A new river crossing for London – Network Performance Delivery's involvement in the opening of Silvertown Tunnel

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Introduction

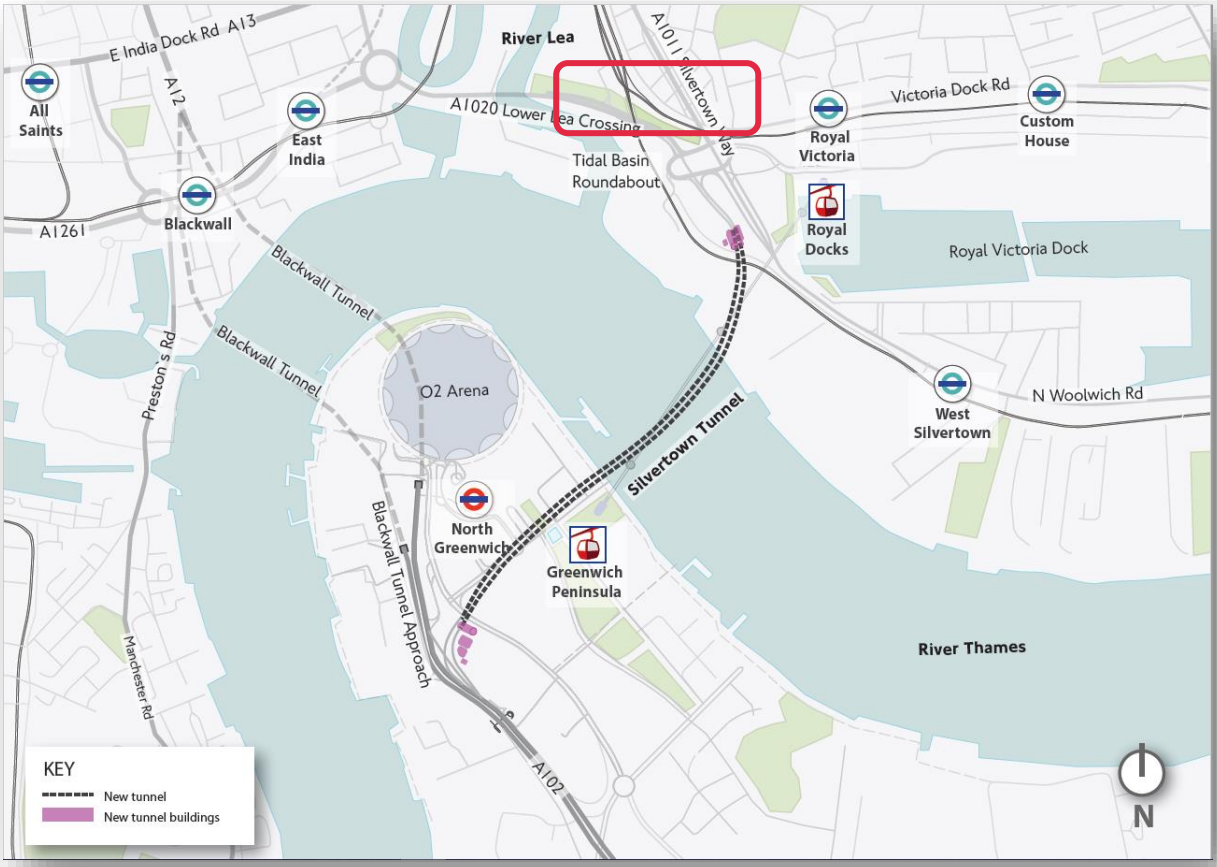
On 7 April 2025, Transport for London (TfL) opened a brand new river crossing – The Silvertown Tunnel. A number of planning and technical teams were involved, both internally and externally to TfL, in delivering this high profile and transformational scheme.

This report focuses on the work carried out by TfL's Network Performance Delivery (NPD) team. NPD are responsible for managing the road network through optimising signal timings. We also assess the impact of a variety of schemes, to ensure a smooth and efficient network as part of our Traffic Manager's duty, and to enhance bus performance.

Silvertown Tunnel: TfL's newest river crossing

Silvertown Tunnel is a 1.4km long twin bore tunnel and provides two lanes – of which one is a bus and freight lane – in each direction. The northbound approach is the A102, parallel to Blackwall Tunnel. On the north side of the river, Silvertown Tunnel is connected to the new Tidal Basin Roundabout, which leads to the A13, Excel Centre, Royal Docks, and London City Airport. See Figure 1 below.

Figure 1: Silvertown Tunnel Location and Alignment, highlighting Tidal Basin Roundabout



Approved by the Secretary of State for Transport in 2018, Silvertown Tunnel was intended to deliver a number of benefits:

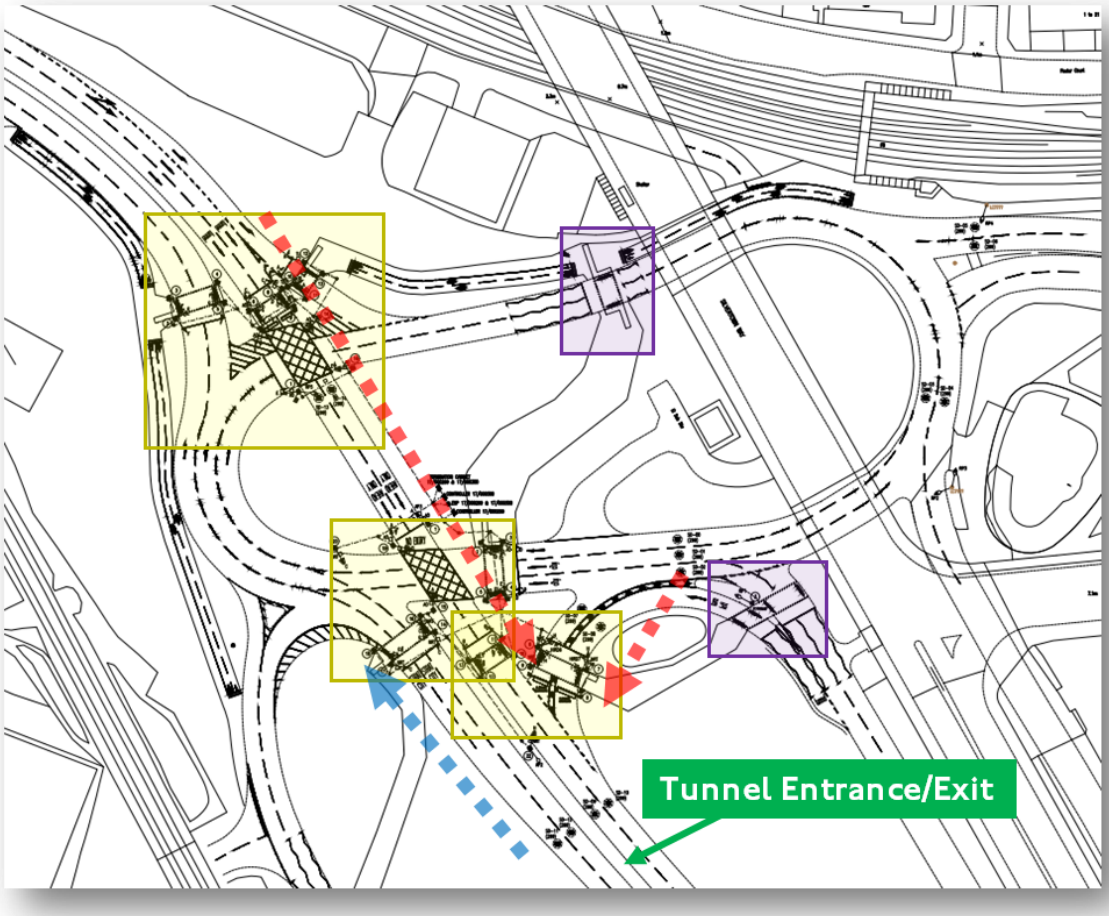
- **Improved crossing opportunities for sustainable travel** – Silvertown Tunnel is large enough to accommodate a bus lane in each direction, and is the first of TfL's river crossings east of Tower Bridge to allow for double decker buses (including Bus Superloop Route 4). For cyclists, a cross-river cycle shuttle bus service provides a safe facility for more vulnerable sustainable travel modes.
- **Reduced congestion and increased resilience for Blackwall Tunnel** – extensive queues on the approach to Blackwall Tunnel are a regular event, and the impact of multiple planned and unplanned closures across the year are costly to businesses and the environment. The parallel alignment of Silvertown Tunnel helps to ease this demand and provide an alternative crossing during incidents.
- **Growth and development** – Heavy Goods Vehicles (HGVs) are also able to use Silvertown Tunnel (height restrictions for Blackwall Tunnel are a regular cause of delays and closures). The new crossing therefore increases the opportunities for moving goods and minimising environmental impacts. Naturally, this also means shorter and more reliable journey times for trade and construction vehicles.

Silvertown Tunnel carries a road user charge from 06:00 to 22:00, 7 days a week. In addition to this, Blackwall Tunnel, which previously had no charge, simultaneously introduced a user charge. The fact that a user charge was therefore applied to both a new and an existing river crossing was a key consideration in the modelling and Go-Live monitoring, as this would have a further impact on driver behaviour.

Tidal Basin Roundabout: The "Hamburger" Roundabout on the doorstep of Silvertown Tunnel

It is unusual for a tunnel to have a complex gyratory system adjacent to the entrance (as highlighted in Figure 1), however the design of Tidal Basin Roundabout helps to efficiently connect Silvertown Tunnel with the A13 corridor to the north, London City Hall and the Excel Centre to the east, as well as London City Airport. A striking feature of the roundabout is the southbound cut-through from the Lower Lea Crossing, where there are three junctions in total before entering the tunnel, as shown in Figure 2. Coordinating the signals to ensure smooth flow into the tunnel, as well as maintaining the fundamental operation of the gyratory network to protect the exit of the tunnel, is therefore a delicate but important balancing act. More on how the signal timings at Tidal Basin Roundabout were set up to operate post-opening is detailed later in this report.

