Interested party reference: 20035666

TRANSPORT FOR LONDON

LOWER THAMES CROSSING – WRITTEN SUBMISSION OF ORAL COMMENTS MADE AT ISSUE SPECIFIC HEARING 10

DEADLINE 6: 31 OCTOBER 2023

1. Introduction

1.1 This document summarises the oral submissions made by Transport for London (TfL) at Issue Specific Hearing 10 (ISH10), covering traffic and transportation matters, held on 24 October 2023 in relation to the application for development consent by National Highways (the Applicant) for the Lower Thames Crossing (LTC) project (the Project). TfL was represented by Matthew Rheinberg, Major Projects & Urban Design Manager, and Shamal Ratnayaka, Strategic Analysis Manager.

1.2 TfL did not attend ISH8 and ISH9 so has not made any comments on matters discussed at those hearings in this submission.

1.3 Oral submissions by all parties attending ISH10 were made pursuant to the agenda published by the Examining Authority (ExA). In setting out TfL's position on the issues raised in the agenda, as submitted orally at the hearing, the format of this submission follows that of the agenda. TfL has also commented on points raised by interested parties, the Applicant, or the ExA during the hearing on which TfL did not make oral submissions, where these are relevant to TfL's responsibilities.

1.4 In addition to covering the agenda items as noted above, this submission also relates to the ExA's list of action points arising from the hearing. TfL's response to Action Point 6 is provided in Section 4 of this submission.

2. Agenda item 3 – Update on matters arising from ISH4

Agenda item 3 (a) (i) – Wider network impacts update – Applicant to provide an updated statement on wider network impacts

2.1 TfL noted that the updated statement on wider network impacts made by the Applicant was largely a repackaging of its previous oral submissions, in particular the assessment the Applicant made at ISH4. TfL then proceeded to explain why the points made in the Applicant's statement for the most part demonstrated why there was a clear policy need for a credible monitoring and mitigation strategy (MMS).

2.2 The Applicant's statement put forward the justification for the LTC Project not needing a full MMS because it was a strategic road scheme, entailing redistribution of traffic, and as such an MMS was not possible. Citing this, TfL explained this was exactly the reason why such a mechanism was needed, because of the uncertainty in the impacts on the wider network, particularly given the modelling having been undertaken around ten years before likely scheme opening.

2.3 TfL pointed out that the Applicant had used the Road Investment Strategy (RIS) process as further justification for not requiring an MMS because the RIS "was part of a programme to address this" - namely any mitigation required – and that one was "obligated and entitled to assume the programme was going to work". However, such a characterisation fails to acknowledge the inherent challenges and uncertainties about funding available for the next

iteration of the strategy (RIS 3). As such, it cannot be taken for granted that this process will ensure that the mitigation required will be funded and secured.

2.4 Furthermore, a key flaw in the Applicant's argument that it is relying on the RIS process is regarding the scope of that process – it is focussed almost entirely on the Strategic Road Network (SRN), which is under the direct control of the Applicant. Yet the major roads in London are, for the most part, constituents of the Transport for London Road Network (TLRN) and so beyond the scope of the SRN, as are the local roads. TfL and the London Borough of Havering have already highlighted the scale of increased traffic on the A127 in London and the impact this has on junctions between that road and the local road network (REPI-304 Paragraphs 3.23 to 3.29). The RIS process is simply not designed to fund interventions on local roads or roads in London and it is misleading for the Applicant to imply otherwise.

2.5 TfL commented on the Applicant's argument that the National Policy Statement for National Networks (NPSNN) does not require traffic congestion impacts to be mitigated, citing Paragraphs 3.2 and 5.202 of the NPSNN which do not specifically mention congestion or delay. However, these paragraphs do mention social and environmental impacts, and Paragraph 5.202 also mentions economic impacts. It is clear that congestion leads to worsening impacts with regard to safety, carbon, air quality, noise and the smooth operation of the network – indeed, Paragraph 2.16 of the NPSNN sets out very clearly these linkages between traffic congestion, economic and environmental impacts. The Applicant appears to be making selective use of specific paragraphs of the NPSNN to justify its position without considering the NPSNN in its totality. TfL argues this is neither a reasonable nor an appropriate way to interpret national policy.

2.6 In responding to this point, the Applicant subsequently stated that it agrees that congestion causes other impacts such as air quality and economic impacts through changes in journey time, but that these have already been addressed in the environmental assessment and economic appraisal. TfL considers that this completely misses the point – it is the unforeseen impacts that emerge, which modelling undertaken ten years prior to opening cannot adequately capture, that is the source of particular concern and why an MMS is essential.

2.7 TfL also objected to the argument pursued by the Applicant that the local highway authorities are aspiring to "free flow traffic conditions" and seeking an MMS "to address unconstrained traffic growth" using a "predict and provide" approach. This is a fundamental misrepresentation of TfL's position. TfL is only seeking for the Applicant to address the adverse traffic impacts of the scheme that have a significant impact on the safe and efficient operation of the road network in London. TfL is not seeking for the Applicant to fund investment in highway schemes to address background growth unrelated to the Project.

2.8 TfL then moved on to the Silvertown Tunnel approach, with the Applicant at pains to explain why, for the purposes of consideration of an MMS, the Silvertown Tunnel and LTC projects were not comparable. The Applicant put forward the argument that, in contrast to the RIS process, there was no equivalent strategy for London. Indeed, the Applicant's statement claimed that London "doesn't have a comparable road investment strategy process, so one is effectively generated through the DCO". TfL was clear that this was incorrect, with the Mayor's Transport Strategy (MTS) providing a similar and parallel approach to the RIS process outside London. The MTS has very clear objectives around traffic and its environmental impacts, and TfL regularly reviews conditions on the traffic network in London to decide whether and where investment is needed. However, given the

very particular nature of the Silvertown Tunnel scheme, it was felt important to have a process to identify the impacts that arise and to have an approach to mitigation in place. This was necessary to give reassurance to the other highway authority stakeholders, including the Applicant, that TfL would fund and secure delivery of any mitigation that was necessary as a direct result of the scheme.

2.9 TfL also commented on the ExA's possible characterisation of the Silvertown Tunnel as a single point to single point scheme rather than being part of a network. TfL considers that the Silvertown Tunnel is more than just a point-to-point scheme, and this is reflected in the membership of the Silvertown Tunnel Implementation Group (STIG), with 14 different highway authorities represented. Indeed, part of the reason TfL is making representations to the LTC DCO examination is precisely because the river crossing system operates very much as a holistic system. There are historic constraints on the ability to cross the River Thames east of central London. The Silvertown Tunnel is part of the approach to seeking to address those constraints inside London, while the LTC Project helps address the same constraints further downstream. Identifying the geographical alignment of the LTC Project and Silvertown Tunnel alike was a very tortuous process partly because of the interactions between the river crossings and the impacts one crossing has on another, given they act as part of a wider network. That is partly why for the Silvertown Tunnel it is appropriate that the impacts need to be understood and revisited during construction and once the scheme becomes operational, to check whether the original modelling did forecast the impacts accurately and whether there are impacts that were not foreseen. This approach equally applies to the LTC Project.

2.10 At this point, it is also worth noting the subsequent representations by the Port of Tilbury London Ltd on this issue, which TfL supports. Specifically, it flagged the increased challenges of forecasting the impacts of the Project because, like the Silvertown Tunnel, it is creating a new road rather than upgrading an existing road. Unlike most DCO schemes promoted by the Applicant, this creates multiple new connections which did not previously exist, generating demand patterns that are not already established, with a greater likelihood of unforeseen impacts arising. This is a further reason why undertaking updated modelling much closer to the time the Project becomes operational is particularly necessary.

2.11 The Applicant's statement went into some detail on the Silvertown Tunnel approach, what it is – and also what it is not. In particular, the Applicant was clear that the Silvertown Tunnel mechanism "doesn't require all impacts to be mitigated", "doesn't give control to STIG", and is "deliberately consistent with policy". TfL commented that it could not disagree with such a characterisation, nor was it seeking anything different in an MMS for the LTC Project. Indeed, TfL is clear that it is precisely these characteristics, laid out in the Applicant's statement, which make the mechanism created for the Silvertown Tunnel appropriate and applicable to the LTC Project.

2.12 The Applicant also gave a summary of the draft monitoring and mitigation approach it had been requested by the ExA to prepare, without prejudice to its position, to be submitted in full at Deadline 6. TfL stated that the key test of any such MMS is whether it provides sufficient assurance to stakeholders that the impacts can and will be mitigated. While TfL will review the detail of the draft mechanism once made available, what information the Applicant did offer suggests the mechanism it has drafted falls substantially short of what is required.

2.13 In particular, the Applicant's statement indicated that the scope of any mitigation is limited to the Applicant's permitted development rights on the SRN. TfL was clear that the exclusion of key highways affected, including both the TLRN and local roads, renders this

approach not fit for purpose. The Applicant's reference to informing a future RIS or co-operation with local highway authorities in bidding for funding cannot address the deficiencies. The Applicant also indicated that its mechanism would involve the creation of a "Network Management Group" – but meeting only annually – which is unlikely to be sufficient.

2.14 It is also worth noting that, in the case of the Silvertown Tunnel, there is a pot of funding as part of the project's budget to support mitigation. An equivalent approach would be very helpful to provide that assurance that there is a credible opportunity to mitigate the impacts which are identified where appropriate, with that funding allocated through the process and in consultation with the other local highway authorities.

2.15 The Applicant's statement also raised concerns that any such mitigation mechanism would undermine the role of the Secretary of State for Transport in determining transport infrastructure spend. Again, TfL could point to this being a key feature embedded in the Silvertown Tunnel approach, with the Secretary of State for Transport responsible for approving the scheme of mitigation put forward by TfL. This gives the Department for Transport (DfT) a very clear say and is an important safeguard which TfL agrees is necessary and is already part of the Silvertown Tunnel approach. There is no reason why this cannot work equally well for the LTC Project and will ensure that any mitigation agreed as necessary does not conflict with national policies and strategies.

2.16 Following TfL's representations, the ExA asked how the Silvertown Tunnel approach identified whether impacts were 'unacceptable', how the thresholds in the Silvertown Tunnel MMS were agreed, and who makes the final decision on what mitigation is implemented. TfL noted that if an impact breaches a trigger for the Silvertown Tunnel, this does not mean it is unacceptable. Indeed, contrary to what the Applicant's statement might have implied, "unacceptable impacts" are not mentioned in the Silvertown Tunnel DCO and MMS, nor is a level of acceptability defined. TfL explained that where a trigger is activated, TfL considers whether mitigation is needed, and this is discussed collectively by the STIG. The submission to the Secretary of State on the scheme of mitigation is required by the Silvertown Tunnel DCO Requirement 7 (6) (b) to include responses to consultation with the local highway authorities who are members of the STIG.

2.17 TfL agreed to provide further details on the triggers in writing, and this is covered in Section 4 of this submission below, in response to Action Point 6 from the hearing. The London Borough of Havering subsequently noted that the triggers for the Silvertown Tunnel MMS were developed after several months of consultation between TfL and the other highway authorities.

3. Agenda item 4 – Public Rights of Way (PRoWs) and Non-Motorised User (NMU) routes

Agenda item 4 (b) (ii) – Design standards – Whether opportunities to maximise the potential benefit for NMU users and routes have been suitably considered

3.1 TfL explained at the hearing that its primary concern was regarding the status of the new walking, cycling and horse-riding (WCH) bridge over the A127 west of M25 Junction 29 which the Applicant had previously considered is necessary to mitigate severance impacts caused by the Project. The bridge also helps address historic severance issues caused by the A127. TfL is concerned that in its most recent submissions, the Applicant has revised its position and now considers the bridge is only needed to address historic severance issues and not as a result of the impacts of the Project.

3.2 The Applicant's latest position is set out in its responses to comments made by interested parties on the draft DCO at Deadline 4 (REP5-089). Paragraph 10.3.2 of this document states: *"Located west of the M25 junction 29, the bridge over the A127 for walkers, cyclists and horse riders is proposed to address historic severance and concerns raised by London Borough of Havering over connectivity in this area. While the Applicant recognises the potential benefits of the non-motorised user route proposed by the London Borough of Havering, this is not required to mitigate issues arising because of the Project. For those reasons, paragraph 5.216 of the NPSNN is not directly relevant in this context."* Paragraph 5.216 of the NPSNN specifically references the need to mitigate impacts on accessibility for NMUs.

3.3 TfL strongly disputes the Applicant's position given previous statements the Applicant has made on this bridge. While TfL agrees that the bridge will help reduce historic severance, the primary reason that the bridge is required is to address the new severance to east-west connectivity caused by the Project on the south side of M25 Junction 29. The Applicant has acknowledged this several times. TfL quoted some previous statements made by the Applicant during the hearing and a fuller list of examples is provided here:

- The bridge was first introduced to the scope of the scheme during the Local Refinement Consultation (APP-088 page 145) where the Applicant stated: *"At present, pedestrians walking on the footways alongside the A127 and passing underneath the M25 can use crossing points over the slip roads connecting the A127 to the M25. The changes to the road network associated with the LTC would take away these crossing points, removing the connection across the M25 along the southern side of the A127, rerouting pedestrians across the northern side of the M25 junction 29 roundabout. The newly proposed bridge improves the connectivity, by providing a crossing of the A127 to the west of the M25, allowing rerouted pedestrians to return to the southern side of the A127 more safely."* This clearly links the need for the bridge to the severance impacts of the Project.
- The severance caused by the Project is further acknowledged by the Applicant in the DCO application documents in the Project Design Report Part D – General Design North of the River – North of the A13 Junction to the M25 (APP-510), where Paragraph 3.2.5 states: *"Severance caused by the Project is also being addressed at Junction 29 of the M25, where new free-flowing slips between the A127 and M25 sever the southern A127 footway. A new WCH bridge to both the east and west of the junction, as well as crossing improvements at the northern side of the junction, will allow users of the southern footway to cross to the north of the M25, cross through the junction and return to the southern footway. The western bridge coincides with a historic route between Cranham and Great Warley that was severed by the A127 and the bridge will re-establish this route for WCH users."* Both the severance caused by the Project and historic severance is therefore noted. Paragraph 3.2.6 goes on to state: *"The WCH strategy in this area will be achieved through: (a) Resolution of new and historic severance around M25 and M25 junction 29 through new bridges…"*
- The most detail is provided in Project Design Report Part E – Design for Walkers, Cyclists and Horse Riders (APP-512). Paragraph 5.4.5 states: *"Further north at the junction between the M25 and the A127 the creation of new free-flowing slip roads on the southern side of the junction sever an existing route along the southern A127 footway used by both pedestrians and cyclists. New bridges over the A127 to the east and west of the M25 allow this eastwest connectivity to be retained but also offer the opportunity to resolve both historic severance caused by the A127…"* Paragraph 5.4.35 also states: *"The creation of free-flowing slips between the A127 and the M25 on the south side of the junction will interrupt the southern footway. For reasons of safety it is not possible to reestablish this footway link across these slips."* Further details of the

justification for the bridge are provided in the section of this document between Paragraphs 5.4.34 and 5.4.39.

3.4 The Applicant also provided a document in July 2022 to TfL and the London Borough of Havering setting out its rationale behind the need for and preferred location of the WCH bridge over the A127 west of M25 Junction 29. The severance caused by the Project is also referred to in this document. TfL has submitted this document to the examination as Appendix A to this submission.

3.5 TfL wishes to issue a correction in relation to a reference it made to supplementary consultation material in Paragraph 5.5 of its Deadline 5 submission (REP5-114). This referred to the provision of a WCH route over the A127 east of M25 Junction 29 rather than the bridge to the west which was introduced later. While the principles are similar, the quotes provided in Paragraph 3.3 above are more directly relevant.

3.6 TfL also noted at the hearing that questions have been raised about whether an at-grade crossing would be more suitable instead of a grade-separated bridge. TfL would have significant concerns about introducing a new at-grade crossing at this location. The substantial increase in forecast traffic flows on the A127 caused by the Project, with around 700-800 additional Passenger Car Units (PCUs) per hour forecast at peak times in each direction as soon as the Project becomes operational, would cause significant safety concerns for an at-grade crossing.

3.7 Furthermore, Design Manual for Roads and Bridges (DMRB) standards clearly show that an at-grade crossing would be unsuitable for a two-lane dual carriageway with a 70 miles per hour (mph) speed limit. With regards to pedestrians and cyclists, the following standards are relevant:

- CD 143 Designing for walking, cycling and horse-riding Paragraph E/4.4 states: *"Stand-alone signal controlled crossings for pedestrians and cyclists shall not be provided where the 85th percentile speed exceeds 50mph."*
- CD 195 England National Application Annex – Designing for cycle traffic Paragraph E/4.1 states: *"Suitable types of cycle crossing – speed limit greater than or equal to 60 mph – no alternative to grade separated. Signal controlled cycle crossing could be acceptable based on traffic flow and number of lanes if speed limit is reduced to 50mph but preferred crossing type would still be grade separated."*
- LTN 1/95 Section 4.2.3 states with regard to zebra crossings: *"Where traffic speeds are higher than 30 m.p.h., people will require longer gaps in the traffic flow or be exposed to the risk of more serious injury if precedence is not conceded for any reason. Zebra crossings should not be installed on roads with an 85 percentile speed of 35 m.p.h. or above."* Section 4.2.4 of the same document states with regard to signal-controlled crossings: *"Caution should be exercised where pedestrian flows are generally light or light for long periods of the day. Drivers who become accustomed to not being stopped at the crossing may begin to ignore its existence, with dangerous consequences. The problems are accentuated as vehicle speeds increase."*
- With specific regard to equestrian crossings, CD 143 Designing for walking, cycling and horse-riding states in Paragraph 5.23: *"At-grade equestrian crossings shall not be provided on: (I) roads with a 120 kph design speed…"* Further information is provided in Paragraph 5.25: *"Where an at-grade equestrian crossing is provided on a dual carriageway, a holding area of 5.0 metres wide by 3.0 metres long shall be provided in the central reserve."* There is insufficient space in the central reservation of the A127 to provide a holding area of this size. Finally, Paragraph 5.25.1 states: *"At-grade equestrian crossings should only be provided on dual carriageways where alternative crossings are not possible."* The design of the proposed WCH bridge shows that an alternative crossing at this location is feasible.

3.8 In conclusion, TfL's position is that while demand for the new WCH bridge is not known, a grade separated crossing of the A127 west of M25 Junction 29 remains necessary as mitigation for the impacts of the Project – as originally set out by the Applicant – to provide a route that is safe and addresses the severance caused. While it also helps address existing severance, this does not detract from the fact that it is primarily required to tackle the additional severance directly caused by the Project.

3.9 TfL wishes to make the ExA aware that on 20 October 2023 a pedestrian was tragically involved in a fatal collision with a heavy goods vehicle at the location of the uncontrolled at-grade crossing of the A127 at the junction with Bird Lane, a short distance to the west of the Order Limits. The circumstances of the collision are under investigation.

Agenda item 4 (c) Future maintenance – Whether future maintenance responsibility and cost has been sufficiently considered

3.10 TfL does not dispute that it is the most appropriate organisation to have maintenance responsibility for the new WCH bridge over the A127 west of M25 Junction 29. TfL has previously made the case in detail about the need for a commuted sum to cover the costs of maintaining the bridge. Most recently this was covered in TfL's comments made on submissions at Deadline 4 (REP5-114 Paragraphs 5.1 to 5.5). In that situation, TfL explained the particular funding arrangements for the highway network in London which mean a commuted sum is fully justified, with the precedents cited by the Applicant for not providing a commuted sum not being relevant as they are not for projects in London. Paragraphs 3.1 to 3.8 above make clear that the bridge is required to mitigate the impacts of the Project and not just to address historic severance, again justifying the need for the Applicant to provide TfL with a commuted sum to cover future maintenance costs.

3.11 The Applicant submitted its preferred form of protective provisions for the protection of local highway authorities at Deadline 4 (REP4-095) Schedule 14 Part 11. This did not include a commuted sum to cover the future maintenance costs TfL will incur as a result of gaining ownership and maintenance responsibilities for the new WCH bridge over the A127 west of M25 Junction 29. The local highway authorities are jointly responding to these protective provisions at Deadline 6 including the proposed insertion of a clause to cover commuted sums.

3.12 In response to this issue, the Applicant repeated the position it has set out previously at the hearing: *"…the maintenance of local highways is funded by the Department of Transport, based on a formula linked to the total mileage of roads and unclassified roads, together with the numbers of various items of infrastructure. That's refreshed every few years to take account of changes in road length and number of highway structures, and thus, as local highway works carried out under the DCO, and the amount of funding that each local highway authority receives, will be amended to recognise these additional responsibilities."* The Applicant therefore continues to fail to address the point that the maintenance of local highways is funded differently in London.

4. Response to action points

4.1 This section contains TfL's response to the action point from ISH10 that is addressed to TfL. TfL has reviewed the other action points addressed to all local highway authorities or all interested parties but does not have any matters to raise in response to those points.

Action Point 6 – Silvertown Tunnel approach: drafting / ambiguity removal - Provide an explanation of the use of the wording "Unacceptable impact", its definition or the triggers where this wording is appropriate as opposed to a situation which could be considered as a

'severe inconvenience'. What could be specified to make a trigger point to enable further work investigation and how is this secured?

4.2 TfL wishes to make clear that neither the Silvertown Tunnel DCO nor its MMS makes use of the phrase "unacceptable impact". The NNNPS also does not use this wording.

4.3 At ISHI0, the Applicant's submissions suggested otherwise, pointing out that it is difficult to define what is or is not unacceptable – and this led to a discussion about whether the impacts of a Project can be defined as unacceptable.

