Enhancements to the Propensity to Cycle Tool to estimate cycle-to-station potential: PCT STARS Phase 2 Report

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1 Introduction

Combining rail travel with cycling is one of the most flexible ways to get around, opening up destinations that might not otherwise be reachable without using a private motor vehicle. Rail stations represent a major destination for cycle journeys, and travel by rail has almost doubled in the last 20 years (ORR 2019). As such, it is vital to understand the dynamics of cycle-rail integration. We investigate this for commuter journeys originating in Bedfordshire.

The Propensity to Cycle Tool (Lovelace et al. 2017) uses 2011 Census data to investigate the proportion of commuters that currently cycle to work, alongside a range of scenarios investigating how cycling levels could increase. These scenarios include two different approaches to meeting the Government target of doubling cycle commutes. Additionally, the 'Gender Equality' scenario models what would happen if women cycled as much as men currently do, since this is the norm in high-cycling countries. The 'Go Dutch' scenario models what would happen if cycling in the UK was at the same levels as found in the Netherlands, while accounting for the impact of hilliness and journey distance. The 'Ebikes' scenario expands this by assuming widespread adoption of ebikes for longer distance commutes.

However, the treatment of commuter journeys in all of these scenarios suffers from a vital limitation. The 2011 Census provides a comprehensive dataset of journey origins and destinations, but the Census questions

relating to commuter travel only record the main mode of transport to work, defined as the mode used for the longest portion of the journey according to distance. Therefore, multimodal journeys are not represented. This is particularly problematic when it comes to journeys involving public transport.

In reality, almost all journeys involving public transport will necessarily be multimodal journeys (Figure 1). The passenger must first reach the train station, bus or tram stop, perhaps doing so on foot, on cycle, or by car or taxi. Following a journey on one or more forms of public transport, they will again require a further trip stage to reach their final destination.

