Temporary Traffic Signals: Remote Access via UTC Control

TfL Lane Rental Industry Publication

TRANSPORT FOR LONDON

Introduction

Roadworks are inevitable and are often a common cause of disruption to people's journeys on the road network especially when they require lane closures and the use of temporary traffic signals.

Temporary portable traffic signals (TPTS) are necessary to maintain a safe public passage through the works area, but aside from the general congestion caused by the roadworks, the signals themselves can have a huge impact on the operation of the road network. This is due largely to the nature of locally controlled signals; the timings are often not suitable for the prevailing traffic levels, and they operate in isolation and without coordination with the surrounding network. In many cases this is exacerbated by the constraints of the portable traffic signal equipment; for example green times can sometimes only be altered in coarse increments, making it difficult to assign dynamic green times.

To minimise the impact of TPTS and reduce unnecessary delay on the road network a method to enable the remote control and adjustment of TPTS through TfL's Urban Traffic Control (UTC) System is required. This allows the signal timings to be dynamically optimised for local conditions and their operation to be linked with the surrounding traffic signal network. In addition the TPTS timings could be adjusted as and when required during planned and unplanned incidents and events occurring on the surrounding network.

Poles-in-barrels

The use of poles-in-barrels is a long-established method of making traffic signal heads portable. It is often used by TfL's contractors to maintain signalised control at sites undergoing significant physical alteration work. Typically the existing traffic signal heads are moved onto temporary signal poles anchored in large metal barrels filled with concrete. Just moving barrels into position causes network disruption, as heavy handling equipment and temporary lane closures are ordinarily required. Each signal aspect and lamp must have a connection wired by hand.

While using poles-in-barrels will maintain UTC capability during site modernisation, it is costly and time-consuming to implement, and also has a large landfill waste impact (the poles and barrels cannot economically be stored or re-used).

Temporary portable traffic signals have until now been used as an alternative to poles-in-barrels only where UTC was not a requirement. Their advantages include; the option for set up and configuration to be carried out at the roadside without disruption to traffic, the signal heads are designed to be easily moved into position, and because they are easily linked to the controller either by radio signals or by using cables carried above the junction.

Using temporary portable traffic signals in place of poles-in-barrels produces a saving of up to 60% per site. TfL typically carries out around 75 schemes per year.

Works by 3rd Parties

TPTS are also used by utilities and third party contractors who need traffic signals to manage traffic flow in order to facilitate their works. This is normally at sites where traffic or pedestrian flows are likely to be affected, or where there is a need to provide safer working conditions for site staff.

In the past these signals would be operated locally with the timings maintained by the site personnel (sometimes with guidance from TfL). UTC control provides the same advantages in this scenario as it does with poles in barrels i.e. signal timings can be optimised for local conditions with linking to the surrounding traffic signal network.

As this is expected to be the most common long-term use of UTC Controlled TPTS, it was decided to conduct on-site trials applying the UTC technology to TPTS.