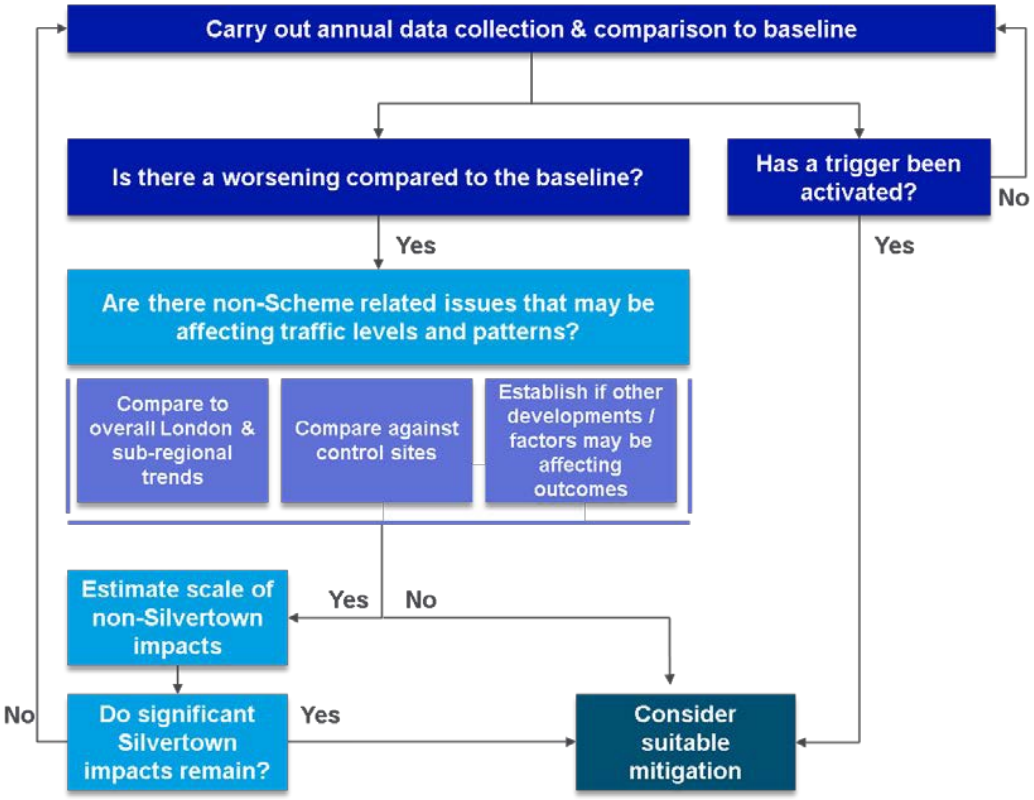
4.4 TfL was clear that the Silvertown Tunnel approach to monitoring and mitigation is focused primarily on the process of engaging the key stakeholders for the MMS rather than the triggers themselves. As such, the functioning of the Silvertown Tunnel MMS is defined in Article 66 (Silvertown Tunnel Implementation Group) and Requirement 7 (Monitoring and mitigation strategy) of the DCO.

4.5 By contrast, the triggers are not defined in the DCO. The triggers are instead explained in detail in the MMS. For convenience, a copy of the Silvertown Tunnel MMS, a certified document of the Silvertown Tunnel DCO, is appended to this submission as Appendix B.

4.6 Paragraph 3.6.5 of the MMS highlights that the purpose of the triggers is to deal with any unexpected impacts of the Scheme, exactly as TfL and other interested parties are seeking for the LTC Project. Paragraph 4.1.2 explains that if the traffic monitoring required shows that a trigger has been activated, indicating a material worsening of traffic conditions as a result of the scheme, then TfL is required to "investigate to determine whether localised mitigation is required to address these impacts". However, the trigger levels do not necessarily represent an impact that is unacceptable.

4.7 Paragraphs 4.2.6 to 4.2.8 of the MMS explain how the triggers work. If the traffic impacts of the scheme differ sufficiently from that anticipated by the modelling, then the trigger is activated. Importantly, the triggers are based on the expected change caused by the scheme, i.e. a percentage change rather than an absolute value change, which means the triggers "remain applicable if background conditions across the network (for instance growth in the number of highway trips across the network) were different from those currently forecast." Importantly, the triggers will be reviewed by the STIG in advance of the scheme opening in light of the revised modelling pre-opening to ensure they remain fit for purpose.

4.8 If a trigger is activated, then TfL will investigate the nature of the impact and its cause to identify whether mitigation in relation to the Silvertown Tunnel project is necessary. If TfL determines mitigation is not required, it will provide the STIG with a clear justification for this. Figure 4-I of the MMS, reproduced below, is a flow chart that summarises how the triggers are used in the Silvertown Tunnel MMS.



4.9 Appendix E of the Silvertown Tunnel MMS provides full detail of how the triggers work. There are three levels of trigger:

- Green – the expected change based on the modelling.
- Amber – the level where an investigation into whether mitigation is needed should be undertaken if required by the STIG.
- Red – the level where an investigation into whether mitigation is necessary is always required.

4.10 As an example of how this process works, for the Rotherhithe Tunnel the expected change in traffic flow caused by the Silvertown Tunnel scheme is between -1% and +3% (the green trigger). If traffic reduces by more than 2% or increases by more than 4% then the amber trigger is activated, and if traffic reduces by more than 6% or increases by more than 8% then the red trigger is activated.

4.11 Triggers cover a range of metrics. These are traffic flows, proportion of heavy goods vehicles, journey time reliability, extent of queues, bus reliability, road safety and junction performance. If a similar approach was to be adopted for the LTC Project, then an alternative range of metrics may be considered more appropriate.

4.12 The triggers for the Silvertown Tunnel were discussed and agreed through detailed engagement between TfL and key stakeholders including the relevant highway authorities over a period of several months, allowing them to be specified in the MMS during the period of the DCO examination. It does not appear to be realistic that this could be achieved for the LTC Project given the time remaining and the Applicant's unwavering position that no approach to mitigating the unforeseen impacts of the Project is required. However, TfL considers that a requirement could be included in the LTC DCO to require the establishment of an implementation group equivalent to STIG which must agree the triggers prior to construction commencing.

Appendix A – The Applicant's document provided to TfL and the London Borough of Havering in July 2022 setting out option assessment for a new WCH crossing of the A127 west of M25 Junction 29

Proposed Crossing on the A127 to the west of M25 Junction 29

Background

The Walking, Cycling and Horse-riding (WCH) Strategy proposals for the Project were presented at the 2021 Community Impacts Consultation (C-Con) and included a new shared use cycle/footbridge over the A127, to the east of the M25 Junction 29, as shown on Figure 1 below.

Figure 1 - WCH proposals at M25 Junction 29 at C-Con

The shared use cycle/footbridge aimed to resolve the A127 footway severance caused by the proposed LTC M25 slip road arrangement on the southern section of the junction, where existing east-west and north-south crossings are no longer feasible under the proposed highway design.

After crossing the A127 at the new cycle/footbridge, users travelling westbound would continue along the northern side of Junction 29, on the A127 or along Codham Hall Lane, providing a connection to Junction 29. Signalised crossings will be provided on the south and eastbound approaches to the roundabout and on the northern and eastern circulatory carriageway. From Junction 29, users would continue west along the existing shared use cycle/footway along the northern side of the A127, until they reach the existing at-grade uncontrolled crossings at the junctions with Front Lane and Folkes Lane.

Stakeholder Feedback

Stakeholder and public feedback at C-Con on the proposals around the M25 Junction 29 were reviewed to understand whether the WCH Strategy should be improved.

The need for an additional crossing to the west of the M25 Junction 29 to allow for a safe north-south crossing of the A127 was identified by both stakeholders and the public. In general, comments related to:

- Concern over the safety of users at the uncontrolled crossing at the Front Lane junction, due to high traffic flows and speed of motorists; and
- The additional journey time to travel between Moor Lane Cranham to Folkes Lane Woodland Country Park when the uncontrolled crossings at the M25 J29 are removed.

Review of Existing Crossing Facilities

A further review of existing crossing facilities to the west of the M25 Junction 29 was undertaken, investigating their connections to the existing/proposed WCH network. It was found that the staggered uncontrolled crossings at Front Lane and Folkes Lane were substandard and the type of provision was not suitable for existing road conditions, given the existing traffic flows and speed limit.

Based on these findings, an investigation into the provision of a new crossing to the west of M25 Junction 29 has been undertaken with the aim of mitigating the need for users to cross via the existing uncontrolled staggered crossings at the A127 / Front Lane junction.

Proposed Type of Crossing

Three alternative crossing options have been investigated that would facilitate the north-south connectivity for WCH, namely:

- **Option 1** – Signalised Junction on the A127 incorporating Front Lane and Folkes Lane
- **Option 2** - Standalone signalised at-grade crossing at the A127 / Front Lane junction
- **Option 3** – New grade-separated crossing

The benefits and disadvantages of each option were reviewed and are shown on Table 1 below.

Table 1 – Review of Crossing Options on the A127, west of M25 J29

Option	Benefits	Disadvantages
Option 1 – Signalised Junction	• Retention of existing WCH desire line connecting Front Lane and Folkes Lane • Controlled crossing facilities for pedestrians and cyclists • Controlled and improved access for vehicles from side roads on to the A127	• Increased journey time for users travelling from Moor Lane towards Woodland Country Park and proposed Hole Farm Woodland • Would not provide a safe crossing for horse-riders as on a heavily trafficked Road • Potential traffic queues from the junction extending back along A127 towards the M25 J29 slip road causing hazardous conditions for merging vehicles • Users would need to wait adjacent to live traffic for pedestrian signal to activate.
Option 2 – At-grade Crossing	• Retention of existing WCH desire line connecting Front Lane and Folkes Lane	• Increased journey time for users travelling from Moor Lane towards Woodland Country Park

	• Controlled crossing facilities for pedestrians and cyclists	and proposed Hole Farm Woodland • Does not provide a safe crossing for horse-riders as on a heavily trafficked Road • Potential for traffic queues from the crossing to extend back along A127 towards the M25 J29 slip road causing hazardous conditions for merging vehicles • Users would need to wait adjacent to live traffic for pedestrian signal to activate.
Option 3 – Grade-separated Crossing	• Direct north-south connection with minimal increase in journey time • Improved road safety by removing potential interaction with motorised vehicles • Dedicated WCH facility providing improved connectivity for horse-riders. • Free flow access	• Need for land and tree removal/replacement at landing locations • Cost of build • Isolation of users • Does not improve existing crossing facilities between Folkes Lane and Front Lane

Preferred Crossing Option

Following the review of the three proposed crossing options to provide improved WCH crossing facilities on the A127 to the west of M25 Junction 29, it was considered that Option 3, a grade-separated bridge crossing, should be provided.

This option would provide a safe crossing facility for walkers and cyclists replacing the existing crossings at the M25 Junction 29, with the added benefit of providing improved connectivity for horse-riders, removing the severance caused by the A127. This option would also not result in potential congestion or queuing on the A127.

Crossing Location

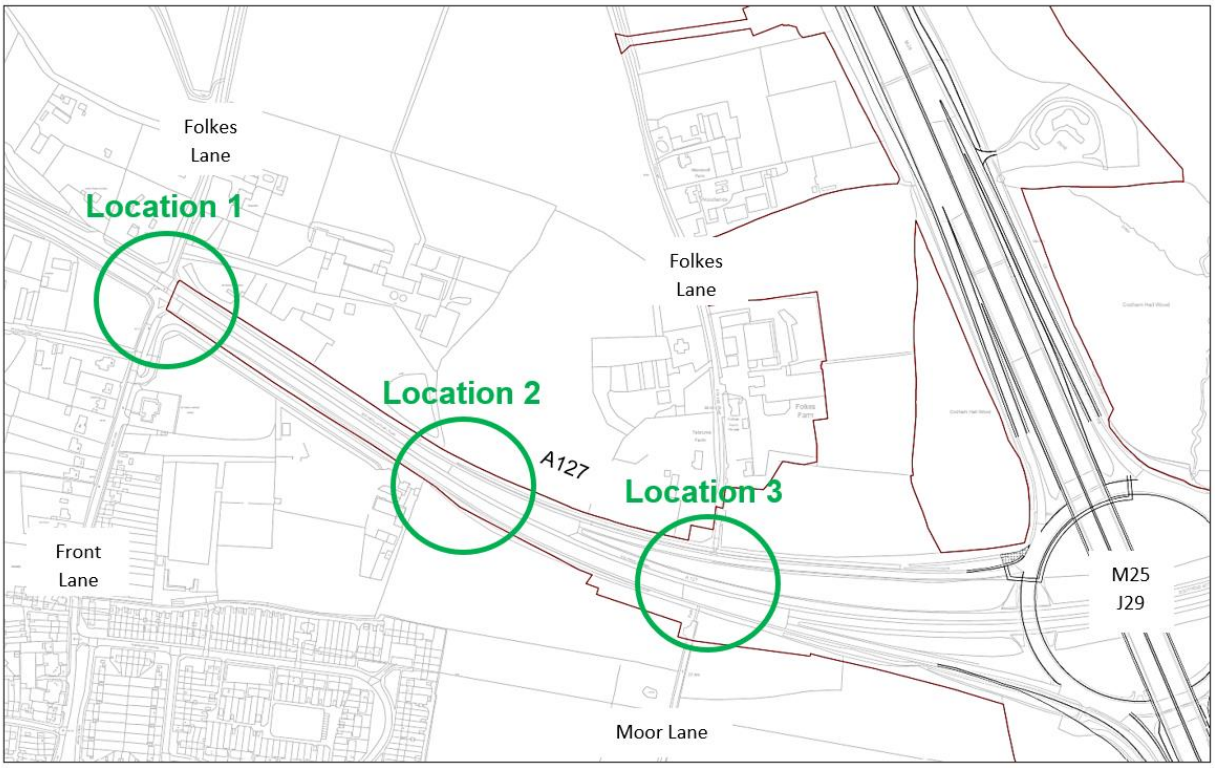
Three locations for the proposed grade-separated crossing were initially investigated to the west of the M25 Junction 29, as shown on Figure 2.

- Location 1 – Connecting Front Lane and Folkes Lane
- Location 2 – Midway between the Front Lane / Folkes Lane junction and the M25 Junction 29
- Location 3 – Connecting Folkes Lane and Moor Lane

A review of each potential location was undertaken to assess its suitability in terms of:

- Directness – Desire lines, journey time and connectivity to the existing and proposed WCH network
- Safety – Interactions between vehicles and WCH users
- Constraints – Location of existing utilities, land use (existing properties/ownership) and landscape geometry and features

Figure 2 - Potential locations for a grade-separated crossing on the A127, west of M25 J29



Directness – Location 3 is the only option that would provide a viable alternative to the existing uncontrolled crossing at M25 Junction 29 due to its directness, minimal change to journey times and connectivity to the wider WCH network. Conversely, locations 1 and 2 would result in a notable detour for users travelling between Moor Lane Cranham to Folkes Lane Woodland Country Park, resulting in increased journey distance and time. However, it is noted that Location 1 would cater for the existing desire line between Folkes Lane and Front lane.

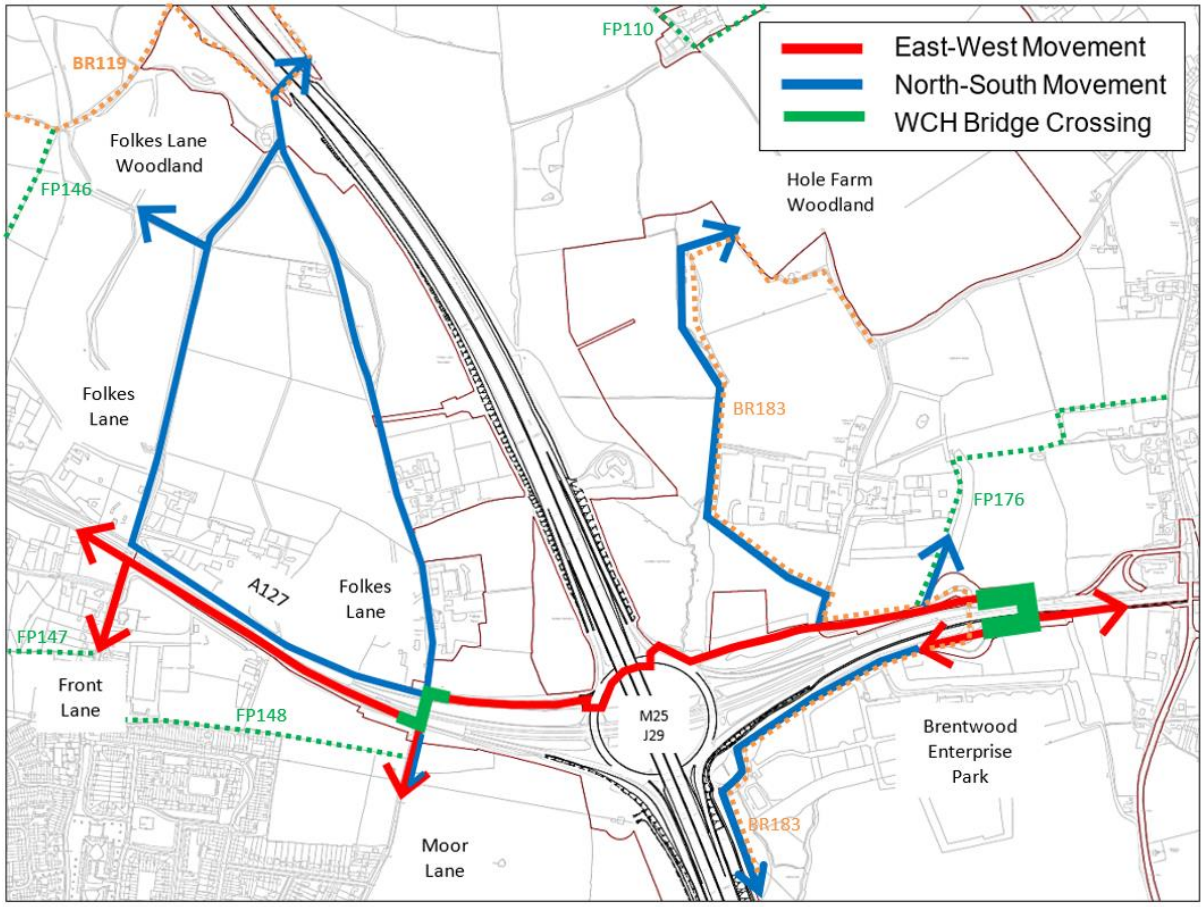
Safety - All locations of the proposed grade-separated crossing would provide potential improvements in road safety by removing potential conflict between WCH and motorised vehicles. However, horse-rider provision at Location 1 may be limited given the connection to the bridge ramps that would need to be adjacent to the live carriageway, due to localised land constraints.

Constraints - Location 1 identified restrictions due to adjacent land use limiting the available space to provide sufficient ramps and steps for a bridge crossing at this location. Potential issues with forward visibility at the Folkes Lane junction were also identified due to the structure (ramps/steps/supports) and potential diversions to existing utilities. At both Location 2 and 3 there are trees that would need to be removed/relocated in order to provide the necessary landings for the ramps and stepped access to the bridge. However, the southern side of the A127 at Location 2 has a dense woodland in comparison to Location 3, where trees are sparser and therefore any removal/replacement and impact on existing biodiversity would be to a much lesser extent.

Preferred Crossing Location

Location 3 was selected as the preferred crossing location, sited to the west of the M25 Junction 29, connecting Moor Lane and Folkes Lane. This location creates a north-south crossing for walkers, cyclists and horse-riders over the A127, improving connectivity to the wider WCH network and to key destinations such as Folkes Lane Woodland and Hole Farm Woodland, as shown in Figure 3. Although this location would require a longer bridge span across the A127, there are less constraints in its construction in terms adjacent land use and providing sufficient ramps and steps to offer suitable accessibility for all.

Figure 3 – Preferred Location for Grade-separated crossing on the A127, west of M25 J29



Summary of Benefits of Proposed Crossing

- Restores north-south links severed by historic road building;
- Provides for all non-motorised users including walkers, cyclists and horse-riders;
- Provides a safe and more direct crossing facility away from potential interactions with motorised vehicles;
- Has no impact on the movement of vehicles along the A127, i.e. does not cause traffic delay;
- Does not unduly impact users travelling north-south from the southern shared use cycle/footway from Moor Lane, as journey times are similar to that of the existing route via the uncontrolled crossings on the western arm of M25 Junction 29;
- Can be constructed with little impact on adjacent land use and will not require diversions of existing utilities; and
- Maintains the north-south connection between Cranham and Brentwood when Bridleway 183 is temporarily closed during the construction of the Project, if in position prior to the main works.

Recent Engagement

The proposed WCH bridge crossing has been presented to stakeholders and the public at local engagement events and at the Local Refinement Consultation held in May/June 2022, presenting the changes made to the WCH strategy since C-Con. Positive feedback was received on the bridge location and the use by all non-motorised users on both crossings over the A127.

Image 1 provides an illustration of the proposed WCH bridge crossing used within the recent local engagement event.