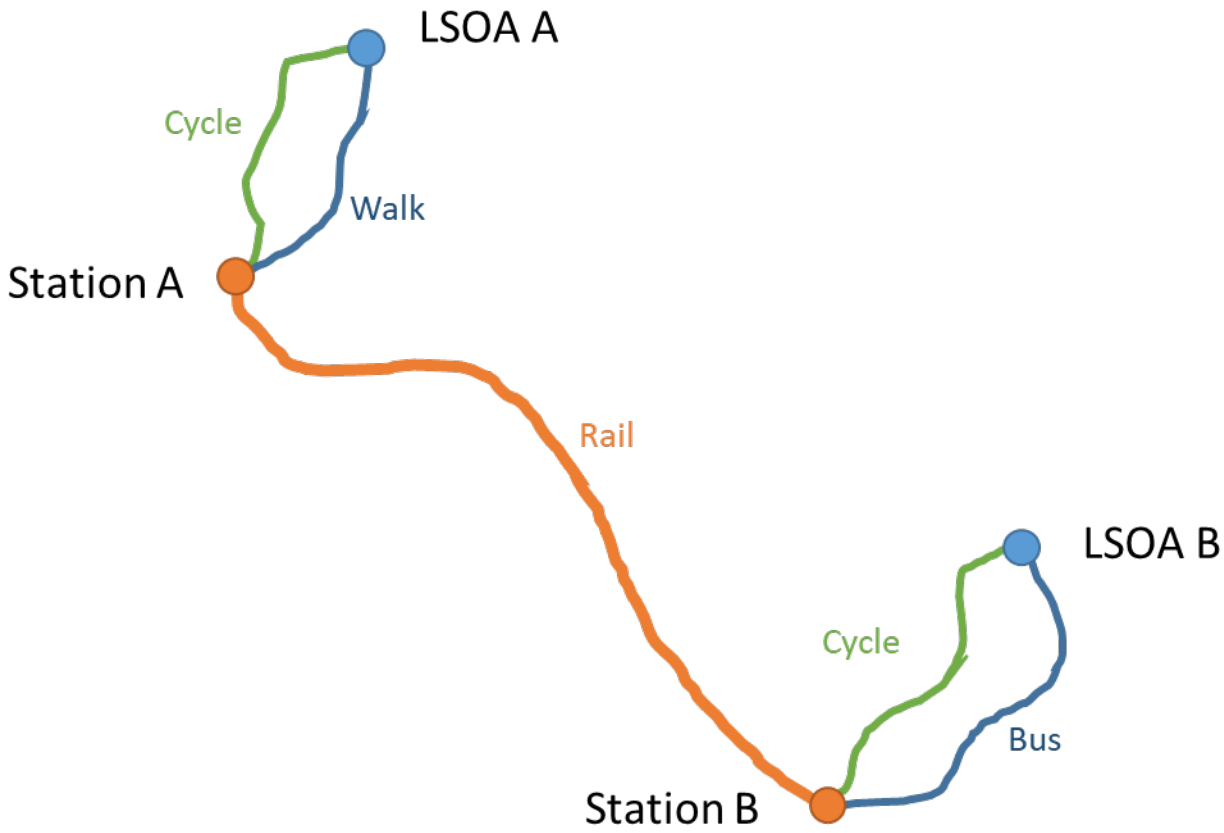

Figure 1: An example showing the multimodal nature of most rail journeys

In counties such as Bedfordshire, commuting by rail is widespread, with the great majority of these commuters travelling to work in London (Figure 2). There are therefore a large number of people travelling to and from local rail stations, who could potentially by accessing these stations by bicycle. These cycle journeys are currently being missed from our estimates of cycle propensity.

