undertake a more granular analysis of the perception survey responses, focussing on less tangible impacts of the LTNs, such as impact on health and healthy aging and social interactions for example.

East Oxford LTNs
Three LTNs have been approved for implementation in East Oxford in March 2022.

In addition to the monitoring methods and evaluation analysis used in this evaluation of the Cowley LTNs, further methods and analysis are planned to feed into the evaluation of the East Oxford LTNs. These include:
- Before and after traffic counts on most roads within the LTNs.
- Air Quality monitoring within the LTNs
- In collaboration with the University of Westminster, monitoring of vehicle, cycling, and pedestrian volumes within the LTNs. This will also feed into a DfT-funded national evaluation of Low Traffic Neighbourhoods.

Conclusion

In this report we have taken a holistic approach to evaluating the effects of implementing LTNs in East Oxford, as part of the Tranche 1 Emergency Active Travel Fund. While the evaluation framework was developed with Tranche 2 in mind, and thus some baselining data were not available, it is critical to thoroughly examine the available data to inform council decisions.

It should be stressed that the pandemic has significantly complicated the evaluation process, and even more for Oxford than other cities, due to the large student population.

We have examined the changes in traffic volume, traffic speed, air quality, perceived safety, journey time, effect on emergency services, bus time reliability and perceived utility both at the LTN regions and their boundary roads. To do this, we have used sensor data, telematics, surveys and collaborated with other key organisations, such as the Oxford City Council, University of Birmingham, Stagecoach, and South and Central Ambulance Service.

Overall, we have found that LTNs work well as a local intervention, effectively reducing the volume of car journeys, increasing volume of active travel, and have numerous benefits to the those who reside within them. These include greater perceived safety, air quality, and tendency to adopt walking and cycling.

However, we have also found some adverse effects in the boundary roads, such as a small increase in car traffic volume and reduced air quality, indicating that at least some traffic is diverted to these roads. There also has been an adverse effect to bus operations, especially during the evening peak.

It is possible that supporting public transport solutions would help resolve multiple of the challenges identified. Thus, a holistic approach is suggested moving forwards where active travel schemes are progressed, complemented with public transport considerations, and long-term inclusive public engagement.

Annex A Intervention maps

Cowley Low Traffic Neighbourhoods
Church Cowley, Temple Cowley and Florence Park
Traffic Count: Mean average change comparison in daily car count March to November pre-Covid (2019) to post-Covid (2021). Control group adjusted.
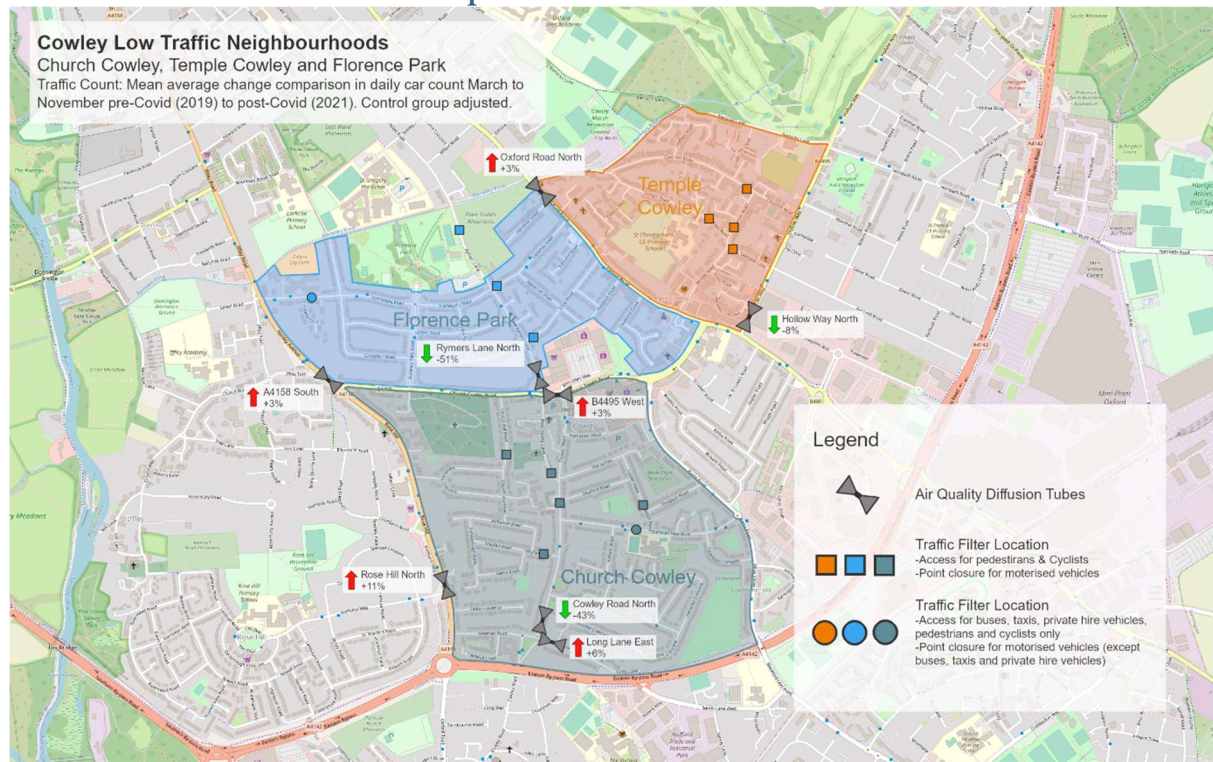
Annex B Timeline of measures