Image 1 – Illustration of the proposed WCH bridge on the A127, west of M25 J29

Appendix B – Silvertown Tunnel MMS

SILVERTOWN TUNNEL

Volume 8

8.84 Monitoring and Mitigation Strategy

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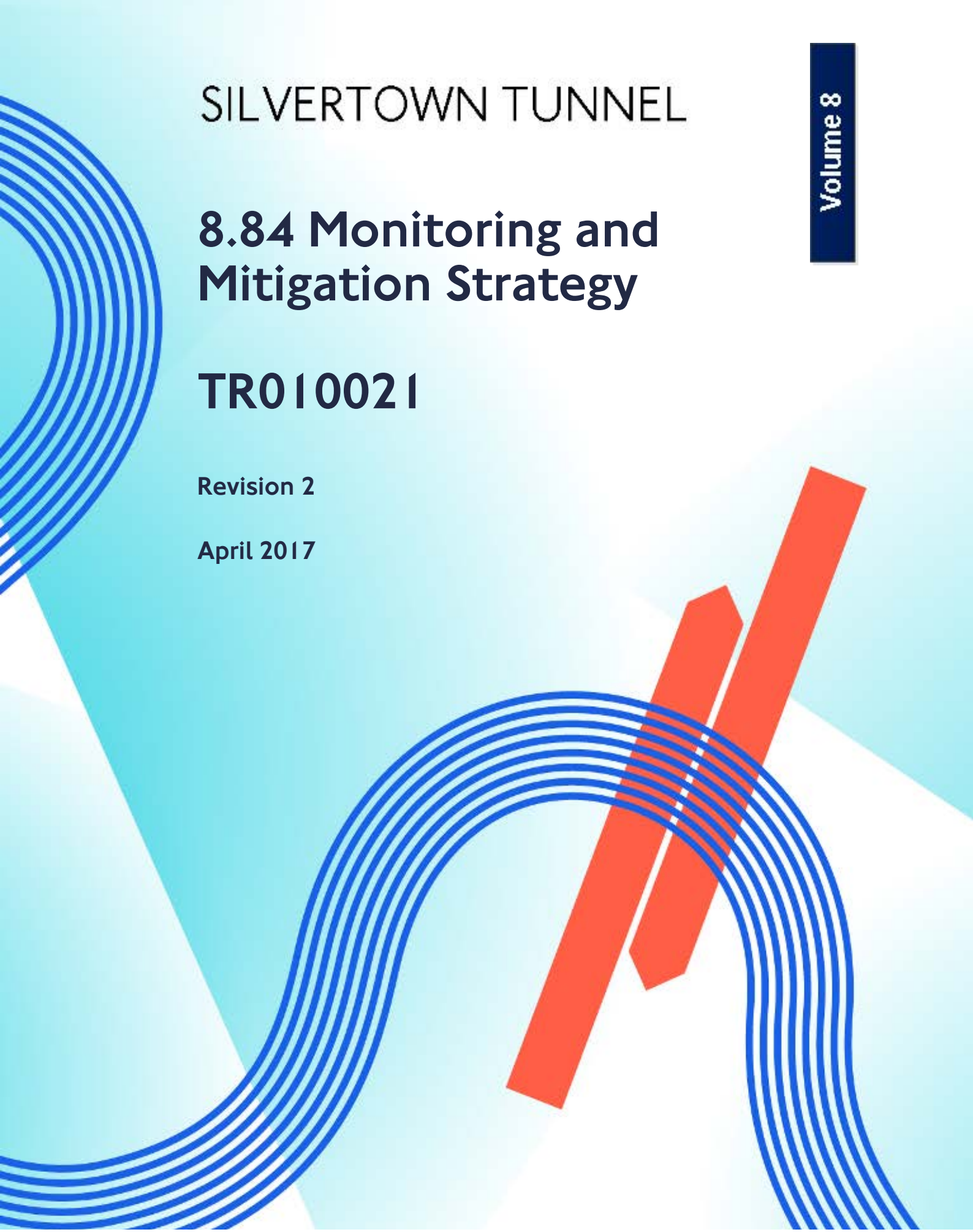
Revision 2

April 2017



MAYOR OF LONDON

TRANSPORT FOR LONDON

EVERY JOURNEY MATTERS

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Silvertown Tunnel

Monitoring and Mitigation Strategy

Planning Act 2008

Infrastructure Planning

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Document Reference: *8.84*

Author: *Transport for London*

Rev.	Date	Approved By	Signature	Description
0	06/03/2017	David Rowe (TfL Lead Sponsor)	[redacted]	For Deadline 4 Submission
1	05/04/2017	David Rowe (TfL Lead Sponsor)	[redacted]	For Deadline 6 submission
2	10/04/2017	David Rowe (TfL Lead Sponsor)	[redacted]	For Deadline 7 submission

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1. INTRODUCTION

1.1 Purpose of this document

1.1.1 The purpose of the Monitoring and Mitigation Strategy (M&MS) is to set out the approach to:

- monitoring the traffic, air quality (including carbon), noise and socio-economic impacts of the Silvertown Tunnel scheme (the Scheme) in operation; and
- determining and implementing appropriate mitigation for any localised traffic and traffic-related impacts which arise as a result of the Scheme, both prior to and after Scheme opening.

1.1.2 The Strategy provides a detailed explanation of how TfL will comply with Requirement 7 (monitoring and mitigation) of the Silvertown Tunnel Development Consent Order (DCO).

1.1.3 The approach set out in this Strategy has been developed with regard to feedback received from the local boroughs throughout the DCO examination.

1.2 Relationship between the Monitoring and Mitigation Strategy, Charging Policies and Procedures and Bus Strategy

1.2.1 The M&MS interacts with the Charging Policies and Procedures document and the Bus Strategy.

1.2.2 Schedule 2 of the DCO provides that TfL must comply with the M&MS in respect of monitoring the impacts of the Scheme and bringing forward any mitigation to address adverse Scheme impacts that are identified. Article 52 of the DCO requires TfL to exercise the user charging power in accordance with the Charging Policies and Procedures and Schedule 2 of the DCO requires bus services through the tunnel to be planned and provided in accordance with the Bus Strategy.

1.2.3 A failure by TfL to comply with the commitments in these documents would amount to a breach of the terms of the DCO.

1.2.4 The main functions of the three documents are as follows:

- **Charging Policies and Procedures** – sets out the principles according to which TfL must set and vary the user charges and the procedures that apply when doing so.

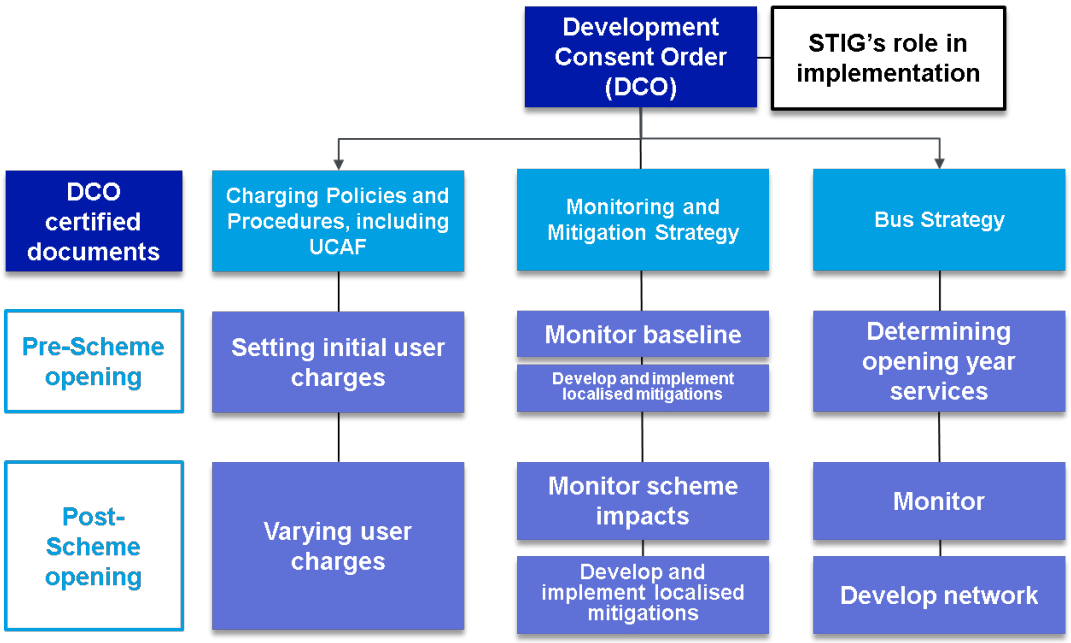
- **Monitoring and Mitigation Strategy** – sets out the scope of monitoring of Scheme impacts that TfL will undertake and the processes for determining and implementing appropriate mitigation for any localised traffic and traffic-related impacts.
- **Bus Strategy** – sets out the commitments which TfL will fulfil in developing bus services prior to Scheme opening and in reviewing and modifying services.

1.2.5 Compliance with the obligations in each of these documents is secured by requirements in Schedule 2 of the DCO and, in the case of the Charging Policies and Procedures document, by Article 52 of the DCO.

1.2.6 The DCO provides a role for members of the Silvertown Tunnel Implementation Group (STIG) in relation to the operation of each of these documents. The role and responsibilities of STIG is explained in each of these documents.

1.2.7 The functions of the three documents and the role of STIG are summarised in Figure 1-1 below.

Figure 1-1: The relationship between the Charging Policies and Procedures, Monitoring and Mitigation Strategy and the Bus Strategy



1.2.8 The M&MS applies from not later than three years prior to the Scheme opening for public use and for three years following the Scheme opening for public use, with the potential for the M&MS to be extended by a further two years[1]. The Bus Strategy and the Charging Policies and Procedures apply for the life of the Scheme.

1.3 Structure of this document

1.3.1 This document is structured as follows:

- Chapter 2 explains the purpose of the refreshed assessment of Scheme impacts and the process for identifying and implementing localised traffic mitigations in advance of Scheme opening.
- Chapter 3 describes the monitoring programme, including the geographical area that will be covered and the timeframes for monitoring baseline conditions and Scheme impacts.
- Chapter 4 explains the processes for reviewing the monitoring data and identifying and implementing any mitigation measures identified as being necessary after the Scheme is operational.
- Chapter 5 provides an overview of the types of mitigation measures which could be implemented, both pre- and post-opening of the Scheme.

[1] With the possible exception of air quality monitoring, which may continue for a longer period as set out in paragraph 3.7.5.

2. PRE-OPENING MITIGATION

2.1 Overview of the refreshed assessment

2.1.1 Prior to the Silvertown Tunnel opening for public use, TfL must refresh its assessment of Scheme impacts, in order to:

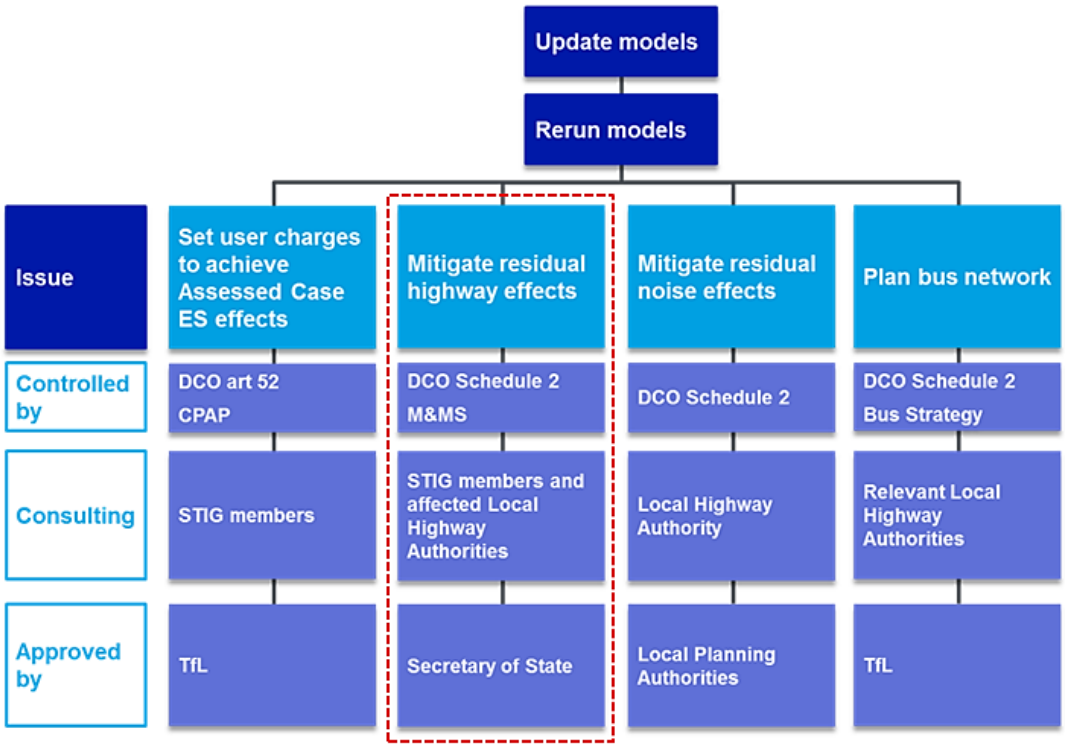
- Set the opening user charges;
- Define the requirement for and form of localised mitigation for residual effects; and
- Specify the bus network through the Silvertown Tunnel that will operate on opening.

2.1.2 For this process TfL will update the relevant transport and environmental models, rerun those models, and develop its proposals for each element in conformity with the commitments, policies and procedures set out in the relevant certified documents and any DCO requirements. The assessment will incorporate a wider range of analyses that the modelling alone.

2.1.3 Because there are interactions between each of these elements, TfL must ensure that they are developed and considered in light of one another.

2.1.4 Figure 2-1 below summarises the elements of the process and the governance arrangements applying to each.

Figure 2-1: Elements comprising the refreshed assessment (pre-scheme opening)



2.1.5 This approach ensures that opening user charges, mitigation measures and the opening bus network are based on the most up to date information that is available before the Scheme opens.

2.1.6 This will result in a better outcome than specifying these aspects of the Scheme now, for the following reasons:

- The Scheme is still a number of years from implementation, with an expected opening date of 2023;
- Significant growth is expected across east and south-east London over the next few years, which could materially change background conditions (there is an inherent degree of uncertainty regarding the pace of this growth). As set out in Chapter 5 of the Transport Assessment [APP-086], across the Silvertown Tunnel host boroughs (Greenwich, Newham and Tower Hamlets) the forecast growth rate in population and employment in the period to 2021 is more than double the London average;
- Linked to this growth, the road network in this part of London is especially dynamic and will change and evolve between now and Scheme opening (with several schemes in the vicinity of the tunnels

being actively considered although not presently committed; for example, Cycle Superhighway 4 and the Bow Vision scheme).

2.1.7 The refreshed assessment will not 'replace' the assessment which was used to identify the likely significant effects of the Scheme in the Environmental Statement. Rather, it will enable TfL to have the benefit of the most up-to-date data when setting the initial user charges and identifying and implementing any mitigation measures that are necessary before the Scheme opens.

2.1.8 This Monitoring and Mitigation Strategy concerns the mitigation of residual traffic-related local effects identified as part of the refreshed assessment process that will be undertaken prior to Scheme opening (the process outlined in red in Figure 2-1). If, through the refreshed assessment, the need for localised traffic-related mitigation measures is identified, TfL will develop these measures in consultation with STIG and submit them to the Secretary of State for Transport for approval. TfL must then implement the approved measures before the Silvertown Tunnel opens for public use, or provide funding for the relevant local highway authority to implement them.

2.1.9 Any measures required to mitigate residual noise impacts will be submitted for the approval of the local planning authority in accordance with requirement 12 of the DCO.

2.1.10 The data from the refreshed assessment will be used by TfL when setting the initial user charges. As these charges will have a direct bearing on the extent and scope of any mitigation measures required, it is important that any mitigation for residual effects is set in the context of these charges.

2.1.11 It should be noted that this M&MS relates to the Scheme in operation. The monitoring and mitigation of construction impacts is governed by the Code of Construction Practice.

2.2 Scope of the refreshed assessment

2.2.1 The refreshed assessment will incorporate the following elements:

- Collection of up-to-date traffic count data and the latest available origin and destination data, as part of the monitoring programme.
- Updating of the strategic transport modelling with new travel data and any new committed relevant transport schemes or major developments that will be implemented prior to scheme opening (i.e. schemes that are not currently included within the Assessed Case but

which are committed at the time of the refreshed assessment). Updating of environmental modelling in parallel with transport modelling.

- Development of an updated Reference Case for the scheme opening year.
- Testing of user charge scenarios in the context of updated Reference and Assessed Cases.
- Assessment of likely traffic, air quality, noise, and socio-economic impacts of scenarios at strategic level and identification of charges which meet the requirement of Policy 8 in the Charging Policies and Procedures document.
- Assessment of the demand for bus services, to inform the planning of the bus network in line with the Bus Strategy and ensure the appropriate level of service is provided at the time the Scheme opens for public use.
- Identification of likely location and magnitude of any localised impacts including the development of local traffic models as required, to enable more detailed consideration of Scheme impacts on the highway network.
- Iterative use of the strategic and local models to identify and optimise any localised mitigation that may be required as a result of the refreshed assessment. The process for identifying the need for mitigation is set out in the following section.

2.2.2 TfL will engage with STIG members on the approach to completing the refreshed assessment, including aspects that are of particular interest to host boroughs such as the collection of origin and destination data and users' values of time (including stated preference surveys).

2.2.3 The refreshed assessment will be undertaken using the most appropriate industry standard modelling tools available within TfL's suite of strategic and local models at the time. This will allow TfL to take advantage of any innovations or model enhancements made over the next few years. The latest air quality and noise modelling software will also be used.

2.3 Identifying the need for and form of localised mitigation

2.3.1 The Scheme is expected to have a significant positive overall impact on the transport network, as set out in the Transport Assessment [APP-086]. TfL's assessment is that, in a limited number of cases, the Scheme could lead to moderate localised deteriorations in road network performance on some parts of the road network, principally as a result of previously queued cross-river traffic being released at peak times due to the increased capacity provided by the tunnel.

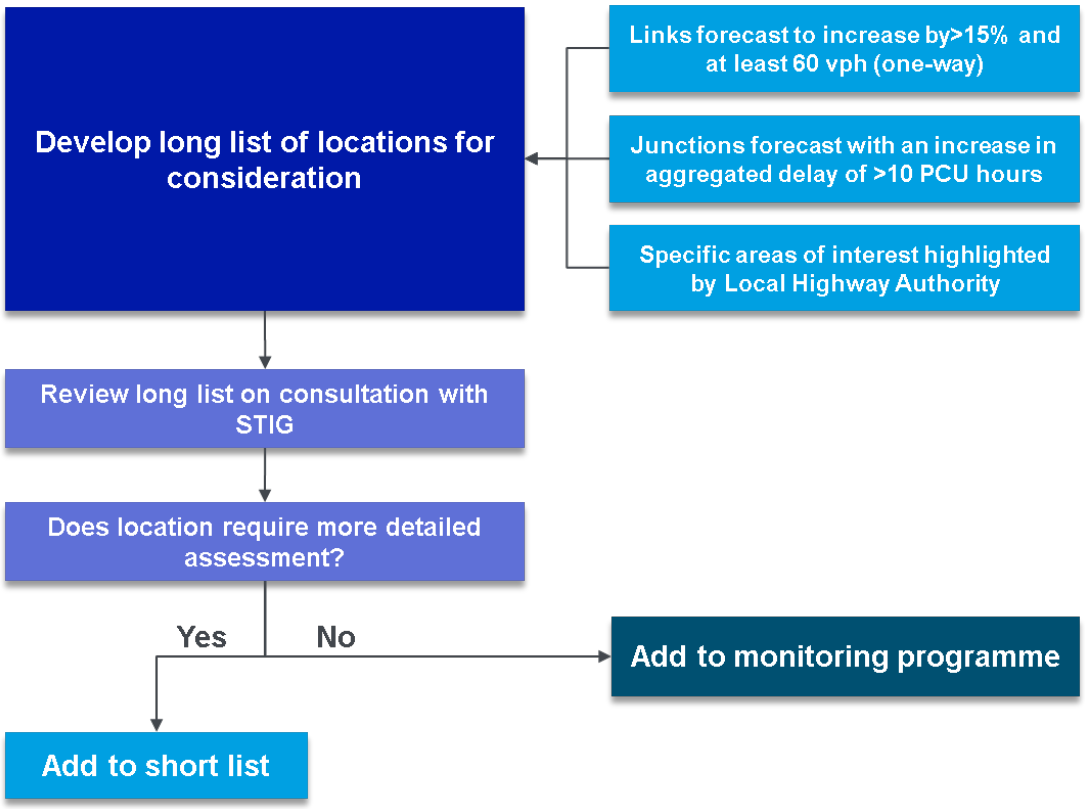
2.3.2 TfL will adopt a methodical approach to identifying the need for mitigation and developing measures through its refreshed assessment, building on the process described in Appendix C of the Transport Assessment [APP-087].

2.3.3 TfL will first establish a 'long list' of locations for consideration of the localised impacts of the Scheme and the need for mitigation, including:

- all links where one-way traffic flows are forecast to increase by more than 15% and by at least 60 vehicles per hour; or
- all junctions that are forecast to experience an increase in aggregated delay of greater than 10 passenger car unit (PCU) hours; or
- areas where local highway authorities have flagged a potential concern that are included in the initial traffic monitoring plan and/or within the 'area of influence' or wider 'buffer zone' identified in Figure 3-1.

2.3.4 Once the long list has been populated this will be reviewed in consultation with the members of STIG and TfL will make a decision on which locations will be included within a 'short list' to be assessed further using local modelling. As part of this process a detailed review of the outputs from the strategic transport modelling will be undertaken for each location. Any long-listed locations not subject to further assessment and not already being monitored will be added to the monitoring programme. Figure 2-2 shows the approach that will be followed in determining which locations will be subject to local modelling.

Figure 2-2: Establishing focus locations for local modelling



Further assessment and development of localised mitigation

2.3.5 For locations on the short list, further assessment of Scheme impacts will be undertaken using local modelling. A range of local and micro-simulation modelling packages will be used, depending on the location and type of junction in question.

2.3.6 The purpose of the local modelling is two-fold; firstly, to enable a more detailed consideration of Scheme impacts and provide further insights into the need for localised mitigation measures, and secondly to test the effectiveness of any measures that are identified to address adverse impacts.

2.3.7 In developing any localised mitigation measures, TfL will iterate the outputs from the local and strategic modelling to ensure that the measures identified are fully optimised.

2.3.8 In assessing the need for localised mitigation for locations in the short list, TfL will take into account views from the affected local highway authority (or authorities should the location affect more than one borough). Input will also be sought from TfL Area and Corridor Managers, for instance to determine

whether the location is subject to other proposals that could have a bearing on the need for or form of mitigation required.

2.3.9 On the basis of this assessment, TfL will make a decision on whether a localised mitigation measure is necessary in order to address an adverse impact caused by the Scheme. Key considerations will be the nature and scale of the impact, as well as the potential for the impact to be effectively mitigated.