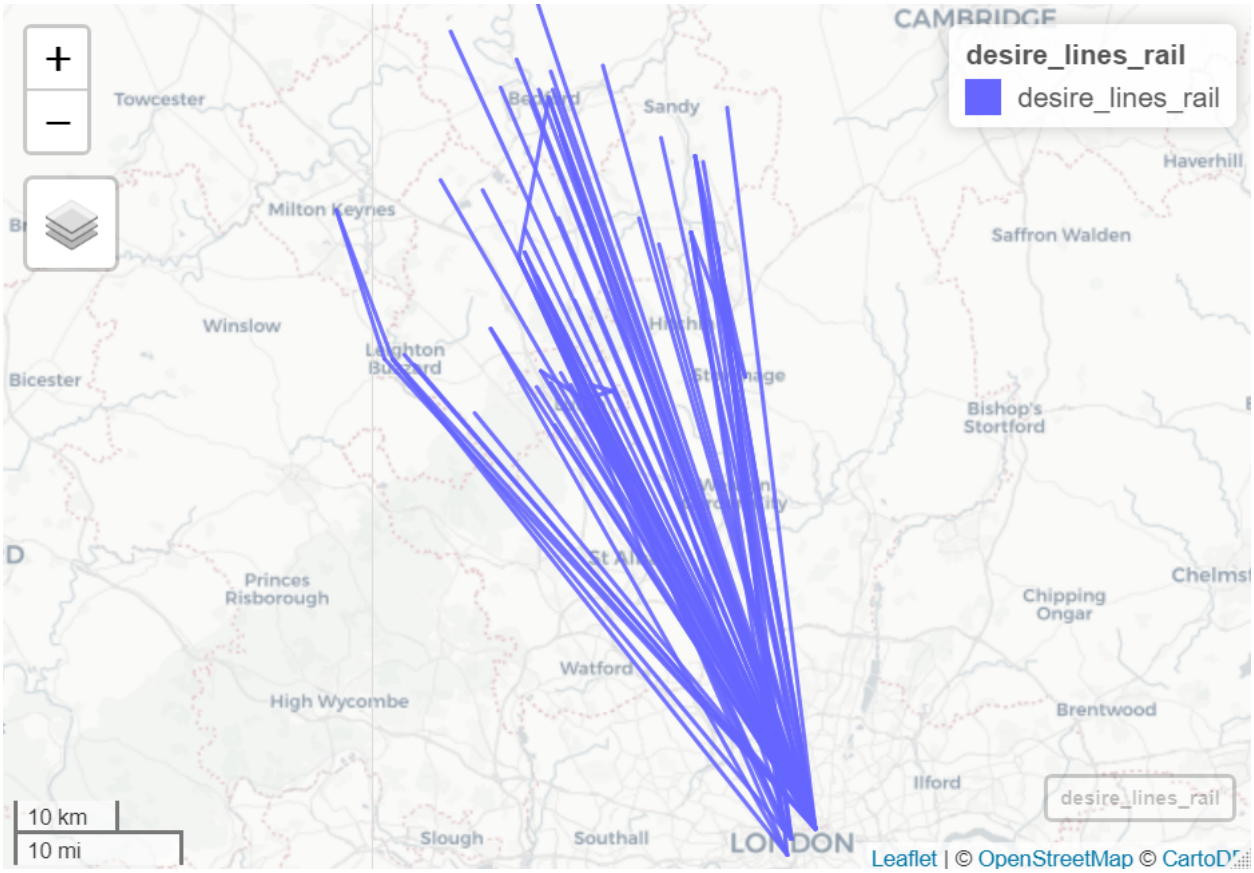

Figure 2: Desire lines for MSOA commute data showing all journeys starting in Bedfordshire where at least 20 people travel by rail

Including journeys to rail stations in the assessment of cycle potential gives a more complete picture of where people want to cycle. This will aid cycle infrastructure planning and the choice of where to focus investment.

1.1 Aims

The aims of this project are to:

- Establish the potential for cycling to stations in the STARS study area
- Inform investment decisions regarding cycle infrastructure and cycle parking at stations
- Feed into monitoring and evaluation of cycling levels

1.2 Modal split of commuting

A high proportion of Bedfordshire commuters currently drive to work. Yet we can see that there is significant potential for cycle commuting to increase. Table 1 shows that the percentage who cycle to work in Bedfordshire currently stands at between 1-4%. If residents were to reach Dutch levels of cycling, this would jump to 14-25%. However, this still ignores the possibility of combined cycle and rail commuting. If we also consider the cycle-to-rail potential, the proportion of cyclists could rise even higher.

lad_name	Commuters	% drive	% rail	% cycle	% active	% Go Dutch
Central Bedfordshire	117753	74	7	2	10	14
Luton	83350	59	7	1	15	20
Bedford	68205	67	5	4	15	25

When we look at individual station catchments, the picture is similar. Again, even when we ignore the potential for combining rail and cycle, the cycle mode share in each catchment could rise substantially, from a 10% rise at Flitwick to a 21% rise at Bedford Midland.

nearest_station	Commuters	% drive	% rail	% cycle	% active	% Go Dutch
Bedford Midland	66203	67	5	4	15	25
Leagrave	64661	68	5	2	12	20
Luton	37973	55	7	1	17	18
Leighton Buzzard	21511	71	9	2	12	14
Flitwick	21109	76	9	1	8	11
Arlesey	17960	76	7	2	9	13
Biggleswade	11770	73	8	3	11	16
Sandy	11202	76	7	2	9	14
Luton Airport	10279	63	6	1	15	15
Harlington	6640	79	8	1	6	10

1.3 Intra-region travel

Around half of all commutes in Bedfordshire take place entirely within the county. When looking at these journeys, we can see that the majority of them are to the nearest town centre, although there is also some inter-town travel. A high proportion of the shorter journeys are made by active travel. These journeys are likely to be similar in distance to many journeys to rail stations. This suggests that many journeys to rail stations could also be made by bicycle if the right infrastructure and facilities supporting cycling are in place.

