Healthy Streets in London

Using our signals creatively to make London healthier

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EVERY JOURNEY MATTERS

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Introduction

The Mayor's Transport Strategy, published in March 2018, sets out some ambitious targets to transform transportation in London. It sets out a Healthy Streets Approach to the whole of London for the first time, which encourages active, efficient and sustainable transport modes to be used to improve health and the human experience of using the streets. The aspiration to develop Healthy Streets and encourage more active travel is set out in a number of targets, including the target for 80% of trips to be taken using sustainable modes of transport (walking, cycling and public transport) by 2041, and the goal for all Londoners to do at least 20 minutes of active travel every day by 2041 (which is a big challenge, because only a third[1] report doing this now). The strategy wants to see a reduction in the dominance of motorised traffic on London's streets in order to improve air quality and reduce road danger.

The Healthy Streets Approach uses 10 evidence-based indicators of what makes streets attractive places. Working towards these will help to create a healthier city. Creating positive experiences of using our streets will help Londoners decide to walk, cycle and use public transport.

The work we undertake in Network Performance can directly impact five of these indicators; Easy to cross; Clean air; Not too noisy, People feel safe, People feel relaxed.

[1] http://content.tfl.gov.uk/healthy-streets-for-london.pdf

A new direction for the annual signal timing review programme

Transport for London's Network Performance team is responsible for setting up and operating London's traffic control system in order that the roads work for everyone. Our programme of 1200 annual traffic signal timings reviews has been radically refocused to enable Healthy Streets and create a better experience for people choosing to travel by sustainable modes. We have developed new signal control techniques and technologies to give advantage to people using sustainable modes, when we can.

We are now using London's traffic control system in ways that we never thought possible, to help people move around the capital. We have developed an award winning[2] program utilising cutting edge traffic signal technology and network management techniques, combined with operational expertise to deliver Healthy Streets. Some of the new techniques include;

Differential Bus Priority	Giving advantage to a bus at a junction, but only if it is running late	2-5 seconds given back to each bus at a junction. Keeps disruption to a minimum for other junction users.
Call cancel	Currently in place to benefit buses, by cancelling pedestrian demand when they have already crossed	Next step? Selecting locations where emissions could be improved if traffic didn't have to stop unnecessarily.
Pedestrian SCOOT	Currently in 7 locations. Extends the green man invitation in places where sporadic, high volumes of pedestrians need to cross	20 more locations being explored for a further roll-out
Cycle SCOOT	Delay saving of around 6% for cyclists using segregated tracks	19 locations being explored for a further roll-out
Green Man Authority	Permanent green man, until traffic detected. Sites selected with high pedestrian flows and low traffic	10 locations being explored for trials
Emissions trials	Using signal strategies to reduce emissions when traffic congestion is known to be causing poor air quality and where there are high pedestrian levels.	Putney High Street was the first trial, which demonstrated a 43% reduction in bus nitrogen oxide. 5 further locations identified for trials.

The Mayor has set out a very clear vision for London's streets. He wants to reduce traffic dominance in areas where people are walking, cycling or visiting. He wants to reduce private car use overall, and encourage Londoners to choose more active modes of transport. One of techniques we are trialing to help realise a healthier street environment is reducing exposure to vehicles emissions by retiming the traffic signals.

[2] Excellence in Technology Winner at the London Transport Awards 2018

Using Signal Timings to Reduce Exposure to Pollution – A Case Study

"With air quality high on the agenda, and as guardians of the signal timings in London, we applied microsimulation modelling expertise and a bold strategy to influence air pollution in a busy pedestrian area." Joe Birdseye, Principal Network Manager

Where conditions allow, traffic queuing and progression can be manipulated to effectively reduce exposure to pollution at key locations, without negatively impacting Buses and traffic journey times. VISSIM-PHEM is an effective tool for testing emission reduction strategies. This strategy will be trialled in other locations.

Putney High Street

Putney High Street has a known air quality problem. Every year it is reported in the press for breaching the EU yearly legal limits of exceedances within the first week of January. The High Street's characteristics make it an ideal location to trial a queue relocation strategy as detailed below and with accompanying Figure 1.