2.3.10 If TfL determines that localised traffic mitigation is required at a given location, TfL will make a preliminary assessment as to the form of mitigation and the programme for its implementation. This preliminary assessment will be presented to the relevant local authorities for consideration and review. TfL and the local authorities may wish to engage with other potentially affected parties as part of this process (for instance user groups, local landowners etc.). TfL will then undertake detailed design of the mitigation measure and produce a detailed cost estimate, having regard to feedback received from the local highway authority.

2.3.11 In determining the form of pre-opening mitigation, TfL and the affected local highway authority/ies will give consideration to both the benefits and any potential adverse impacts that a mitigation measure could have including at locations elsewhere. Such considerations may have a bearing on the form of mitigation adopted.

2.3.12 In instances where physical changes to the streetscape are required, TfL will ensure the measures developed are sympathetic to the existing streetscape and take account of relevant guidance (including for instance TfL's *Streetscape Guidance* and the *London Cycling Design Standards*).

Secretary of State approval

2.3.13 TfL will work closely with affected local authorities to identify and develop the package of localised traffic mitigation to be implemented pre-opening. Once the proposed package of localised traffic-related mitigation measures has been finalised, TfL will submit details of the package to the Secretary of State for Transport for approval.

2.3.14 The details must include the following information:

- A description of each mitigation measure, accompanied by a plan (where appropriate) and a reasoned justification for why the measure is deemed necessary;

- A description of the process undertaken to develop the package of measures, including locations investigated by TfL but not taken forward for mitigation;
- The local authorities' responses to consultation on the proposed mitigation measures and programme for implementation;
- Costs estimates for the proposed measures; and
- The proposed programme for implementation of the measures.

2.3.15 If the Secretary of State intends to approve mitigation measures with material modifications, the Secretary of State must consult the relevant highway authority on the proposed modifications and take into account responses to the consultation by the authority.

2.4 Funding and delivery of pre-opening mitigation

2.4.1 The cost of implementation all pre-opening mitigation measures approved by the Secretary of State will be met by TfL as part of the overall implementation of the Silvertown Tunnel scheme.

2.4.2 TfL will expedite the delivery of pre-opening mitigation measures (for instance through allocating designated resources for design and implementation, and ring-fencing funding), so as to ensure that all pre-opening mitigation measures will be implemented by TfL before opening of the Scheme (or sufficient opportunity provided to the local highway authority/ies to implement measures on the local road network), with the exception of the circumstances explained in paragraphs 2.4.4 and 2.4.5. Any necessary consultation will be completed in line with normal procedures prior to implementation.

Measures on the TLRN

2.4.3 Where mitigation measures can be implemented under TfL's statutory powers (e.g. measures on roads for which TfL is the highway authority (the Transport for London Road Network (TLRN) or changes to signal timings) TfL will be responsible for implementing the mitigation.

2.4.4 In limited circumstances where it may not be feasible or appropriate to complete implementation prior to Scheme opening, TfL will consult with the relevant borough on the programme for its implementation and include a justification for this programme in the submission to the Secretary of State (where applicable). Examples of where mitigation identified through the

refreshed assessment could be implemented post-opening include where a separate major scheme was being delivered on a part of the network on which a localised mitigation was required; in such cases, provided the proposed programme for implementation is approved by the Secretary of State, the mitigation may be implemented as part of the major scheme but funded by TfL as a Silvertown Tunnel measure.

Measures on borough roads

2.4.5 Where TfL is not able to implement an approved measure under its statutory powers, (e.g. junction modifications on roads for which TfL is not the highway authority), TfL may seek agreement with the relevant highway authority under section 8 of the Highways Act 1980 for TfL to implement those measures to an agreed timescale. Alternatively, the highway authority may be responsible for implementation of the mitigation, with the necessary funding provided by TfL and secured via a bilateral agreement. In these circumstances, TfL will apply the same timescale for identifying and agreeing the works but the timing for the implementation of these works will be a matter for the relevant highway authority.

2.4.6 A highway authority may choose to implement an alternative mitigation to the measure approved by the Secretary of State following the usual process of scheme planning, design, consultation and implementation. The alternative mitigation must provide a broadly comparable level of value in addressing the Scheme impact. TfL will contribute towards the cost of the mitigation up to the estimated cost of the original measure approved by the Secretary of State, or less if the alternative mitigation is of lower cost. If the highway authority wishes to take the opportunity to implement supplementary measures at its own cost (for instance to tie the mitigation in with wider streetscape improvements) it will be able to do so.

2.5 Indicative timeline

2.5.1 The refreshed assessment will be undertaken sufficiently in advance of Scheme opening to ensure there is time to complete the process described above and implement any necessary mitigation. An indicative timeline for completion of the refreshed assessment and implementation of resulting mitigation is set out in Table 2-1. In practice some of the activities set out in the table may commence earlier than listed, if this is necessary to ensure the activity is completed on time.

2.5.2 Collection of the data required to inform the refreshed assessment represents the first step in the process. Monitoring of baseline conditions

pre-opening will commence no later than three years prior to the expected date of Scheme opening, and any data that is required to inform the refreshed assessment (for example traffic counts) will be collected as part of this process. The finalised scope of the monitoring programme will be presented to STIG members for review approximately six months before the commencement of traffic-related monitoring (i.e. around three and a half years prior to Scheme opening).

Table 1-1: Indicative time for refreshed assessment and implementing pre-opening mitigation

Years prior to scheme opening	Indicative date (based on current programme)	Activity
3.5	Q1 2020	Agree monitoring programme
3	Q3 2020	Commence monitoring
2.75	Q4 2020	Update strategic modelling to include latest available data
2.5	Q1 2021	Test and refine user charges, including assessment of traffic, air quality, noise and socio-economic impacts
2.25	Q2 2021	Develop local modelling and identify localised mitigation measures required
2	Q3 2021	Consult STIG on proposed mitigation measures
1.75	Q4 2021	Submit package of mitigation to Secretary of State for approval

1.5	Q1 2022	Implement localised mitigation measures
1.5	Q1 2022	TfL Board to approve initial user charges by reference to the Charging Policies and Procedures

2.5.3 The timeline above allows around 18 months for delivery of mitigation measures identified through the refreshed assessment. This is considered to be a sufficient timescale for implementation of localised mitigation prior to Scheme opening, taking account of the considerations set out in section 2.4.

3. MONITORING PROGRAMME

3.1 Overview

3.1.1 This chapter explains the monitoring programme (including timeframes for carrying out monitoring) and how its results will be disseminated. The following chapter then explains how the findings of the monitoring will be used to identify any post-opening mitigation measures required.

3.1.2 As well as being used to identify any post-opening mitigation requirements, monitoring of the impacts of the Scheme in operation will also be used to inform decisions around setting and varying the user charges, and this process is set out in the Charging Policies and Procedures document. Where variations to the user charge are considered within the period of monitoring, data collected through the monitoring programme will input to the User Charging Assessment Framework (UCAF).

3.1.3 The monitoring of construction impacts is governed by the Code of Construction Practice.

3.2 Topics covered

3.2.1 The monitoring programme will comprise the following topic areas:

- Traffic monitoring
- Air quality and carbon monitoring
- Noise monitoring
- Socio-economic monitoring.

3.2.2 The monitoring programme focuses on the four topics listed above as these have potential to be affected by the operation of the Scheme including changes to the user charges. Each of these topics is discussed in further detail in this chapter, and detailed monitoring plans for the first year of monitoring can be found in Appendices A to D.

3.2.3 Information on a range of different metrics will be collected for each of the topic areas. These metrics will be collected using various data collection methods, potentially including new data collection methods emerging as a result of recent technological innovations (for example using mobile phone data to estimate transport demand).

3.2.4 As a general rule TfL will make use of existing sources of data collection where possible. These will be supplemented with the installation of new monitoring equipment and with bespoke data collection exercises to fill any gaps.

3.2.5 The data collected through the monitoring programme will be reported in monitoring reports which will be provided to members of STIG.

3.3 Principles underlying the monitoring programme

3.3.1 The traffic, environmental and socio-economic monitoring will comply with the following principles.

- Monitoring shall describe and characterise the main effects of the Scheme in operation, through comparison with the baseline collected prior to opening.
- Monitoring shall enable unexpected or unanticipated effects to be identified.
- Monitoring shall seek to understand, as well as to measure, by employing a range of quantitative and qualitative research techniques in a complementary manner to enable a comprehensive understanding of the Scheme's wider potential effects, including travel behaviour.
- Monitoring shall provide Best Value, employing techniques that are appropriate and proportionate to the expected scale, extent and importance of the expected changes.

3.3.2 The monitoring programme will be of sufficient scope to provide a sound understanding of the impact of the Scheme in operation. Nonetheless, TfL recognises the value of monitoring undertaken by others and hence in addition to the data collected through the monitoring programme, TfL will take into account monitoring data collected by local authorities and other bodies where it is relevant and appropriate to do so.

3.4 Timing and duration of monitoring

3.4.1 The monitoring programme will commence no later than three years prior to the expected date of Scheme opening and continue for three years post opening[2]. The duration of the post-opening monitoring will be reviewed and TfL will consult the members of STIG on whether it is appropriate to extend this period by up to an additional two years. The monitoring programme is time limited because the most significant effects are expected to materialise within around a year of the Scheme opening and it will become increasingly difficult to distinguish the effects of the Scheme from other projects over time.

3.4.2 Following the three to five year monitoring post-opening, the collection of monitoring data will revert to TfL's general network performance monitoring programme.

3.4.3 The data collected prior to the opening of the Scheme will form the baseline against which a comparison will be made following the Scheme's implementation.

3.4.4 As this baseline period will coincide with the Scheme's construction, data from locations affected by construction traffic will be compared with previous years' data and regional trends, and in light of data from the Contractor appointed to build the Scheme regarding construction traffic behaviour, to ensure that a fair and representative baseline is used.

3.5 Geographical scope of the monitoring

3.5.1 The geographical area encompassed by the monitoring programme will vary for each topic, but in all cases will cover an area of sufficient spatial scope to fully capture the expected material impacts of the Scheme in operation. For example, the noise impacts resulting from the Scheme are expected to be limited to a localised area in the vicinity of the Scheme itself whilst the traffic impacts may occur over a much wider area.

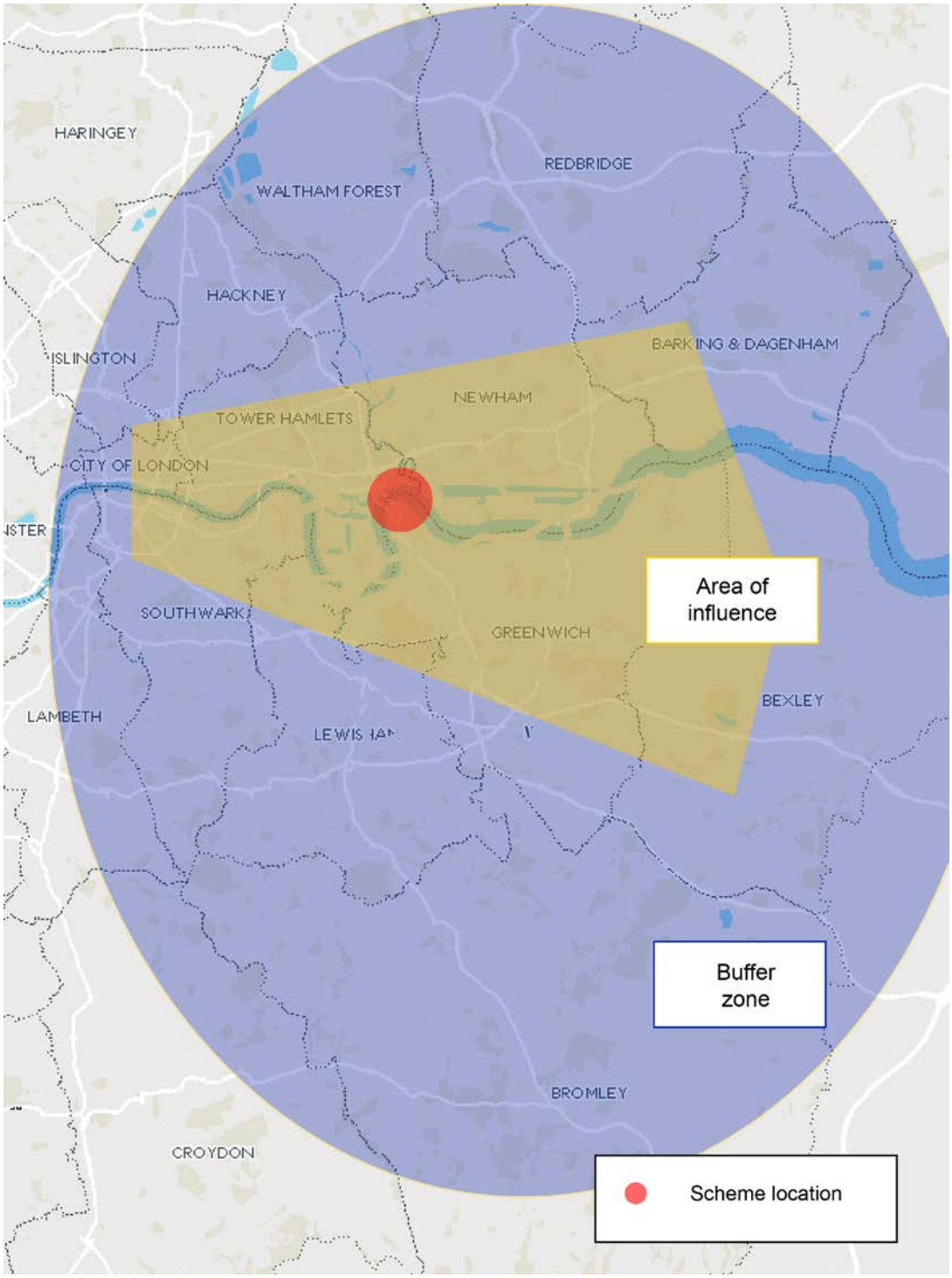
3.5.2 The monitoring area can be seen in Figure 3-1. The 'area of influence' is the area where changes are most marked, and represents the area in which the monitoring is focused; this covers the majority of the three host boroughs (Greenwich, Newham and Tower Hamlets), the three nearest adjacent crossings (Woolwich Ferry, Rotherhithe Tunnel and Tower Bridge) and parts

[2] With the possible exception of air quality monitoring, which may continue for a longer period as set out in paragraph 3.7.5.

of other boroughs in the vicinity of the Scheme where Scheme impacts are reasonably foreseeable. Additional traffic monitoring locations are included in the wider 'buffer zone', which covers a large part of east and south-east London.

3.5.3 The geographical scope of the monitoring will be reviewed at the time when TfL is undertaking its refreshed assessment of Scheme impacts. Should this refreshed assessment identify potential Scheme impacts at locations not identified in current modelling, the scope of the monitoring programme will be extended to ensure these locations are included in the monitoring programme. If justified by the refreshed assessment, the monitoring of Scheme impacts could be undertaken over a much wider area through TfL's wider monitoring programmes.

Figure 3-1: Monitoring area



3.5.4 Once the Scheme is operational, should a member of STIG identify potential impacts that they consider may be a result of the Scheme at a location not being monitored under the Scheme's monitoring programme at that time (for instance using TfL's publically available wider data set), this can be brought

to TfL's attention for further consideration and possible inclusion in the monitoring programme going forward.

3.6 Traffic monitoring

3.6.1 There are a range of traffic metrics that can provide information on the traffic impacts of the Scheme. Whilst the type of information to be collected is defined, the method by which this data is collected is not prescribed by this monitoring programme and a range of monitoring techniques could potentially be employed. This is because traffic data collection is an area of rapid development and new data collection methods are emerging as a result of continued technological innovation.

3.6.2 The key metric considered is traffic flows. Monitoring traffic flows and changes in flows at river crossings, their approaches and diversionary routes is fundamental to the monitoring programme for the Scheme. It provides the means by which any localised delays and or network performance issues which are noted following its implementation may be identified. It also provides context for the monitoring of environmental and socio-economic impacts.

3.6.3 A range of other traffic-related metrics will also be monitored including journey times and journey time reliability, junction performance, traffic composition, bus performance and road safety. The monitoring programme will take account of the relevant impacts of the Scheme on all highway users including motorists, bus passengers, pedestrians and cyclists.

3.6.4 The proposed locations for data collection, data collection methods and the geographical scope of the traffic monitoring are set out in Appendix A. The scope of the monitoring has been informed by the expected impacts of the Scheme as set out in the Transport Assessment [APP-086]. In addition to the locations listed in Appendix A, data will be collected at control sites to enable differentiation of the impacts of the Scheme from those attributable to other unconnected changes on the network. The control sites used for comparison will be presented to STIG members and specified within the monitoring reports. Where a control sites is within a borough that is a member of STIG, details of the control site will be sent to the relevant local authority for comment.

3.6.5 To aid the process of identifying any unexpected impacts of the Scheme on the highway network once operational, a range of traffic-related triggers have been set. These triggers will be based on the monitoring data collected and

reported within the monitoring reports. Further information on the triggers can be found in section 4.2 and Appendix E of this document.

3.7 Air quality and carbon monitoring

3.7.1 Three years prior to Scheme opening TfL will install a network of diffusion tubes and, where appropriate, automatic air quality monitors to collect air quality data for a continuous period of at least twelve months to establish an up-to-date baseline. This will provide a picture of the actual concentrations at a point closer to the Scheme opening. In addition, the results of monitoring undertaken by relevant local authorities and Defra will be utilised by TfL to provide additional baseline information.

3.7.2 The air quality monitoring will be undertaken for the measurement of NO_2 only. The rationale behind this decision is that the current baseline monitoring for other pollutants (PM_{10} and $PM_{2.5}$) show that they are achieving compliance with the Air Quality Strategy (AQS) Objectives/EU Limit Values. The assessment also indicates that the Scheme has a negligible impact on particulates. It must also be noted that the Greater London Urban Area is compliant in relation to the EU Limit Value for PM_{10}.

3.7.3 The geographical scope of the air quality monitoring is detailed in Appendix B. This has been informed by the likely air quality impacts of the Scheme as reported in the Environmental Statement and Updated Air Quality and Health Assessment.

3.7.4 NO2 monitors will be sited in areas:

a) where the Scheme is forecast to bring about a change in air quality in excess of 0.4 µg/m3 where annual mean concentrations are above the national air quality objective value;

b) where the Scheme could lead to traffic diverting to alternative routes which were not foreseen in the original assessment; and

c) to ensure the monitoring locations are representative of relevant exposure at sensitive receptors.

3.7.5 Once the Scheme is operational the air quality monitoring must continue for three years, or until the monitoring shows there is no exceedance of the annual national air quality objective for NO_2 monitored at locations where the Scheme results in a worsening of air quality, whichever is the longer.

3.7.6 The air quality monitoring data will be reported in the annual monitoring report which must be reviewed as soon as reasonably practicable by a firm of air quality experts appointed by TfL in consultation with STIG members. The expert review must determine whether or not there has been a material worsening of air quality as a result of the Scheme (as detailed in section 4.4 of this document).

Monitoring the carbon impacts[3]

3.7.7 Carbon Dioxide (CO_2) emissions will also be calculated as part of the monitoring programme. As carbon dioxide is a greenhouse gas, it has an impact on a global scale, rather than producing any measurable adverse localised impacts. As such the Scheme's impact on CO_2, must be assessed at a total emissions level.

3.7.8 In order to accurately calculate the carbon impact of the Scheme, the calculation will be based on the observed traffic flows obtained through the traffic monitoring, and will use established relationships to estimate the CO_2 impact of traffic change. The carbon impact will be calculated by reference to the traffic using the Blackwall and Silvertown tunnels.

3.8 Noise monitoring

3.8.1 The noise impacts of the Scheme are a function of the volume of traffic flows, which may change over time. Monitoring traffic flows therefore provides a means by which any localised traffic noise issues which may arise from the Scheme in operation can be identified. Prior to the commencement of any construction activity associated with the Scheme TfL will install a network of noise monitors to collect data for a continuous period of at least twelve months to establish an up-to-date baseline. This will provide a better picture of the background noise environment closer to the Scheme opening.

3.8.2 The approach to data collection and the geographical scope of the noise monitoring is detailed in Appendix C. The monitoring of noise will be limited

[3] CO2 is not usually considered within air quality assessments as it is a greenhouse gas and does not directly affect human health, although it does need to be controlled to mitigate the health and environmental impacts of climate change. The EU Ambient Air Quality Directive (2008/50/EC) lists which pollutants are considered as air quality pollutants (Benzene, 1,3 Butadiene, Carbon monoxide, Lead, NO2, PM10 / 2.5, Sulphur Dioxide), and excludes CO2. This has been transposed in to English law.

to the area around the Silvertown Tunnel portals; monitoring is not proposed, nor considered necessary, outside of this immediate area having regard to the noise modelling undertaken and reported in the Environmental Statement. Secure locations will be used for noise monitoring to ensure the equipment is not at risk to theft or damage.

3.8.3 Noise monitoring will be undertaken using a number of permanently installed type 1 "Live L_{Aeq}" remote access data logging sound level meters recording noise within the vicinity of the Tunnel on a 24 hours a day, seven days a week basis during the monitoring period.

3.8.4 In assessing noise levels, and subject to agreement with the data owners, where available TfL will have regard to any long term noise monitoring undertaken by the local authorities or other statutory bodies within the local area of influence, or in the vicinity of the tunnel portals where appropriate and representative.

3.8.5 Once operational, the noise monitoring will continue for a minimum of three years. Before the end of that period, TfL will consult STIG members on whether it is appropriate to extent this period by up to an additional two years.

3.8.6 The noise monitoring data collected post-opening will be presented within the annual monitoring reports.

3.9 Socio-economic monitoring

3.9.1 In the three year period prior to Scheme opening TfL will collect and collate socio-economic data on an annual basis. This will include analysing secondary data related to business activity and employment, as well as collecting primary data on cross-river movement by residents and businesses[4]. This will provide the baseline for comparison with data collected post-opening also collected on an annual basis.