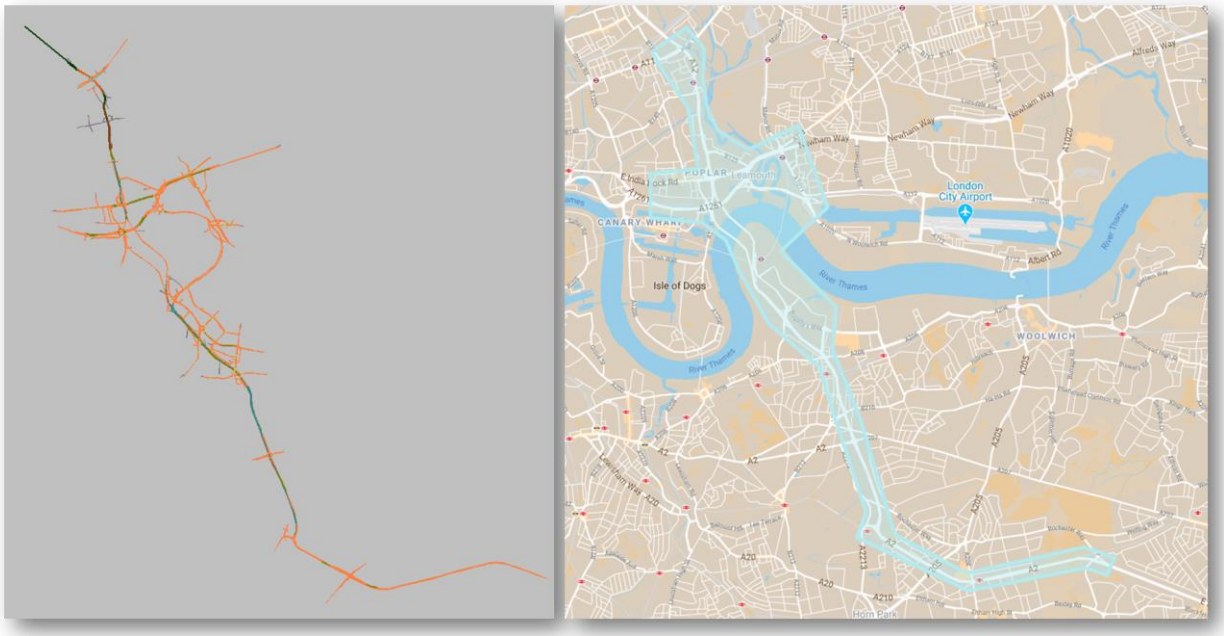
Figure 2: Annotated layout of Tidal Basin Roundabout. Red arrows indicate the two conflicting southbound entries to Silvertown Tunnel, with the blue arrow showing the northbound exit. Three junctions are highlighted in yellow, and the remaining signals in purple are pedestrian crossings



Determining the likely impacts and mitigation strategy through modelling

Initial modelling for Silvertown Tunnel had originally been produced for the Development Consent Order (DCO) in 2015. However, NPD were heavily involved in more detailed modelling to look more closely at the wider impacts of the scheme. This started in 2021 and used a complex combination of strategic and microsimulation modelling (VISSIM model layout shown below in Figure 3), which included a predicted user charge for both Silvertown and Blackwall.

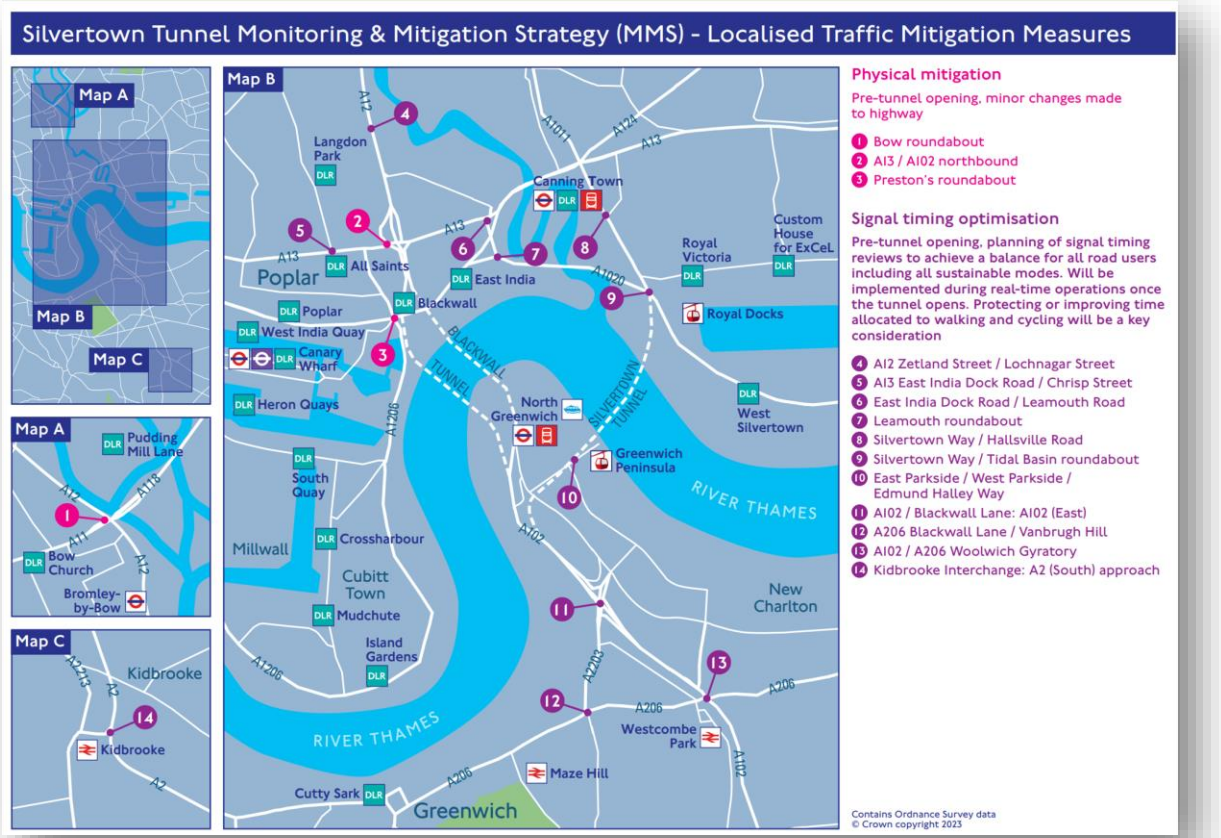
Figure 3: Detail of the VISSIM model used to assess Silvertown Tunnel (left), and the microsimulation study area overlayed on a map (right). The model extended from north of Bow Roundabout to beyond Eltham on the southern side.