Implementation of the Cowley LTNs began on 1 March 2021 and traffic filter installations were staggered through the end of March.

Due to supply issues, some bollards were installed in April 2021. The last bollard was installed on 17th May 2021 on Clive Road, completing the LTN implementation with the exception of the installation of ANPR enforcement cameras at bus gates on Bartholomew Road (Church Cowley LTN) and Cornwallis Road (Florence Park LTN).

Annex C Surveys

Baseline survey

1

Please say whether you are responding as a:

You must provide an answer to this question.

- Church Cowley resident
- Florence Park resident
- Temple Cowley resident
- Resident of another part of Oxford
- Resident outside Oxford
- Local business, group or organisation in the Cowley area
- On behalf of an interest group
- Other

If other—please state
[ ]

- Only display this item when option *6 (Local business, group or organisation in the Cowley area)* of question *1 (Please say whether you are responding as a:)* was selected

Question for businesses and organisations

What do you think the impact of the Low Traffic Neighbourhood will be on your business or organisation?

Select the most applicable option in each row.

Grid showing question statements against rating options

	Positive	Neutral	Negative
My customers or members	( )	( )	( )
My staff or volunteers	( )	( )	( )
My deliveries	( )	( )	( )
My overall business	( )	( )	( )

Please enter any additional comments
[ ]

2

Please enter your full post code.

We want to understand the impact on and views of residents of individual streets.

The Council will not share any personal data outside the organisation except in an anonymised format for analysis

[ ]

3

For each of the following ways of travel, please say how often you use them for local journeys within Oxford

Select the most applicable option in each row.

Grid showing question statements against rating options

	Most days	A few times a week	About once a week	About once or twice a month	Now and again- - A few times a year	Never
Car driver (own car)	( )	( )	( )	( )	( )	( )
Car passenger	( )	( )	( )	( )	( )	( )
Car club driver or passenger	( )	( )	( )	( )	( )	( )
Bus	( )	( )	( )	( )	( )	( )
Cycling	( )	( )	( )	( )	( )	( )
Walking	( )	( )	( )	( )	( )	( )
Taxi	( )	( )	( )	( )	( )	( )
Motorbike or moped	( )	( )	( )	( )	( )	( )
Mobility scooter/wheelchair	( )	( )	( )	( )	( )	( )
e-scooter or push scooter	( )	( )	( )	( )	( )	( )

4

Have your current travel habits changed due to the COVID-19 pandemic?

Select the most applicable option in each row.

Grid showing question statements against rating options

	A lot more	More	The same	Less	A lot less	N/A
I cycle	( )	( )	( )	( )	( )	( )

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
I walk	( )	( )	( )	( )	( )	( )
I use public transport	( )	( )	( )	( )	( )	( )
I use a car	( )	( )	( )	( )	( )	( )

5

We would like to understand how you feel about cycling in your local area.

Before the start of the Low Traffic Neighbourhood experiment, to what extent do you agree or disagree with the following statements?

Select the most applicable option in each row.

Grid showing question statements against rating options

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
Cycling is unsafe because of the traffic	( )	( )	( )	( )	( )	( )
My local area is safe for an 8-year-old child to cycle	( )	( )	( )	( )	( )	( )
There are special lanes, routes or paths for cycling	( )	( )	( )	( )	( )	( )
My local area is pleasant for cycling	( )	( )	( )	( )	( )	( )

6

We would like to understand how you feel about walking in your local area.