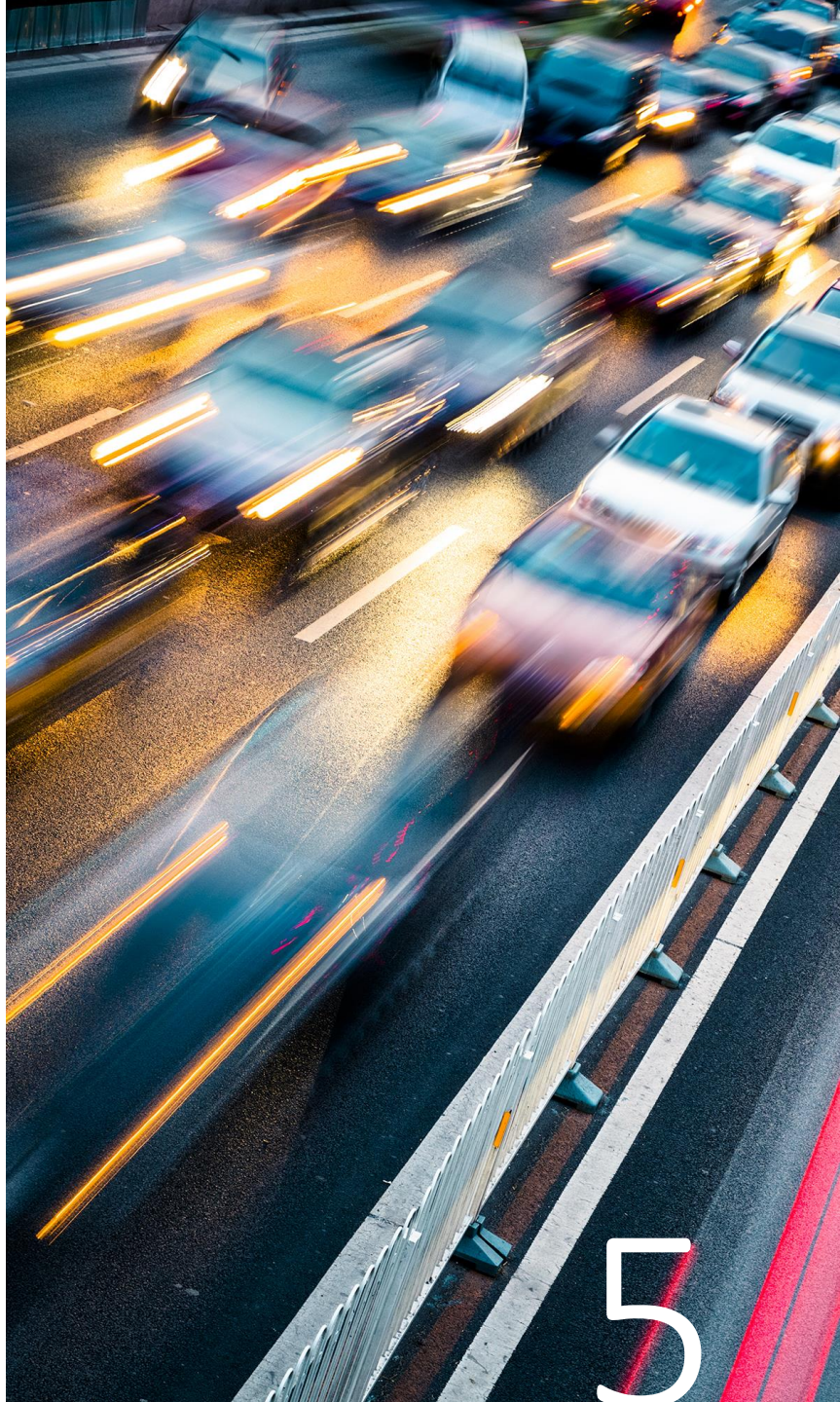
The Trial

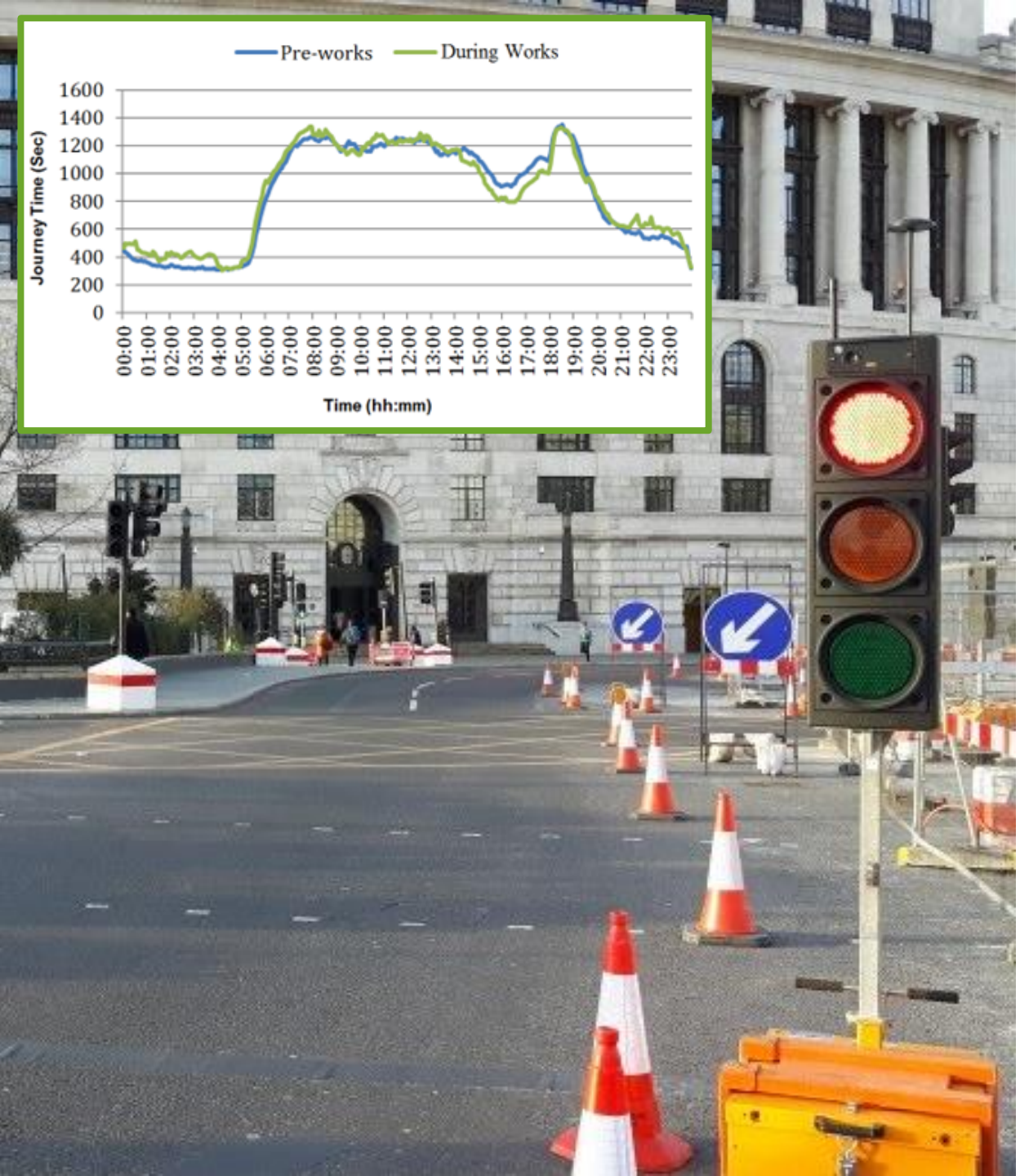
The trial involved two phases; initially 16 sites were selected and UTC TPTS implemented by TfL specialist engineers. This first phase ensured that the new equipment was fit for purpose and provided the functionality required. This was followed by phase 2 where third party contractors carried out the implementation and commissioning of the signals; allowing a business as usual process to be developed.

From the two phases of trials it was found that at some sites the solution was not suitable, practical, or cost effective. From this a brief suitability guide was developed for internal use within TfL to help formulate the decision process as to when to use this new capability. At the majority of the trial sites UTC TPTS allowed TfL staff sufficient control to significantly mitigate the effects of the associated street works.

Depending on location and extent of the roadworks, co-ordination with adjoining signals can also be maintained with no overall loss of capacity.

The 16 initial trial sites were in operation for a total duration of 9507 hours (with an average of 594 hours per site). Through the reduction in traffic delay and the conversion into a monetary value (using DfT Value of Time and Vehicle (car) Occupancy): It is estimated central UTC control of these portable signal **saved £235,000 each through reduced vehicle delay**.