Thresholds were agreed for determining whether modelled impacts required mitigation or not. For example, if bus journey times increased from one stop to another by over 30 seconds, then mitigation would need to be explored.

The modelling results predicted that physical mitigation would be required at three locations (shown below in Figure 4). Journey time thresholds were exceeded in the VISSIM modelling, the adjustment of signal timings within the model hadn't proven to be enough, and therefore more carriageway needed to be built. Two of the three locations were roundabouts – Bow and Preston's – where traffic flows were predicted to increase in multiple conflicting directions, hence why adjusting the timings to favour one movement would negatively impact another. There were a further 11 locations (including Tidal Basin Roundabout) where minor signal timing changes were expected to restore increased journey times to their original levels.

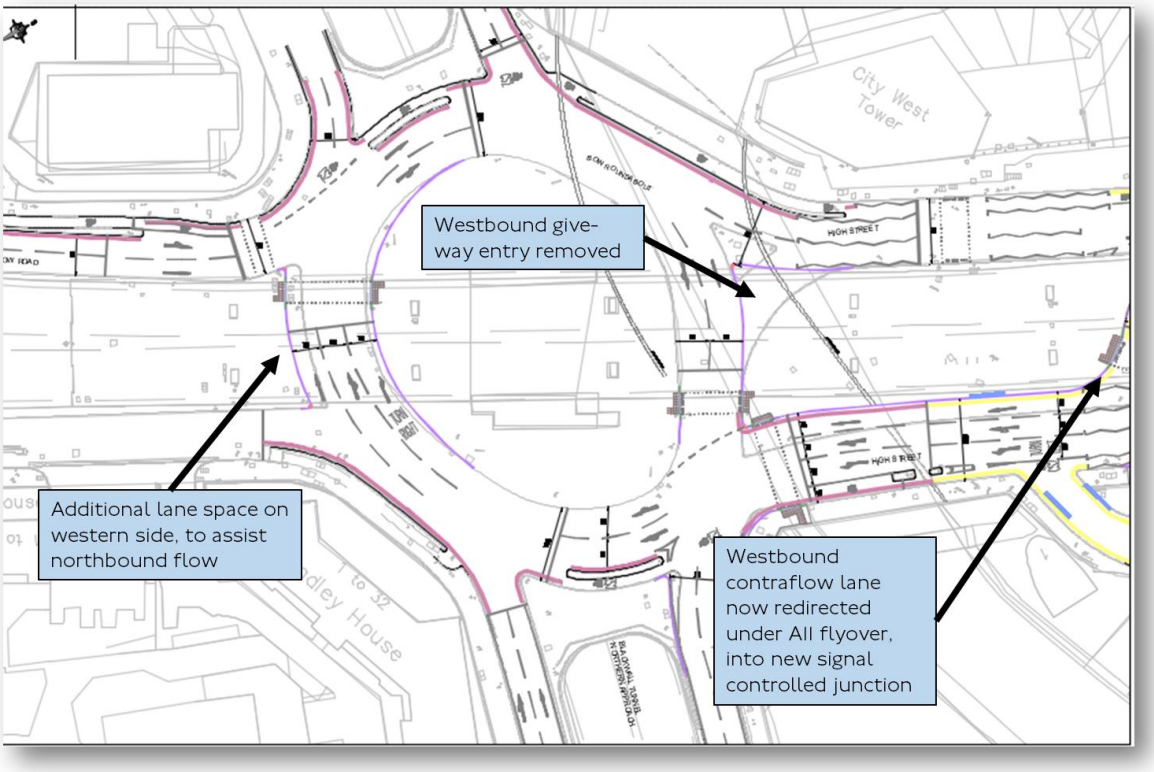
Figure 4: Map of mitigation strategy, showing locations of physical and signal mitigation sites



An example of the most complex physical mitigation scheme was at Bow Roundabout (location no.1 in Figure 4). Modelling had predicted journey time delays on conflicting approaches (northbound and eastbound), making it challenging to provide additional capacity by increasing the green time on one approach, without a negative impact on the other. The reason for this impact was that the model primarily showed an increase in northbound traffic, which was made possible because Silvertown would release the capacity previously queuing for Blackwall Tunnel, and allow better access to a key intersection of two TLRN corridors.