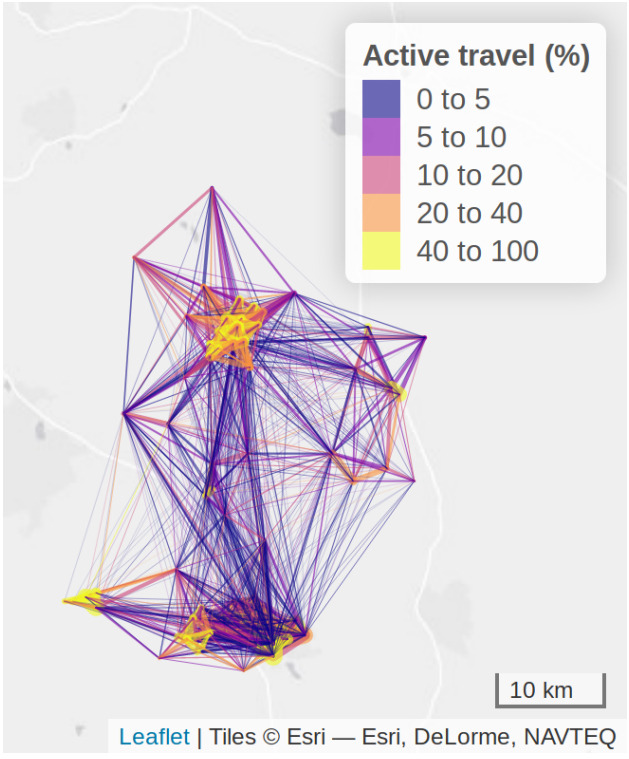

Figure 3: The proportion of commuter journeys within Bedfordshire that are made using active travel

2 Methodology

Our approach uses data relating to commuting. This means we are only considering the cycle-to-station potential for commuter journeys. People also travel by rail for various other purposes, such as leisure, business trips, education, and other personal business. (add in some stats from the ORR) Therefore our estimates do not capture the full potential for cycle to rail stations.

2.1 Phase 1 and Phase 2 approaches for journey routing

We have developed two methods for estimating cycle to rail stations. Both of these methods make use of 2011 Census data on travel to work. The census data is spatially aggregated at the LSOA (Lower Layer Super Output Area) level, a geographic unit with a population of around 1500. For each LSOA it is possible to calculate a 'centroid' marking the centre of gravity of the population of the LSOA. Thus we can see which LSOA each commuter lives and works in, and we use the LSOA centroids as the points of origin and destination for each journey.

In our Phase 1 approach we take the 2011 Census returns and assess them using the journey planning service TransportAPI, to find out whether the trip could be made by rail to arrive by 9:00 AM. If so, we select the fastest rail journey. This method does not simply route commuters to their nearest station, but takes account of their final destination to pick an appropriate station.

The Phase 2 approach starts with commutes that are already made by rail according to the 2011 Census. We filter these to select only the trips where there is a rail station within 5 km of the centroid of the LSOA in which the journey originates. Taking the mainline Bedfordshire stations as our dataset, we find the nearest station by road, and route the trip to that station. This is different from the Phase 1 approach in which the departure station was chosen based on the rail journey time only. Based on these routings, we estimate the potential for the journey from home to station to be cycled.

In Phase 2 we only use mainline Bedfordshire stations, because these all have frequent direct services to and from London and are all well-used stations, with seven of the ten stations having over 1 million entries and exits in 2016-17. This gives us the ten most-used rail stations in Bedfordshire, as listed in Table 3 below. These comprise six stations on the Midland Mainline, three stations on the East Coast Mainline, and one station on the West Coast Mainline. Since the presence of frequent direct services to the main commuter destination of London is a feature of all of these stations, routing via the nearest station seems appropriate when modelling potential cycle journeys.