Victoria Embankment

Cycle Highway North/South, City of London

As part of the site works for the North-South Cycle Superhighways substantial changes were made to the road layout and traffic signal infrastructure. Ordinarily poles in barrels would be used for such works, which take time and expense to install and maintain through the many phases of the works. On this occasion it was decided that the site would be an ideal candidate to trial the use of UTC controlled TPTS. This allowed the site to remain under UTC control, be coordinated with the adjacent sites and made moving the signals for subsequent phases less disruptive.

During the works, the journey times along this section of the road were measured using TfL's Automated Number Plate Recognition System (ANPR). This was only possible because adjacent camera pairs were in the correct place to measure the journey times for this specific section of the road network. As shown left, journey times were maintained during the road works, with 'pre-works' being the performance of the network prior to any changes.

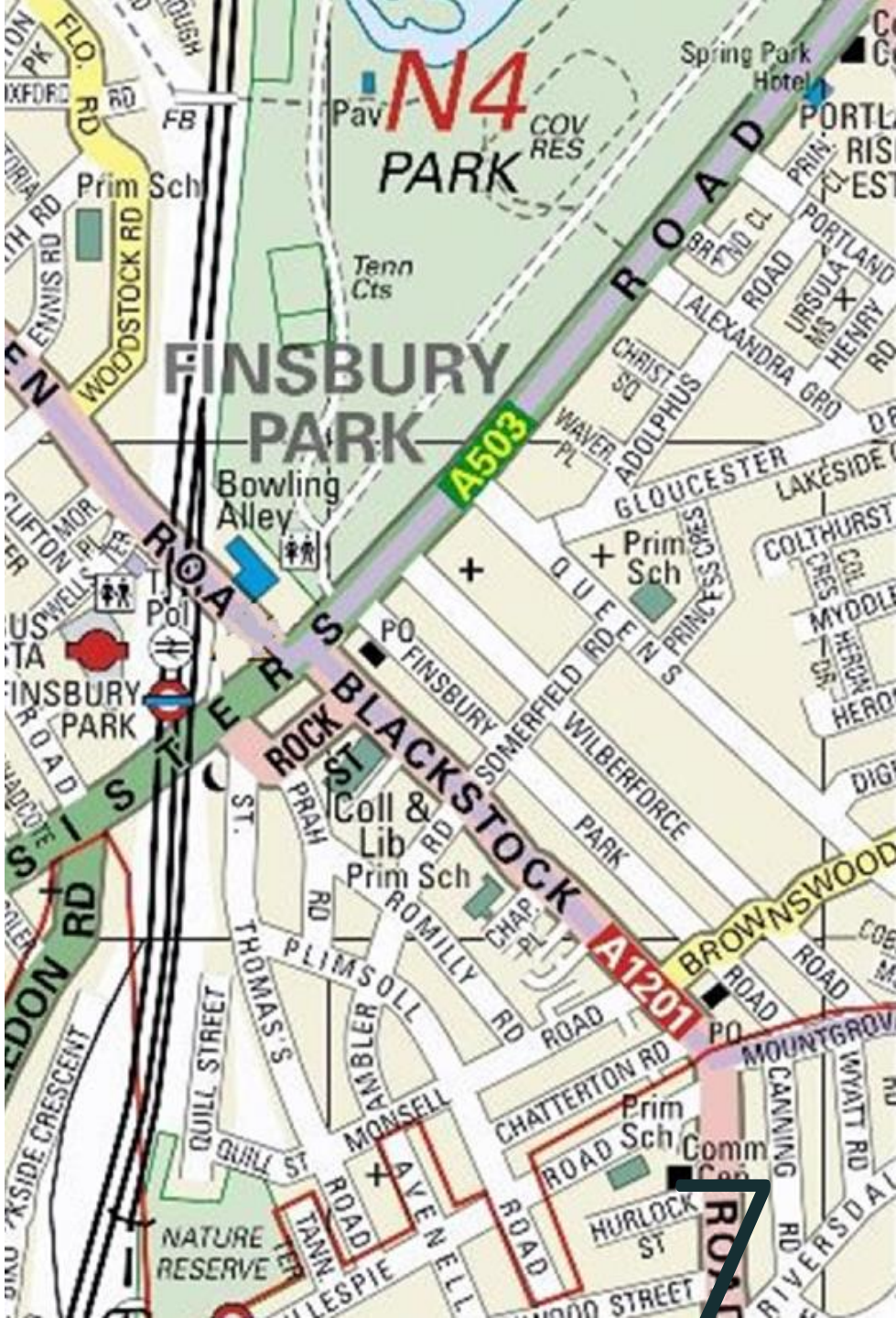
Seven Sister Road

Crane Operation, Haringey

Along Seven Sisters Road, UTC controlled TPTS were used facilitate crane works through the introduction of two way working on a busy main road. Linking with the adjacent signals to the south-west was critical to maintaining traffic flow through the network.

In addition to the normal operating timings, additional contingency timings for the temporary signals were designed and made available to TfL's Network Management Control Centre (NMCC) for use as and when required.

This installation was implemented as part of Phase 2 of the trials, where third party contractors organised and installed the equipment.



Walthamstow

Junction Improvement, Waltham Forest

As part of the junction improvement works around Selbourne Road and Walthamstow Bus Station, lane closures were implemented to facilitate the works and movement of buses exiting the station.