Before the start of the Low Traffic Neighbourhood experiment, to what extent do you agree or disagree with the following statements?

Select the most applicable option in each row.

Grid showing question statements against rating options

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Walking is unsafe because of the traffic	( )	( )	( )	( )	( )
My local area is safe for an 8-year-old child to walk alone	( )	( )	( )	( )	( )
My local area is pleasant for walking	( )	( )	( )	( )	( )
There are good quality pavements for walking	( )	( )	( )	( )	( )
There are enough safe places to cross roads	( )	( )	( )	( )	( )

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
My local area has enough places to stop and rest outdoors	( )	( )	( )	( )	( )
There are places to walk to, such as shops, restaurants, leisure facilities	( )	( )	( )	( )	( )

7

We are interested to know your thoughts on moving around your local area.

Before the start of the Low Traffic Neighbourhood experiment, to what extent do you agree or disagree with the following statements?

Select the most applicable option in each row.

Grid showing question statements against rating options

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The area is unsafe because of the level of crime or antisocial behaviour	( )	( )	( )	( )	( )
Air pollution caused by motor traffic is a problem in my area	( )	( )	( )	( )	( )
I regularly stop and talk with people in my local area	( )	( )	( )	( )	( )
Getting to where I want to go by car is quick and easy	( )	( )	( )	( )	( )

- Always jump to *8 (In a sentence, please summarise what you think about the Low Traffic Neighbourhoods.)*

X

We are interested to know about the barriers to walking or walking more in your local area. Which of the following reasons, if any, apply to you?

Select all that apply.

- It is too far to walk
- It takes too long (i.e. I don't have time to walk)
- Lack of footpaths (or poor condition of footpaths) or lack street lighting
- Road safety concerns e.g. Too much traffic, not enough crossing points
- Too much air pollution
- Personal security concerns (or parental concern for children)
- Health reasons (poor health or disability prevents walking, lack of resting places or benches, too many steps or hills)
- No one to walk with (or parents cannot accompany them)
- Prefer current mode of transportation

If other please specify
[ ]

X

We are interested to know about the barriers to cycling or cycling more. Which of the following reasons, if any, apply to you?

Select all that apply.

- I cannot ride a bike (or I am not confident doing so)
- It is too far to cycle
- It takes too long (I don't have time to cycle)
- Lack of cycle paths and adequate street lighting (or poor-quality paths)
- Too much air pollution
- Road safety concerns e.g. too much traffic
- Personal security concerns
- Lack of facilities at destination (e.g. to shower or store bike)
- Ill-health reasons or disability that prevents cycling
- I don't own a bike (or bike broken)
- No interest in cycling

If other please specify
[ ]

8

In a sentence, please summarise what you think about the Low Traffic Neighbourhoods.

[ ]

9

Additional comments

Is there anything else you would like to say that has not already been covered in the survey?

[ ]

Information about you

We would like to know more about you so that we can understand our customers and residents. By answering the following questions we can check if we are hearing the views of a wide range of people and communities.

If you do not want to provide any parts of this information, please select prefer not to say.

All information given is anonymous and is governed by the General Data Protection Regulations 2018. It will be treated as strictly confidential.

10

What is your age?

- Under 16
- 16-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65 – 74
- 74 – 85
- Over 85
- Prefer not to say

11

Are you…?

- Female
- Male
- Other
- Prefer not to say

12

As a woman, are you pregnant, on maternity leave or returning from maternity leave?

- Yes
- No
- Prefer not to say
- N/A

13

What is your ethnic group?

- Arab
- Asian or Asian British (Indian, Pakistani, Bangladeshi, Chinese or any other Asian background)
- Black or Black British (Caribbean, African, or any other Black background)
- Mixed (White and Black Caribbean, White and Black African, White and Asian and any other mixed background)
- White (British, Irish, Scottish, Welsh or any other white background)
- Prefer not to say

- Other ethnic group

if other please specify
[ ]

14

What is your current religion, if any?

- Buddhist
- Christian (including Church of England, Catholic, Protestant and all other Christian denominations)
- Hindu
- Jewish
- Muslim
- Sikh
- No religion
- Prefer not to say
- Any other religion (write in below)

If any other religion, please write in:
[ ]

15

Do you have a long standing illness, disability or infirmity

You can tick more than one box

Select at least 1 option

- No
- Yes - mobility issues
- Yes - sight issues
- Yes - hearing issues
- Yes - general health issues
- Prefer not to say

16

Which of the following best describes your sexual orientation?