2.2 Modelling all rail commutes

The first step is to identify commuter journeys currently made by rail. @ref/combi6 shows all rail commutes originating in Bedfordshire, as estimated according to our Phase 1 and Phase 2 approaches. The two panels differ because under the Phase 1 method trips are routed to a station that provides the shortest rail journey time, which can include stations outside Bedfordshire, while in Phase 2 trips are routed to the nearest station, including only the ten mainline Bedfordshire stations.

A further difference is that in Phase 2, we only consider journeys where the distance to the station is <5km. While this will capture the majority of cycleable trips, it would also be possible to increase this maximum distance to include longer journeys.

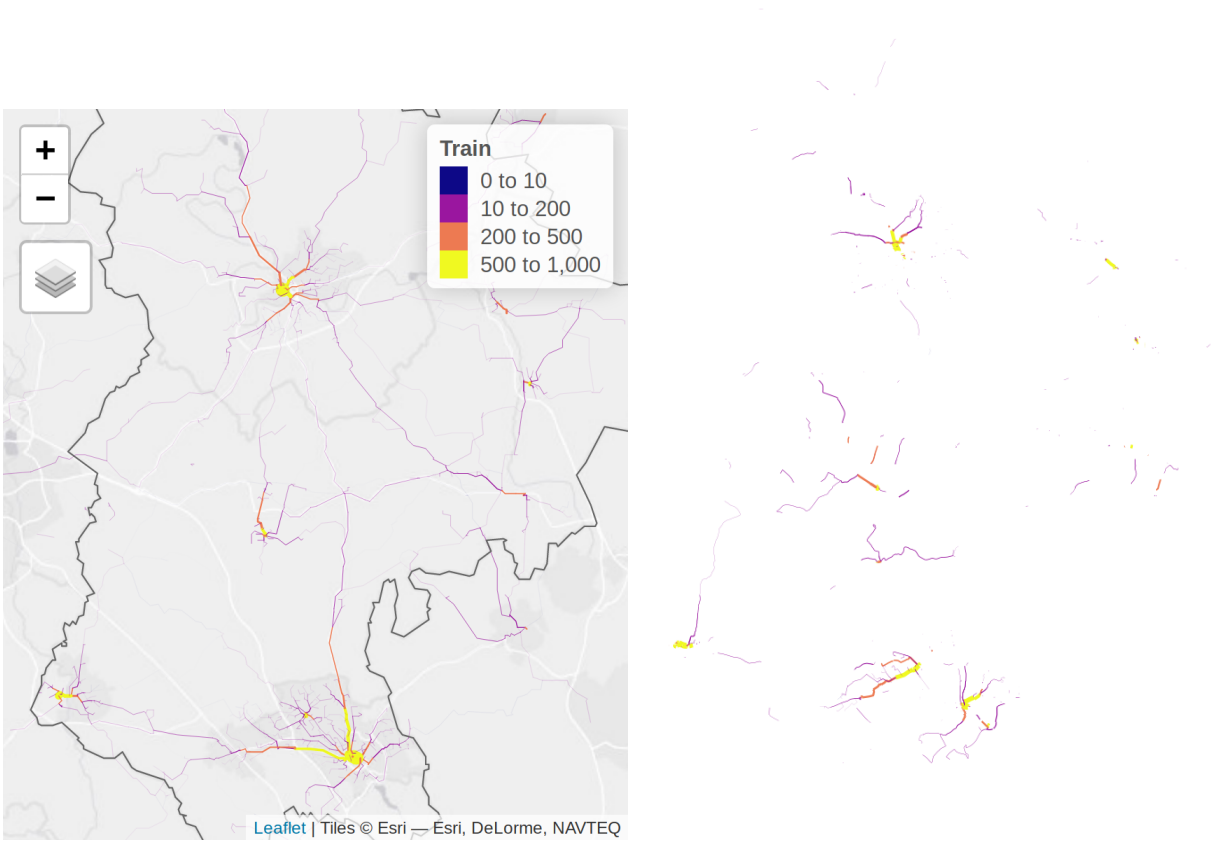

Figure 4: Phase 1 and 2 estimates of cycle to rail potential

2.3 Go Dutch cycle to rail stations (Phase 1 and 2 estimates)

We can now estimate how many commuters would cycle to the station, if cycling levels in Bedfordshire were equivalent to those in the Netherlands. To do this we use the Go Dutch scenario developed as part of the Propensity to Cycle Tool (ref).