The temporary signals implemented mirrored the normal staging arrangement of the permanent signals. Works were in place from 29 September 2017 until 16 October 2017. No reports of disruption were received from bus operators.

Upper Street (AI)

Trunk Mains Replacement, Islington

Thames Water undertook trunk mains replacement along a section of Upper Street/Islington High Street which required lane closures and access changes to facilitate the works.

UTC controlled TPTS were used to minimise the impact along the busy network. For this particular case an all red pedestrian movement was incorporated into the operation of the TPTS to minimize the impact the works had on pedestrians.

Linking with the adjacent signals was critical to maintaining traffic flow through the network. Works were in place from 20 October 2017 to 3 November 2017.

Outcomes

TfL undertook this project to confirm that the use of UTC control could minimise the negative impact of TPTS and reduce unnecessary delay on the road network. The aim was to develop and trial the technology and institute processes to commission TPTS sites onto UTC.

The project was successful in its stated aims: both equipment suppliers have produced working systems that have proved to operate effectively on street. UTC control has also been shown to deliver reductions in delays incurred.

Internal processes within TfL were developed and tested through this trial; these will be renewed periodically as and when required.

Lessons Learnt

Although the project has delivered on the original aims as regards improvements in control and traffic flow, several challenges had to be overcome. The following are the standout lessons:

- The portable equipment does not yet match the facilities available at standard traffic signal controllers.
- Significant experience is a pre-requisite for UTC commissioning and support.
- 4G routers used to connect TPTS to TfL's UTC system can be intermittent in respects to signal quality compared to fixed lines. Fixed lines can be made available for TPTS but at a greater cost.
- The onsite TPTS equipment has yet to be tested in extreme cold or heat.