As a result, a scheme was designed to provide additional circulatory lanes on the western side, but also to remove a give-way entry on the eastern side (originating from a contraflow westbound lane) which added to traffic friction. The latter element was even more complex as it involved repurposing space under the A11 flyover, reversing a lane which was currently used for a local U-turn, and instead adding a new junction to control the traffic which used to enter via the give-way. This is represented in the plans below (Figure 5).

Figure 5: Design for Bow Roundabout's physical mitigation scheme

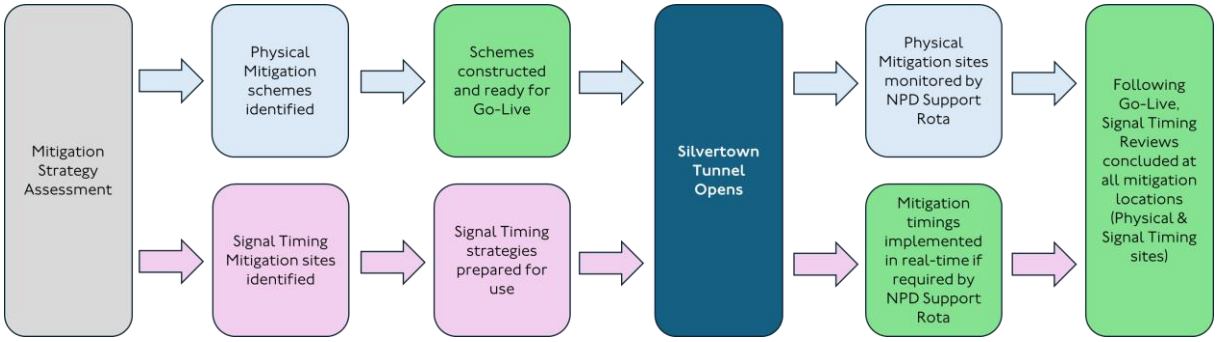


Bow Roundabout is also the location of a high-profile cycle safety scheme. The timings are therefore sensitive to change with a lot of safety-critical linking. It was vital to ensure that the mitigation strategy did not compromise this.

NPD were the driving force behind an accelerated modelling and construction programme, which ensured that the design of the UTC-controlled temporary signals and the commissioning of permanent signals were all completed before the Tunnel opened. Given that the predicted impacts of Silvertown meant we needed *more* lanes than we had before, it was obviously essential to have all disruptive construction and traffic management works completed in advance, so avoiding a *loss* of capacity at the opening.

The countdown to Go-Live, and the grand opening

Figure 6: Flow diagram demonstrating how the physical mitigation and signal timing mitigation were delivered.



With the mitigation strategy for Silvertown Tunnel now defined, it was time for NPD to put everything into action. With the physical mitigation schemes being constructed prior to the Tunnel opening (as shown in the top row in Figure 6), the team were already very busy designing and commissioning the signal timings for the new layouts. Before the opening, these scheme locations were already experiencing high traffic demands across the day, which meant NPD teamed up with Engineering and the signal contractors at 2am in order to complete the signal work with minimal disruption!

For the tunnel opening, an additional rota of Network Managers was put in place to support TfL's Surface Control Centre. April 7 was the start of Easter holidays for many, and therefore NPD planned to monitor both the opening and some additional post-easter dates, when traffic volumes were expected to increase. NPD support the TfL Surface Control Centre 7am-7pm (the rest of the time we provide an On-Call resource). For Go-Live, we provided additional support as per the table below:

Table 1: Summary of NPD Go-Live Support

Date	Level Of Additional Support
April 7th (Opening Day)	1x Network Manager in Control Centre from opening (00:00) 2x Network Mangers in Control Centre (1x 07:00-13:00, 1x 13:00-19:00) 2x Network Managers on site covering CCTV blind spots (1x 07:30-09:00, 1x 15:30-17:30)
Two days after opening (April 8th – 9th)	2x Network Mangers (1x 07:00-13:00, 1x 13:00-19:00) 2x Network Managers on site covering CCTV blind spots (1x 07:30-09:00, 1x 15:30-17:30)
Remainder of first week (April 10th – 11th)	2x Network Mangers (1x 07:00-13:00, 1x 13:00-19:00)
First Weekend (April 12th – 13th)	Saturday: 1x Network Manager (09:00-18:00) Sunday: 1x Network Manager (10:00-18:00)
Post-Easter checks (April 22nd – 23rd)	2x Network Mangers (1x 07:00-13:00, 1x 13:00-19:00)

In order to ensure the signal mitigation strategy could be implemented effectively, all of the timings that the modelling had predicted would be required were prepared in CASTs: CASTs are a feature in UTC-UX which allow us to deploy a selection of pre-defined SCOOT parameters, enabling us to rapidly make timing changes at the click of a button. This could be described as being "proactively reactive", whereby a predicted signal mitigation strategy was ready to go, however our Network Managers would use their expertise to ensure the most appropriate timings were used to suit what was actually occurring on the network. As shown in Figure 6, the implementation of mitigation timings post-opening was initially handled by the Support Rota, and then changes to all mitigation sites were cemented by Signal Timing Reviews to complete the operational response.

A comprehensive review of contingency timings across the wider network was also undertaken. Reactive signal strategies were likely to be required, especially during the initial post-opening period when customers responded to the new river crossing and user charges. Additional CASTs were created at locations in close proximity to Silvertown such as Canning Town, as well as further afield on the approach to Silvertown in Eltham, in readiness for any unforeseen flow increases. This helped ensure NPD were ready to respond rapidly to any scenario which could occur as a result of the tunnel opening.