3.9.2 The approach to data collection and the geographical scope of the socio-economic monitoring is detailed in Appendix D. The geographical scope of the monitoring needs to be sufficiently large to fully capture the discrete

[4] This will include data from the London Travel Demand Survey (LTDS), a continuous household survey of the London area that captures information on households, people, trips and vehicles. This will allow usage of crossings and the types of travel making use of the crossings to be assessed.

socio-economic impacts of the Scheme, and will include the local authorities where impacts are expected to be most significant as identified in the Regeneration and Development Impact Assessment (part of the Business Case [APP-102].

3.10 Reporting of monitoring data

3.10.1 TfL will produce annual monitoring reports of the impacts of the Scheme and will present these to members of STIG for review. The reports will enable the impacts arising as a direct effect of the operation of the Scheme to be identified.

3.10.2 The annual monitoring reports will include the following contents:

- Summary of any mitigation measures implemented since the previous monitoring report
- Summary of any wider changes in background patterns or trends, for example environmental changes brought about by the impacts of new developments or meteorological influence
- Traffic monitoring outputs
- Traffic-related triggers
- Air quality monitoring and predicted carbon emissions outputs
- Noise monitoring outputs
- Socio-economic monitoring outputs
- Reasoned recommendations where appropriate for any changes to the monitoring programme for the coming year

3.10.3 For the first year after the Silvertown Tunnel opens for public use, TfL will produce and submit to STIG interim monitoring reports on a quarterly basis to help ensure that any impacts can be identified promptly. These reports will be less detailed than the annual monitoring reports but will include data collected to date and a high level analysis of the results.

3.10.4 Certain types of data to be collected as part of the monitoring programme are available on a ‘live’ basis, and it is likely that these will become increasingly available over time. Whilst all data will be reported in the monitoring reports, wherever possible TfL will aim to make the monitoring

data available to members of STIG via online data platforms (for example the TfL Data Store).

3.11 Review of monitoring data

3.11.1 The annual monitoring reports will be produced by TfL and sent to STIG members within two months of data collection. STIG will be responsible for:

- Reviewing the findings presented in the monitoring reports
- Considering the need for and type of any mitigation measures that might be required to address Scheme impacts, in line with the process set out in Chapter 4 of this document
- Reviewing the monitoring programme and make recommendations to TfL for changes where appropriate

3.11.2 Proposals for changes to the monitoring programme can be made by any member of STIG in the interest of enabling future impacts to be fully captured. Aspects on which STIG members may request changes include the monitoring locations, metrics considered and data collection methods. In updating the monitoring programme, TfL shall have regard to any recommendations made by STIG.

3.11.3 STIG will also be able to request changes to the contents of the monitoring reports including the addition of new topics and removal of existing topics if considered appropriate. TfL will remain responsible for the final content and structure of the monitoring reports.

4. POST-OPENING MITIGATION

4.1 Overview

4.1.1 This chapter explains the process for identifying and implementing after the Silvertown Tunnel has opened for public use any measures required to mitigate any adverse Scheme impacts which were not foreseen and mitigated at the pre-opening stage.

4.1.2 The need for any mitigation following the Scheme's opening will be identified through review of the monitoring reports containing the data collected through the monitoring programme. Different processes will apply to different Scheme impacts, as follows:

- The traffic data (including the triggers) will be reviewed by STIG. If TfL concludes (having regard to the views of STIG members) that traffic conditions have materially worsened as a result of the Scheme, or a trigger has been activated, TfL will investigate to determine whether localised mitigation is required to address these impacts. This could include measures to address any noise-related impacts caused by changes to traffic conditions.

- The socio-economic data will be reviewed by members of STIG. If TfL consider, having regard to the views of STIG members, that the Scheme has had a material adverse socio-economic impact, TfL will consider whether localised mitigation is required to address these impacts.

- The air quality data will be reviewed by a firm of experts appointed by TfL in consultation with the members of STIG. If in the view of the experts there has been a material worsening in air quality as a result of the Scheme, TfL must develop a scheme of mitigation and submit this to the Mayor of London for approval (see section 4.4 below).

4.1.3 The process for reviewing each element of the monitoring data is described in further detail below, split into traffic impacts, socio-economic impacts, air quality impacts and noise impacts. The approach to developing and implementing mitigation for all impacts identified as a result of the Scheme in operation is then set out.

4.2 Traffic impacts

4.2.1 TfL will produce monitoring reports of the impacts of the Scheme in operation and present these to members of STIG for review and consideration. In considering the impacts of the Scheme, TfL and the members of STIG will be able to draw on all information and data that is set out within the monitoring reports, including the mitigation triggers. Particular focus will be given to whether there has been a change in traffic flows. In response to the monitoring reports, STIG members may request that TfL considers the need for mitigation at any locations within their borough where they consider the Scheme may be having an adverse impact.

4.2.2 By reviewing the observed monitoring data collected once the Scheme has opened, and comparing this against the observed baseline data collected prior to opening, it will be possible to identify the traffic-related impacts arising as a direct effect of the Scheme in operation. It should be noted that changes observed between the pre- and post-opening monitoring data will not necessarily be a result of the Scheme.

Key considerations

4.2.3 Where having reviewed the monitoring data and taking into account the views of the members of STIG TfL concludes that any adverse changes in traffic metrics are a consequence of the Scheme in operation, TfL will consider the appropriate form of mitigation in consultation the highway authority on whose roads the measures may be required.

4.2.4 It is important that any changes to the metrics caused by non-Scheme factors, such as changing background trends or other developments, are taken into account when considering the need for mitigation. This will be done by comparing the traffic monitoring data to control sites and overall London-wide and sub-regional data, as well as assessing the impacts that other developments (including changes to land uses and changes to the highway network) may be having on the various metrics.

4.2.5 The duration of the change also needs to be taken into account. If the change identified is temporary or short-term in nature, for example the change is only observed for a matter of weeks immediately following Scheme opening, long-term mitigation may not be required as the change is likely to be a result of initial fluctuations in traffic flows as users adapt to the Scheme. Many such fluctuations would be expected to settle down over time.

Traffic-related triggers

4.2.6 The triggers will provide a means of assisting with the determination of whether any traffic-related changes that may have occurred as a result of the Scheme require mitigation. The triggers consider whether a level of change observed after the Scheme has opened differs from what was anticipated, and are designed to provide an alert if these levels are breached. If a trigger is activated, TfL must consider if mitigation is required.

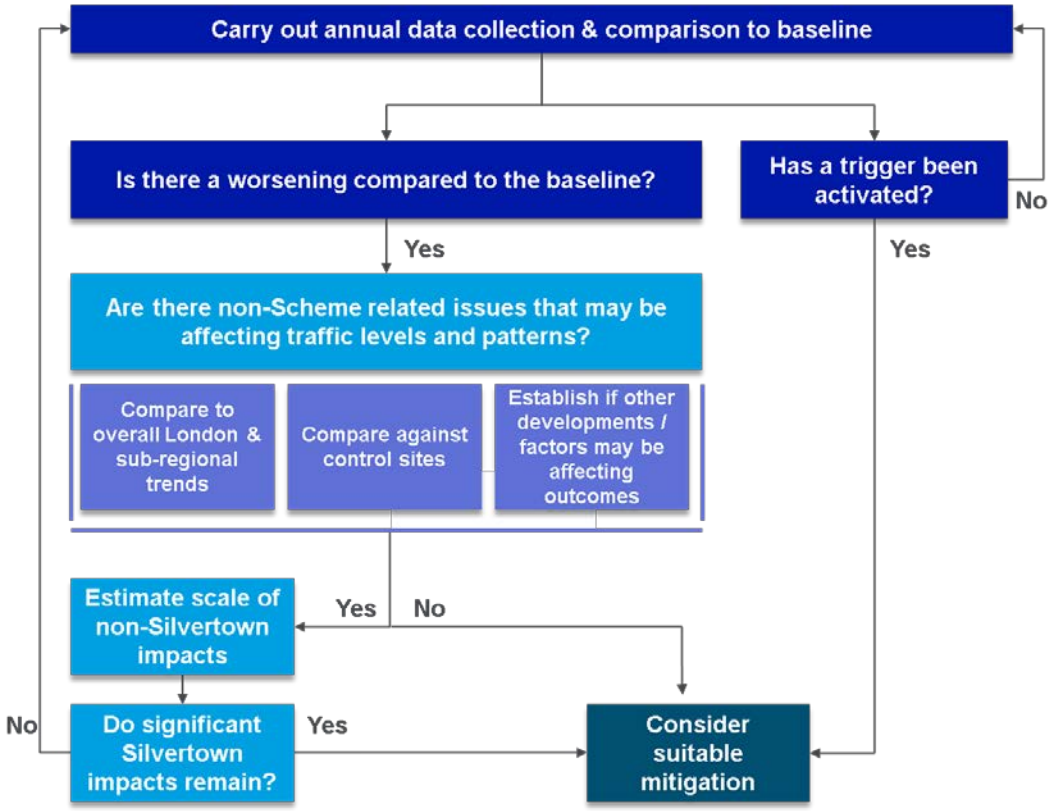
4.2.7 The triggers are intended to indicate whether observed Scheme impacts (based on data collected through the monitoring programme) are materially different from those forecast in the Assessed Case and set out in the DCO application, over a prolonged period of time. By basing the triggers on the expected change caused by the Scheme, the triggers will remain applicable if background conditions across the network (for instance growth in the number of highway trips across the network) were different from those currently forecast.

4.2.8 A detailed set of triggers has been developed based on discussions with stakeholders and these can be found in Appendix E. The triggers will be reviewed in light of the refreshed assessment prior to Scheme opening and if necessary updated in agreement with STIG members to ensure they remain fit for purpose in light of future changes to road network performance and conditions.

TfL investigation of the need for mitigation

4.2.9 The process for establishing the traffic-related Scheme effects, based on both the review of the monitoring data and the traffic-related triggers, is summarised in Figure 4-2.

Figure 4-1: Establishing the traffic-related Scheme effects post-opening



4.2.10 Following a request from any member of STIG in response to the monitoring reports, or if a trigger is activated, TfL will consider whether mitigation is necessary. Key considerations will be the nature and scale of the impact, as well as the potential for the impact to be effectively mitigated.

4.2.11 As part of this appraisal TfL will consider any committed interventions, and input from TfL Area and Corridor Managers will be sought to determine whether the location is subject to other proposals that could have a bearing on the need for or form of mitigation required. TfL's appraisal of all requests for mitigation to be considered will be shared with the other STIG members for consideration.

4.2.12 In the event of a trigger being activated, TfL will investigate the nature of the impact and its cause. If TfL determines that mitigation is not required it will provide the members of STIG with a clear justification for this.

4.3 Socio-economic impacts

4.3.1 It is acknowledged that it will be difficult to isolate the precise impact of the Scheme on most changes in the socio-economic characteristics of east London. For example, changes in business performance and the labour

market will be driven primarily by the strength of the UK and London economy, as wide range of other factors, with the Scheme playing a relatively minor role.

4.3.2 For this reason, TfL will monitor the socio-economic characteristics of cross-river travellers, as well as wider socio-economic trends, in order to understand the Scheme's contribution.

4.3.3 Where TfL determine that a socio-economic impact is directly attributable to the Scheme, TfL will consider the best way to mitigate the impact. This may include the provision of new or enhanced bus routes, funding local-led business or labour market support, support to help businesses adjust to the user charge or changes to the charging regime for particular groups.

4.4 Air quality impacts

4.4.1 It is acknowledged that differentiating between effects on air quality as a direct result of the operation of the Scheme and effects arising from other, unrelated activities is likely to be a complex process which will require expert input. TfL will therefore appoint an independent air quality expert to review the air quality monitoring data set in the annual monitoring reports. TfL will consult with STIG members regarding the expert to be appointed.

4.4.2 Just relying on air quality monitoring data will not differentiate between effects resulting from the Scheme and those arising from other, unrelated activities. In coming to a view on the air quality impacts of the Scheme, consideration will therefore need to be given to other data sources including London wide local authority monitoring data, traffic flows, composition or speeds as well as outputs from strategic and local traffic modelling and/or air quality modelling. The Scheme is unlikely to have a material impact on air quality without also having an impact on traffic beyond what was predicted in the refreshed assessment.

4.4.3 If the annual review carried out by the appointed firm of experts concludes that the authorised development has materially worsened air quality beyond the impacts predicted within the Environmental Statement at locations where there are exceedances of national air quality objectives, TfL must consult the relevant air quality authorities on a preliminary scheme of mitigation including a programme for its implementation within three months of the review. Following that consultation, TfL must prepare a detailed scheme of mitigation and submitted this to the Mayor of London for approval. Before considering whether to approve the scheme of mitigation, the Mayor must

consult the relevant air quality authorities and take into consideration any responses received.

4.4.4 TfL then must implement or secure the implementation of the scheme of mitigation in accordance with the programme approved by the Mayor of London.

4.4.5 A ‘material worsening’ of air quality will be deemed to have arisen if, after the annual monitoring review, the Scheme is shown to have resulted in a ‘significant impact’ following the approach set out in Interim Advice Note (IAN)174/13.

4.5 Noise impacts

4.5.1 In respect of noise, a 25% change in traffic flow is required to bring about a noticeable 1dB change in noise in line with the DMRB thresholds. A traffic-related trigger would be activated if traffic flows at the Blackwall and Silvertown Tunnels changed to a much smaller degree than this (±3% from forecast level of change). Accordingly, consideration of localised mitigation measures would be triggered by changes in traffic flow numbers considerably below the levels which could give rise to noticeable noise impacts.

4.5.2 Notwithstanding this, to ensure noise impacts are properly understood, TfL will appoint an independent noise expert to carry out an annual review the noise monitoring data presented within the annual monitoring reports. TfL will consult STIG members regarding the expert to be appointed.

4.5.3 It is acknowledged that differentiating between effects on noise from the Scheme in operation and those arising from other, unrelated activities is likely to be complex. Just relying on noise monitoring data will not differentiate between noise effects resulting from the Scheme and other unrelated activities. Therefore, in conjunction with the noise monitoring data presented within the annual monitoring report, the flows, composition (including the percentage of heavy vehicles) and speed of the traffic through the tunnels will be considered by the independent noise specialist.

4.5.4 To fully appreciate the effects of changes in any, or all of these parameters on the road traffic noise levels through the tunnels, the traffic monitoring data will be used by the noise expert to calculate a “Basic Noise Level” in accordance with the guidance of the Calculation of Road Traffic Noise (DfT, 1988). This will allow noise resulting from changes in each of the total flow,

percentage of heavy vehicles and speed to be appropriately accounted for and reported.

4.5.5 If the annual review carried out by the independent noise expert concludes that the difference in calculated Basic Noise Level values between the predicted flows and measured flows through the Blackwall and Silvertown Tunnel is greater than 1dB (and that the difference is attributable to the Scheme), TfL will consider the need for localised noise mitigation measures in consultation with the relevant local authorities.

4.6 Development of post-opening mitigation

4.6.1 Where it is identified that mitigation is required to address an adverse Scheme impact post-opening, TfL will determine the form of mitigation to be implemented in consultation with the relevant highway authority. Mitigation could take a number of forms, and it may be that a package of different measures is deemed necessary to address the identified impacts. Further detail on the range of mitigation measures which could be implemented can be found in Chapter 4 and Appendix F.

4.6.2 Should a change to the user charges be identified as a form of mitigation, the process set out in Charging Policies and Procedures for varying the user charges will apply. This includes the use of the User Charging Assessment Framework (UCAF) and a consultation with STIG members.

4.6.3 In the event of a change to the bus network being identified as form of mitigation, for instance to address a socio-economic impact, the process set out in the Bus Strategy will apply.

4.6.4 Where localised mitigations are identified on the highway network to address localised effects, for example an adverse traffic-related impact at a particular junction, a similar process for identifying pre-opening localised mitigations will be followed (as set out in Chapter 2). TfL will first complete a preliminary assessment as to the form of localised mitigation and the programme for its implementation. This preliminary assessment will then be presented to the relevant local authority for consideration and review within three months of the need for mitigation being identified.

4.6.5 TfL and the local authority may wish to engage with other potentially affected parties as part of their review (for instance user groups, local landowners etc.). TfL will then undertake detailed design of the mitigation where necessary, having regard to feedback received from the local highway authority.

4.6.6 In determining the form of post-opening mitigation, TfL and the affected local authority will need to give consideration to both the benefits and any potential adverse impacts that a mitigation measure could have including at locations elsewhere. Such considerations may have a bearing on the form of mitigation adopted.

4.6.7 In instances where physical changes to the streetscape are required, TfL will ensure the measures developed are sympathetic to the existing streetscape and take account of relevant guidance (including for instance TfL's *Streetscape Guidance* and the *London Cycling Design Standards*).

4.7 Funding and delivery of post-opening localised mitigation

4.7.1 TfL will meet the cost of implementing all post-opening mitigation measures identified as being necessary in relation to impacts attributable to the Scheme.

4.7.2 TfL will expedite the delivery of post-opening localised mitigation measures (for instance through allocating designated resources for design and implementation, and ring-fencing funding). The intention will be to implement the mitigation measure as soon as reasonably practicable. Any necessary consultation will be completed in line with normal procedures prior to implementation.

Measures on the TLRN

4.7.3 Where mitigation measures can be implemented under TfL's statutory powers (e.g. measures on roads for which TfL is the highway authority (the Transport for London Road Network (TLRN)), or changes to single timings), TfL will be responsible for implementing the mitigation.

Measures on borough roads

4.7.4 Where TfL is not able to implement a mitigation measure under its statutory powers, (e.g. junction modifications on roads for which TfL is not the highway authority), TfL may seek agreement with the relevant highway authority under section 8 of the Highways Act 1980 for TfL to implement those measures. Alternatively, the highway authority may be responsible for implementation of the mitigation, with the necessary funding provided by TfL and secured via a bilateral agreement. In these circumstances, TfL will apply the same timescale for identifying and agreeing the works but the timing for the implementation of these works will be a matter for the relevant highway authority.

4.7.5 A highway authority may choose to implement an alternative mitigation to the measure proposed by TfL following the usual process of scheme planning, design, consultation and implementation. The alternative mitigation must provide a broadly comparable level of value in addressing the Scheme impact. TfL will contribute towards the cost of the mitigation up to the estimated cost of the measure proposed by TfL, or less if the alternative mitigation is of lower cost. If the highway authority wishes to take the opportunity to implement supplementary measures at its own cost (for instance to tie the mitigation in with wider streetscape improvements) it will be able to do so.

5. INDICATIVE MITIGATION MEASURES

5.1 Introduction

5.1.1 Indicative mitigation measures to address the impacts of the Scheme have been identified and are set out at Appendix F. The mitigation measures are capable of addressing a range of impacts that may be identified as being caused by the Scheme including air quality, noise and socio-economic impacts.

5.1.2 The list of indicative measures demonstrates that there are a range of measures available that could be implemented within reasonable timescales by TfL and/or the local highway authorities under their existing powers to address a variety of traffic and associated impacts.

5.2 Indicative measures

5.2.1 A range of potential measures will be explored when developing any mitigation, in order to ensure that the measures are tailored to the cause, locality and extent of any potential impacts. Appendix F sets out a range of potential mitigation measures, the effect that each measure is likely to have and where appropriate the statutory powers for delivering that mitigation measure. It should be noted that this list is not exhaustive and other measures could also potentially be considered.

Changes to the user charge

5.2.2 In addition to physical measures, changes to the Silvertown and Blackwall Tunnel user charges could also be used as a mitigation measure in certain circumstances. The approach to setting the initial user charges and making subsequent variations is set out in the Charging Policies and Procedures.

5.2.3 Variations to the user charges could potentially take a number of forms, meaning that this is a highly flexible form of mitigation. It could include for example:

- adding or removing discounts and exemptions, or changing the criteria for these;
- changing the hours at which the charges apply or the types of vehicles to which they apply; and
- changing the charge levels.

5.2.4 For air quality and noise impacts, once physical mitigation measures (for example noise barriers) have been implemented prior to Scheme opening, the most likely mitigation measure post-opening would be to vary the user charge.

Mitigation at adjacent crossings

5.2.5 If a significant adverse impact was identified on an adjacent river crossing as a result of the Scheme, either on completion of the refreshed assessment (pre-opening) or observed through the monitoring data (post-opening), TfL would in the first instance consider a range of potential traffic management measures to mitigate the impact on the crossing (including the potential for adjustments to the user charges at the Blackwall and Silvertown tunnels to address the issue).

5.2.6 The implementation of a user charge at adjacent crossings would subsequently be considered as a potential mitigation if such management measures were deemed to be insufficient for mitigating the impact or otherwise not appropriate. The legal powers necessary to implement any user charge, as well the potential need for any amendments to existing legislation, would be duly considered as part of this process.

Support for sustainable transport measures

5.2.7 In the unlikely event that mitigation measures implemented to address an adverse Scheme impact have not proved sufficient to directly and fully mitigate it, residual impacts may remain. In these circumstances, if in the opinion of TfL and the affected local authority these residual impacts are sufficient to justify offsetting by strategic or local measures to encourage the take up of sustainable and active travel, TfL would consider implementing or making available support to the affected local authority to implement these measures as appropriate.

5.2.8 Such measures could range from enhancements to pedestrian and cyclist infrastructure on the local highway network, to the provision of additional cycle parking, travel planning for residents, schools and businesses and other ‘soft’ measures. These offsetting measures would be proportionate to the scale of the residual impacts remaining and could be delivered by the relevant local authority subject to agreement with TfL.