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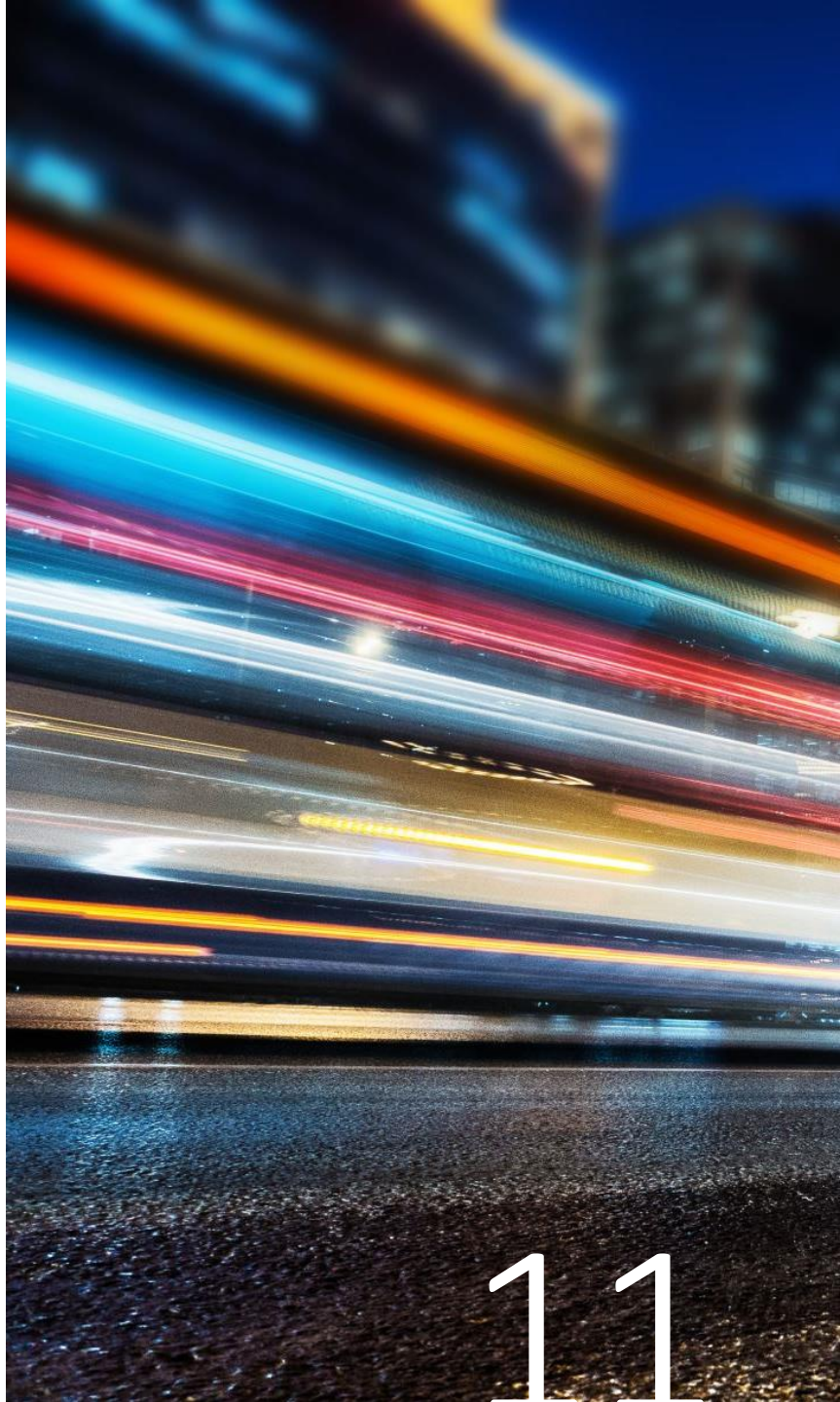

Conclusion/ Recommendations

The use of UTC-enabled portable traffic signals should become the default for traffic signal modernisations and for signalled roadwork schemes where UTC control is likely to be useful and deliverable.

The benefits developed by UTC control of TPTS are significant, and will mitigate some of the impact of road works and signalled modernisation/schemes.

There are still areas that need and could be developed further:

- TfL internal processes to deliver TPTS requires updating to reflect new working procedures
- The functionality of TPTS will need to be developed to supply all facilitates available with permanent signals.

Overall the trial has been a success and met its objectives; areas for further work have been highlighted and will be progressed through future continuous improvement workstreams.

TfL Lane Rental Scheme

Optimising customer journeys through the delivery of safer, innovative and sustainable roadworks

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