- Straight/ Heterosexual
- Gay or lesbian
- Bisexual
- Other sexual orientation – please write in

- Prefer not to say

If other, please write in
[ ]

17

Do you look after, or give any help or support to anyone because they have long-term physical or mental health conditions or illnesses, or problems related to old age?

- No
- Yes, 9 hours a week or less
- Yes, 10 or more hours a week
- Prefer not to say

18

Are you married or in a civil partnership?

- Yes
- No
- Prefer not to say

19

Is your gender identity the same as your sex registered a birth?

- Yes
- No – write in gender identity
- Prefer not to say

If no, please write in gender identity
[ ]

20

In order to understand the impact of the Low Traffic Neighbourhoods and your views over time, we will be conducting this survey in the first month, after 5 months and after 1 year if the experiment is continued.

If you would like to be kept informed of future surveys for these LTNs please thick the relevant box and enter your email below so that we can contact you if this is necessary.

I consent for Oxfordshire County Council to hold my personal details and to re-contact me for engagement and consultation purposes. I confirm that I have read the statement below describing how my data will be used and I understand how to withdraw my consent.

- I would like to be kept informed about consultation, surveys and information relating to Low Traffic Neighbourhoods
- I would like to be contacted again to help shape Oxfordshire County Council's services, policies and priorities (not just LTNs)

Please enter your email address if you would like to be contacted for the reasons selected above
[ ]

Thank You

Thank you for taking the time to answer these questions.

Your data

Under the Data Protection Act 2018, we (Oxfordshire County Council) have a legal duty to protect any personal information we collect from you. Oxfordshire County Council is committed to open government and this may include quoting extracts from your consultation response in our report.

Your personal information will only be used in relation to this consultation

View Oxfordshire County Council's privacy notice online at www.oxfordshire.gov.uk - search privacy notice.

How did you find out about this consultation?

(Please tick all that apply)

- Facebook
- Twitter
- Instagram
- LinkedIn
- Oxfordshire.gov.uk website
- Email from Oxfordshire county council
- Letter from council
- Local news item (newspaper, online, radio, tv)
- Oxfordshire county councillor
- Parish or town council
- Local community group/organisation
- Friend/relative
- Other

If other, please provide details:
[ ]

Follow up survey

1. In order to understand the impact of the Low Traffic Neighbourhoods and your views over time, we will be conducting this follow-up survey now and after 1 year if the experiment is continued. So that we can compare your answers to previous and future surveys, please enter your email address below.

By giving your email, you are giving your consent for Oxfordshire County Council to hold your contact details.

We promise:

- to hold your information securely and not pass it onto anyone else without your permission
- only to use your email to link together the survey responses you have provided, without linking the responses to yourname and contact details
- to only use your contact details for the purposes above

You have the right to withdraw your consent at any time by writing to:

activetraveloxfordcity@oxfordshire.gov.uk or by writing to:

Cowley LTNs evaluation,

FREEPOST OXFORDSHIRE COUNTY COUNCIL

(No further address details required)

Please enter your email address below.

2. If you would like to be kept informed of future surveys for the Cowley LTNs please tick the box below so that we can contact you if this is necessary.

> I consent for Oxfordshire County Council to hold my personal details and to re-contact me for engagement and consultation purposes. I confirm that I have read the statement above describing how my data will be used and I understand how to withdraw my consent.

(Choose all that apply)

☐   I would like to be kept informed about consultation, surveys and information relating to Low Traffic Neighbourhoods

3. Please say whether you are responding as a:

(Choose any one option) (Required)

☐   Church

☐   Cowley

☐   resident

Florence

Park

resident

Temple

Cowley

resident

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☐   **Resident of another**

☐   **part of OxfordResident**

         outside Oxford

☐   **Representing a business/ school / employer**

☐   **Representative of a resident association, group, campaign group, community**

☐   **facilityRepresentative of a place of worship**

☐   **Councillor (parish, city**

☐   **and/or county)Other**

         (please specify)

Answer this question only if you have chosen Representing a business/ school / employer for Please say whether you are responding as a:

4.   **What has the impact of the low traffic neighbourhoods been on your business or organisation?**

Questions	Positive	Neutral	Negative
My customers or members			
My staff or volunteers			
My incoming deliveries			
My outgoing deliveries			
My overall business			

5.   **Please enter your full post code**

We want to understand the impact on and views of residents of individual roads.