List of Abbreviations

ANPR	Automatic Number Plate Recognition
AQS	Air Quality Strategy
ATC	Automatic Traffic Counts
CO_2	Carbon Dioxide
Defra	Department for Environment, Food and Rural Affairs
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
DVLA	Driver and Vehicle Licensing Agency
ES	Environmental Statement
EU	European Union
LCAP	London Congestion Analysis Project
MSOA	Middle Level Super Output Area
NML	Noise Monitoring Location
NO_2	Nitrogen Dioxide

PM_{10}	Particulate Matter (typically less than or equal to 10micron)
SCOOT	Split Cycle Offset Optimisation Technique
STIG	Silvertown Tunnel Implementation Group
TfL	Transport for London
TLRN	Transport for London Road Network

Glossary of Terms

AM peak	The morning peak hours when traffic is busiest. In the context of the Silvertown Tunnel scheme this applies to the hours between 6:00 and 10:00 in the northbound direction.
Assessed Case	Scenario adopted for assessment of likely effects of the proposed scheme, in the context of central forecasts of transport conditions and with user charges set so as to balance the Scheme's traffic, environmental, socio-economic and financial objectives.
Blackwall Tunnel	An existing road tunnel underneath the River Thames in east London, linking the London Borough of Tower Hamlets with the Royal Borough of Greenwich, comprising two bores each with two lanes of traffic.
Carbon	'Carbon' is used as short hand to refer to the basket of six greenhouse gases (GHGs) recognised by the Kyoto Protocol. GHGs are converted to carbon dioxide equivalents (CO_2e) based on their global warming potential per unit as compared to one unit of CO_2.
Development Consent Order	This is a statutory order which provides consent for the project and means that a range of other consents, such as planning permission and listed building consent, will not be required. A DCO can also include provisions authorising the compulsory acquisition of land or of interests in or rights over land which is the subject of an application. http://infrastructure.planninginspectorate.gov.uk/help/glossary-of-terms/
Excess Wait Time	The time waited in excess of the average scheduled wait time e.g. when waiting for a bus service.
Host Boroughs	The Royal Borough of Greenwich, and the London Boroughs of Newham and Tower Hamlets where the existing Blackwall Tunnel and proposed Silvertown Tunnel are situated.

Inter peak	The time period between the AM peak and the PM peak when traffic levels are lower. In the context of the Silvertown Tunnel scheme this refers to the hours between 10:00 and 16:00.
Mitigation	Measures including any process, activity, or design to avoid, reduce, remedy or compensate for negative environmental impact or effects of a development.
PM Peak	The evening peak hours when traffic is busiest. In the context of the Silvertown Tunnel scheme this applies to the hours between 16:00 and 19:00 in the southbound direction.
Rotherhithe Tunnel	An existing road tunnel underneath the River Thames in east London, linking the London Borough of Tower Hamlets with the London Borough of Southwark, comprising a single bore with two lanes of traffic. Pedestrian and cycle access is permitted.
The Scheme	The construction of a new bored tunnel with cut and cover sections at either end under the River Thames (the Silvertown Tunnel) between the Greenwich peninsula and Silvertown, as well as necessary alterations to the connecting road network and the introduction of user charging at both Silvertown and Blackwall tunnels.
Transport for London (TfL)	A London government body responsible for most aspects of the transport system in Greater London. Its role is to implement transport strategy and to manage transport services across London. These services include: buses, the Underground network, Docklands Light Railway, Overground and Trams. TfL also runs Santander Cycles, London River Services, Victoria Coach Station and the Emirates Air Line. As well as controlling a 580km network of main roads and the city's 6,000 traffic lights, TfL regulates London's private hire vehicles and the Congestion Charge scheme.

The Tunnel, Silvertown Tunnel	Proposed new twin-bore road tunnels under the River Thames from the A1020 in Silvertown to the A102 on Greenwich Peninsula, East London.
Tunnel Portal	A structure created which defines the end of a section of tunnel.
User Charging	The charge to be paid by users of the Silvertown Tunnel and Blackwall Tunnel that is to be imposed in order to manage traffic demand and help pay for the Scheme.
Woolwich Ferry	The Woolwich Ferry links Woolwich (Royal Borough of Greenwich) and North Woolwich (London Borough of Newham). It also links two ends of the inner London orbital road routes; the North Circular and South Circular. It runs every 5-10 minutes throughout the day, from Monday to Friday and every 15 minutes on Saturdays and Sundays. It carries pedestrians, cyclists, cars, vans and lorries. The ferry is operated by Briggs Marine and Environmental on behalf of TfL.

Appendix A Traffic Monitoring Plan

A.1 Traffic monitoring plan

Table A-1 Initial traffic monitoring plan

Outcome	Metric	Location	Duration
River crossings			
Blackwall Tunnel & Silvertown Tunnel crossing performance	Hourly traffic crossing flow (including vehicle type & assessment of volume to capacity ratio)	Blackwall Tunnel & Silvertown Tunnel northbound & southbound	Continuous, subject to data collection methods
	Peak hour traffic crossing delay	Blackwall Tunnel & Silvertown Tunnel northbound & southbound approaches	AM peak, inter peak & PM peak data to allow establishment of trends over time
Performance of adjacent crossings: Woolwich Ferry	Hourly traffic crossing flow (including vehicle type)	Woolwich Ferry northbound & southbound	Continuous, subject to data collection methods

Outcome	Metric	Location	Duration
	Queue lengths	Woolwich Ferry northbound & southbound approaches	AM peak, inter peak & PM peak data to allow establishment of trends over time
Performance of adjacent crossings: Rotherhithe Tunnel	Hourly traffic crossing flow (including vehicle type & assessment of volume to capacity ratio)	Rotherhithe Tunnel northbound & southbound	Continuous, subject to data collection methods
	Peak hour traffic crossing delay	Rotherhithe Tunnel northbound & southbound approaches	AM peak, inter peak & PM peak data to allow establishment of trends over time
Performance of adjacent crossings: Tower Bridge	Hourly traffic crossing flow (including vehicle type & assessment of volume to capacity ratio)	Tower Bridge northbound & southbound	Continuous, subject to data collection methods
	Peak hour traffic crossing delay	Tower Bridge northbound & southbound approaches	AM peak, inter peak & PM peak data to allow establishment of trends over time

Outcome	Metric	Location	Duration
Key corridors (see Figure A-1 for a map highlighting these locations)			
Performance of key corridors: A2 (incl. A102)	Vehicle journey times	GLA boundary to Blackwall/Silvertown Tunnel diverge northbound & southbound	Continuous, subject to data collection methods
	Vehicle journey time reliability	GLA boundary to Blackwall/Silvertown Tunnel diverge northbound & southbound	Continuous, subject to data collection methods
	Hourly traffic flow (including vehicle type & assessment of volume to capacity ratio)	GLA boundary to Blackwall/Silvertown Tunnel diverge northbound & southbound	Continuous, subject to data collection methods
Performance of key corridors: A12	Vehicle journey times	Redbridge Roundabout to Blackwall Tunnel portal northbound & southbound	Continuous, subject to data collection methods
	Vehicle journey time reliability	Redbridge Roundabout to Blackwall Tunnel portal northbound & southbound	Continuous, subject to data collection methods

Outcome	Metric	Location	Duration
	Hourly traffic flow (including vehicle type & assessment of volume to capacity ratio)	Redbridge Roundabout to Blackwall Tunnel portal northbound & southbound	Continuous, subject to data collection methods
Performance of key corridors: A13	Vehicle journey times	Aldgate to Renwick Road eastbound & westbound	Continuous, subject to data collection methods
	Vehicle journey time reliability	Aldgate to Renwick Road eastbound & westbound	Continuous, subject to data collection methods
	Hourly traffic flow (including vehicle type & assessment of volume to capacity ratio)	Aldgate to Renwick Road eastbound & westbound	Continuous, subject to data collection methods
Other strategic & local links (see Figure A-1 for a map highlighting these locations)			
Performance of other strategic & local links: Albert Road (east)	Traffic flow (including assessment of volume to capacity ratio)	Pier Road to Woolwich Manor Way northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Albert Road (west)	Traffic flow (including assessment of volume to capacity ratio)	Connaught Bridge to Pier Road/Albert Road junction eastbound & westbound	Hourly data for a typical weekday & weekend day

Outcome	Metric	Location	Duration
Performance of other strategic & local links: A1261 Aspen Way	Traffic flow (including assessment of volume to capacity ratio)	A13 East India Dock Road to Leamouth Circus eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Cassland Road	Traffic flow (including assessment of volume to capacity ratio)	A102/Cassland Road/Wick Road junction to Cassland Road/B113 junction eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Charlton Way	Traffic flow (including assessment of volume to capacity ratio)	Shooters Hill Road to Vanburgh Park eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Connaught Bridge	Traffic flow (including assessment of volume to capacity ratio)	N Woolwich Road to Victoria Dock Road northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A200 Creek Road	Traffic flow (including assessment of volume to capacity ratio)	A2209 Deptford Church Street to Greenwich Town Centre eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A20 Eltham Road	Traffic flow (including assessment of volume to capacity ratio)	Kidbrooke Park Road to Burnt Ash Road eastbound & westbound	Hourly data for a typical weekday & weekend day

Outcome	Metric	Location	Duration
Performance of other strategic & local links: Homerton High Street	Traffic flow (including assessment of volume to capacity ratio)	Kenworthy Road to Ponsford Street eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Jamaica Road	Traffic flow (including assessment of volume to capacity ratio)	Lower Road to Tower Bridge eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Kenworthy Road	Traffic flow (including assessment of volume to capacity ratio)	A102/B112 junction to A102/Cassland Road/Wick Road junction northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Limehouse Link	Traffic flow (including assessment of volume to capacity ratio)	Eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Lower Lea Crossing	Traffic flow (including assessment of volume to capacity ratio)	Leamouth Circus to Tidal Basin Roundabout eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A200 Lower Road / Evelyn Street	Traffic flow (including assessment of volume to capacity ratio)	Rotherhithe Tunnel Roundabout to A2209 Deptford Church Street northbound & southbound	Hourly data for a typical weekday & weekend day

Outcome	Metric	Location	Duration
Performance of other strategic & local links: Maze Hill	Traffic flow (including assessment of volume to capacity ratio)	Trafalgar Road to Vanburgh Terrance northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A11 Mile End Road / Bow Road	Traffic flow (including assessment of volume to capacity ratio)	A13 to Bow Roundabout eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A2 New Cross Road / Blackheath Hill	Traffic flow (including assessment of volume to capacity ratio)	A2/A207 junction to Old Kent Road eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A1020 Nth Woolwich Road	Traffic flow (including assessment of volume to capacity ratio)	Tidal Basin Roundabout to Connaught Bridge northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A2 Old Kent Road	Traffic flow (including assessment of volume to capacity ratio)	New Cross Road to Tower Bridge Road eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Royal Albert Way	Traffic flow (including assessment of volume to capacity ratio)	Gallions Reach Roundabout to Connaught Bridge / A1020 / A112 junction eastbound &	Hourly data for a typical weekday & weekend day

Outcome	Metric	Location	Duration
		westbound	
Performance of other strategic & local links: Royal Docks Road	Traffic flow (including assessment of volume to capacity ratio)	A13/A406 Interchange to Beckton Roundabout northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A1011 Silvertown Way	Traffic flow (including assessment of volume to capacity ratio)	Tidal Basin Roundabout to Canning Town Roundabout northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A205 South Circular	Traffic flow (including assessment of volume to capacity ratio)	Woolwich Ferry Roundabout to A20 Sidcup Road northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Stockwell Street/Crooms Hill/General Wolfe Road	Traffic flow (including assessment of volume to capacity ratio)	A206 to A2 northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links:	Traffic flow (including assessment of volume to	A100 Tower Bridge to Limehouse Link eastbound	Hourly data for a typical weekday & weekend day

Outcome	Metric	Location	Duration
A1203 The Highway	capacity ratio)	& westbound	
Performance of other strategic & local links: Tower Bridge Road	Traffic flow (including assessment of volume to capacity ratio)	Tower Bridge to Old Kent Road northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A206 Trafalgar Road / Romney Road	Traffic flow (including assessment of volume to capacity ratio)	Greenwich Town Centre to A102	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: B207 Trundley's Road / Sanford Street	Traffic flow (including assessment of volume to capacity ratio)	Bestwood Street to New Cross Road northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Tunnel Avenue	Traffic flow (including assessment of volume to capacity ratio)	Blackwall Tunnel Southern Approach to Blackwall Lane northbound & southbound	Hourly data for a typical weekday & weekend day

Outcome	Metric	Location	Duration
Performance of other strategic & local links: Victoria Park Road	Traffic flow (including assessment of volume to capacity ratio)	Victoria Park Rd/Wick Road junction to Harrowgate Road/Victoria Park Road junction eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Wick Road	Traffic flow (including assessment of volume to capacity ratio)	A12 junction to Well Street/B113 junction eastbound & westbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: Woolwich Manor Way	Traffic flow (including assessment of volume to capacity ratio)	A13 Newham Way to Gallions Roundabout northbound & southbound	Hourly data for a typical weekday & weekend day
Performance of other strategic & local links: A206 Woolwich Road	Traffic flow (including assessment of volume to capacity ratio)	A102 to Woolwich Ferry Roundabout northbound & southbound	Hourly data for a typical weekday & weekend day
Junctions (see Figure A-1 for a map highlighting these locations)			
Performance of junctions: A100 Tower Bridge Road / Grange Rd / Bermondsey St	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A100 Tower Bridge Road / A1203 E Smithfield / A1210 Mansell St	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A1011 Silvertown Way / Tidal Basin Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A102 Kenworthy Road B112 Marsh Hill	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A102 / A206 Woolwich Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A1020 Lower Lea Crossing / Tidal Basin Roundabout	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A1020 Royal Albert Way / A1020 Royal Docks Road / Sir Steve Redgrave Bridge / Gallions Roundabout	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A1020 North Woolwich Road / Connaught Bridge	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A112 Connaught Road / Connaught Bridge	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A112 Connaught Road / A1020 Royal Albert Way / Connaught Bridge	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A112 Prince Regent Lane / Victoria Dock Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A112 Prince Regent Lane / A124 Barking Road / A112 Greengate Street	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A12 Blackwall Tunnel Northern Approach / Devas Street	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A12 Blackwall Tunnel Northern Approach / A13 East India Dock Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A12 / A11 Bow Roundabout	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A1206 Preston's Road Roundabout / Cotton Street	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A1261 Aspen Way / Upper	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Bank Street			
Performance of junctions: A1261 Aspen Way / A1261 W India Dock Rd / A1203 Limehouse Link	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A13 Alfreds Way / Renwick Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A13 Eastbound diverge at A1020 junction	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A13 / A117 High Street South / A117 Woolwich Manor Way	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A13 / A112 Prince Regent Lane	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A13 / Canning Town Gyratory	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A13 Newham Way / A406 North Circular Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 Blackheath Hill / Greenwich South Street / Lewisham Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 Blackheath Hill / Hyde Vale	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 Deptford Bridge / Greenwich High Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 Deptford Bridge / Deptford Church Street	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A2 / A2213 / Kidbrooke Interchange	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 Shooters Hill Road / Charlton Way	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 Shooters Hill Road / Prince Charles Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 / A102 / A207 / Sun in the Sands Roundabout	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 / A205 Westhorne Avenue	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A2 New Cross Road / Pagnell Street	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A20 Lee High Road / A2212 Burnt Ash Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A20 Lewisham Way / Dixon Rd	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A20 Sidcup Rd / B263 Green Lane / Southwood Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A200 Creek Road / Deptford Church Street	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A200 Evelyn Street / Deptford High Street	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A200 Evelyn Street / Oxestalls Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A200 Lower Road / Surrey Quays Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A200 Lower Road / Bush Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A200 Lower Road / A200 Jamaica Road / Rotherhithe Tunnel	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A205 / A206 / Woolwich Ferry Roundabout	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A205 South Circular Road / A207 Shooters Hill Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A205 South Circular Road / / A208 Well Hall Road / Rochester Way	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A205 South Circular Road / A21 Rushey Green	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A205 South Circular Road / / A210 Eltham Road / A210 Eltham Hill	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A205 South Circular Road / A2212 Burnt Ash Hill	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A206 / Blackwall Lane / Vanbrugh Hill	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A206 / A200 / Greenwich Town Centre	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A206 Plumstead Road / Burrage Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: A206 Romney Road / Park Row	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A206 Woolwich Road / Anchor & Hope Lane	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A206 Trafalgar Road / Maze Hill	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A21 Bromley Road / Bellingham Road / Randlesdown Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: A210 Eltham High Street / A208 Well Hall Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: B210 Charlton Way / Maze Hill / Prince Charles Road	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday

Outcome	Metric	Location	Duration
Performance of junctions: B212 Lee Road / B220 Lee Terrace	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Performance of junctions: Bugsby's Way / Anchor and Hope Lane	Junction delay, degree of saturation, journey time	-	AM peak and PM peak for a typical weekday
Buses and other public transport			
Performance of cross-river bus routes via Blackwall Tunnel & Silvertown Tunnel	Bus journey time, speed	Relevant sections of cross-river bus routes on key approaches to Blackwall & Silvertown Tunnels	Continuous, subject to data collection methods
	Excess wait time	Entire route of all cross river bus routes using Blackwall & Silvertown Tunnels	Continuous, subject to data collection methods
Performance of bus routes on the network adjacent to the crossings	Bus journey time, speed	Relevant sections of bus routes on key approaches to Blackwall & Silvertown Tunnels	Continuous, subject to data collection methods

Outcome	Metric	Location	Duration
	Excess wait time	Entire route of relevant bus routes using approaches to Blackwall & Silvertown Tunnels	Continuous, subject to data collection methods
Bus patronage levels	Bus patronage data	Entire route of all cross river bus routes using Blackwall & Silvertown Tunnels	Continuous, subject to data collection methods
Cycle Shuttle service	Patronage data	Entire route (note: route is to be confirmed)	Continuous, subject to data collection methods
Rail patronage levels	Rail patronage data	Jubilee line between Canning Town and North Greenwich Docklands Light Railway between Island Gardens and Cutty Sark Docklands Light Railway between King George V and Woolwich Arsenal	Continuous, subject to data collection methods

Outcome	Metric	Location	Duration
Road safety			
Changes in patterns of road accidents, especially those involving vulnerable road users	Accident data	Key corridors, other strategic & local links & junctions set out earlier in this table	Full annual records
Pedestrian & cyclist indicators			
Impact of Scheme related changes in traffic flow on severance and the ability of pedestrians and cyclists to use/cross the roads	Traffic flow data Pedestrian & cyclist indicators such as crossing wait times etc.	Albert Road/Connaught Road between Hartmann Road and Pier Road	Traffic flow: 24-hour data for a typical week and weekend Pedestrian & cyclist indicators: AM peak and PM peak for a typical weekday
		Bugsby's Way between John Harrison Way and Peartree Way	
		Connaught Bridge between Connaught Roundabout and Connaught Road	
		Lower Lea Crossing between Leamouth Circus and Tidal Basin Roundabout	

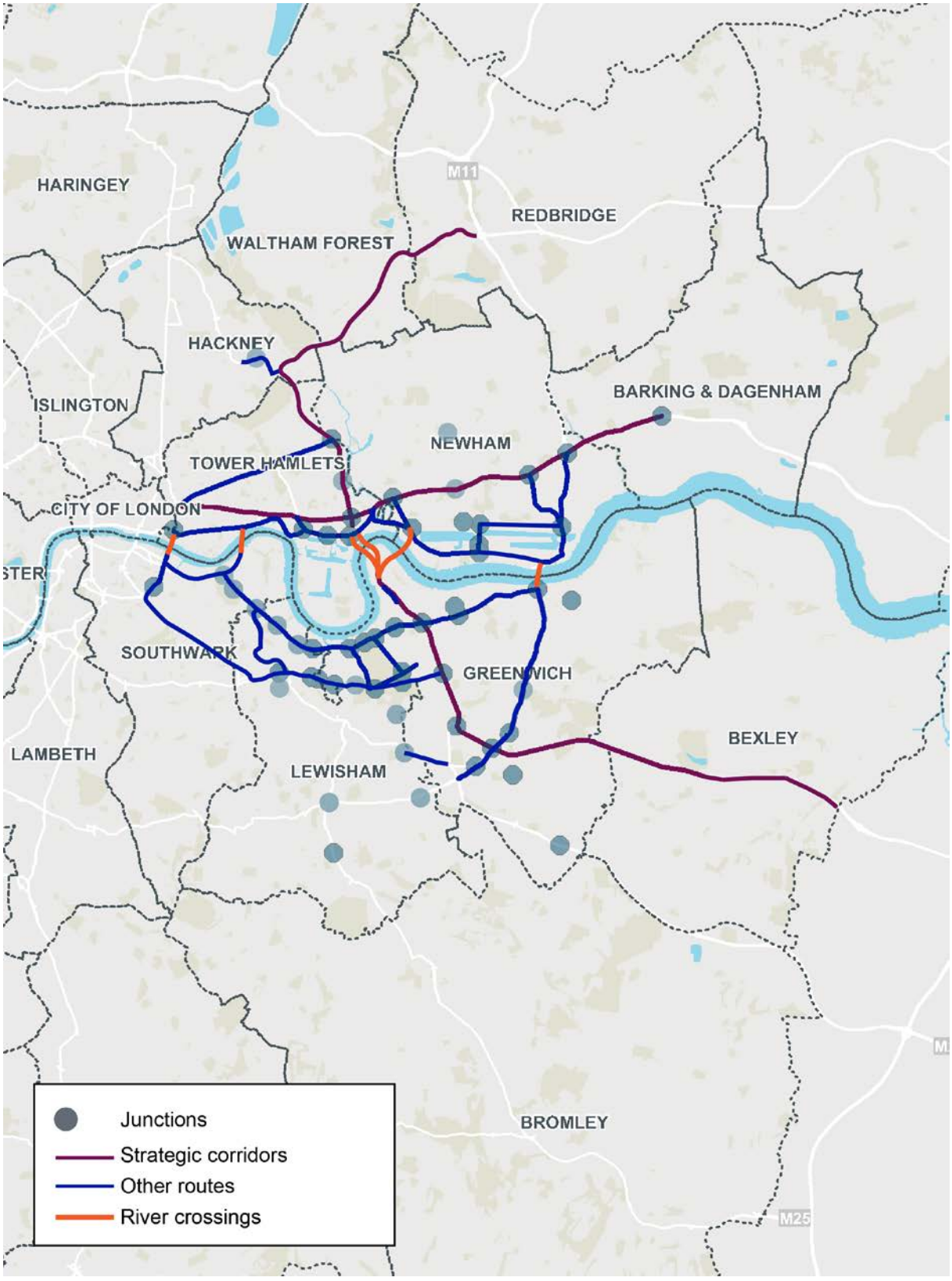
Outcome	Metric	Location	Duration
		Millennium Way between Edmund Halley Way and John Harrison Way	
		A206 Nelson Road/Trafalgar Road between Greenwich High Road and Blackwall Lane	
		North Woolwich Road between Silvertown Way and North Woolwich Roundabout	
		Prince of Wales Road between A2 Shooters Hill and South Row	
		Prince Regent Lane between A13 and Victoria Dock Road	
		Silvertown Way between A13 and North Woolwich Road	