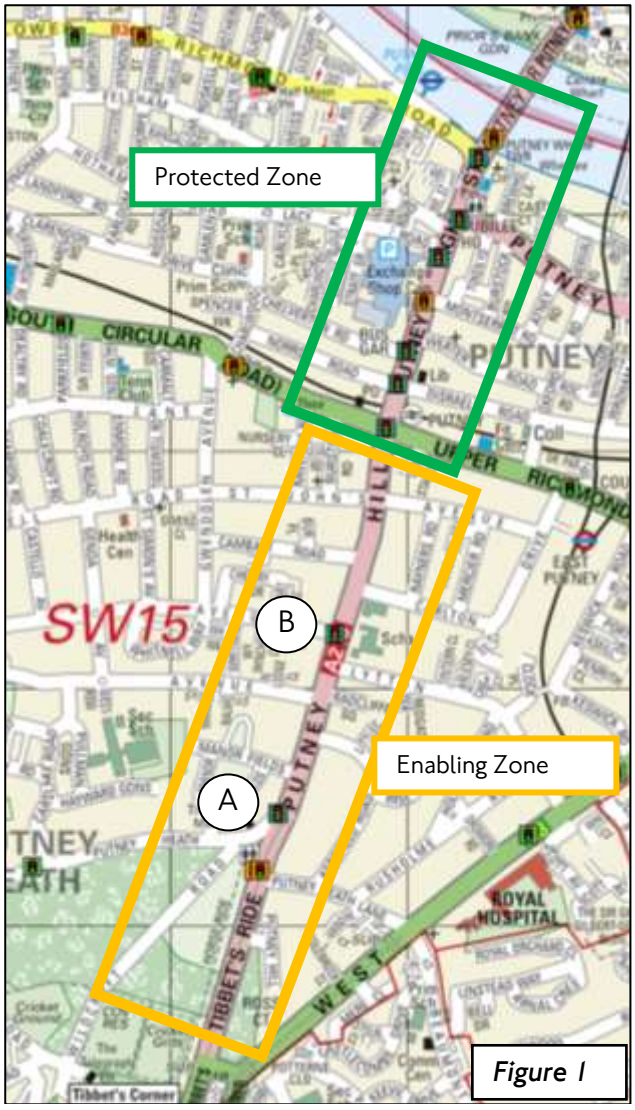


Figure 1

Protected Zone:

- High-sided building (urban canyon) – polluted air circulates
- A traffic congestion problem – high traffic flows converging on the bridge
- A concentration of traffic signals – stop-start traffic behaviour
- High numbers of buses – traditionally high-polluting diesel engines
- High pedestrian footfall – many people exposed to poor quality air.

Enabling Zone

- Low foot traffic – overall exposure to pollution is reduced
- On a hill with more open space surrounding – dispersal of pollutants is better
- Northbound Bus Lane – to protect bus speeds
- Signalled junctions suitable for traffic management

The Strategy

- Aiming for a reduction in vehicle emissions in the Protected Zone, the heavy northbound flow is held at junctions A and B, relocating the queue to the Enabling Zone.
- New controller PROM chips were installed, that enable a southbound-only stage to run, such that southbound traffic is free to progress away from the Protected Zone.
- Green time for northbound at A and B is adjusted by time of day to achieve a manageable queue that does not impact on the A3 to the south.
- Buses are protected by a northbound bus lane, so not affected by the increased queue.
- The junctions and crossings in the Target Zone are optimised for vehicle and bus progression with the lower traffic flow. Vehicle Stops are reduced, which reduces idling and acceleration.

A note on SCOOT for background

SCOOT has a built-in facility to optimise for emissions. A test of this optimiser was undertaken in comparison to the standard Stops and Delays optimisation. Using a UTC-VISSIM replica of a SCOOT Region on A10, emissions calculation software Enviver measured the modelled vehicle emissions of Stop-Delay SCOOT versus Emissions SCOOT. A live street trial using SCOOT's own measurement of emissions was also undertaken. Results showed a very slight change in emissions reported in both cases. The conclusion of the trial was that standard SCOOT is already an effective tool to reduce emissions, and that the Emissions optimiser does not add any significant additional benefits.

The Trial

The strategy was live-tested on street in two separate trials, the first of which coincided with a modelling exercise, and the second which ran for longer. Putney High Street is a Borough controlled road, so agreement from London Borough of Wandsworth was required.