In numbers:

- **18** UTC commissionings were undertaken to deliver new signals at Tidal Basin Roundabout, and new road layouts at Bow Roundabout, Preston's Roundabout and the A13 junction with A102.
- **64** signal sites health checked ahead of Go-Live. This number includes the physical and signal mitigation sites, those surrounding them in SCOOT regions, as well as additional sites along the Superloop 4 route
- **28** contingency timing CASTs created / redesigned to ensure the UTC-UX system had enough tools to manage a wide range of network impacts

A live monitoring dashboard was created by colleagues in Operational Analysis. This provided hourly flow rate changes plotted alongside baseline flows for the neighbouring river crossings: Blackwall Tunnel, Rotherhithe Tunnel and Tower Bridge. This enabled the supporting Network Managers, in addition to monitoring the predicted mitigation strategy, to quickly identify if any alternative river crossings were seeing a flow impact. Likely causes of flow changes could have been increased demand for Silvertown Tunnel, or potential reassignment in response to the new user charges for both Silvertown and Blackwall.

Perfecting the signal strategy for Tidal Basin Roundabout

Although the construction of the roundabout itself was completed a few months prior to the tunnel opening, a key flow contributor – the tunnel itself – would obviously be missing until the opening day. This therefore made NPD's preparation more complex:

- SCOOT detection was designed and commissioned in advance of the tunnel opening, however full SCOOT enabling could not be completed until all

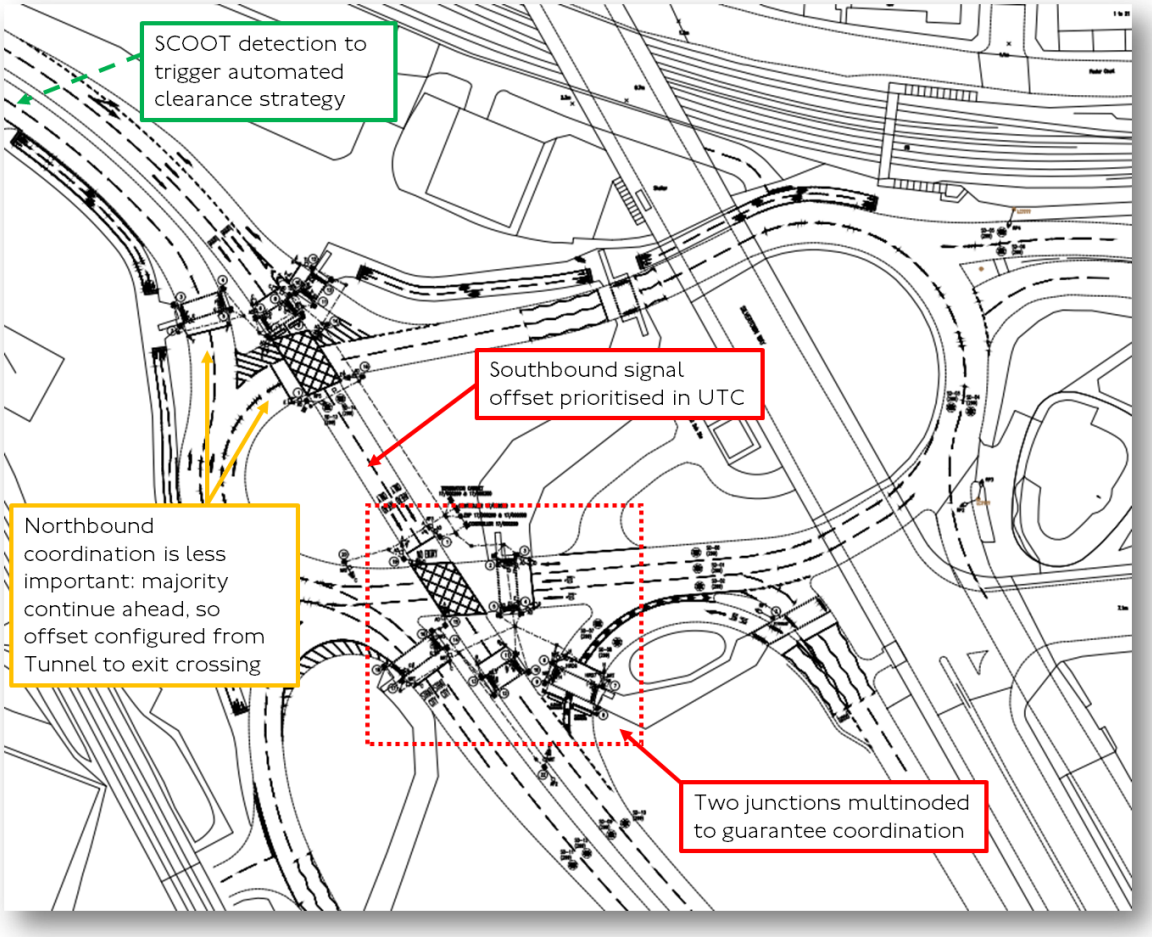
movements at the roundabout were in use. Consequently, the timings on day one were fixed-time signal plans, derived initially from the VISSIM microsimulation modelling which had been produced for the detailed assessments.