Outcome	Metric	Location	Duration
		Victoria Dock Road between Caxton Street North and Connaught Roundabout	
		West Parkside/Pilot Busway between Edmund Halley Way and John Harrison Way	
		A206 Woolwich Road between Blackwall Lane and Anchor and Hope Lane	
Use of local roads by cyclists and pedestrians	Pedestrian & cyclist numbers	Boord Street footbridge	24-hour data for a typical weekday and weekend
		Lower Lea Crossing	
Use of Emirates Air Line as pedestrian & cyclist crossing	Pedestrian & cyclist numbers	Emirates Air Line	24-hour data for a typical week and weekend

Outcome	Metric	Location	Duration
Impact of mitigation measures on pedestrians & cyclists	Pedestrian & cyclist numbers, wait times etc.	Locations where mitigations are being implemented as a result of this strategy	24-hour data for a typical weekday and weekend
Travel behaviour			
Changes in travel behaviour of Blackwall Tunnel & Silvertown Tunnel users and the local population	Survey data including stated and revealed preference for users of different modes and vehicle types	No fixed geographic location	Every two years during a neutral month
Control sites			

Outcome	Metric	Location	Duration
Changes in travel patterns and trends independent of the Scheme	Vehicle journey times Vehicle journey time reliability Traffic flow (including assessment of volume to capacity ratio) Junction delay Degree of saturation Bus speed Accident data	Making use of TfL's existing and ongoing data collection programme	Making use of TfL's existing and ongoing data collection programme
Additional traffic data to update the strategic traffic model			
To update the strategic traffic model in advance of Scheme opening	Traffic flows, vehicle journey time routes, origin & destination pairs	As required to update the model	As required to update the model

Figure A-1 Traffic monitoring locations



Appendix B Air quality monitoring plan

Figure B-1 Air quality monitoring locations

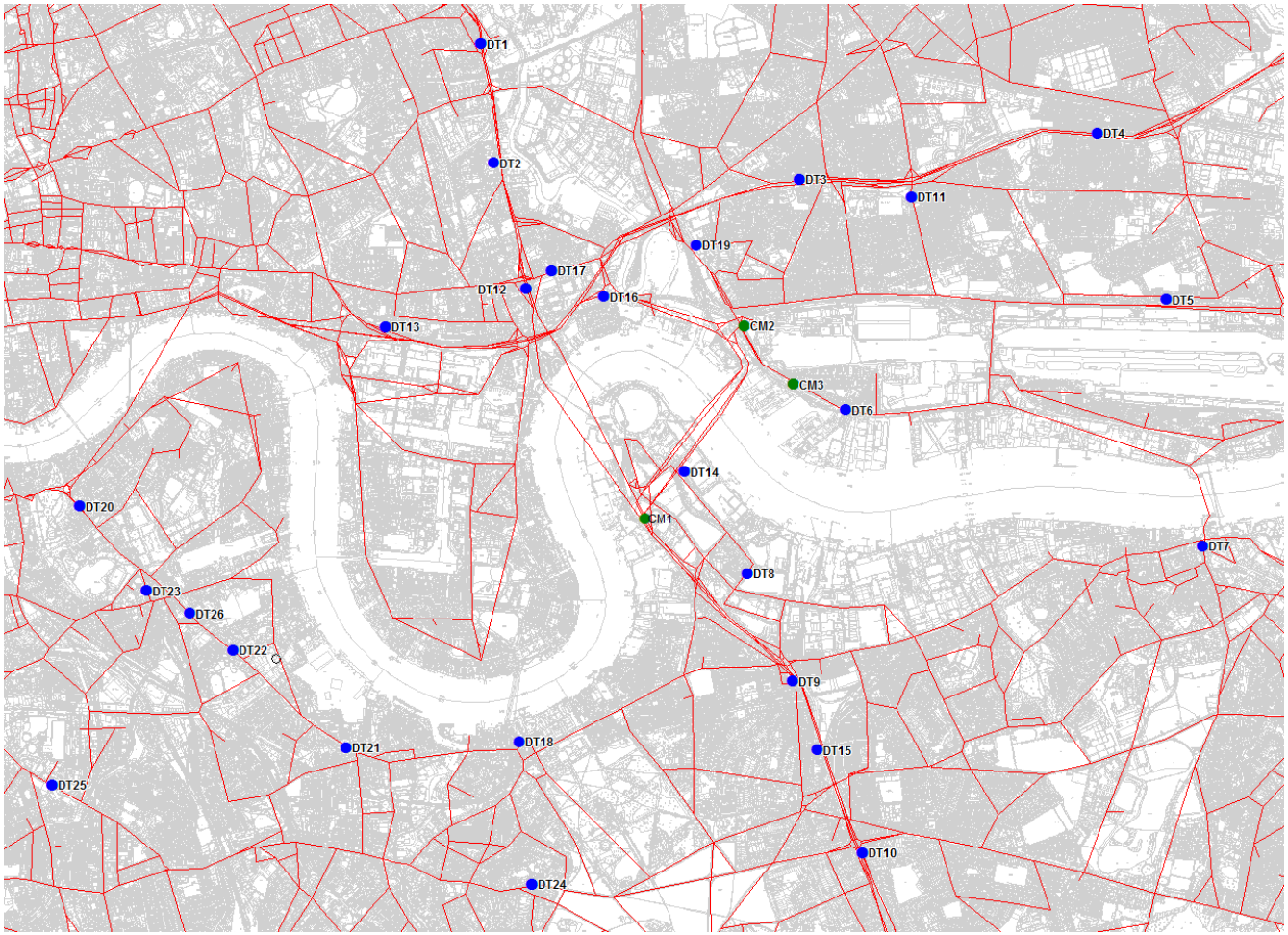


Table B-1 Initial air quality monitoring plan

B.1.1 The exact location of the air quality monitoring sites will be agreed with the relevant local authority at the time of installation.

Location	X co-ordinate	Y co-ordinate	Diffusion Tube (DT) or Continuous Automatic Monitoring (CM)
Silvertown Tunnel Southern Portal, Greenwich Peninsula	539168	179338	CM1
Hoola Development, Royal Victoria	539908	180728	CM2
Dalemain Mews, West Silvertown	540257	180314	CM3
Washington Close, Bromley-By-Bow	538034	182752	DT1
Tevoit Street, Bromley-By-Bow	538127	181888	DT2
Douglas Road	540302	181769	DT3
Newham Way, Beckton	542427	182102	DT4
Campion Close, Cyprus	542911	180913	DT5
North Woolwich Road, West Silvertown	540633	180133	DT6
John Wilson Street, Woolwich	543174	179161	DT7

Location	X co-ordinate	Y co-ordinate	Diffusion Tube (DT) or Continuous Automatic Monitoring (CM)
Southern Way, Millennium Village	539926	178964	DT8
Westcombe Hill, Westcombe	540254	178196	DT9
Sun-in-the-Sands, Greenwich	540756	176970	DT10
Prince Regent Lane, Custom House	541098	181646	DT11
Robin Hood Lane, Poplar	538356	180991	DT12
Ming Street, Poplar	537347	180722	DT13
East Parkside, Greenwich Peninsula	539482	179687	DT14
Siebert Road, Westcombe	540423	177707	DT15
Switch House, East India	538908	180936	DT16
East India Dock Road, Poplar	538545	181129	DT17
College Approach, Greenwich	538306	177768	DT18
Silvertown Way, Canning Town	539566	181301	DT19

Location	X co-ordinate	Y co-ordinate	Diffusion Tube (DT) or Continuous Automatic Monitoring (CM)
Lower Road, Canada Water	535179	179438	DT20
Evelyn Street, Deptford	537066	177726	DT21
Evelyn Street, Deptford Park	536258	178418	DT22
Rotherhithe Old Road, Rotherhithe	535648	178839	DT23
Blackheath Hill, Blackheath	538394	176750	DT24
Old Kent Road, Peckham	534977	177458	DT25
Lower Road, Rotherhithe	535942	178694	DT26

Appendix C Noise monitoring plan

Figure C-1 Noise monitoring locations

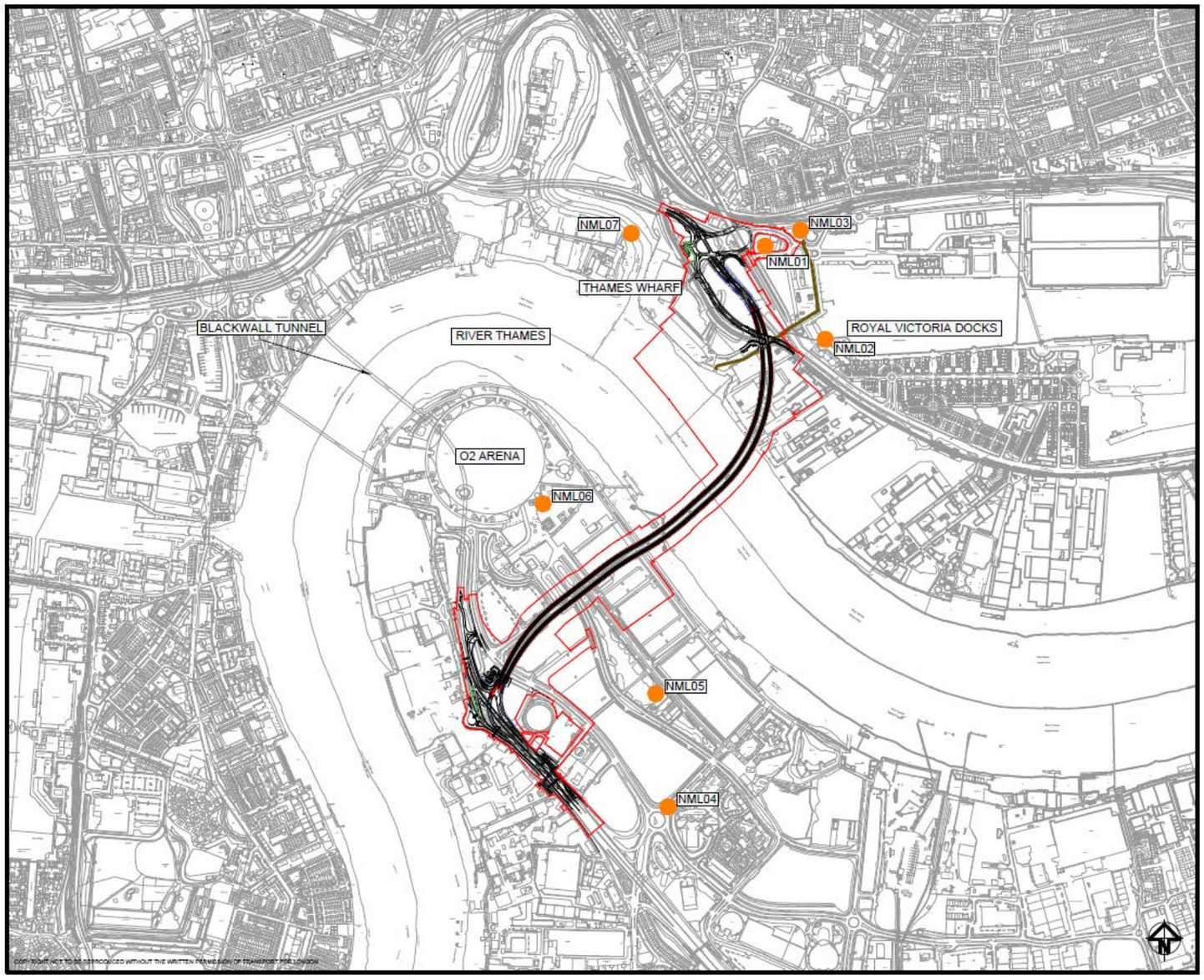


Table C-1 Initial noise monitoring plan

C.1.1 The exact location of the noise monitoring sites will be agreed with the relevant local authority at the time of installation.

Monitoring Location	Location Description	Approximate National Grid Reference	Monitoring Regime
NML01	Residential properties within the southern extent/façade of the Hoola mixed use/ residential development	TQ 39909 80728	Continuous monitoring using Calibrated Type 1 Data logging Sound Level Meter quantifying at minimum L_{Aeq}, L_{A10} and L_{Amax} parameters in hourly periods
NML02	Residential properties in the vicinity of the existing Western Beach Apartment block	TQ 40093 80452	Continuous monitoring using Calibrated Type 1 Data logging Sound Level Meter quantifying at minimum L_{Aeq}, L_{A10} and L_{Amax} parameters in hourly periods
NML03	Residential properties within the southern extent/façade of the Pump Tower residential development	TQ 40014 80774	Continuous monitoring using Calibrated Type 1 Data logging Sound Level Meter quantifying at minimum L_{Aeq}, L_{A10} and L_{Amax} parameters in hourly periods
NML04	The Millennium School educational facility	TQ 39667 79082	Continuous monitoring using Calibrated Type 1 Data logging Sound Level Meter quantifying at minimum L_{Aeq}, L_{A10} and L_{Amax} parameters in hourly periods
NML05	Residential properties	TQ 39614	Continuous monitoring

Monitoring Location	Location Description	Approximate National Grid Reference	Monitoring Regime
	in the vicinity of the Pilot Public House	79381	using Calibrated Type 1 Data logging Sound Level Meter quantifying at minimum L_{Aeq}, L_{A10} and L_{Amax} parameters in hourly periods
NML06	The Ravensbourne College educational facility	TQ 39275 79961	Continuous monitoring using Calibrated Type 1 Data logging Sound Level Meter quantifying at minimum L_{Aeq}, L_{A10} and L_{Amax} parameters in hourly periods
NML07	The Faraday School educational facility	TQ 39521 80744	Continuous monitoring using Calibrated Type 1 Data logging Sound Level Meter quantifying at minimum L_{Aeq}, L_{A10} and L_{Amax} parameters in hourly periods

Appendix D Socio-economic monitoring plan

D.1 Residents

D.1.1 TfL will commit to undertaking a residents survey and behavioural survey to monitor the impact of the Scheme on London's socio-economic groups. At least 1,000 people will be surveyed across east and south-east London on an annual basis, stratified by location, age, gender and income to ensure it is representative of the area's population.

D.1.2 Table D - 1 sets out an indicative range of metrics that will be collected from the survey to help inform whether mitigation is required for specific socio-economic groups. This list is not intended to be exhaustive and will be finalised in consultation with STIG members. All of the following will be analysed by income band (to identify the impacts on lower income groups), location (to identify the impacts on specific regeneration areas) and socio-economic classification including age, gender, disability and ethnicity.

Table D - 1 Initial socio-economic monitoring plan - residents

Outcome	Metric	Location	Duration
The number of residents that cross the River to reach their place of work - highway	Residents Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that cross the River to reach their place of work – public transport	Residents Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that cross the River to reach retail and social infrastructure - highway	Residents Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that cross the River to reach retail and social infrastructure - public transport	Residents Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that cross the River for social purposes -	Residents Survey	Borough and LSOA level	Continuous over an

highway			annual period
The number of residents that cross the River for social purposes - public transport	Residents Survey	Borough and LSOA level	Continuous over an annual period
The frequency of cross-river trips by residents, by journey purpose - highway	Residents Survey	Borough and LSOA level	Continuous over an annual period
The frequency of cross-river trips by residents, by journey purpose - public transport	Residents Survey	Borough and LSOA level	Continuous over an annual period
The time of day of cross-river trips by residents, by journey purpose - highway	Residents Survey	Borough and LSOA level	Continuous over an annual period
The time of day of cross-river trips by residents, by journey purpose – public transport	Residents Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that reassigned their journey to other crossings over the past year and the reason for this switch, by journey purpose	Behavioural Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that redistributed to an alternative destination over the past year and the reasons for this, by journey purpose	Behavioural Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that switched mode over the past year and the reasons for this, by journey purpose	Behavioural Survey	Borough and LSOA level	Continuous over an annual period
The number of residents that	Behavioural	Borough and	Continuous

retimed their trips over the past year and the reasons for this, by journey purpose	Survey	LSOA level	over an annual period

D.1.3 In addition to the metrics set out above, the surveys will also allow further exploration of the reasons why changes in travel behaviour may have taken place for particular socio-economic groups. This will include:

- Whether the cost of the Scheme has had any impact on particular socio-economic group's ability to cross the river, to access employment opportunities or for social reasons, and the behavioural responses to this.
- Whether the reduction in congestion, or improvement in journey time reliability, has had any impact on a particular socio-economic group's ability to cross the river.
- Whether the impact of the bus services has had any impact on a particular socio-economic group's ability to cross the river.

D.1.4 In addition to the residents and behavioural surveys, TfL will continue to collect and analyse a significant amount of data on the travel patterns of east and south-east London residents as part of its annual London Travel Demand Survey (LTDS). This will be used to understand how cross-river travel behaviour may have changed within the context of changing travel behaviour within the wider area. TfL will also use socio-economic monitoring data from local authorities where available.

D.2 Businesses

D.2.1 TfL will commit to undertaking a business survey to monitor the impact of the Scheme on London's businesses. At least 500 businesses will be surveyed across east and south-east London on an annual basis, stratified by location, size and sector to ensure it is representative of the area's business mix.

D.2.2 Table D - 2 sets out an indicative range of metrics that will be collected from the survey to help inform whether mitigation is required for specific types of businesses. This list is not intended to be exhaustive and will be finalised in consultation with STIG members. All of the following will be analysed by business size, sector and location.

Table D - 2 Initial socio-economic plan – businesses

Outcome	Metric	Location	Duration
The number of cross-river trips made to visit potential customers	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of potential customers that visit the business from the other side of the River	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of employees that travel to the business from the other side of the River	Business Survey	Borough and LSOA level	Continuous over an annual period
The frequency of cross-river trips by businesses, by journey purpose - highway	Business Survey	Borough and LSOA level	Continuous over an annual period
The frequency of cross-river trips by businesses, by journey purpose – public transport	Business Survey	Borough and LSOA level	Continuous over an annual period
The time of day of cross-river trips by businesses, by journey purpose - highway	Business Survey	Borough and LSOA level	Continuous over an annual period
The time of day of cross-river trips by businesses, by journey purpose – public transport	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of businesses that reassigned their journeys to other crossings and the reason for this switch, by journey purpose.	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of businesses that redistributed to an alternative destination and the reasons for	Business Survey	Borough and LSOA level	Continuous over an annual

this, by journey purpose			period
The number of businesses that switched mode and the reasons for this, by journey purpose	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of businesses that retimed their trips and the reasons for this, by journey purpose	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of time critical deliveries missed as a result of crossing the River	Business Survey	Borough and LSOA level	Continuous over an annual period
The degree to which staff are late for work/miss meetings as a result of crossing the River	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of times unpredictable events when crossing the river have impeded business operations	Business Survey	Borough and LSOA level	Continuous over an annual period
The number of businesses taking part in the Business Transition Scheme and views on this	Business Survey	Borough and LSOA level	Continuous over an annual period

D.2.3 In addition to the metrics set out above, the survey will also allow further exploration of the reasons why changes in travel behaviour may have taken place for particular business types. This will include:

- Whether the Scheme has enabled the business to grow or invest and the reasons for this
- Whether the business has taken on more staff, or lost staff, as a result of the Scheme and the reasons for this
- The impact of any changes in reassignment, redistribution or mode shift on the operation and profitability of the business

- The impact of any changes in congestion and journey time reliability on the operation and profitability of the business

D.2.4 Other secondary data

D.2.5 In addition to the primary data that TfL will collect through surveys, TfL will also monitor wider socio-economic characteristics to identify the impact of the Scheme within its wider context.

D.2.6 Table A - 3 sets out the additional range of secondary data that will be monitored. Again, this list is not intended to be exhaustive and will be finalised in consultation with STIG members.

Table A - 3 Secondary socio-economic data

Outcome	Source	Location	Duration
Unemployment rate, split by age and gender	JSA Claimant Count	Borough and LSOA level	For each month over an annual period
Indices of Multiple Deprivation	DCLG	Borough and LSOA level	Every four years
The number of business operating, by size and sector	Business Register and Employment Survey	Borough and LSOA level	Annually
The number of employees, by size and sector	Business Register and Employment Survey	Borough and LSOA level	Annually
Rental levels for commercial and industrial floorspace	Commercial agents/Costar database	Borough and LSOA level	Annually
The number of pupils who attend schools outside of their home Borough	Boroughs	Borough	Annually

Appendix E Mitigation Triggers

E.1 Overview of Trigger Process

E.1.1 Mitigation triggers are proposed as a means of assisting the identification of any unexpected traffic-related impacts of the scheme on the highway network following opening of the scheme (likely impacts identified ahead of opening are subject to their own mitigation procedure). Triggers refer to levels of change post scheme opening which exceed the level of change anticipated, and are designed to provide an alert if these levels are breached.

E.1.2 Trigger levels are ranked using a RAG (Red, Amber, Green) system. Green represents the expected change (based on the difference between modelled scheme and modelled reference case, with forecasting range / variability and measurement error taken into account as necessary); amber is the first level of warning and would warrant an investigation into mitigation if deemed necessary by STIG; and red always warrants an investigation into whether mitigation is needed. If TfL determines that mitigation is not required following a trigger activation it will provide the members of STIG with a clear justification for this.