Trial One took place on two weekdays after a week of testing. It was accompanied by a large survey, including turning counts, journey times, vehicle trajectory data and bus journeys, as well a significant amounts of SCOOT data. Two neutral days were also surveyed in the same way to act as a control in comparisons.

Trial Two was extended to two weeks, including weekends. This allowed a greater period of time for traffic conditions to settle, as well as a more robust test of a refined strategy. Air quality, pedestrian demand and traffic levels are at similar levels on the weekend, so it was important to test the strategy's effectiveness on these days as well.

Modelling

A VISSIM Microsimulation model was constructed to replicate the on-street conditions and provide detailed assessment of vehicle emissions with and without the emissions reduction strategy. The VISSIM is connected to an offline copy of the UTC cell, so replicates the signal timings and the behaviour of SCOOT that was in effect, as well as the actual traffic flows on street on the trial and control days.

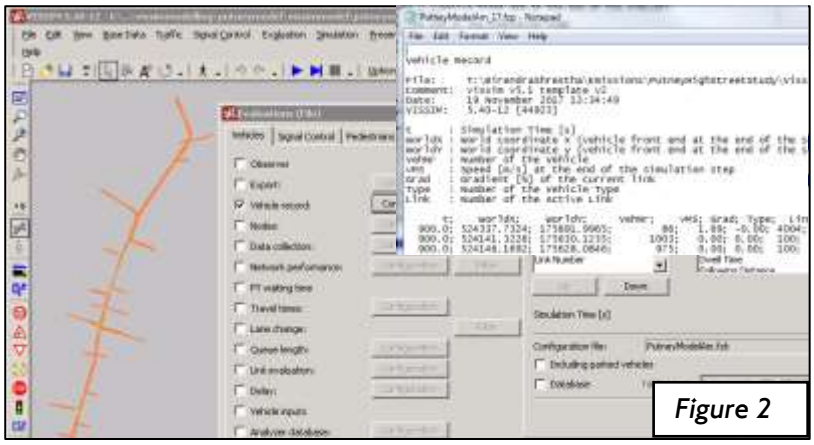


Figure 2

To provide comparison of vehicle emissions in both scenarios, the VISSIM data for every vehicle is exported to leading emissions modelling software PHEM. This uses the speed, gradient, position, acceleration of every simulated vehicle for every second to calculate the emissions. The accumulated data is compiled to provide a detailed picture of the impact on vehicle emissions.
Figure 2 shows the VISSIM model.

PHEM was also used to attain emissions data direct from iBus data files. iBus produces a data file for each individual bus on its journey second by second. Similar to the VISSIM data, this actual bus trajectory data was used in PHEM to produce accurate comparisons of trial and control day bus emissions.

Operational Results

The Operational results from the second trial show clear reductions in vehicle stops and congestion (as well as saturation and delay) in the Protected Zone. This was achieved while maintaining a manageable queue in the Enabling Zone, and crucially an overall reduction in bus journey times in both directions and in the wider network. Traffic journey time surveys also show that overall journey time for northbound traffic was reduced.

Average change in vehicle stops during trial in the protected zone (trial 2);

	Northbound	Southbound
AM Peak	-21%	-12%
Interpeak	-20%	-13%
PM Peak	-25%	-19%
Weekend	-4%	-10%

Average change in congestion during trial in the protected zone (trial 2);

	Northbound	Southbound
AM Peak	-39%	-19%
Interpeak	-46%	-30%
PM Peak	-61%	-56%
Weekend	-35%	-23%