- Numerous contingency fixed-time plans were created, ensuring there was a strategy in our system for every conceivable scenario. For example, we designed plans which would restrict traffic entering the roundabout to help protect the circulatory movements. Without being possible to test in a live environment, these required a lot of judgement and some supporting modelling to ensure incidents of all kinds could be managed straight away.

After allowing a brief period of time for Silvertown Tunnel's flows to settle, a SCOOT enabling timing review of Tidal Basin Roundabout was completed. The signal timings now optimise under SCOOT control. Some of the features of the SCOOT setup here include (also see Figure 7):

- Multinoding of the two adjacent junctions on the southbound tunnel entry, to guarantee a closing offset between the two green signals, and avoid trapping any vehicles across the gyratory.
- Strong Congestion Importance Factors on the tunnel exit and southbound cut-through, to ensure these two approaches are prioritised for green time if SCOOT congestion is detected.

Figure 7: Key elements of the finalised signal strategy for Tidal Basin Roundabout



Developing automated strategies and the long-term operation of Silvertown Tunnel

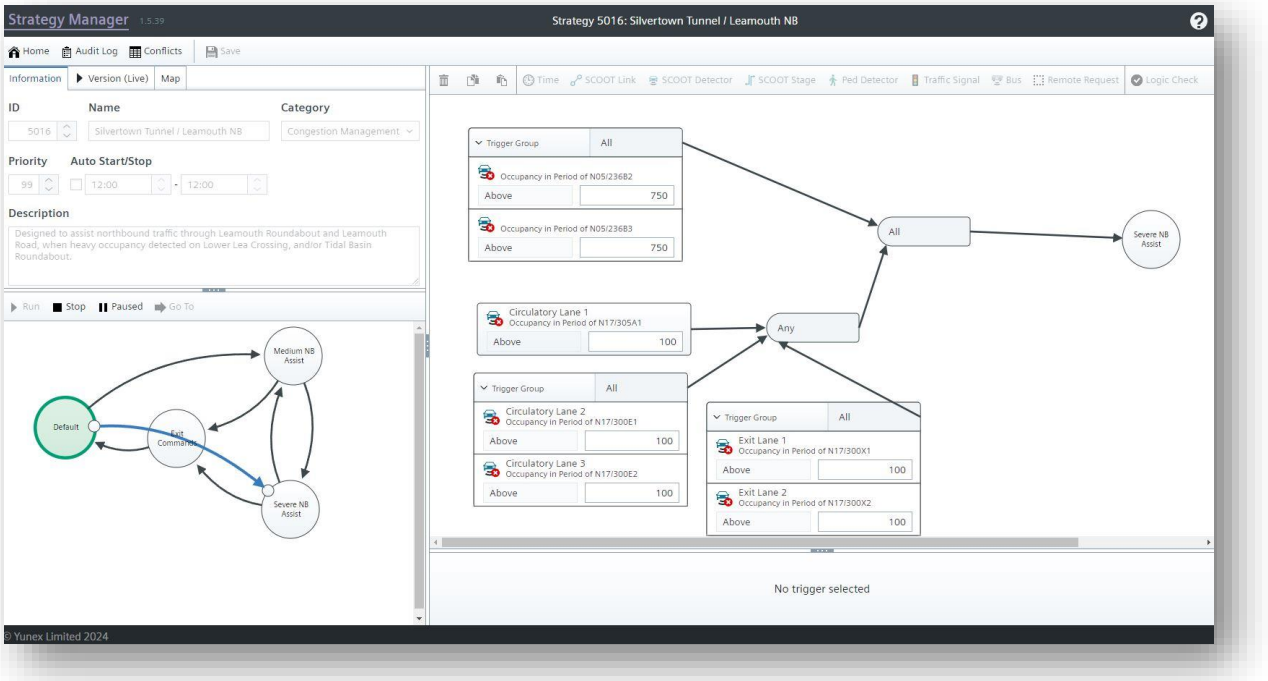
As you can see, TfL's NPD team invests a significant amount of time and resources into the Go-Live of transformational schemes. However, in order to ensure the network operates efficiently 24/7 when the Go-Live period has ended, a crucial final step is to develop the signal strategies which automatically respond to changes on the network. The Stratman (Strategy Manager) tool which works alongside UTC-UX enables us to specify a range of conditions which will then trigger changes to the signal timings.

For Silvertown Tunnel, it is vitally important that queues do not tailback into Tidal Basin Roundabout and block the exit of the tunnel. Such an incident results in the closure of Silvertown Tunnel, and consequently delays and increased pressure on the wider network. To help prevent this, our Stratman technology monitors the amount of traffic occupying the SCOOT detectors on the Lower Lea Crossing approach to Leamouth Roundabout, as well as on the exit of Tidal Basin Roundabout. The occupancy trigger is an effective parameter which shows how

much vehicular presence has been detected and indicates whether stationary queues are beginning to form.