We can see some notable differences between the modelled distributions of cycling to stations under Phase 1 and Phase 2. In particular, Phase 2 shows many more cycle trips to Leagrave station. Most of these were routed to Luton station in the Phase 1 method, but since Leagrave has a good quality rail service to London, with trains running every 15 minutes, it may be reasonable to assume that commuters who cycle to the station would be more likely to use Leagrave if it is their nearest station.

In general, when deciding whether to use the Phase 1 or Phase 2 approach to model cycle-to-station potential, a key question is whether, for the area in question, commuters are likely to choose to cycle to a more distant station in order to shave some time off their rail journey.

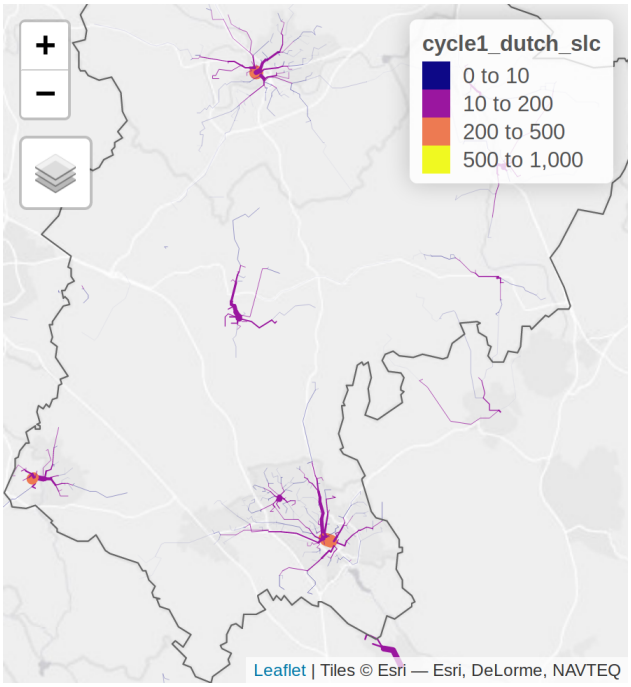

Figure 5: Cycle commuting to rail stations under the Phase 1 and Phase 2 approaches

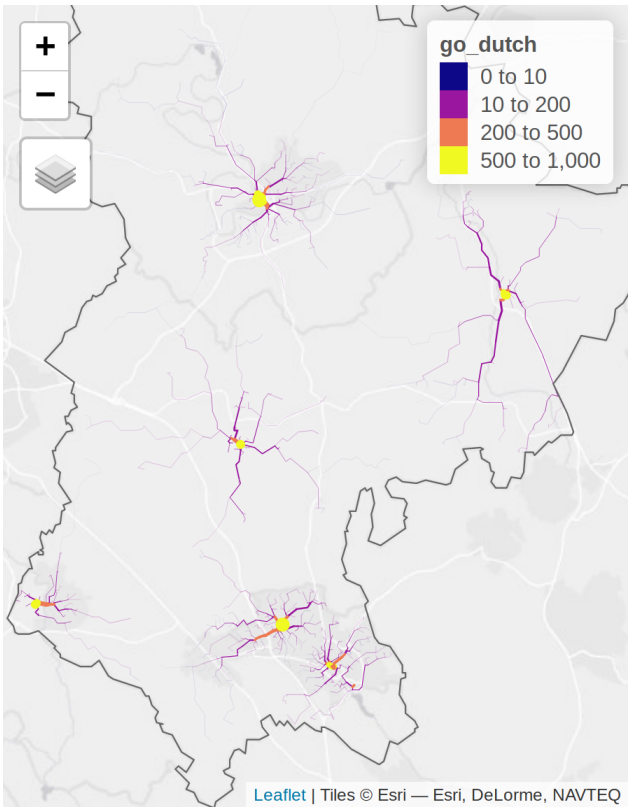

Figure 6: Cycle commuting to rail stations under the Phase 1 and Phase 2 approaches