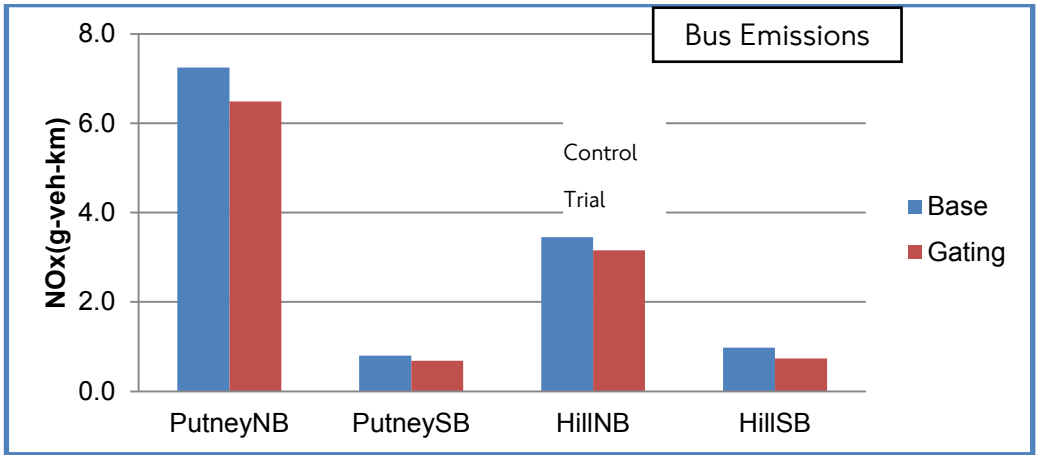
Average change in northbound AM general traffic journeys (min.secs) (trial 1);

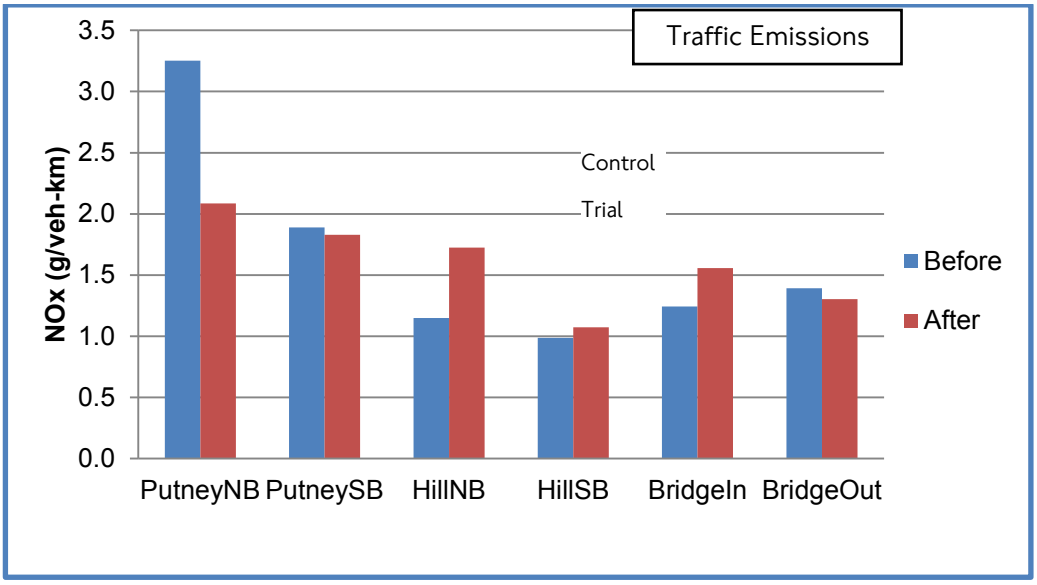
	Baseline	Trial
Through enabling zone	11.33	14.36
Through protected zone	11.36	3.55
TOTAL	23.09	18.32

Bus Performance iBus GPS Data through the protected and enabling zones;
(percentage improvement to Bus Journey Times during trial 2)

	Northbound	Southbound
AM Peak	4%	30%
Interpeak	18%	16%
PM Peak	18%	37%

Modelling Results to calculated emissions





Results calculated from actual Bus trajectory data show a universal reduction in emissions in both the Protected and Enabling zones. Results from the VISSIM-PHEM model for general traffic show a clear reduction in emissions in the Protected Zone, with an increase in the Enabling Zone as expected. The model can now be used to test other strategies offline, apply fleet changes and assess the emissions impacts of proposed schemes. The method can now be repeated elsewhere with the same technology.

The next step

The results from this trial at Putney are encouraging in demonstrating that a healthier street environment can be achieved through implementing a different signal strategy in a local area. Site visits to the location illustrated first-hand the benefits of the approach to the TfL team (see photos below taken during trial 2).

Conclusion

The success of this trial has led to the identification of 5 more town centre locations which could benefit from bespoke signal strategies to improve emissions in locations with high numbers of pedestrians. Funding is being sought and engagement starting with local authorities to confirm trial details.

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