We will not share any personal data outside the organisation except in an anonymised format for analysis.

6. **So far, what is your view regarding the Cowley LTNs in:**

Select the most applicable option in each row.

Questions	Fully support	Tend to support	Neutral	Object	Strongly Object
Church Cowley					
Temple Cowley					
Florence Park					

7. **Looking back to BEFORE the Cowley LTNs were implemented, what was your view then regarding the Cowley LTN in:**

Select the most applicable option in each row.

Questions	Fully support	Tend to support	Neutral	Object	Strongly Object
Church Cowley					
Temple Cowley					
Florence Park					

8. **For each of the following ways of travel, please say how often you use them for local journeys within Oxford.**

Select the most applicable option in each row.

Questions	Most days	A few times a week	About once a week	About once or twice a month	Now and again-- a few times a year	Never
Car driver (own car)						
Car passenger						
Car club driver or passenger						
Bus						
Cycling						
Walking						
Taxi						
Motorbike or moped						
Mobility scooter/wheelchair						
E-scooter or push scooter						

9. **Have your current travel habits changed due to the COVID-19 pandemic?**

Select the most applicable option in each row.

Questions	a lot more	more	the same	less	a lot less	N/A
I cycle						
I walk						

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I use public transport					
I use a car					

10. We would like to understand how you feel about cycling in your local area.

To what extent do you agree or disagree with the following statements now that the LTNs are in place?

Select the most applicable option in each row.

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Cycling is unsafe because of the traffic					
My local area is safe for an 8-year-old child to cycle					
There are special lanes, routes or paths for cycling					
My local area is pleasant for cycling					

11. We would like to understand how you feel about walking in your local area.

To what extent do you agree or disagree with the following statements now that the LTNs are in place?

Select the most applicable option in each row.

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Walking is unsafe because of the traffic					
My local area is safe for an 8-year-old child to walk alone					
My local area is pleasant for walking					
There are good quality pavements for walking					
There are enough safe places to cross roads					
My local area has enough places to stop and rest outdoors					
There are places to walk to such as shops, restaurants and leisure facilities					

12. We are interested to know your thoughts on moving around your local area.

To what extent do you agree or disagree with the following statements now that the LTNs are in place?

Select the most applicable option in each row.

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The area is unsafe because of the level of crime or antisocial behaviour					
Air pollution caused by motor traffic is a problem in my area					
I regularly stop and talk with people in my local area					
Getting to where I want to go by car is quick and easy					

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13. Please let us know what you think about the Cowley low traffic neighbourhoods.

14. Is there anything else you would like to tell us about the Cowley low traffic neighbourhoods?

Your Data

Under the Data Protection Act 2018, we (Oxfordshire County Council) have a legal duty to protect any personal information we collect from you. Oxfordshire County Council is committed to open government and this may include quoting extracts from your consultation response in our report.

Your personal information will only be used in relation to this consultation.

View Oxfordshire County Council's **privacy notice** online at **www.oxfordshire.gov.uk** - search privacy notice.

About you

The council is committed to **keeping your information secure** and we will not share any personal data outside the organisation except in an anonymised format.

We would like to know a little about you so that we can understand more about our customers and residents. It helps us to know if we are hearing the views of a wide range of people and communities.

If you do not want to provide any of this information, please select 'prefer not to say'.

All information given is anonymous and is governed by the General Data Protection Regulations 2018. It will be treated as strictly confidential.

15. What is your age?

(Choose any one option)

- [ ] under 16
- [ ] 16-24
- [ ] 25-
- [ ] 35-44
- [ ] 45-54
- [ ] 55-64
- [ ] 65-74
- [ ] 75-85
- [ ] over 85
- [ ] prefer not to say

16. What is your gender?

(Choose any one option)

- [ ] Female
- [ ] Male
- [ ] Prefer not to say
- [ ] Other (please describe)

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17. Are you pregnant, on maternity leave or returning from maternity leave?