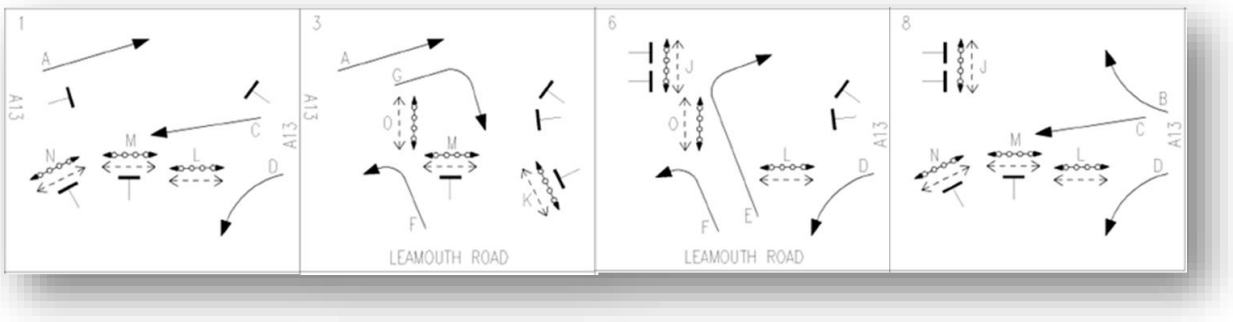
Increases in northbound traffic through Silvertown Tunnel typically occur when Blackwall or another parallel crossing is closed. The result is usually increased demand for the Lower Lea Crossing, continuing northbound from Leamouth Roundabout to join the A13. Therefore, when occupancy surpasses a certain threshold on the approach to Leamouth Roundabout (Figure 8 shows the logic and thresholds), Stratman instantly increases the green time to the Lower Lea Crossing and Leamouth Road. In more severe incidents when occupancy continues to increase on the exit of Tidal Basin Roundabout, the green times are increased even further, and for as long as necessary (until occupancy levels reduce), as shown in the diagram on the left of Figure 8.

Figure 8: Silvertown's Stratman logic for detecting and clearing northbound congestion

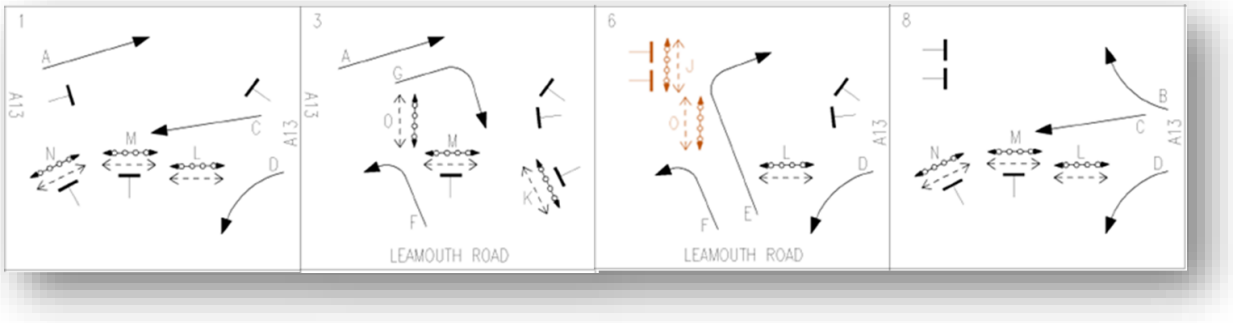


During initial unplanned closures of Blackwall Tunnel in the first few weeks post-opening, our teams closely monitored this route via Silvertown to the A13, and identified an opportunity to make signal method of control enhancements to assist with the volumes of traffic on diversion. At the junction of the A13 with Leamouth Road, it was determined that 16 seconds of additional green time could be made available by providing an alternative signal stage. The green time could be reallocated to Leamouth Road to assist additional traffic leaving Silvertown, or to the eastbound right turn when additional traffic was approaching the Silvertown southbound bore. Steps are now being taken to acquire funding and engage with the signal contractor, to ensure this simple capacity enhancement identified by NPD can be provided to better manage the impact of all future planned and unplanned tunnel closures.

The current method of control:



Spot the difference - the proposed method of control means phases J and O will only appear when there is demand, reducing interstages on occasions when there is no demand. Removing phase J from stage 8 also helps to give more green time to other movements:



The first double decker buses crossing the Thames east of Tower Bridge: introducing the Superloop 4

TfL's Superloop bus network has already proven to be a valuable service connecting passengers in outer London. It's therefore only fitting that a new Superloop route was launched on the same day as Silvertown Tunnel, completing the roll-out of a significant new transport network in the area. There was a lot of overlap between NPD's preparations for both Silvertown Tunnel and Superloop 4 (SL4). Prior to the route launching, it was again essential to review the existing network setup and ensure it was operating as efficiently as possible in readiness for the route.

Health checks of all signals along the route were undertaken in advance to identify faults and improvements to timings. Arguably the most vital work was a route-wide update of UTC Bus Priority configurations: NPD ensured the SL4 was included at all relevant Bus Priority sites, designing the most effective layout of bus detection locations to account for the new stops along the route. The benefits of UTC Bus Priority are widely recognised, and this work ahead of the route's launch meant customers would experience these benefits from day one.

Conclusion

Silvertown Tunnel showcases NPD's unique involvement in managing and optimising transformational schemes. From planning mitigation strategies years in advance, to delivering and perfecting strategies in real-time during Go-Live, and identifying solutions to longer term problems in the future, NPD's role in the lifetime of such projects is essential. Much of what has been detailed in this paper is best practice for ensuring the smooth implementation of schemes on our network. Nevertheless, the complexity and significance of opening a new tunnel in London showcased our technical capability on the biggest stage, with the benefits being felt by our customers every day.