E.1.3 The triggers will cover the 'area of influence' identified in Figure 3-1 which represents the geographical area where anticipated changes (in terms of traffic conditions) are most marked. Specifically, the triggers will cover changes in traffic-related metrics at the following locations:

- The Blackwall and Silvertown tunnels;
- Other river crossings;
- Strategic corridors[5]; and
- Local roads.

[5] Strategic corridors include the strategic radial and orbital corridors outlined in the Mayor's Transport Strategy (MTS corridors), the Transport for London Road Network (TLRN) and Strategic Road Network (SRN). These are key links that carry the highest volumes of traffic and the majority of TfL bus routes.

E.1.4 Monitoring undertaken in the area of influence will cover all of the most marked impacts of the Scheme. Should additional monitoring be undertaken in the wider buffer zone, for instance at the request of STIG, it is possible that additional triggers could be set for locations outside the Area of Influence if there is a demonstrable need for doing so.

E.1.5 Triggers will be reviewed prior to scheme opening and if necessary updated in consultation with STIG to ensure they remain fit for purpose. It should be stressed that STIG can have regard to any information set out in the monitoring reports in forming a view on the impacts of the scheme; a trigger doesn't have to be breached for STIG to explore a potential scheme effect, in the same way that activation of a trigger does not necessarily mean that mitigation is required. Similarly, the triggers do not in any way restrict STIG's ability to apply professional judgement when considering the monitoring reports. Indeed, it is expected that the collective experience of STIG would be put to good use in interpreting the monitoring reports and the triggers.

E.2 Proposed Metrics

E.2.1 Triggers will be set for the following traffic-related metrics:

a. Traffic Flows - This metric considers changes in traffic flows as a result of the Scheme. It is proposed that triggers based on traffic flows will form the principal mitigation triggers for the Scheme. The primary source of data for measuring average traffic flow is Automated Traffic Counts (ATCs), of which there are currently approximately 350 located at various sites across London. Traffic flows are considered the primary metric for assessing unanticipated scheme impacts.

b. Vehicle Composition (HGVs) - Triggers for HGV usage are given as increases to the current observed proportion of HGVs (that is the flow of HGVs as a proportion of all traffic) in each geographic area. There is expected to be no background growth in the proportion of HGVs using the assessed roads. Vehicle composition can be determined from data derived from Automatic Number Plate Recognition (ANPR) cameras combined with records from the Driver & Vehicle Licensing Authority (DVLA).

c. Journey Time Reliability - The current methodology for assessing JTR involves scaling journey lengths, on the corridors of interest, to a "30 minute standard journey" and then counting the percentage of trips which take more than 5 minutes longer than the expected time. The primary source of data for assessing the impact of the scheme on

journey time reliability is ANPR data, captured continuously as part of the London Congestion Analysis Project (LCAP).

d. Queues extending beyond a certain point - The primary source of data for assessing the scheme impact at Woolwich will be usage data. In addition, surveys of vehicle queuing will be undertaken to provide an indication of impacts on the adjacent road network. The ferry approaches present a unique situation, with the total queue length having a high degree of variation and thus not likely to be a true indicator of actual road operation. The methodology proposed has therefore been developed to capture and compare the amount of time per day that the queued ferry traffic extends to a point on the highway network that impacts on through (non-ferry) traffic. This methodology can be consistently replicated each year to enable like-for-like comparison.

e. Bus Reliability (EWT) - Bus reliability can be measured using excess wait time[6] data derived from TfL's iBus monitoring system. Note that TfL are currently investigating the use of bus journey time reliability as a metric for monitoring buses. If this becomes the standard metric for bus evaluation, then it may be appropriate to adopt this metric for the trigger. The routes and start/end points would be agreed nearer to the time of Scheme opening once the bus network to be in place on opening of the Scheme has been agreed.

f. Road Safety - The key metric for road safety is the number of KSIs. Further it is suggested that rather than the number of KSIs directly, the number of incidents which result in a KSI are used to asses the impact of the scheme at Blackwall/Silvertown.

g. Junction Performance - There is potentially scope for additional triggers to be set based on the performance of certain specific junctions, for example if the monitoring reveals a Scheme-related effect in the vicinity of a junction that is not included within an LCAP link. As junction performance varies significantly, it is expected that individual triggers

[6] Excess wait time is a key indicator of bus reliability, which is a measure of how much time passengers had to wait above the time they would be expected to wait if every service ran to schedule.

would need to be set for each junction considered nearer to the time of Scheme opening based on outputs from the refreshed assessment.

E.3 Overview of Data Constraints

E.3.1 Trigger levels will be set based on expected changes due to the scheme derived from outputs of the modelled scheme. The intention is that the triggers will tell us whether observed scheme impacts are materially different from those forecast in the Assessed Case, over a prolonged period of time. The intention is not that a freak or unusual event causes a trigger, but that a trigger is activated if there is a sustained deviation from expected scheme outcomes.

E.3.2 By appropriately reflecting the expected change caused by the scheme, the triggers thresholds would remain applicable if background conditions across the network (i.e. the Reference Case) were different from those currently forecast. Setting the trigger thresholds based on absolute values is not considered appropriate because changes in background conditions, which are not a result of the scheme, could render the triggers irrelevant. A trigger based on an absolute traffic flow of x at a certain location, for instance, may not be breached even if the scheme was having an unforeseen effect if background growth across the network was lower than forecast. Similarly, if background growth was higher than forecast, the trigger could be breached purely by traffic growth regardless of the scheme's effect.

E.3.3 Were background conditions observed to be notably different in practice to those forecast, this would be identified as part of the pre-scheme monitoring and the refreshed assessment of scheme impacts undertaken prior to opening. TfL would then take appropriate steps so that the scheme is not likely to give rise to materially new or materially different environmental effect to those assessed in the Environmental Statement, for example through adjustments to user charging and the implementation of localised mitigation. The post-opening triggers in effect provide an additional level of surety that unanticipated scheme effects can be identified and addressed post scheme opening.

E.3.4 Due to the need for sustained change to be distinguished from expected variation in flows (over a given time period) the trigger thresholds cannot be based on variance from the forecast scheme impacts alone. This is particularly the case for triggers based on traffic flows, but could also apply to a lesser degree for triggers based on other metrics (for example journey time reliability).

E.3.5 Currently there is high variability in daily traffic flow across the network – in a given week, for example, flows may vary by ±20% so a trigger which simply looks for a 5% difference in expected flow will trigger frequently but may not actually pick up a sustained trend in the change in traffic flow. Although considering data on a quarterly basis will help to reduce the level of variability, significant variability remains. Similarly and as explained above, the method for a trigger to be activated needs to take into account growth, as otherwise background growth may cause a trigger to activate rather than an unexpected scheme effect.

E.4 Overview of Data Analysis

E.4.1 The means of accounting for variability and growth will be agreed at a later date. There are two potential methods for doing this. The first involves building in allowance for variability and growth based on observed data collected through the monitoring programme (in order to determine exactly what these allowances should be, consideration of the acceptable number of false positives is required). The second involves isolating the scheme impacts from background growth and variability using regression to look at the expected difference in the level of flow pre- and post- Scheme opening. The host boroughs have expressed a preference for adopting this approach.

E.4.2 Where other metrics follow a similar pattern of variability an adaptation of the chosen method will be used to set the appropriate trigger thresholds. Where no variation is expected trigger levels will be set without reference to day to day variation.

E.4.3 In slightly more detail, the considerations which have to be taken into account over the monitoring period, are as follows:

- Background growth
- Measurement error
- Initial fluctuations in flow
- Temporal fluctuations

E.4.4 For background growth, the first method outlined about above involves including a fixed percentage in the trigger level to account for this. The second method using regression explicitly takes this into account.

E.4.5 For measurement error, this reflects the fact that the methods used to count traffic are not 100% accurate. Including a small allowance for measurement

error in the metrics that are based on traffic counts (incorporated within the forecasting range/variability allowance) is one method of addressing this.

E.4.6 For initial fluctuations in flow, it is likely that it will take time for the drivers to become used to the Scheme being in place and, as such, there may be significant variation in usage patterns in the initial period. It is possible that these will be above and beyond what might be expect due solely to day to day variation in daily traffic flow, and this should be given due consideration for any trigger activations within the first year after Scheme opening.

E.4.7 For the temporal fluctuations, in order to account for seasonal variations it is planned that, for the purpose of the triggers, the monitoring data will be aggregated and compared quarterly to the same quarter in the baseline. This will help to minimise the likelihood of thresholds being triggered by general variability experienced across the network and not attributable to the Scheme, and fits with reporting cycles for the annual monitoring reports that will be produced for STIG.

E.4.8 It is planned that the triggers will be based primarily on all day (24 hour) weekday flows. However, it is recognised that the Scheme could have different impacts across different periods of the day and accordingly triggers will also be set for peak periods for the traffic flow, vehicle composition and journey time reliability metrics.

E.4.9 In the case of the AM peak period this will be defined as 6am to 10am (rather than 7am to 10am) as the Blackwall Tunnel generally experiences traffic building up earlier than other parts of the network, whilst the PM peak will be defined as 4pm to 7pm. Consideration of peak periods rather than peak hours will ensure that the worst case impacts are captured as well as any peak contraction that may occur (as is expected as a result of the Scheme).

E.5 Initial mitigation triggers

E.5.1 The initial mitigation triggers are set out in Table A-4.

E.5.2 It is planned that the triggers will be reviewed by TfL in consultation with STIG members in the light of the refreshed assessment undertaken prior to scheme opening, at a point when the opening year bus network has been confirmed. It will then be possible to specify the bus routes to be covered by the triggers and any triggers relating to junction performance, as well as agree the approach for dealing with variability and growth.

E.5.3 As part of this review, it may be appropriate to amend the trigger metrics or thresholds for other reasons (for instance because of a change in the way data is collected or reported, or a notable change in background conditions). In such instances TfL will set out a rationale for any amendments it considers necessary and share this with STIG members for approval.

E.5.4 Similarly, it is planned that the triggers will be reviewed post-opening of the Scheme as part of the first annual monitoring report to ensure they are fit for purpose and performing their intended function. Where potential changes are identified, TfL will set out a rationale for any amendments it considers necessary and share this with STIG members for approval.

Table A - 4: Initial mitigation triggers

Metric	Location	Blackwall / Silvertow	Blackwall Tunnel	Silvertown Tunnel	Rotherhithe Tunnel	Tower Bridge	Woolwich Ferry	MTS corridors	Local roads	Notes
Traffic flows	Red alert	+4%	82%	32%	+8%	+7%	+5%	+7%	+7%	Change from baseline. Forecast change is based on change between Ref and Assessed Case. The individual triggers for Blackwall and Silvertown are based on the proportion of traffic flow at each crossing relative to the combined traffic flow.
	Amber alert	0%	78%	28%	+4%	+3%	+1%	+3%	+3%	
	Forecast range/variability	-1%	77%	27%	+3%	+2%	0%	+2%	+2%	
	Forecast change in flow	-3%	75%	25%	+1%	0%	-2%	0%	0%	
	Forecast range/variability	-5%	73%	23%	-1%	-2%	-4%	-2%	-2%	
	Amber alert	-6%	72%	22%	-2%	-3%	-5%	-3%	-3%	
	Red alert	-10%	68%	18%	-6%	-7%	-9%	-7%	-7%	
			Based on proportion of flow relative to combined flow							
Vehicle composition (HGVs)	Red alert	0%				+7%	+7%	+7%	+7%	Change from baseline. Forecast change is based on change between Ref and Assessed Case.
	Amber alert	-4%				+3%	+3%	+3%	+3%	
	Forecast range/variability	-5%				+4%	+4%	+2%	+2%	
	Forecast change in HGVs	-7%				2%	2%	0%	0%	
	Forecast range/variability	-9%				0%	0%	-2%	-2%	
	Amber alert	-10%				-1%	-1%	-3%	-3%	
	Red alert	-14%				-5%	-5%	-7%	-7%	
Journey time reliability	Forecast JTR	TLRN mean	TLRN mean	TLRN mean	TLRN mean	TLRN mean		TLRN mean		Change from TLRN average, on the basis that currently JTR at Blackwall Tunnel is significantly worse than average.
	Amber alert	-3%	-3%	-3%	-3%	-3%		-3%		
	Red alert	-6%	-6%	-6%	-6%	-6%		-6%		
Queues extending beyond a certain point	Amber alert - north side						16%			% of time queues extend beyond a predefined point on the highway network, based on current conditions. North side point = entry to waiting area, south side point = Woolwich Church Street.
	Red alert - north side						20%			
	Amber alert - south side						9%			
	Red alert - south side						13%			
Bus reliability (EWT)	Forecast EWT	EWT mean	EWT mean	EWT mean				EWT mean	EWT mean	Change from London-wide average, on the basis that currently bus reliability at Blackwall Tunnel is significantly worse than average.
	Amber alert	-2%	-2%	-2%				-2%	-2%	
	Red alert	-5%	-5%	-5%				-5%	-5%	
Road safety	Amber alert - SI	1-2	1-2	1-2						Absolute numbers of KSIs.
	Red alert - SI	>2	>2	>2						
	Amber alert - Fatal	>0	>0	>0						
	Red alert - Fatal	>1	>1	>1						
Junction performance	Forecast DoS							Tbc	Tbc	Change from baseline. Forecast change will be determined based on baseline conditions.
	Amber alert							Tbc	Tbc	
	Red alert							Tbc	Tbc	

Appendix F Potential mitigation measures

Potential mitigation measures, delivery mechanisms and impacts covered

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Variation of the user charge	Varying the user charge can be used as a tool to manage traffic demand on the network. An effective charge ensures efficient flow of traffic and reduced adverse environmental impacts.	TfL would administer this through the Charging Policy and Procedures document (CPAP)	✓	✓	✓	
Changes to charging regime for particular groups	The user charge can be varied for specific vehicle types or users.	TfL would administer this through the Charging Policy and Procedures document (CPAP)	✓	✓	✓	✓
Discount on user charge for low income users	Reduce the cost of the user charge and therefore increase the net-benefits for low income users	TfL would administer this through the Charging Policy and Procedures document (CPAP)				✓
Introduction or alteration of emissions based charging	To encourage the cleanest vehicles and/or discourage the dirtiest vehicles	TfL would administer this through the Charging Policy and Procedures document (CPAP)		✓		

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Introduction of a user charge at adjacent crossings	A user charge could be introduced at adjacent river crossings. This would provide a mechanism for managing demand at other river crossings.	TfL would administer this through its existing powers under section 295 of, and Schedule 23 to, the Greater London Authority Act 1999. In the case of the Woolwich Ferry it would be necessary to repeal or amend the Metropolitan Board of Works Act 1885.	✓	✓	✓	

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Improvements to Woolwich Ferry vehicle waiting areas, including potential reconfiguration	Improvements to the waiting areas could lead to more efficient utilisation of available space and reduce the likelihood of traffic queuing to use the service impacting on the local highway network	Within TfL's or the boroughs' remit where changes are implemented within the existing highway boundary. TfL has power to carry out works within or adjacent to a GLA road for the improvement or maintenance of the highway. The relevant borough has the same power in relation to any roads for which it is the highway authority.	✓			
New or enhanced bus routes	Adjusted/implemented routes can re-route bus traffic in a more efficient manner, and relieve noise and AQ problem spots	This would be delivered as per the approach set out in the Bus Strategy	✓	✓	✓	✓
Concessions on cross-river public transport	Discounts or exemptions on particular public transport routes could be applied to encourage mode shift and mitigate against potential socio-economic impacts of the user charge	TfL would administer this through the Charging Policy and Procedures document (CPAP) and the Bus Strategy				✓

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Use of low emission buses	Using low emission buses only to cross the river can help mitigate harmful AQ effects. This can be useful if traffic is in congested conditions.	This would be delivered as per the approach set out in the Bus Strategy		✓	✓	
Technology to encourage take up of low emission vehicles	To encourage the cleanest vehicles and/or discourage the dirtiest vehicles	Dependent on technology utilised		✓		
Change in existing signal timings to manage localised congestion, air quality and/or noise impacts.	By re-distributing the length of total green time received by each arm, more green time can be given to the arm experiencing an increase in flow and/or delay in order to smooth the operation of the junction. Where operational, SCOOT will respond automatically to fluctuations in traffic flow through the use of on-street detectors embedded in the road. Changes in signal timings can also serve to reduce severance and improve crossing opportunities for pedestrians and cyclists.	In relation to all roads in London, functions in respect of traffic signals under sections 65, 73, 74 and 75 of the Road Traffic Regulation Act 1984 are vested in TfL. See section 275 Greater London Authority Act 1999.	✓	✓	✓	

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Introduction of new signals to manage localised congestion, air quality and/or noise impacts.	The introduction of signals at priority junctions, or additional signals at part-signalised junctions can aid in smoothing traffic flow and thereby reduce delay where it is problematic. The introduction of new signals can also serve to reduce severance and improve crossing opportunities for pedestrians and cyclists.	In relation to all roads in London, functions in respect of traffic signals under sections 65, 73, 74 and 75 of the Road Traffic Regulation Act 1984 are vested in TfL. See section 275 Greater London Authority Act 1999.	✓	✓	✓	
Minor junction or geometry changes to manage localised congestion, air quality and/or noise impacts.	Minor changes to junctions or links (e.g. small scale widening, changes to turning movements, flare lengths, crossing locations) can add capacity to a link or junction where constraints and hence delay are being experienced. Such changes can also serve to improve road safety at those locations and to reduce severance for pedestrians and cyclists.	Within TfL's or the boroughs' remit where changes are implemented within the existing highway boundary. TfL has power to carry out works within or adjacent to a GLA road for the improvement or maintenance of the highway. The relevant borough has the same power in relation to any roads for which it is the highway authority.	✓	✓	✓	

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Traffic management measures to manage localised congestion, air quality and/or noise impacts.	To control and restrict traffic by direction, time of day and/or vehicle class/type to mitigate localised environmental impacts.	TfL's or the boroughs' existing powers under the Road Traffic Regulation Act 1984.	✓	✓	✓	
Priority measures for different user groups e.g. bus lanes to manage localised congestion, air quality and/or noise impacts.	To improve journey times for particular user groups to ensure they are not adversely affected.	TfL's or the boroughs' existing powers under the Road Traffic Regulation Act 1984.	✓	✓	✓	
Adjust speed limits to manage localised congestion, air quality and/or noise impacts.	A reduction in speed limit can smooth traffic flows and reduce congestion. A change to speed limits may also influence journey times and consequently traffic flows, potentially leading to localised environmental improvements. Adjusting speed limits can also serve to improve road safety.	TfL's or the boroughs' existing powers under the Road Traffic Regulation Act 1984.	✓	✓	✓	

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Pedestrian (and cyclist) crossings to reduce severance and/or improve road safety.	Where an increase in flow creates severance problems, the introduction of different types of pedestrian crossings can improve crossing opportunities for pedestrians (and cyclists) and improve road safety.	TfL has power to carry out works within or adjacent to a GLA road for the improvement or maintenance of the highway. The relevant borough has the same power in relation to any roads for which it is the highway authority.				✓
HGV bans to manage localised congestion, air quality and/or noise impacts.	Banning HGVs from using certain roads can help to manage any adverse displacement of HGV traffic and concentrate HGV traffic on strategic routes, able to accommodate these movements.	TfL's or the boroughs' existing powers under the Road Traffic Regulation Act 1984.	✓	✓	✓	
Noise barriers to manage localised noise impacts.	Noise barriers can be effective in reducing the impact of traffic noise on receptors.	TfL has the power to carry out works within or adjacent to a GLA road for the improvement or maintenance of the highway. The relevant borough has the same power in relation to any roads for which it is the highway authority.			✓	

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Low noise surfacing to manage localised noise impacts.	Low noise surfacing can be effective in reducing the impact of traffic noise on receptors.	TfL has the power to carry out works within or adjacent to a GLA road for the improvement or maintenance of the highway. The relevant borough has the same power in relation to any roads for which it is the highway authority.			✓	
Business Transition Scheme	Help businesses to plan their movements in the most cost-efficient way and to act as a potential brokerage service for new opportunities	TfL would fund the Scheme, elements of which would be administered by boroughs				✓
Funding local-led business/labour market support	Concessions can be given for local residents, workers, and businesses for crossing the river.					✓
Freight and servicing management in local centres	Local coordination of freight and servicing trips can help to reduce the number of these trips on the local network.		✓	✓		✓

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Engagement with schools	Work with schools to raise awareness about air pollution and the measures that can be taken to reduce emissions e.g. Supporting schools to implement travel plans.			✓		✓
Public realm improvements, including improvements to facilities for pedestrians and cyclists	Public realm improvements to improve conditions for road users including pedestrians and cyclists.	TfL has the power to carry out works within or adjacent to a GLA road for the improvement or maintenance of the highway. The relevant borough has the same power in relation to any roads for which it is the highway authority.		✓	✓	✓
Designate Air Quality focus / management areas	Liaison with communities can help identify areas to be safeguarded and maintained as cleaner air spaces.			✓		✓

Mitigation	Effect	Delivery	To address these impacts:			
			Traffic	AQ	Noise	Other
Controlled parking zones and parking management	Better control of on-street parking, which can help to improve network performance and conditions for pedestrians and cyclists	TfL's or the boroughs' existing powers under the Road Traffic Regulation Act 1984.	✓			✓
Improvements to signage and wayfinding	Improved signage could help to improve network performance and aid wayfinding by road users	TfL's or the boroughs' existing powers under the Road Traffic Regulation Act 1984.	✓			
Measures to encourage mode shift from private vehicles to public transport, walking and cycling, for example improvements to pedestrian and cyclist facilities, travel planning and associated measures	Increased take up of sustainable and active travel in local areas impacted by the Scheme, potentially to offset residual impacts not addressed by other measures	Delivered by boroughs or TfL under existing powers	✓	✓	✓	✓