(Choose any one option)

☐ Yes

☐ No

☐ Prefer not to say

☐ N/A

18. What is your ethnic group?

(Choose any one option)

☐ Arab

☐ Asian or Asian British (Indian, Pakistani, Bangladeshi, Chinese or any other Asian background)

☐ Black or Black British (Caribbean, African, or any other Black background)

☐ Mixed (White and Black Caribbean, White and Black African, White and Asian and any other mixed background)

☐ White (British, Irish, Scottish, Welsh or any other white background)

☐ Prefer not to say

☐ Other ethnic group (please specify)

19. What is your current religion, if any?

(Choose any one option)

☐ Buddhist

☐ Christian (including Church of England, Catholic, Protestant and all other Christian denominations)

☐ Hindu

☐ Jewish

☐ Muslim

☐ Sikh

☐ No religion

☐ Prefer not to say

☐ Any other religion (write in below)

20. Do you have a long standing illness, disability or infirmity

You can tick more than one box

(Choose all that apply)

☐ No

☐ Yes-- mobility issues

☐ Yes-- sight issues

☐ Yes-- hearing issues

☐ Yes-- general health issues

☐ Prefer not to say

21. Which of the following best describes your sexual orientation?

(Choose any one option)

☐ Straight/ Heterosexual

☐ Gay or lesbian

☐ Bisexual

☐ Prefer not to say

☐ Other sexual orientation-- please write in

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22. Do you look after, or give any help or support to anyone because they have long-term physical or mental health conditions orillnesses, or problems related to old age?

(Choose any one option)

☐ No
☐ Yes, 9 hours a week or less
☐ Yes, 10 or more hours a week
☐ Prefer not to say

23.   Are you married or in a civil partnership?

(Choose any one option)

☐ Yes
☐ No
☐ Prefer not to say

24. Is your gender identity the same as your sex registered a birth?

(Choose any one option)

☐ Yes
☐ No – write in gender identity
☐ Prefer not to say

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FINAL

Annex D Noise Pollution

In order to better understand how LTNs impact noise levels, sensors were deployed around the Temple Cowley Low Traffic Neighbourhood. This is the first evaluation that used sensors to assess the impact of LTN modal filters on ambient noise levels. Moreover, noise modelling is a relatively new field, and thus this part of the analysis should be treated as indicative.

In collaboration with the OxAria research project with the University of Birmingham and University of Oxford, ten AudioMoth sensors were deployed to monitor the Temple Cowley Low Traffic Neighbourhood.

Figure 45 - AudioMoth deployment locations, Cowley Low Traffic Neighbourhoods (no.8-17)

Audiomoth sensors were deployed before and after modal filters were installed to provide granular data localised to the specific area. The Audiomoth noise sensors measure both frequency and amplitude of noise, but do not record individual sounds, or personal data. Using an experimental method (Normalised Difference Soundscape Index, NDSI) building on innovation work from Southampton University[vii] and UCL[viii], this enables us to identify the extent of noise exposure over time and understand the type of noise, whether this is anthropogenic (human-originated) or biotic (natural).

A previous study was carried out by iHUB and the University of Oxford in 2020[ix] to assess the AudioMoth device and NDSI algorithm. A full report including data outputs are published on the Pitch-in projects website and serve as an example for the soundscape information to be returned regarding the Cowley Low Traffic Neighbourhoods as part of the OxAria project. This will be included in the final evaluation report. Audiomoth sensors collected data for two 6-week periods in April and June 2021. Data is currently with the University of Birmingham pending processing and analysis, due for report end Q2 2022.

Annex E References

[i] [What is a low traffic neighbourhood? - Sustrans.org.uk](#)

[ii] [Agenda for Delegated Decisions by Cabinet Member for Environment (including Transport) on Thursday, 21 January 2021, 10.00 am (oxfordshire.gov.uk)](#)

[iii] [Microsoft Word - OXFORD LCWIP v200101 (oxfordshire.gov.uk)](#)

[iv] [Traffic Management Act 2004: network management to support recovery from COVID-19 - GOV.UK (www.gov.uk)](#)

[v] [Traffic Management Act 2004 (legislation.gov.uk)](#)

[vi] [Gear change: a bold vision for cycling and walking (publishing.service.gov.uk)](#)

[vii] Alvares-Sanches, T, et al. 2019. Spatial Variation in Sound Frequency Components Across an Urban Area Derived from Mobile Surveys. Future Cities and Environment, 5(1): 7, 1–17

[viii] Fairbrass AJ, Firman M, Williams C, Brostow GJ, Titheridge H, Jones KE. CityNet—Deep learning tools for urban ecoacoustic assessment. Methods Ecol Evol. 2019;10:186–197

[ix] An IoT approach to characterising biodiversity of green spaces for planetary health. 2020. Pitch-in (website): https://pitch-in.ac.uk/projects/an-iot-approach-to-characterising-biodiversity-of-green-spaces-for-planetary-health/