3 Cycle infrastructure planning

This analysis can help to identify places where it would be particularly useful to install new or improved cycle infrastructure, or to increase cycle parking.

In Luton, we can see that the existing cycle infrastructure is relatively limited, with cycle lanes or tracks only present on a small number of routes from Luton or Leagrave stations.

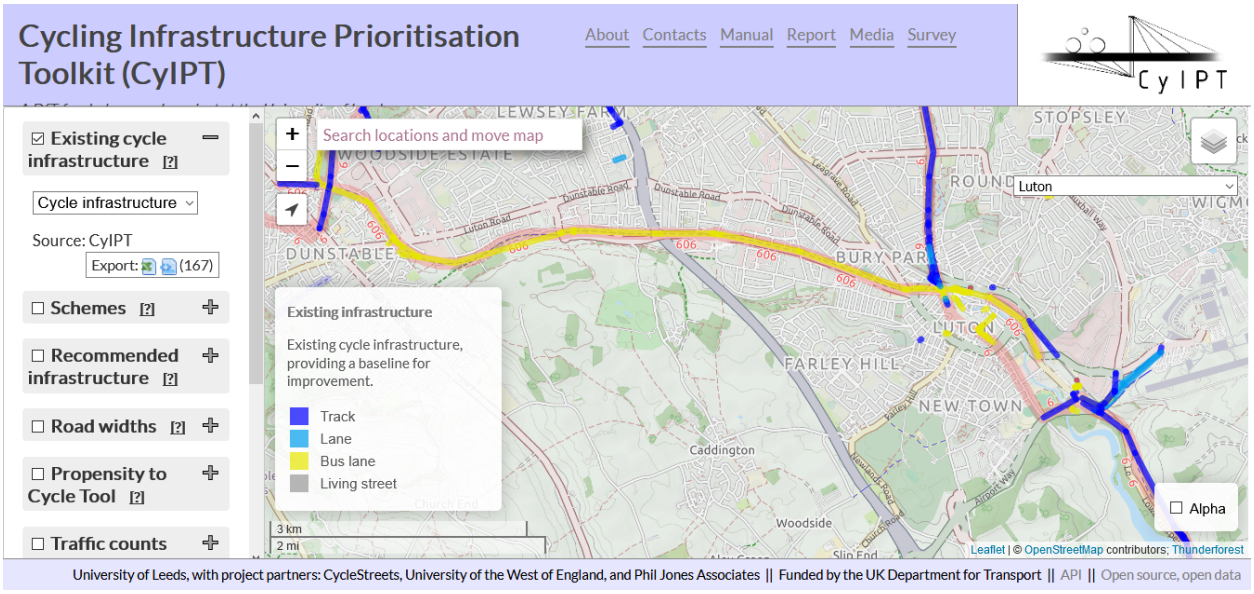

Figure 7: Existing cycle infrastructure in central Luton, as recorded by CyIPT

However, there is a strong overlap between the roads we find high to have cycle potential under the Go Dutch scenario, and routes that have already been proposed as candidates for new cycle routes in Luton. These include routes heading west from Leagrave station along Leagrave High Street, a route north from Leagrave station that links the station to , and north from Luton station along High Town Road.

4 References

ORR (2019), '2019-20 Q1 Statistical Release – Passenger Rail Usage | ORR Data Portal'. Accessed 12 November 2019. https://dataportal.orr.gov.uk/statistics/usage/passenger-rail-usage/.